The Dynamics of Firm Lobbying[†]

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How is economic policy made? In this paper we study a key determinant of the answer to the question: lobbying by firms. Estimating a binary choice model of firm behavior, we find significant evidence for the idea that barriers to entry induce persistence in lobbying. The existence of these costs is further confirmed in studying how firms responded to a particular policy change: the expiration of legislation relating to the H-1B visa. Due to its influence on firm behavior, we argue that this persistence fundamentally changes the environment in which legislation is made. (*JEL* D22, D72, D78, L21)

Lobbying is a primary avenue through which firms attempt to change economic policy in the United States, with total expenditures far outnumbering contributions to political action committees (PACs). While lobbying by businesses is a frequently debated issue in popular discourse, there is little systematic empirical evidence on these behaviors at the firm level. Estimating a model of firm behavior on a newly constructed dataset on firms' lobbying expenditures and operations, we find evidence that barriers to entry induce persistence in lobbying across a number of different econometric approaches. These findings are further confirmed in studying firms' behavior in response to the decline in H-1B visas that occurred in 2004. We hope that our findings will help guide future work in political economy and inform debates over the role of large corporations in influencing policy decisions.

Prior empirical work on firm participation in the policy making process has suffered significantly from data constraints. Most of the available evidence that we do have comes from data on campaign contributions.[1] These contributions often come from PACs, which can be set up and organized by firms but which must raise money

[1] See Grenzke (1989), Grier, Munger, and Roberts (1994), Romer and Snyder (1994), Hansen and Mitchell (2000), and Cooper, Gulen, and Ovtchinnikov (2010). Studies of politically connected firms include Lenway, Morck, and Yeung (1996), Fisman (2001), Faccio (2006), Faccio, Masulis, and McConnell (2006), Jayachandran (2006), Bertrand et al. (2011), Coates (2011), and Igan and Mishra (2011). For discussions

from voluntary donations from individuals. These studies have addressed such questions as the correlation between political activity and firm size as well as the effect that contributions have on a firm's stock market price. Little work has been done, however, either empirically or theoretically, in looking at the determinants of firm efforts in a dynamic context. With the exception of Facchini, Mayda, and Mishra (2011), the empirical literature on the role of interest groups in shaping immigration policy is also quite thin.

We argue that upfront costs and returns to experience both act as barriers to entry to beginning to lobby. While these mechanisms have been studied in prior work, their importance in potentially inducing state dependence in lobbying is an open question. A priori, there are reasons to believe that lobbying could exhibit significant entry and exit over time. For example, the maxim that "a week is a lifetime in politics" suggests that firms might only lobby when legislation directly affecting them is actively being considered. This could induce significant entry and exit based on the changing political environment.[2] This intuition comes out of our model below; if there are no returns to experience or upfront costs of engaging in lobbying, firms should base their decisions of whether or not to lobby solely on what is most profitable in the current period.

There are several reasons why firms might benefit from experience in lobbying. The political science literature has long stressed the importance of establishing continuing relationships with policymakers for the effectiveness of interest groups' efforts. In the context of PAC contributions, Snyder, Jr. (1992, 17) has suggested that "...contributors must develop a relationship of mutual trust and respect with office holders in order to receive tangible rewards for their contributions." A similar dynamic may be at play with lobbying as well. For example, to the extent that lobbying represents a legislative subsidy to sympathetic policymakers (Hall and Deardorff 2006), politicians may require an initial investment of time and resources to signal a firm's willingness to support them. It has also been suggested that firms may become more effective at lobbying over time, as they learn more about the process and the most effective ways to pursue their interests. The legal rules about lobbying can be quite complex and several studies have noted that managers of firms often need to invest significant time in learning about the process when the firm begins lobbying.[3] Firms may also gain from learning about policymakers' private dispositions, which may not be fully reflected in their public positions (e.g., how much time they are willing to spend on a particular issue). As the costs of learning and establishing relationships with policymakers are likely to be the highest in a firm's first several years of lobbying, we consider them as barriers to entry.

The idea that there are upfront costs to engaging in lobbying has also had a significant history. Such costs could include: the initial costs of searching for and hiring

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of the lobbying process, see Ansolabehere, de Figueiredo, and Snyder (2003) and Facchini, Mayda, and Mishra (2011). Recent firm-level empirical work on lobbying includes Richter, Samphantharak, and Timmons (2009) and Igan, Mishra, and Tressel (2011). The literature on the political economy of trade, in contrast, is much further developed theoretically and empirically (e.g., Grossman and Helpman 1994, Mitra 1999, Gawande and Bandyopadhyay 2000, Ludema, Mayda, and Mishra 2010, Bombardini and Trebbi 2011).

[2] For discussions of how the legislative agenda can change quickly and in an unpredictable fashion, see Kingdon (2002).

[3] See, for example, the discussion in the dissertation by Drutman (2010).

the right lobbyists; educating these new hires about the details of the firm's interests; developing a lobbying agenda; researching what potential allies and opponents are lobbying for; and investigating how best to attempt to affect the political process (e.g., in which policymakers to invest). Salamon and Siegfried (1977, 1031) cite evidence from Bauer, Pool, and Dexter (1963) to argue that "...firm size is an important determinant of the political activity of executives, since the executives of large firms could afford the luxury of hiring staffs and taking the time to inform themselves about policy issues. What makes the absolute size of available resources, and hence firm size, so important politically is the fact that political involvement has certain fixed costs attached to it..." More recently, Bombardini (2008) has developed a model in which upfront costs affect firms' decisions of whether or not to lobby. She uses data on campaign contributions to demonstrate that her approach fits the data on the industry-level structure of tariffs better than prior models. Masters and Keim (1985) and Grossman and Helpman (2001) additionally consider the effects of these costs.[4]

To shed light on these issues, we match data on firms' lobbying expenditures with other aspects of their operations. These data exhibit several striking features. The first is that few firms lobby, even in our sample of publicly traded firms—only 10 percent of the firms in our sample engage in lobbying in one or more years over 1998–2006. Second, we find that lobbying is strongly related to firm size. This is especially true at the extensive margin of whether or not firms lobby, but less so at the intensive margin of how much firms spend on lobbying once the decision has been made to participate in the process. Finally, we find that lobbying status is highly persistent over time. The probability that a firm lobbies in the current year given that it lobbied in the previous year is 92 percent. This fact, combined with the relationship between firm size and lobbying, means that in a typical year 96 percent of total expenditures come from firms that were lobbying in the prior year.

To test whether the persistence in whether a firm lobbies or not is a result of state dependence or other factors such as firm characteristics, we construct a dynamic model of firm lobbying behavior. In this model, we explore the possibility that either of two mechanisms might induce state dependence. First, firms have to pay a one time sunk cost when they begin to lobby. These costs then create an option value associated with continuing to lobby; once firms have entered the political process, they tend to stay in because they would prefer not to spend the money to set up a lobbying operation again in the near future. Second, the benefits to a firm of lobbying are allowed to increase with experience. This can reflect a number of considerations mentioned above, such as the returns from building relationships with policymakers. Prior lobbying raises the probability of doing so today because the benefits are larger. This approach then implies an estimating equation for the probability that a given firm lobbies in a particular year. Across a number of different estimation approaches we find significant evidence of state dependence in lobbying, where prior experience has a direct impact on a firm's current status.

To further test these predictions, we then look in depth at a specific policy shift that has been the subject of significant public debate: the dramatic decline in the limit on

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[4] See also the work of Olson (1965) and Mitra (1999).

H-1B visas that occurred in 2004. This decline was due to the expiration of prior legislation and was predetermined before the start of the sample. Constructing a smaller panel of firms that are likely to be responsive to changes in immigration policy, we show that this event precipitated a significant shift in firms' behavior for those that had lobbied previously for other issues. The manner in which this adjustment occurs indicates little constraint on shifts across issues important for firms if they are already lobbying. At the same time, we find that changes in the cap did not have an effect on the extensive margin of lobbying; the decline in the limit on H-1B visas did not induce new firms to begin to lobby, even among those very dependent upon the program. We consider the large shift in the intensive margin relative to that of the extensive margin as corroborating evidence for the existence of barriers to entry.

Our paper contributes to the nascent empirical literature on lobbying and represents one of the first to study this behavior at the firm level. The results argue that the dynamic nature of lobbying status is a feature that should be included in both future theoretical and empirical work. In particular, models of special interest politics would likely benefit from introducing dynamics with persistence in the set of actors engaged in influencing policy. Empirically, selection into lobbying is driven by a number of distinct factors and studies that fail to address this issue will find biased results. This applies to a wide range of topics, from the impact of lobbying on firm performance to the determinants of trade protectionism.

Our results further speak to the reasons for stability in economic policy. The determinants of this stability are a primary issue in political economy and one that has significant implications for welfare. On one hand, it can provide certainty for firms in terms of making investment and hiring decisions. This certainty has been shown to have significant impacts on macroeconomic outcomes.[5] On the other, this persistence makes it less likely that reforms are enacted, including those that would have positive and negative impacts on welfare. Prior explanations for this persistence include the creation of vested interests (e.g., Brainard and Verdier 1994, and Coate and Morris 1999) and uncertainty about the gains and losses to different groups resulting from a policy reform (e.g., Fernandez and Rodrik 1991). Our work adds to these explanations by arguing that barriers to entry induce persistence in firms' efforts to affect the political process, in essence fixing the "players in the game," which in turn contributes to greater stability in policy. The literature on the reasons for persistence in economic policy in particular has had a long and distinguished history, and our work offers an additional rationale.

The existence of barriers to entry for firms in lobbying directly may also help to explain why they often join together to form associations. In particular, they may play a role in explaining why many small firms do not lobby directly but do belong to groups like the Chamber of Commerce. For example, the website of this influential group touts the fact that 96 percent of its members are small businesses with 100 employees or fewer. In a similar vein, these costs may also affect how firms respond to changes in the political environment. For example, Dharmapala, Foley, and Forbes (2011) describe an episode in which multinationals organized to lobby

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[5] See, for example, Bernanke (1983), Rodrik (1991), and Baker, Bloom, and Davis (2013) among others.

for a temporary tax holiday. We find a similar type of response to the immigration policy change that we study, with Compete America and TechNet as two examples of groups that formed around this issue. These efforts, however, were less important in our context than the direct activities of large firms. More recent efforts to reform the immigration system have also led to the formation of associations of firms.

In the next section we describe our data and a number of stylized facts that are suggestive of the existence of barriers to entry. We then develop our model of firm behavior and empirical approach in Section II. The results from our baseline estimations as well as a number of robustness checks are presented in Section III. Section IV considers evidence on barriers to entry from responses to changes in immigration policy and Section V concludes.

I. Data and Stylized Facts

Our data come from a number of sources. The primary information on firms' operations comes from Compustat and serves as the platform upon which we build. These data contain a wealth of information on the operations of publicly traded companies in the United States, including sales, employment, assets, and research and development expenditures. Information on industry imports comes from the Center for International Data at the University of California at Davis. Data on lobbying behavior is available due to the Lobbying Disclosure Act of 1995, which was subsequently modified by the Honest Leadership and Open Government Act of 2007. This act requires individual companies and organizations to provide a substantial amount of information on their lobbying activities. Since 1996, intermediaries who lobby on behalf of companies and organizations have had to file semi-annual reports to the Secretary of the Senate's Office of Public Records (SOPR). These reports list the name of each client, the total amount of funds that they have received from each client, and a listing of a pre-specified set of general issues for which they lobbied for each client. All firms with in-house lobbying departments are required to file similar reports, stating their total lobbying expenditures directed towards in-house lobbying activities or external lobbyists. Table A1 in the Appendix shows the list of pre-specified 76 general issues given to each respondent, at least one of which has to be entered. For each general issue, the filer is also required to list the specific issues which were lobbied for during the semi-annual period. Thus, unlike PAC contributions, lobbying expenditures of companies can be associated empirically with very specific, targeted policy areas.[6]

We compile comprehensive data on lobbying behavior from the websites of the Center for Responsive Politics (CRP) and the SOPR in Washington, DC. Figure A1 in the Appendix shows part of the report filed by Microsoft for its lobbying

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[6] According to the Lobbying Disclosure Act, the term "lobbying activities" refers to "lobbying contacts and efforts in support of such contacts, including preparation and planning activities, research and other background work that is intended, at the time it is performed, for use in contacts, and coordination with the lobbying activities of others." We abstract from the decision to lobby by setting up an in-house lobbying department or by hiring external consultants. While setting up a whole office for in-house operations is likely more expensive, if a firm employs a lobbyist externally the new hire still has to spend a significant amount of time learning the particular needs and characteristics of their new client and how items currently on the agenda will affect them specifically.

expenditures between January–June 2005. Microsoft lists "immigration" as a general issue and lists "H-1B visas," "L-1 visas," and "PERM (Program Electronic Review Management System)" as specific issues under immigration. Besides immigration, Microsoft also lists eight other issues in this report that are not shown. Given our interest in studying firms' responses to changes in high skilled immigration policy in Section IV, we went through the specific issues listed in each report under the general issue "Immigration" to determine lobbying specifically for high skilled immigration topics. The specific issues that are listed are often bills proposed in the US House and Senate. For example, H.R. 5744: Securing Knowledge, Innovation, and Leadership Act of 2006 and S. 1635: L-1 Visa Reform Act of 2004 are bills that we deemed to be relevant for high skilled immigration. In addition to mentioning specific bills, firms also mention "H-1B visas," "L-1 visas," "high skilled immigration," and the like in their lobbying reports. We define a firm to be lobbying for high skilled immigration in any of these cases. In these data 15 percent of the top 2000 lobbyists are associations of firms. For our analysis of firms' responses to changes in immigration policy, we also use data on applications for H-1B visas and the ethnic composition of a firm's workforce. These data are described in Section IV.

We begin by establishing a number of new facts about the lobbying behavior of firms over time. We consider a balanced panel of US headquartered firms over the period 1998–2006 that have full sales and employment data. This approach allows us to abstract from the decision to take a company public as well as entry and exit into production. The resulting sample contains 3,260 firms and 29,340 observations.[7] Table 1 presents a number of descriptive statistics for all of the firms in the sample, as well as for firms that lobby and those that do not. As mentioned above, one of the clearest stylized facts that emerges from these figures is that very few firms lobby. This is striking, as our data only contain publicly traded companies. These firms are by and large of significant size and thus more likely than a typical private firm to lobby.

Table 2 lists the top firms in the sample that lobby along with their total lobbying expenditures during the sample period. Microsoft tops the list with 58 million dollars. While there is some shuffling in the relative ranks in this list across years, there is stability in the set of top firms generally. We find that these top firms have a disproportionate impact; each lobbies in every year of our sample and together they account for 35 percent of expenditures. These facts also likely contribute to the persistence that we see in economic policy.

We additionally find that both the intensive and extensive margins of lobbying are related to firm size. The average firm that lobbies sells roughly four times more than firms that do not lobby, even in our sample of relatively large firms. Employment and assets are similarly three and a half times and two times larger, respectively. While firms that lobby are only slightly more likely to engage in research and development (R&D), they tend to spend a significantly larger amount on R&D if they do engage in it. These results on firm size are consistent with the literature on campaign

[7] Data in Compustat are based on each company's fiscal year. As discussed below, we lag Compustat data by one year when merging with the lobbying data. With both the lobbying data and the patenting data described later, we invested substantial effort in identifying subsidiaries and appropriately linking them to parent firms.

TABLE 1—DESCRIPTIVE STATISTICS FOR FIRM PANEL

	All firms	Non-lobbying firms	Lobbying firms
Annual sales ($m)	1,823	1,423	5,407
	(8,046)	(7,179)	(12,995)
Annual employment (k)	8	7	23
	(38)	(37)	(45)
Annual assets ($m)	4,046	3,726	6,914
	(30,732)	(31,764)	(18,896)
Share of firms engaging in R&D	44	43	53
	(50)	(49)	(50)
Annual R&D expenditures ($m)	91	50	1,874
	(462)	(297)	(8,245)
Median lobbying expenditures ($m)			0.164
Average lobbying expenditures ($m)			0.475
			(0.892)
Share of firms that lobby in a given year	6.2		
Share of firms that ever lobby	10.0		
Number of firms	3,260	2,933	327
Observations	29,340	26,397	2,943

Notes: The sample includes 3,260 firms over 1998–2006 for a total of 29,340 observations. Firm operations data are taken from Compustat. Annual R&D expenditure figures are only for firms that perform some R&D. Median and average lobbying expenditure figures are similarly only for firms that lobby. All amounts are in constant 1998 dollars. Statistics for shares are all in percentage points. Standard deviations are denoted in parentheses.

TABLE 2—TOP FIRMS BY LOBBYING EXPENDITURES

Rank	Company name	Total spent on lobbying 1998–2006 ($m)
1	Microsoft	58
2	Amgen	37
3	Johnson and Johnson	31
4	Honeywell International	29
5	Union Pacific Railroad	27
6	Dow Chemical	27
7	Procter and Gamble	25
8	Schering-Plough	23
9	Wyeth	22
10	British Petroleum	22

Notes: Table lists the top ten firms in our sample of 3,260 firms in terms of their lobbying expenditures over 1998–2006. While there is some shuffling across the relative ranks in this list across years, there is stability in the set of top firms generally. All amounts are in constant 1998 dollars.

contributions, reflecting the correlation between lobbying efforts and PAC contributions. Considering the intensive margin relationship between firm size and lobbying, there is a correlation of 28 percent between sales and lobbying expenditures. Alternatively measuring this intensive margin relationship with employment and lobbying expenditures yields a correlation of 19 percent. The somewhat weaker correlation between firm size and lobbying on the intensive margin relative to that on the extensive margin is consistent with the existence of barriers to entry. If no such
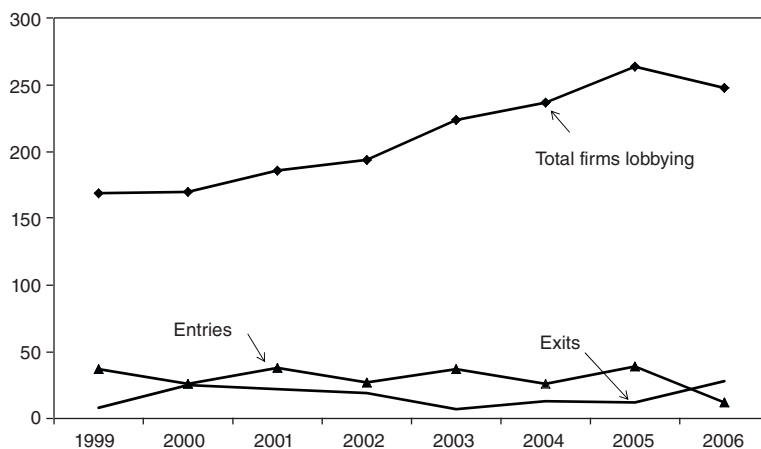
FIGURE 1. ENTRIES, EXITS, AND TOTAL FIRMS LOBBYING

Note: Figure plots the total number of firms lobbying in each year as well as aggregate annual entries and exits from lobbying activity.

barriers existed, we might expect a significantly stronger correlation between firm size and lobbying expenditures on the intensive margin.

Another particularly striking feature of the data is the high degree of persistence of firm lobbying behavior over time. Given that a firm lobbied last year, the unconditional likelihood of lobbying in the current year is 92 percent. Figure 1 plots the total number of firms lobbying as well as the total number of entries and exits in each year of our sample. Entries and exits are small relative to the overall number of firms lobbying, reflecting the high level of persistence. There is little correlation between total yearly entry and exit rates. The total number of firms that lobby in our sample increases steadily over time, with entries in each year regularly outnumbering exits. This pattern is consistent with the findings of Blanes i Vidal, Draca, and Fons-Rosen (2012), who document that total lobbying expenditures were roughly twice as large in 2006 as they were in 1998.

In Figure 2 we graph the persistence levels for the main two-digit North American Industrial Classification System (NAICS) industries in our sample, with all sectors having a persistence rate above 80 percent. We find similar results when considering variation in lobbying across the firm size distribution. Partitioning the data into quintiles using the sales distribution of those that lobby, we find that the level of persistence across each of the categories is above 88 percent. We also find similar results across employment quintiles. Firms that engage in R&D and those that do not have persistence levels of 93 and 90 percent respectively, further suggesting that this stability in lobbying status is unlikely to be driven primarily by firm characteristics.

As noted above, the two facts that (i) lobbying status is highly persistent over time, and (ii) lobbying is strongly associated with firm size, mean that the intensive margin of lobbying dominates annual changes in lobbying expenditures. Thus, in a typical year 96 percent of expenditures were made by firms that lobbied in the previous year. To get a sense of how this persistence affects aggregate expenditures over time, Figure 3 plots the total amount spent on lobbying based on which year
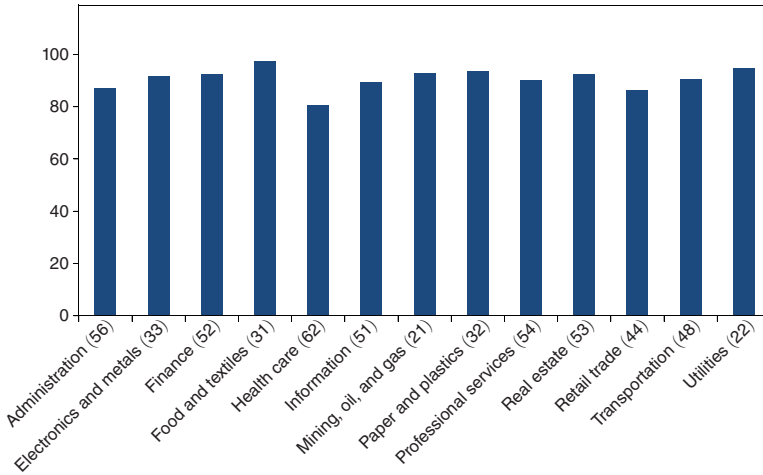
FIGURE 2. PERSISTENCE IN LOBBYING BY INDUSTRY

Note: Figure plots the average level of persistence in lobbying status for the main two-digit NAICS industries in our sample in percentage terms.
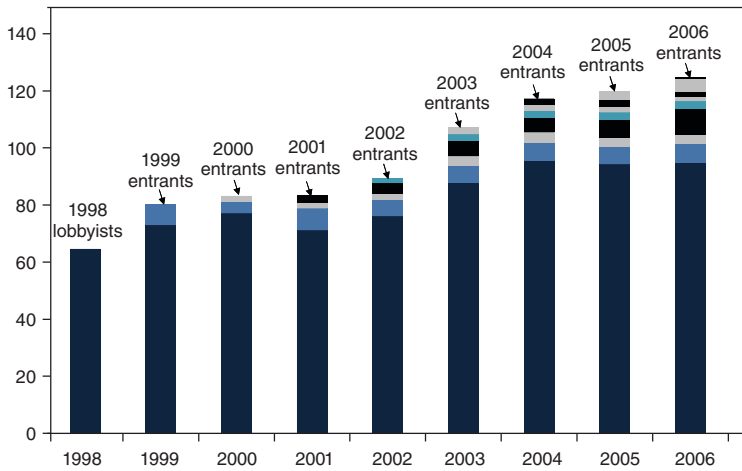

FIGURE 3. AGGREGATE ANNUAL EXPENDITURES BY ENTRY COHORT

Notes: Figure plots aggregate lobbying expendtures in millions of dollars for each cohort of entering firms, using the first year in which they lobbied in the sample. Amounts are in constant 1998 dollars.

firms first began lobbying in the sample. The vast majority of resources spent over time are accounted for by firms that were lobbying at the beginning of the sample, and this remains true even by the end of our sample eight years later. We think that this stability in firms' efforts points to a political dynamic that encourages stability in policy.
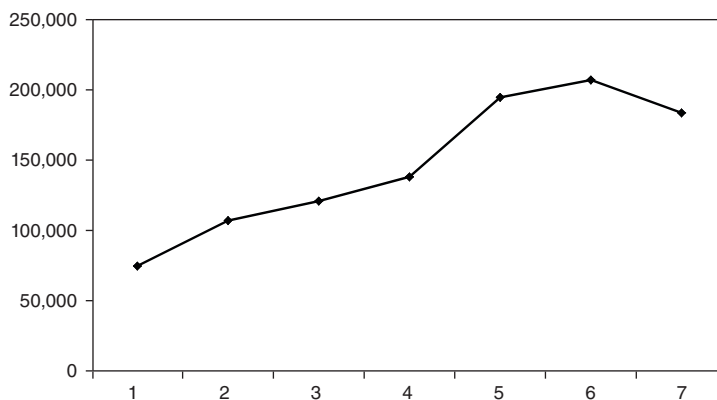
FIGURE 4. MEDIAN EXPENDITURES IN A FIRM'S FIRST YEARS LOBBYING

Notes: Figure plots median expenditures for firms in the first years after entry into lobbying, conditional on continuing to lobby. Year 1 on the *x*-axis is the first year lobbying. Amounts are in constant 1998 dollars.

In Figure 4 we plot the median lobbying expenditures for firms in each year after they begin lobbying, conditional on continuing to lobby. If upfront costs exist, it would make sense for firms to enter lobbying when the size of their potential efforts reaches a certain scale. Thus, initial expenditures would be of at least modest size. If the returns to lobbying increase with experience, it would make sense for firms to increase expenditures as they become more well connected and learn more about the political environment. We construct this figure by considering firms that began lobbying after the start of our sample and continued lobbying in each year afterwards until the end of our sample. Outlays jump up initially to $74,000 and then rise steadily to approximately $200,000, staying roughly flat thereafter. This pattern of starting out with modest lobbying and then increasing expenditures with time holds when looking at detrended values and mean values as well. We interpret these trends as preliminary evidence of the types of barriers to entry that we consider.

One central concern in studying the dynamics of firm lobbying is measurement error in the variable for lobbying status. Under the Lobbying Disclosure Act, lobbying firms are required to provide a good-faith estimate rounded to the nearest $20,000 of all lobbying-related income in each six-month period. Likewise, organizations that hire lobbyists must provide a good-faith estimate rounded to the nearest $20,000 of all lobbying-related expenditures in a six-month period. An organization that spends less than $10,000 in any six-month period does not have to state its expenditures; if lobbying is not disclosed in such cases, the figure is reported in the data as zero. Thus, as long as a firm spent $20,000 or more in a given year, lobbying status will be correctly observed. Looking at the data, average yearly lobbying expenditures for active firms are $475,000 and the median value is $164,000. 95 percent of firm-year observations that report positive lobbying expenditures list amounts greater than $32,000. We see little clustering around the $20,000 threshold; much of the remaining observations report expenditures of less than $20,000, either due to costs of more than $10,000 in a six-month period or reporting even when it is

TABLE 3—PERCENTAGE OF AGGREGATE EXPENDITURES BY LOBBYING ISSUE

Entire lobbying dataset		Firm sample		Firm sample: R&D firms		Firm sample: Non-R&D firms	
Taxes	7.5	Taxes	9.2	Budget/appropriations	8.5	Taxes	10.4
Budget/appropriations	6.6	Budget/appropriations	7.4	Taxes	8.4	Budget/appropriations	5.7
Health issues	5.0	Trade	5.8	Trade	7.2	Energy	5.5
Trade	4.7	Health issues	5.7	Health issues	6.8	Environment	4.5
Environment	3.6	Defense	4.7	Defense	6.3	Health issues	4.1
Transportation	3.3	Patents	3.9	Patents	5.5	Utilities	3.8
Energy	3.1	Environment	3.7	Medicare	4.4	Trade	3.7
Labor issues	3.1	Medicare	3.5	Computer industry	3.6	Telecommunications	3.4
Government issues	3.1	Energy	3.4	Environment	3.1	Broadcasting	3.1
Medicare	2.7	Telecommunications	2.9	Consumer issues	3.1	Labor issues	2.9

Notes: Table lists the top 10 issues lobbied for in (i) the entire lobbying dataset, (ii) our sample of 3,260 firms, (iii) the set of firms in our sample that conduct R&D and (iv) those that do not. Figures are in percentage points. Estimates are constructed by first dividing the amount spent by a firm in each year by the total number of issues for which it reported. We then apportion the amount equally to each issue and then aggregate across firm-year observations to get a total figure for each issue. These estimates are then divided by the total level of aggregate expenditures to get percentage estimates. Some issue names are abbreviated for presentation. Appendix Table 1 contains the full names of the issues listed here. In our firm sample Defense and Patents tend to be more important issues relative to lobbying overall. This is driven primarily by the firms that conduct R&D in our sample. These R&D firms also lobby relatively more for the issue of Federal Budget and Appropriations as well as Trade (Domestic and Foreign).

not required. As a result, we think that the measurement error induced by reporting requirements is likely to be minimal.

Considering the composition of these expenditures, the average number of issues for which these firms lobbied is 4.3 and the median is 2. These figures decline somewhat over the sample period, such that the increase in total lobbying expenditures found in Figure 3 comes from expansions in the amount spent per issue and the number of firms that lobby. In particular, the total increase in expenditures in our sample can be attributed to a 77 percent increase in the number of firms lobbying, a 20 percent decrease in the average number of issues lobbied for, and a 37 percent increase in the average amount spent per issue. There is also substantial variation in the number of issues lobbied for, even conditional on expenditures. The correlation between these two measures is 55 percent. Notably, there is significantly less persistence in lobbying for particular issues than there is for overall lobbying status. Fully 60 percent of firms that lobby across adjacent years switch the set of issues that they report.

Table 3 provides a list of the top ten issues that are lobbied for overall as well as for by companies in our sample. We rank the issues based on a rough estimate of the percentage of total lobbying expenditures going to these issues. We develop this figure by dividing the amount spent by a firm in each year by the total number of issues for which it reported. We then apportion the amount equally to each issue and then aggregate to get a total figure. Thus, according to this rough estimate, 9.2 percent of total lobbying expenditures by these firms is on subjects relating to taxes. We find a similar ranking when just considering the frequency of how often lobbying firms list each issue.

The top issues that the companies in our sample lobby for are similar to overall lobbying efforts, with some extra emphasis on Defense and Patenting. Columns 3 and 4 demonstrate that this difference is primarily driven by the firms in our sample

that engage in R&D activity. These findings also suggest that what firms lobby for is closely related to their specific characteristics and that firms should be more sensitive to policy developments that have an impact on their particular interests. We return to these issues below. In contrast, very similar figures for the most important issues are found across election years versus non-election years, pointing to a dynamic in which elections in and of themselves do not dramatically shift the set of issues on which firms lobby in the aggregate.

II. Model and Estimation Approach

To better understand the determinants of the dynamics of lobbying, we consider a model of firm behavior. Our work extends the approach used in the literature on international trade.[8] We incorporate two mechanisms that could induce persistence in lobbying—the effects of sunk entry costs and returns to experience. If there are upfront costs to beginning to lobby, then there should be an option value associated with being involved in the political process. Additionally, if there are returns to experience in lobbying, firms have added incentives to continue lobbying once they begin.

We begin by defining $\pi_{it}(\mathbf{p}_t, \mathbf{s}_{it}, \mathbf{A}_{it})$ as the additional profits that firm i could make in year t if it lobbies. This level is dependent on (i) exogenous processes $\mathbf{p}_t$, such as the business cycle and political climate, (ii) firm-level state variables $\mathbf{s}_{it}$, such as the capital stock, and (iii) the firm's experience in lobbying $\mathbf{A}_{it}$. In defining $\pi_{it}(\mathbf{p}_t, \mathbf{s}_{it}, \mathbf{A}_{it})$ as the additional profit that a firm could make in period t if it lobbied relative to the state in which it did not lobby, the model is able to accommodate the fact that the firm has other avenues through which it can affect policy outcomes. This allows us to focus on direct lobbying by firms. We assume that once they begin, lobbying firms can alter the amount that they spend costlessly, making π_{it} the profit-maximizing level of additional profits. We will return to the validity of this assumption in looking at how firms responded to changes in immigration policy in Section IV.

We further define L_{it} as an indicator variable for whether firm i lobbies in year t. $\mathbf{L}_{it}^{(-)} = \{L_{it} \mid j = 0, 1, 2, \ldots, J_i\}$ denotes the firm's lobbying history where J_i is the firm's age. Firms decide on a series of future lobbying choices $\mathbf{L}_{it}^{(+)} = \{L_{i,t+j} \mid j \geq 0\}$ that maximize the expected present value of profits. The first time that firms lobby, they have to pay a one time cost F_0. In order to account for the possibility that re-entering the process after only a few years of not lobbying is less (or more) costly than entering anew, we define the re-entry cost F_j as the expenditure that a firm needs to incur if it stopped lobbying j periods ago and wants to begin again. Related, we define $\tilde{L}_{i,t-j} = \left(L_{i,t-j} \prod_{k=1}^{j-1}(1 - L_{i,t-k}) \right)$ as an indicator for whether the firm last

lobbied j periods ago. Using this expression, we can then write the net profits from lobbying for the firm as

$$(1) \quad R_{it}(\mathbf{L}_{it}^{(-)}) = L_{it}\Big[\pi_{it}(\mathbf{p}_t, \mathbf{s}_{it}, \mathbf{A}_{it}) - F_0(1 - L_{i,t-1}) - \sum_{j=2}^{J_i}(F_j - F_0)\tilde{L}_{i,t-j}\Big].$$

Given this expression, we can write the firm's dynamic problem. It selects the sequence $\mathbf{L}_{it}^{(+)}$ that maximizes the expected present value of payoffs today subject to the discount rate δ. Denoting $E_t(\cdot)$ as the expected value in period t conditional on the information set Ω_{it}, we can thus write

$$(2) \qquad\qquad V_{it}(\Omega_{it}) = \max_{\mathbf{L}_{it}^{(+)}} E_t\Big(\sum_{j=t}^{\infty}\delta^{j-t}R_{ij}\,|\,\Omega_{it}\Big).$$

In a dynamic programming context, we can additionally write the firm's choice of whether or not to lobby today L_{it} as the value that meets the following condition

$$(3) \qquad\quad V_{it}(\Omega_{it}) = \max_{L_{it}} R_{it}(\mathbf{L}_{it}^{(-)}) + \delta \cdot E_t\{V_{i,t+1}(\Omega_{i,t+1})\,|\,\mathbf{L}_{it}^{(-)}\}.$$

Using our expression for $R_{it}(\mathbf{L}_{it}^{(-)})$ from above and comparing the difference in the net benefits between choosing $L_{it} = 1$ versus $L_{it} = 0$, the firm will lobby in the current period if

$$(4) \quad \pi_{it}(\mathbf{p}_t, \mathbf{s}_{it}, \mathbf{A}_{it}) + \delta\big[E_t(V_{i,t+1}(\Omega_{i,t+1})\,|\,L_{it} = 1) - E_t(V_{i,t+1}(\Omega_{i,t+1})\,|\,L_{it} = 0)\big]$$

$$\geq F_0 - F_0 \cdot L_{it-1} + \sum_{j=2}^{J_i}(F_j - F_0)\tilde{L}_{i,t-j}.$$

Here the term $\delta[E_t(V_{i,t+1}\,|\,L_{it} = 1) - E_t(V_{i,t+1}\,|\,L_{it} = 0)]$ represents the option value associated with being able to lobby tomorrow without having to pay the upfront entry cost, which is dependent on expectations about future benefits. We can use the expression in (1) to estimate the determinants of lobbying. In order to simplify notation, we first define

$$(5) \quad \pi_{it}^* \equiv \pi_{it}(\mathbf{p}_t, \mathbf{s}_{it}, \mathbf{A}_{it}) + \delta[E_t(V_{i,t+1}(\Omega_{i,t+1})\,|\,L_{it} = 1) - E_t(V_{i,t+1}(\Omega_{i,t+1})\,|\,L_{it} = 0)].$$

This provides an expression for the expected benefits that the firm plans to receive if it lobbies today. We can then write the firm's choice as a binary decision problem

$$(6) \qquad L_{it} = \begin{cases} 1 & \pi_{it}^* - F_0 + F_0 \cdot L_{it-1} + \sum_{j=2}^{J_i}(F_0 - F_j)\tilde{L}_{i,t-j} \geq 0 \\ 0 & \text{otherwise.} \end{cases}$$

To proceed with estimation, we need to develop an estimate of $(\pi_{it}^* - F_0)$. This term is likely to be determined by a number of factors, including characteristics such as firm size, experience in lobbying, and industry status as well as external

time-varying factors such as the election cycle. We thus parameterize $\pi_{it}^* - F_0$ with the functional form

$$(7) \quad \pi_{it}^* - F_0 \approx \mu_i + \lambda_1 L_{it-1} + \lambda_2 L_{it-1} L_{it-2} + \lambda_3 L_{it-1} L_{it-2} L_{it-3}$$

$$+ \lambda_4 L_{it-1} L_{it-2} L_{it-3} L_{it-4} + \gamma_2 \tilde{L}_{i,t-2} + \gamma_3 \tilde{L}_{i,t-3} + \mathbf{X}_{it}' \boldsymbol{\beta} + \phi_t + \varepsilon_{it}.$$

We assume that the firm eventually experiences diminishing marginal returns from lobbying experience, such that after four years of lobbying the marginal effect of an extra year of lobbying is negligibly small. We come to similar conclusions when alternatively extending these controls back five years. We also account for the fact that the benefits to experience for a firm may not fully dissipate upon exiting from lobbying. The term μ_i controls for unobserved time-invariant characteristics. These effects will account for a significant amount of the variation in firms' industry characteristics and geographic locations. ϕ_t similarly controls for year effects, such as the business cycle and changes in the overall political environment. The term $\mathbf{X}_{it}' \boldsymbol{\beta}$ accounts for shifts in firm characteristics, including the logarithms of sales, employees, R&D expenditures, and the level of industry imports. These variables will allow us to account for changes in firm size and issues related to intellectual property rights. It is worth noting that the variables in $\pi_{it}^* - F_0$ will affect the firm's choice to lobby based both on how they influence the current level of profits as well as the option value associated with having already established a presence in the policy making process. Thus, even if lobbying may not yield significant returns today, it may be wise to begin lobbying as an investment in future political outcomes.

This approximation then leads to the estimating equation

$$(8) \quad L_{it} = \mu_i + \xi \cdot L_{it-1} + \lambda_2 L_{it-1} L_{it-2} + \lambda_3 L_{it-1} L_{it-2} L_{it-3} + \lambda_4 L_{it-1} L_{it-2} L_{it-3} L_{it-4}$$

$$+ \zeta_2 \cdot \tilde{L}_{i,t-2} + \zeta_3 \cdot \tilde{L}_{i,t-3} + \mathbf{X}_{it}' \boldsymbol{\beta} + \phi_t + \varepsilon_{it},$$

where $\xi = \lambda_1 + F_0$ and $\zeta_j = \gamma_j + (F_0 - F_j)$. Note that these coefficients capture two effects. The first is a direct effect of past lobbying, in that firms do not have to pay the sunk cost of entry F_0 or F_j if they have been engaged previously. They also account for serially correlated (but not fixed) firm-specific benefits from lobbying that are captured by the terms λ_1 and γ_j in the parameterization of $\pi_{it}^* - F_0$.

III. Model Estimation Results

Table 4 presents the results from estimating the specification in equation (8). Consistently estimating dynamic panel data models is an active area of research, often requiring particular parametric assumptions. As such, we consider several different approaches. Given that our model leads naturally to a limited dependent variable specification, we begin by considering a random effects dynamic probit estimator that uses the methodology of Butler and Moffitt (1982). This widely used approach has the advantage of bounding our predicted values between zero and one and will provide a useful benchmark for future estimations. It does, however, necessitate

TABLE 4—DETERMINANTS OF LOBBYING PARTICIPATION, RANDOM EFFECTS DYNAMIC PROBIT ESTIMATIONS

	Dependent variable is a (0,1) indicator variable for lobbying participation by firm						
	Butler-Moffitt (1)	Butler-Moffitt (2)	GHK (3)	GHK (4)	GHK MA(1) (5)	Butler-Moffitt (switchers) (6)	GHK (switchers) (7)
(0,1) Lobbied last year	2.4797 (0.0996)	2.4570 (0.0885)	2.8322 (0.2364)	2.6776 (0.1115)	2.7233 (0.1182)	1.6609 (0.0809)	1.7620 (0.1114)
log Sales		0.1776 (0.0343)		0.1372 (0.0334)	0.1351 (0.0329)	−0.0071 (0.0286)	−0.0084 (0.0276)
log Employment		0.0769 (0.0351)		0.0890 (0.0385)	0.0866 (0.0378)	0.0128 (0.0321)	0.0115 (0.0309)
log R&D expenditures		0.0764 (0.0136)		0.0540 (0.0112)	0.0530 (0.0111)	0.0066 (0.0093)	0.0066 (0.0089)
log Industry imports		−0.0062 (0.0069)		0.0030 (0.0065)	0.0030 (0.0064)	−0.0032 (0.0060)	−0.0030 (0.0058)
Serial correlation coefficient			−0.1796 (0.0467)	−0.1257 (0.0391)	0.1546 (0.0488)		−0.0841 (0.0711)

Notes: Estimations consider a balanced panel of publicly-listed firms over the period 1998–2006. Columns 1 and 3 consider a specification without firm level characteristics. Columns 2 and 4–7 include time means of these characteristics following the approach of Mundlak (1978). In column 5 we assume that the error term follows an MA(1) process instead of an AR(1) process as in columns 3–4 and 7. In columns 6 and 7 we consider estimations where we drop firms that never lobbied or lobbied in every year during the course of our sample. The sample here is confined to firms that switched lobbying status at least once over the period 1998–2006. Columns 1–5 consider 27,495 observations and columns 6–7 consider 2,034. In all estimations, pre-period measures of sales, employment, R&D expenditures, and industry imports are used in the initial conditions equation following the approach of Heckman (1981b). Standard errors are in parentheses.

specifying a parametric distribution for μ_i, only includes one lag of the dependent variable, and assumes that the error term is serially uncorrelated. Following Mundlak (1978), we consider assuming $\mu_i = \overline{\mathbf{X}}_i' \boldsymbol{\alpha} + \zeta_i$, where $\zeta_i \sim iid\, N(0, \sigma_\zeta^2)$ and are independent of $\mathbf{X}_{it}$ and ε_{it} for all i and t. This allows us to account for a greater amount of firm heterogeneity by including time means of the $\mathbf{X}$ variables in estimation, specifically logarithms of sales, employment, research and development expenditures, and industry imports.[9] The remaining effect ζ_i is integrated out using Gaussian-Hermite quadrature. Pre-period measures of these four variables are used in the initial conditions equation following the approach of Heckman (1981b).

We present the results in columns 1 and 2, finding statistically significant evidence of state dependence. In the first column we omit time means of firm characteristics and in the second we include them, finding similar effects for the lagged dependent variable. In order to better understand the magnitudes of the estimates, we calculate the average partial effect (APE) of L_{it-1} on $P(L_{it} = 1)$ implied by our results. We begin by calculating $p_1 = \frac{1}{n} \sum_{i=1}^n \Phi\left\{\left(\hat{\xi} + \overline{\mathbf{X}}_i' \hat{\boldsymbol{\alpha}}\right)(1 - \hat{\rho})^{1/2}\right\}$ and $p_0 = \frac{1}{n} \sum_{i=1}^n \Phi\left\{\left(\overline{\mathbf{X}}_i' \hat{\boldsymbol{\alpha}}\right)(1 - \hat{\rho})^{1/2}\right\}$, where $\hat{\rho} = \hat{\sigma}_\zeta^2 / \left(\hat{\sigma}_\zeta^2 + \hat{\sigma}_\varepsilon^2\right)$ and $\Phi(\cdot)$ is the cumulative distribution function of the standard normal distribution. In our baseline estimates in column 2 the estimate of $\hat{\rho}$ is 0.62 with a standard error of 0.03. We then obtain the APE by taking the difference $p_1 - p_0$. Effects are measured for the year

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[9] We exclude large conglomerate firms in Compustat in our baseline specification due to the difficulty of assigning them to particular industries. Our results are robust to their inclusion by defining these firms as constituting their own industry. Similar to other studies, we code a minimal value of R&D expenditures for those observations with missing or zero values. We find comparable results when excluding this covariate from the estimations.

2003, and the results are generally of a similar magnitude across years. We find an APE of L_{it-1} on the probability of lobbying in the current period of 0.65, suggesting a significant level of state dependence. In a similar vein to our estimations here, we also consider estimating the specification in (8) with the conditional fixed effects logit estimator of Chamberlain (1980). This approach yields statistically significant evidence of state dependence as well.

One issue with these approaches is that they assume that the error term is serially uncorrelated. If such dependence existed even after controlling for firm and year effects μ_i and ϕ_t, our estimates of ξ could be biased. In order to address this issue, we consider a simulated maximum likelihood estimator based on the GHK algorithm of Geweke, Hajivassiliou, and Keane.[10] This dynamic random effects estimator assumes a particular structure for the error term, which in turn determines the form of the likelihood function. The approach then takes advantage of the fact that the likelihood of an observed sequence of outcomes can be expressed as the product of recursively defined conditional probabilities. In estimation, antithetic sampling is used throughout in order to improve efficiency. Appealing to the approach of Heckman (1981b) as above, measures of pre-period sales, employment, research and development expenditures, and industry imports are used in the initial conditions equation.

In columns 3 and 4 we consider results where we assume that the error term ε_{it} follows an $AR(1)$ process $\varepsilon_{it} = \tau \varepsilon_{it-1} + \omega_{it}$. The estimated coefficient for τ ranges between -0.13 and -0.18, suggesting a modest level of negative serial correlation. In column 5, we alternatively assume that the error term follows an $MA(1)$ process $\varepsilon_{it} = u_{it} - \theta u_{it-1}$. The positive estimate for θ also indicates a modest level of negative serial correlation in the error term and we find a comparable level of state dependence in lobbying. More generally, across each of the approaches in columns 3–5 the results are similar to those found in columns 1 and 2, suggesting that the adjustments made in allowing for serial correlation do not significantly alter our conclusions. In columns 6–7 we consider estimating the specification in equation (8) with the approaches pursued in columns 2 and 4 but dropping firms that never lobbied or that lobbied in every year of our sample. This simple heuristic test yields evidence of state dependence across both approaches, although it is intuitively estimated to be smaller in magnitude. We also consider estimating the model at the firm-election cycle level rather than the firm-year level. Here, we use 1998 as the year for the initial conditions and then collapse the data down for 1999–2000, 2001–2002, etc. We come to similar conclusions here as well, with the results strongly consistent with the existence of state dependence in lobbying.

In order to get a sense of the effects of additional lags of the dependent variable, in Table 5 we consider estimating the specification in (8) with a linear probability model. This approach allows for a much more flexible treatment of the effects of

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[10] See Geweke (1991), Hajivassiliou, McFadden, and Ruud (1991), Keane (1994), Hyslop (1999), and Stewart (2006a, 2006b, 2007). Heckman (1981a) discusses the challenges of separately identifying the effects of unobserved heterogeneity and state dependence in inducing persistence in behavior. Chay and Hyslop (1998) compare the performance of different estimators for dynamic binary response panel data, finding that linear probability models can provide an attractive alternative approach to limited dependent variable models in this type of context. Roodman (2006) reviews at length the estimation of dynamic panel data models with the type of GMM estimators that we will consider next. Nickell (1981) considers biases in the estimation of these models.

TABLE 5—DETERMINANTS OF LOBBYING PARTICIPATION, GMM ESTIMATIONS

	Dependent variable is a $(0,1)$ indicator variable for lobbying participation by firm				
	OLS (1)	Blundell-Bond (2)	Blundell-Bond (3)	Blundell-Bond (4)	Blundell-Bond (5)
$(0,1)$ Lobbied last year	0.4429 (0.0232)	0.8848 (0.0432)	0.8448 (0.0376)	0.8669 (0.1617)	0.8511 (0.1514)
$(0,1)$ Last lobbied two years ago			0.1557 (0.1565)	0.3528 (0.1655)	0.3514 (0.1643)
$(0,1)$ Last lobbied three years ago			0.0693 (0.0773)	0.0548 (0.0763)	0.0577 (0.0762)
$(0,1)$ Lobbied for two years				−0.0554 (0.1526)	−0.0387 (0.1434)
$(0,1)$ Lobbied for three years				0.0379 (0.0497)	0.0383 (0.0495)
$(0,1)$ Lobbied for four years				0.0674 (0.0454)	0.0697 (0.0451)
log Sales	0.0005 (0.0006)	0.0046 (0.0021)	0.0031 (0.0024)		0.0043 (0.0028)
log Employment	0.0016 (0.0015)	−0.0042 (0.0038)	−0.0010 (0.0050)		−0.0045 (0.0060)
log R&D expenditures	0.0010 (0.0009)	0.0004 (0.0009)	−0.0004 (0.0010)		−0.0014 (0.0011)
log Industry imports	0.0006 (0.0007)	0.0002 (0.0003)	0.0006 (0.0003)		0.0006 (0.0003)
Arellano-Bond test statistic		1.29	0.66	−0.08	−0.20

Notes: Estimations consider a balanced panel of publicly-listed firms over the period 1998–2006. Estimations include firm and year fixed effects and cluster standard errors by firm. Lags of order 2 are used in the Blundell-Bond estimations. Firm-specific characteristics are lagged by one year throughout. In columns 4 and 5 we consider estimations with and without these controls, finding similar results. This robustness holds across the other columns as well. The text discusses further variations and robustness checks on these estimations. Columns 1–2 contain 26,080 observations, column 3 has 19,560, and columns 4–5 have 16,300. Standard errors are in parentheses.

prior lobbying on a firm's current status. We begin by considering a within fixed effects estimator that includes a first lag of the dependent variable. This approach is attractive in that it dispenses with a number of the parametric assumptions inherent in using the estimators that we will consider next. Given the length of the panel ($T = 9$), however, Nickell bias should lead to a lower estimated coefficient on lagged lobbying status. Across each of the estimations in Table 5, robust standard errors are clustered at the level of the firm and firm characteristics are lagged by one year. We find similar results when including longer lags or dropping these controls entirely. While giving a smaller coefficient on ξ than what we will find in subsequent columns, the results yield statistically significant evidence in favor of the existence of state dependence. Controlling for other factors, lobbying in the previous period is estimated to raise the probability that a firm lobbies today by 44 percent.

In order to address the issue of Nickell bias, we next consider estimating the specification in (8) with the generalized method of moments estimator of Blundell and Bond (1998). This approach provides for a flexible treatment of the effect of prior lobbying status on current decisions, allows for correlation between the time varying covariates in $\mathbf{X}_{it}$ and the firm fixed effect μ_i, and does not specify a parametric distribution for μ_i. Lags of order two are used as instruments and the initial periods where we can first observe lobbying status are used as pre-sample years. With each

of these specifications, the coefficients on lagged lobbying status L_{it-1} are found to be economically important and statistically significant. In columns 3–5 we include additional controls for prior lobbying status, mostly finding relatively small effects that are statistically insignificant. The results yield comparable estimates for the coefficient on L_{it-1} as in column 2. In columns 4 and 5 we consider specifications with and without the firm characteristics in $\mathbf{X}_{it}$, finding similar results. This robustness holds across columns 1–3 as well. We further find statistically significant results for ξ with the estimator of Arellano and Bond (1991), although these estimates are more sensitive across variants.

As the approach of Blundell and Bond (1998) pursued in Table 5 assumes serially uncorrelated errors, we consider a test that was originally developed by Arellano and Bond (1991). Under the null hypothesis of a lack of serial correlation in ε_{it}, first differences of the error term should not exhibit serial correlation of order 2. Assuming that the errors are uncorrelated across firms, the test statistic is asymptotically distributed $N(0, 1)$ under the null hypothesis. In each of our estimations in columns 2–5 we do not reject the null, as none of the magnitudes of the test statistics approach the threshold value of 1.96. Intuitively, the magnitude of the test statistic declines as we progressively add additional controls for prior lobbying status. One issue with this approach, however, is that the test can fail to reject the null too often at low levels of serial correlation. As a second way of checking our results against this concern, we considered using lags of order 3 in estimation instead of lags of order 2. This type of approach was suggested by Arellano and Bond (1991) as a way of consistently estimating parameters when the error term follows a moving average process of finite order. We also come to similar conclusions when considering this alternative approach, suggesting that serial correlation in the error term is unlikely to be driving our results.

A final potential concern with the approach that we have taken so far is whether the specification in (8) fully accounts for free-riding behavior in lobbying. Specifically, separately including firm and time fixed effects in our parameterization may miss changes in industry dynamics over time. Given its flexibility, we have tested the robustness of our approach to these concerns using the estimator of Blundell and Bond (1998). We find similar results when including current or lagged measures of total lobbying expenditures by other public companies in the sample in firm i's three-digit NAICS industry. We also find similar results when including industry-year fixed effects, with industries defined at the two-, three- or four-digit NAICS industry classification levels. We find very similar patterns when controlling for a firm's within-industry rank in terms of sales or employment over time. Finally, we find similar estimates when dropping firms in industries that are the most lobbying-intensive or concentrated in terms of sales. Together we view these results as suggestive of the fact that our findings are not being driven by free-riding behavior.

IV. Evidence from Immigration Policy

This section provides further insights into the dynamics of lobbying by studying firms' responses to a particular change in US legislation: the expiration of the expansion of the cap for H-1B temporary work visas that occurred in 2004. This event

offers a way of studying the issue of barriers to entry without the functional form assumptions associated with estimating the model in Section II, while at the same time illustrating many of the features of the theory. Most importantly, we show that the new entrants for lobbying on high skilled immigration in 2004 and afterwards were firms that were already lobbying on other issues prior to 2004. Reflective of barriers to entry, this prior lobbying investment by firms is more important than the raw sensitivity of firms to the H-1B program. We begin by describing the institutional environment and 2004 expiration in detail, including the attractive properties of this policy change for characterizing firm lobbying efforts.

The H-1B is the primary visa that governs temporary high skilled immigration to the United States for work in science and engineering. Immigrant workers are an important source of science and engineering talent for the United States; in the 2000 Census, immigrants accounted for 24 and 47 percent of all workers in these fields with bachelor's and doctorate educations, respectively. Since the Immigration Act of 1990 established the H-1B program, there has been a limit to the number of H-1B visas that can be issued per year. While other aspects of the program have remained relatively stable, this limit has changed substantially. Figure 5 plots the evolution of the numerical limit on H-1B visa issuances over time. The cap was initially set at 65,000 visas until legislation in 1998 and 2000 significantly expanded the program to 195,000 visas. These changes expired in 2004, and the cap fell back to 65,000 visas. This limit was subsequently increased by 20,000 visas in 2006 through legislation enacted in 2004 that provided an "advanced degree" exemption. Coinciding with the downturn in high-technology sectors in the early 2000s, the cap took 12 months to reach in 2001 and was not reached at all in 2002 and 2003. This changed abruptly, however, in 2004 when the limit fell back to 65,000 visas. The cap has been reached in every year since 2004.

To better understand whether barriers to entry affect firms' lobbying behavior, we use the 2004 change in visa allocations to analyze how firms sensitive to the H-1B program adjusted their lobbying behavior at the intensive versus extensive margins. The 2004 change is an attractive laboratory for two key reasons. First, the expiration date of the cap increase was pre-set in the 1998 and 2000 legislation that increased the cap. Causal assessments related to lobbying efforts are challenging due to the endogenous efforts by firms to shape their environments. It is especially difficult to isolate the timing and direction of events around the passage of new legislation, while the predetermined expiration of legislation provides greater traction (e.g., Romer and Romer 2010). The second appealing feature of studying this policy shift is that we can measure well how sensitive firms are to changes in the H-1B program, whereas this is difficult for many other issues. We can thus build an attractive laboratory to compare past lobbying involvement against raw sensitivities to legislative topics.[11]

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[11] Our working paper provides more details on the H-1B program itself along with a listing of the 171 firms in our sample. Kerr and Lincoln (2010) and Kerr, Kerr, and Lincoln (2013) describe the LCA data in further detail. These papers, along with Kerr (2007, 2008), also explain the methodology that we use to construct our second dependency metric based upon ethnic patenting. Related papers include Lowell and Christian (2000), Lowell (2000, 2001), Stephan and Levin (2001), Matloff (2003), Zavodny (2003), Borjas (2006), Hanson, Scheve, and Slaughter (2009),
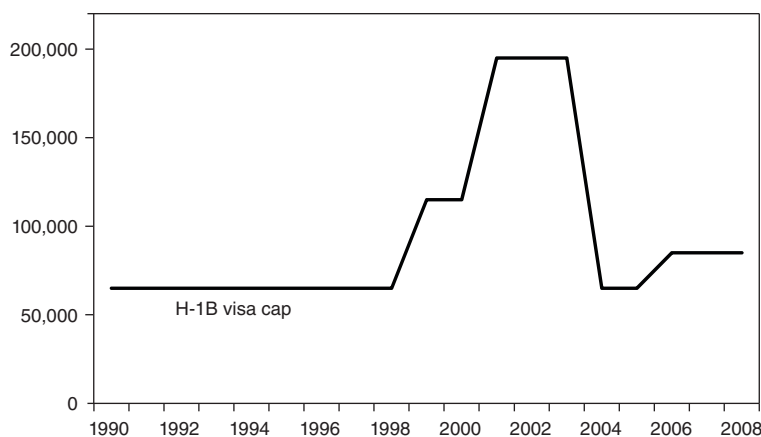
FIGURE 5. EVOLUTION OF H-1B VISA CAP

Notes: Figure plots the cap on the number of H-1B visas that can be issued by fiscal year. The cap was reached in every fiscal year since 1997 except 2002 and 2003.

Our first metric of dependency is based upon Labor Condition Applications (LCAs). To hire a foreign worker under the H-1B program, an employer must first submit an LCA to the US Department of Labor (DOL). The LCA lists a specific person the firm wishes to hire, and the primary purpose of the LCA is to demonstrate that the worker in question will be employed in accordance with US law. The second step in the application process after the LCA is approved is to file a petition with the United States Citizenship and Immigration Services (USCIS), which makes the ultimate determination about the visa application. While data on the H-1B visa issuances are not available, the DOL releases micro-records on all applications it receives, numbering 1.8 million for 2001–2006. These records include firm names, and we match the firm names on LCA records to the firms in our Compustat database. This provides us a measure of firms' demand for H-1B visas, independent of whether or not a visa is actually granted. Firms seeking a large number of H-1B visas are likely to be sensitive to the downward adjustment of the cap and have reason to lobby for its expansion.

Our second metric uses information on the ethnic composition of firms' science and engineering employees. To estimate this dependency, we obtained data on each firm's patents and inventors from the US Patent and Trademark Office (USPTO). While we are unable to directly discern immigrant status for inventors, we can identify the probable ethnicities of inventors from their names. The basic approach uses the fact that inventors with the surnames Chang or Wang are more likely to be of Chinese ethnicity than of Hispanic ethnicity, while the opposite is true for Martinez and Rodriguez. We use two commercial ethnic databases that were originally developed for marketing purposes, and the name matching algorithms have been extensively customized for the USPTO data. The match rate is 99 percent and is verified

Hunt and Gauthier-Loiselle (2010), Hunt (2011), Oreopoulos (2011), Peri (2012), Foley and Kerr (2013), and Kato and Sparber (2013). Freeman (1971) provides a classic discussion of the science and engineering labor market.

through several quality assurance exercises. The H-1B program draws primarily from India and China, which account for over half of all visas during our sample period, and is used heavily for science and engineering. Firms that employ a large number of Chinese and Indian scientists and engineers are also likely to be very sensitive to the cap's level.

We develop a panel dataset of 171 firms over 2001–2006 for whom we can construct these measures of dependency on the H-1B visa. This period centers on the 2004 expiration, and the time frame is also partially dictated by the availability of LCA and lobbying data. Our sample construction requires that each firm appears in the Compustat database in all six years, is headquartered in the United States, and that it accounts for at least 0.05 percent of total US domestic patents. Reflecting the extreme skewness of the firm size distribution, this group of 171 firms accounts for more than $3 trillion of worldwide production annually. Gabaix (2011) notes the particular influence of very large firms on aggregate economic outcomes, and our work continues in this vein to describe their efforts to shape the political process.

Table 6 presents a number of descriptive statistics for these firms. They are significantly larger and more likely to lobby overall than our initial sample described in Table 1. About 70 percent of these firms lobby in at least one year over the period 2001–2006, and 20 percent lobby for immigration. Reflecting the greater share of high-tech firms in this sample, roughly three quarters of firms that lobby for immigration specifically lobby for high skilled immigration. This latter measure is determined by manually reviewing the specific issues listed on the lobbying reports for evidence of lobbying related to high skilled immigration programs (e.g., the H-1B or L-1 programs) or specific legislation that affected high skilled immigration. We report results for lobbying related to high skilled immigration in particular, and we obtain similar outcomes when looking at the general immigration measure given the substantial overlap. In terms of our dependency measures, on average 18 percent of firms' patents are developed by inventors of Indian and Chinese ethnicity and the typical firm files for 94 LCA applications annually.

Table 7 presents simple regression evidence documenting the fact that firms that are more dependent on high skilled immigration tend to lobby more on this topic. The results are similar when we consider a more general indicator for lobbying on any immigration-related issue, reflecting the fact that the majority of the firms in our sample that lobby for immigration list high skilled immigration in the specific issues sections of their reports. The links to our two measures of dependency, however, are sharper for lobbying specifically for high skilled immigration. In falsification tests, there are no significant associations between LCA applications or Chinese and Indian patenting and lobbying for nonimmigration related issues like Clean Air and Water, Consumer Product Safety, or Retirement. These findings suggest that firm attributes are an important predictor of what they lobby for.

Figure 6 illustrates how firms responded to the cap expiration. It plots the fraction of the firms in our sample who lobby for high skilled immigration along with the ratio of new H-1B issuances to the cap. These two measures track each other closely, with the fraction of firms lobbying for high skilled immigration doubling from 6 to 12 percent between 2003 and 2004. The closeness of these series suggests that

TABLE 6—DESCRIPTIVE STATISTICS FOR HIGH SKILLED IMMIGRATION PANEL

	All firms	Firms not lobbying for high skilled immigration issues	Firms lobbying for high skilled immigration issues
Firm operations			
Annual sales ($m)	14,680	11,561	32,073
	(31,725)	(25,555)	(51,334)
Annual employment (k)	44	38	77
	(67)	(64)	(76)
Annual assets ($m)	22,604	20,085	36,651
	(65,144)	(68,196)	(41,899)
Annual R&D expenditures ($m)	753	579	1,720
	(1,431)	(1,281)	(1,798)
Patenting efforts			
Annual patent count	236	152	704
	(482)	(222)	(1,001)
Annual US domestic patents by Chinese	43	24	151
and Indian ethnicity inventors	(99)	(40)	(206)
Immigration visa applications			
Annual Labor Condition Application count	94	49	345
	(258)	(80)	(576)
Lobbying efforts (percentage of firms)			
Lobbying for any issue	62		
Lobbying for any issue, at least one year	70		
Lobbying for immigration	10		
Lobbying for immigration, at least one year	20		
Lobbying for high skilled immigration	7		
Lobbying for high skilled immigration, at least one year	15		
Average annual lobbying expenditure ($m)	1.3		
Median annual lobbying expenditure ($m)	0.2		

Notes: The sample includes 171 US-headquartered firms over 2001–2006 for a total of 1,026 observations. A list of these firms is contained in our working paper. We collect lobbying efforts from mandated lobbying reports filed with Congress biannually. Patent data are from the United States Patent and Trademark Office. We identify inventors of Chinese and Indian ethnicity through inventor names. Labor Condition Applications (LCA) are an initial step in the H-1B application process. We collect these LCA records from the Department of Labor. Firm operations data are taken from Compustat. Dollar amounts are in constant 1998 dollars. Standard deviations are denoted in parentheses.

lobbying efforts for these issues intensified once the H-1B cap was reduced in 2004 and became binding again for the private sector. Our data further indicate that these adjustments were significantly larger by firms that were already lobbying. Although only half of the firms that lobbied for high skilled immigration in 2004 previously lobbied for the issue in 2003, all of them had lobbied for at least one issue in the prior year. Notably, the percentage of firms lobbying for immigration stays elevated in 2005 and 2006, even after the initial decline in the cap in 2004.

Table 8 provides tabular evidence regarding the importance of past experience for determining which firms lobbied on high skilled immigration once the issue became binding again in 2004. Columns 1 and 2 tabulate traits where we split firms into ten groups based upon (*i*) whether they lobbied or not in the 2001–2003 period on any issue and (*ii*) the strength of their LCA demand. On this second dimension, firms are separated into quintiles based upon their average LCA usage during the sample

TABLE 7—DETERMINANTS OF LOBBYING FOR HIGH SKILLED IMMIGRATION ISSUES

	Dependent variable is a (0,1) indicator for high skilled immigration lobbying			
	(1)	(2)	(3)	(4)
log Sales	0.0359 (0.0205)	0.0029 (0.0156)	−0.0022 (0.0153)	−0.0040 (0.0195)
log Employment	−0.0081 (0.0206)	−0.0026 (0.0185)	0.0095 (0.0174)	0.0015 (0.0195)
log R&D expenditures		0.0476 (0.0150)	−0.0019 (0.0133)	0.0230 (0.0173)
log Industry imports			−0.0013 (0.0027)	−0.0024 (0.0088)
log US, Chinese, and Indian patents			0.0192 (0.0078)	0.0172 (0.0070)
log LCA applications			0.0390 (0.0117)	0.0288 (0.0114)
Controls	Basic	Basic	Basic	Extended

Notes: Estimations consider determinants of lobbying efforts over 2001–2006. Firm-specific characteristics are lagged by one year to reduce issues of simultaneity. Basic controls include year fixed effects. Extended controls further include industry-year fixed effects (two-digit NAICS level), controls for types of technologies patented, and controls for geographic regions of patenting activity. Regressions include 960 observations, are unweighted, and cluster standard errors by firm. The decline in observation count from 1,026 in Table 6 is due to cases where Compustat covariates like employment are missing. We find similar results when restricting the panel to a very similar set of firms that have no missing data. Standard errors are in parentheses.
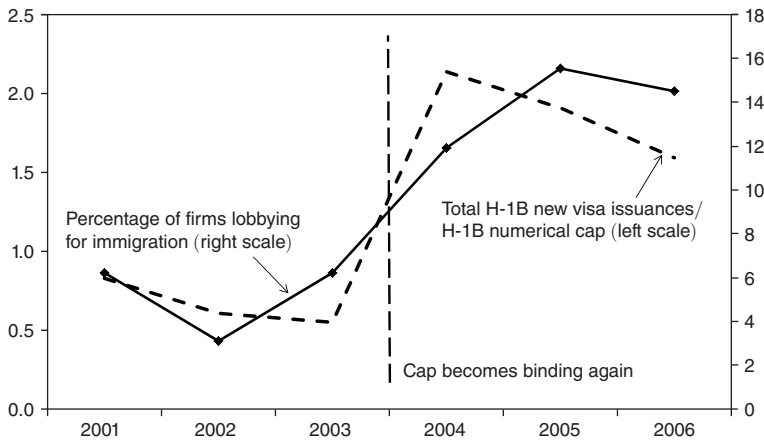

FIGURE 6. H-1B VISAS AND LOBBYING BEHAVIOR

Notes: Lobbying for immigration intensifies as H-1B visas become harder to obtain. One measure of this difficulty is the total number of new visa issuances, which includes universities and nonprofits that are not subject to the cap, divided by the numerical cap placed on issuances for for-profit firms.

period. Columns 3 and 4 provide a similar decomposition using the ethnic patenting based dependency. Firms in the lowest quintile have only 2–3 percent of the dependency as firms in the highest quintile.

TABLE 8—LOBBYING ADJUSTMENTS TO HIGH SKILLED IMMIGRATION ACROSS DISTRIBUTION

	LCA based dependency			Ethnic patenting based dependency	
	Firms not lobbying on any issue 2001–2003	Firms lobbying on 1 + issue 2001–2003		Firms not lobbying on any issue 2001–2003	Firms lobbying on 1 + issue 2001–2003
	(1)	(2)		(3)	(4)
Panel A. Share lobbying for high skilled immigration issues 2001–2003					
Least dependent	0.00	0.00	Least dependent	0.00	0.00
Second quintile	0.00	0.00	Second quintile	0.00	0.00
Third quintile	0.00	0.05	Third quintile	0.00	0.05
Fourth quintile	0.00	0.04	Fourth quintile	0.00	0.05
Most dependent	0.00	0.28	Most dependent	0.00	0.27
Panel B. Share lobbying for high skilled immigration issues 2004–2006					
Least dependent	0.00	0.06	Least dependent	0.00	0.13
Second quintile	0.00	0.10	Second quintile	0.04	0.06
Third quintile	0.00	0.14	Third quintile	0.00	0.05
Fourth quintile	0.08	0.22	Fourth quintile	0.00	0.23
Most dependent	0.00	0.48	Most dependent	0.00	0.50

Notes: Table summarizes lobbying dynamics regarding high skilled immigration. Columns 1 and 2 tabulate traits where we split firms into ten groups based upon (i) whether they lobbied or not in the 2001–2003 period and (ii) upon the strength of their LCA demand. The latter is measured across quintiles based upon each firm's average LCA usage during the sample period. Columns 3 and 4 provide a similar decomposition using the ethnic patenting dependency. Panel A gives the share of firms that lobby at least once during the 2001–2003 period on high skilled immigration issues. Panel B provides the share of firms lobbying for high skilled immigration in at least one year after the cap becomes binding in the 2004–2006 period.

Panel A gives the share of firms that lobby at least once during the 2001–2003 period on high skilled immigration issues. By definition, these shares are zero for the firms that did not lobby at all during 2001–2003. Among those that did lobby on at least one issue, the share lobbying on high skilled immigration is very small until it jumps to over 25 percent in the highest dependency quintile. Panel B provides the share lobbying on high skilled immigration in at least one year during the 2004–2006 period after the cap becomes binding. The picture is striking: among firms that did not lobby in 2001–2003, there is virtually no entry into high skilled immigration lobbying. On the other hand, some firms who lobbied during 2001–2003 on other issues start lobbying on high skilled immigration even though their dependency is very low. This decoupling for raw dependency upon the program is very suggestive of barriers to entry. Although it is difficult to develop dependency measures for the large sample considered in Sections II–IV, all of these firms that lobbied for immigration in 2004 lobbied for at least one issue in 2003. Of the 3,260 firms in the sample, there is only one firm that began lobbying in 2004–2006 for high skilled immigration that did not lobby on any issue in 2001–2003. This firm, Nike, appears in both of our two samples. Thus, we see a strong shift once the cap binds in our small sample for firms already lobbying but little shift amongst the roughly 90 percent of the 3,260 firms in our large sample that never lobby.

We next consider regression evidence on firms' responses to these policy changes using the specification

$$(9) \qquad L_{it} = \mu_i + \mathbf{X}'_{it}\boldsymbol{\beta} + \delta \cdot \ln HS_{i,t_0} \cdot CapBinds_t + \phi_t + \varepsilon_{it}.$$

Here L_{it} is an indicator variable for whether firm i lobbied for high skilled immigration in year t. Referring back to the model in Section II, the extra profits from lobbying for immigration should be dependent on events $\mathbf{p}_t$, firm-level state variables $\mathbf{s}_{it}$, and a firm's lobbying history $\mathbf{A}_{it}$. We control for shocks $\mathbf{p}_t$ that affect all firms equally with year fixed effects ϕ_t. We account for firm-level characteristics $\mathbf{s}_{it}$ with a vector of firm fixed effects μ_i and time varying controls $\mathbf{X}_{it}$. The covariates in $\mathbf{X}_{it}$ include the logarithms of firm sales, employment, R&D expenditures and industry level imports. We lag each of these characteristics by one year to reduce issues of simultaneity and find similar results when lagging them by two periods or excluding the controls entirely. We return to the effects of prior lobbying experience below.

While these covariates should control for a number of factors that determine whether or not a firm lobbies for immigration, given our results in Tables 3 and 7 we think that there should also be an interaction effect between the firm's characteristics and events like the decline in the cap on H-1B visas. Specifically, firms that are more dependent on high skilled immigrants should demonstrate stronger reactions to the decline than other firms. We thus include the interaction term $\ln HS_{i,t_0} \cdot CapBinds_t$. Here, HS_{i,t_0} represents a firm's initial dependence on high skilled immigration, and $CapBinds_t$ equals one for the years 2004–2006 and is zero otherwise. Including this term will allow us to quantify how firms' responses to the large decline in available visas in 2004 relied on their dependence on high skilled immigrants. The firm and year fixed effects control for the main effects in the interaction. We measure the dependencies HS_{i,t_0} only using data from 2001 so that they are predetermined, initial values at the start of the sample period. The log transformation ensures that outliers in dependency do not overly influence our results.

Table 9 reports estimations of equation (9). The first three columns consider the LCA dependency measure, and the last three consider the ethnic patenting measure. Standard errors are clustered at the cross-sectional level of the firm. In columns 1 and 4, we find strong evidence of a shift in lobbying for immigration once the cap binds. Reported results focus on lobbying for high skilled immigration, and results are similar for overall immigration. Firms with a higher number of LCA applications and greater ethnic patenting by Chinese and Indian inventors in 2001 lobbied more intensively for high skilled immigration-related issues when the H-1B cap became binding in 2004–2006. A firm with a 10 percent higher dependence on foreign-born workers is 0.3–0.4 percent more likely to lobby for immigration issues during years 2004–2006.

Reassuringly, these measured effects are extremely localized to lobbying for immigration. In Figure 7, we repeat the regression in column 1 of Table 9 for the top 20 issues on which firms lobby. Immigration is associated with the largest point estimate in absolute value. Similarly, it is also one of only two outcomes with a statistically significant coefficient at a 95 percent confidence level. The association with product safety appears to be spurious. Results are similar when using the ethnic patenting-based measure, with lobbying for science/technology being the only other significant outcome besides high skilled immigration. This may be partly explained by the very close connection of this issue with the H-1B program. We also find statistically insignificant coefficients close to zero when considering with specification (9) a (0,1) indicator variable for lobbying on any issue as the outcome

TABLE 9—ENTRY INTO HIGH SKILLED IMMIGRATION LOBBYING WITH BINDING H-1B CAP

	Dependent variable is a (0,1) indicator for high skilled immigration lobbying					
	(1)	(2)	(3)	(4)	(5)	(6)
(0,1) Binding H-1B issuances cap × firm dependency in 2001	0.0363 (0.0150)		0.0297 (0.0113)	0.0314 (0.0130)		0.0224 (0.0113)
(0,1) Year is 2003 (nonbinding cap) × firm dependency in 2001		0.0074 (0.0110)			0.0122 (0.0098)	
(0,1) Year is 2004 (binding cap) × firm dependency in 2001		0.0353 (0.0166)			0.0259 (0.0148)	
(0,1) Year is 2005 (binding cap) × firm dependency in 2001		0.0385 (0.0166)			0.0343 (0.0141)	
(0,1) Year is 2006 (binding cap) × firm dependency in 2001		0.0436 (0.0194)			0.0492 (0.0195)	
(0,1) Firm lobbied in the prior year			−0.0254 (0.0227)			−0.0175 (0.0180)
(0,1) Firm lobbied in the prior year × (0,1) binding H-1B issuances cap × firm dependency in 2001			0.0414 (0.0103)			0.0454 (0.0116)
Dependency measure	LCA	LCA	LCA	Ethnic patent	Ethnic patent	Ethnic patent
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm covariates	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Estimations consider entry into lobbying for high skilled immigration issues when the H-1B visa issuances cap became binding for the private sector in 2004 due to expiration of prior legislation. The sample considers the years 2001–2006. Firm dependencies for high skilled immigration are measured in 2001 and interacted with an indicator variable for sample years when the cap was reached (2004–2006). Main effects are absorbed into the firm and year fixed effects, respectively. Dependency measures in columns 1–3 and 4–6 use applications for H-1B visas in 2001 and firm Chinese and Indian patenting in 2001, respectively. Firm covariates include lagged logarithms of sales, employment, R&D expenditures, and industry imports, as well as controls for types of technologies patented and controls for geographic regions of patenting activity. Regressions include 960 observations, are unweighted, and cluster standard errors by firm. Standard errors are in parentheses.

variable. Overall, this is a very localized response given that these top issues include lobbying on labor issues, patent policy, and similar topics. This provides confidence that our estimation design is capturing the link between demand for foreign workers and lobbying for an expanded number of visas.

Another issue with our analysis in columns 1 and 4 is that it compares firms' behavior before and after the decline of the cap. If forward-looking firms began lobbying prior to the decline, our estimates would suffer from attenuation bias. As suggested by Figure 6, however, although we do see some movement in the data, we do not see firms significantly anticipating the decline prior to 2004. We think that this is due to several reasons. First, due to support from within both political parties, firms had been remarkably successful in their prior lobbying efforts on the H-1B program from its creation in 1990 to 2004. This was true both in terms of the speed and the size of the visa cap increase they could obtain. Within the first year that the cap was binding in 1997, legislation almost doubled the cap with more than two thirds support from both houses of Congress. Another extension followed two years later to increase the program to three times its initial size of 65,000, passing on a 96–1 vote by the Senate and a voice vote in the House.
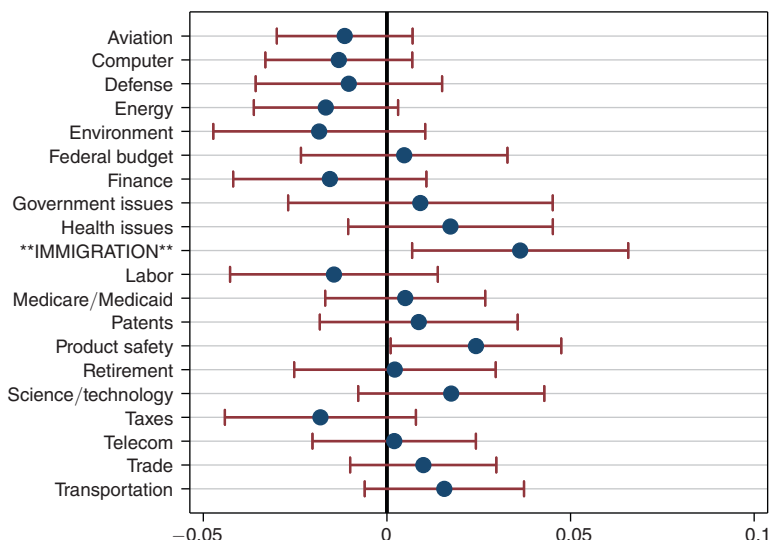
FIGURE 7. PLACEBO ANALYSES OF SPECIFIC ISSUES LOBBIED FOR

Notes: Figure repeats the base estimation from Table 9 used for high-skilled immigration lob-
bying with the placebo outcomes of lobbying for the top 20 specific issues on which firms in
the sample are generally lobbying for (immigration is among the top 20). The reported coef-
ficients and 95 percent confidence bands are from the interaction of LCA-based dependencies
with the binding H-1B cap.

As a result, a high degree of confidence that future efforts would be successful
quickly was warranted. This confidence would not have been entirely misplaced;
although it was smaller than desired, the H-1B Visa Reform Act of 2004 did raise
the cap by 20,000 visas. Moreover, most observers at the time (even strong critics
of the program) expected the effectiveness of lobbying on this issue to continue. If
firms had not been as successful in the past and had fully anticipated how difficult it
ended up being to change the policy, they may have begun lobbying earlier. Second,
the economic and political climate in 2002 and 2003 was not conducive to beginning
to lobby early for such an expansion. In 2003 firms were using less than half of the
available H-1B visa supply and there were relatively high rates of unemployment for
high technology workers. To the extent that firms did anticipate this change in their
behavior, however, we expect our results in columns 1 and 4 to be biased towards
not finding an effect of the policy change.[12]

In order to address these issues, columns 2 and 5 of Table 9 next consider a more
flexible specification. Rather than interacting a firm's dependency with a single

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[12] As an example of the expectations of observers at the time, while arguing against the H-1B program, the North
American Alliance for Fair Employment report in 2004 noted: "What cannot be questioned is that, in the United
States the political process invariably works to legitimize the *employer's wish* for lower-cost, high-skilled foreign
labor. The IT industry has a powerful and disproportionate influence on the policy-making process. Designing a
nonpermanent residency program on the will of political forces, such as big businesses, is an invitation to continue
this trend" (pages 10–11, italics in original report). Reform efforts in 2004 and afterward became more difficult for
firms as Congressional leaders began to bundle adjustments to the H-1B visa cap into discussions of comprehensive
immigration reform that involved low skilled immigration. This political gridlock persisted for at least a decade
afterwards and was not anticipated by firms or many other industry observers at the time.

indicator variable for the post period, we instead interact the dependency measure with separate indicator variables for every year from 2003 to 2006. Effects are measured relative to the reference years of 2001 and 2002. With this approach, we observe only a minimal lobbying response in 2003; strong entry into lobbying on high skilled immigration did not begin until 2004. Moreover, this response persists until 2006 and appears to grow with time. This is important as it means that our estimates do not simply reflect increased activity around the 2004 presidential election. While high skilled immigration issues were mentioned during the campaigns, firm lobbying strengthened well after the campaign ended. The issue became even more important for firms in these years given higher visa demand during the continued economic recovery and the fact that further legislation to increase the cap was not passed.[13]

While the returns from lobbying for immigration should depend on the interaction between a firm's dependency and the level of available visas, it should also depend on its prior experience in lobbying. Columns 3 and 6 of Table 9 expand the estimation framework to include an indicator variable for whether the firm lobbied in the previous year and an additional interaction of this prior lobbying status with the core interaction regressor in the specification in (9). We demean the main effects before interacting. This estimation measures whether prior lobbying status increases the likelihood of firms starting to lobby when they are sensitive to the program.

The interaction of prior firm lobbying and immigration dependency is extremely important, highlighting the substantial degree to which firms are adjusting on the intensive margin of lobbying expenditures instead of the extensive margin of whether or not to lobby at all. This pattern suggests that barriers to entry played a significant role in shaping how firms responded to these policy changes. If the costs of beginning to lobby had not played a substantial role, we would have expected significant adjustments along the intensive margin as well as the extensive margin for dependent firms. This indicates that these costs also play a large role in shaping the responses of firms to changes in the policy environment. We also find little difference in the level of response for firms with large lobbying expenditures relative to firms with small lobbying expenditures after controlling for firm dependency on high skilled immigration.

As a final step, Table 10 builds upon the interaction approach developed in columns 3 and 6 of Table 9. We separate past firm lobbying into two types of behavior: (i) lobbying on any issue and (ii) lobbying specifically on immigration. This separation will allow us to better understand the different sources of state dependence that were explored in the model in Section II. Prior lobbying specifically about immigration may reveal additional information about the potential benefits to the firm from lobbying today for a higher visa cap. Lobbying overall, on the other hand, will capture the more general effects of being engaged in the political process. In columns 2

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[13] As a second analysis, we considered placebo tests on the timing of the reforms in the spirit of Figure 7 by running every possible combination of three years being picked as the potential reform period (20 permutations from 6 years choose 3 years). As predicted by column 2 of Table 9, the true reform period of 2004–2006 was the maximum value at 0.036. The next three highest values were 0.022, 0.021, and 0.018. This exercise indicates the particular timing of the effects.

TABLE 10—EFFECTS OF PRIOR LOBBYING FOR IMMIGRATION VERSUS LOBBYING OVERALL

	Dependent variable is a (0,1) Indicator for high skilled immigration lobbying					
	(1)	(2)	(3)	(4)	(5)	(6)
(0,1) Binding H-1B issuances cap × firm dependency in 2001	0.0297 (0.0113)	0.0296 (0.0112)	0.0217 (0.0092)	0.0224 (0.0113)	0.0236 (0.0105)	0.0164 (0.0092)
(0,1) Firm lobbied in the prior year	−0.0254 (0.0227)		−0.0163 (0.0165)	−0.0175 (0.0180)		−0.0130 (0.0150)
(0,1) Firm lobbied in the prior year × (0,1) binding H-1B issuances cap × firm dependency in 2001	0.0414 (0.0103)		0.0294 (0.0086)	0.0454 (0.0116)		0.0336 (0.0097)
(0,1) Firm lobbied in the prior year on immigration		−0.0397 (0.1300)	−0.0420 (0.1298)		−0.0227 (0.1268)	−0.0261 (0.1271)
(0,1) Firm lobbied in the prior year on immigration × (0,1) binding H-1B issuances cap × firm dependency in 2001		0.0739 (0.0324)	0.0645 (0.0324)		0.0678 (0.0351)	0.0586 (0.0352)
Dependency measure	LCA	LCA	LCA	Ethnic patent	Ethnic patent	Ethnic patent
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm covariates	Yes	Yes	Yes	Yes	Yes	Yes

Notes: See Table 9. These extensions consider separate interactions for lobbying in the prior year on any issue as well as lobbying in the prior year about immigration specifically. Standard errors are in parentheses.

and 5 of Table 10 we find larger effects when only considering prior lobbying about immigration specifically (relative to columns 3 and 6 of Table 9).

Even more powerful, however, is the joint evidence in columns 3 and 6 of Table 10 where we include both interactions. The indicators for prior lobbying overall and prior immigration lobbying are both small and statistically insignificant, while both of the interaction terms are positive and significant. These coefficients are slightly smaller in economic magnitude than when introduced individually, but they always retain at least 70 percent of their original size. It is especially important to note the strong economic and statistical significance of the general lobbying indicator's interaction with firm dependency in columns 3 and 6. Even after controlling for past lobbying on immigration specifically, lobbying on any issue in the past strongly influences whether dependent firms begin lobbying about high skilled immigration once the issue becomes pressing in 2004. This suggests that it is not only the benefits from past lobbying on a particular issue that are important but also an overall engagement in the process that determines the dynamic nature of lobbying.[14]

These findings strongly suggest that the choice to lobby on an issue, once lobbying, depends on the importance of the issue to the firm and not the overall scale of lobbying being undertaken by the firm.[15] While not our central focus, these results also shed light on a debate within the political economy literature. Some authors have suggested that lobbyists are specialists that focus primarily on a particular set

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[14] We thank Alan Auerbach for his suggestions regarding this analysis.

[15] We are unfortunately unable to numerically estimate adjustment costs in this paper (e.g., Bond and Cummins 2000). We view this as a promising area for future research.

of issues. An alternative view is that lobbyists can influence a wide range of issues, within the constraints of whom they know. Our results suggest that firms can shift the set of issues that they lobby for relatively easily. This provides suggestive evidence for the "access" hypothesis as opposed to the "expertise" hypothesis. These results are consistent with the relatively low levels of persistence regarding which issues firms lobbied for in our larger firm sample as well as the recent work of Bertrand, Bombardini, and Trebbi (2011) and Blanes i Vidal, Draca, and Fons-Rosen (2012).

V. Conclusions

While lobbying is the primary way in which firms attempt to affect the political process, there has been little systematic empirical evidence on the dynamics of these activities. In this paper we find evidence for state dependence in lobbying; whether or not a firm lobbied previously has a significant effect on whether it lobbies in the current period. We argue that this persistence is a result of the fact that firms face barriers to entry. This argument is first tested by estimating a model of firm behavior in which prior lobbying status is allowed to affect a firm's current status. Across a number of different estimation approaches we find evidence that prior lobbying affects firms' current efforts. We next test this argument by studying how firms responded to a predetermined policy change—the expiration of the increase in the cap for H-1B visas that occurred in 2004. We find that firms dependent on high skilled immigration adjusted their lobbying behavior towards immigration-specific issues in response to the decline. While the response was flexible among firms already lobbying, we do not find adjustments on the extensive margin—i.e., firms that were not lobbying on any issue previously did not start lobbying in response to the policy shift.

We argue that barriers to entry are important because they fundamentally change the environment in which policy is made. In particular, by inducing persistence in the set of players in the political process, these costs can help explain the stability that we see in economic policy. Policies might change for a variety of reasons, but we find little evidence that rapid shifts in the set of interest groups is one of them. This stability can have positive and negative welfare impacts. On the positive side, a number of studies demonstrate how policy uncertainty can hamper firm investment and employment decisions, with consequences for firms and workers alike. Greater stability in policy making provides an important foundation for business decision making. On the negative side, this stability can reduce the number and range of voices heard in the process of passing legislation, might lead to regulatory capture, and may inhibit welfare-enhancing reforms from being passed if the reforms are not advantageous to the current set of players. Barriers to entry may also help explain the existence of associations of firms, such as the Chamber of Commerce.

In terms of policy, we think that our work has a number of implications. To begin with, persistence in lobbying is likely to make monitoring the influence of large firms less costly and raises the potential effectiveness of certain types of efforts towards better governance. For example, additional reporting requirements for some of the firms at the top of the expenditure distribution are especially likely to capture the most important activities directed at influencing policy. Whether or not it is advantageous for welfare, proposed legislation that takes into account the existing

composition of firms actively engaged in the process is more likely to be successful. The size of groups that would support or oppose policies should be important, but so should the fact of whether or not they are politically connected. This may also help explain the success and failure of different pieces of legislation in the past. Finally, our results support the view in the public debate that big businesses have a disproportionate impact on the policy process.

More generally, we view a better understanding of the role that firms play in policy determination through their lobbying efforts as an important objective for future research. Continuing with the high skilled immigration example, there are only a handful of studies that consider the role of firms in the immigration process or the consequences of policy choices on those firms. The size of this literature is somewhat surprising given the fact that the H-1B program centers on a firm-sponsored visa: the firm identifies the worker it wishes to hire, applies for a visa on their behalf, potentially applies for a green card on behalf of the worker, and generally has a guaranteed period of time during which the worker is tied to the firm. Not surprisingly, firms attempt to define the rules of these procedures. Moreover, they lobby extensively for the capacity to make as many of these hires as they wish. Our understanding of high skilled immigration policies thus requires an appreciation of the firm's role in policy determination. The same is certainly true, if not more so, in other high profile issues like government support to automobile companies and airlines as well as the strength and scope of regulations on financial services. The existence of barriers to entry in lobbying—and their impact on firm dynamics and the composition of firms lobbying on policy issues—is an important ingredient for future theoretical and empirical work in this vein.

APPENDIX

TABLE A1—LIST OF LOBBYING ISSUES

Accounting	Economics/economic development	Pharmacy
Advertising	Education	Postal
Aerospace	Energy/nuclear	Railroads
Agriculture	Environmental/superfund	Real estate/land use/ conservation
Alcohol and drug abuse	Family issues/abortion/adoption	Religion
Animals	Firearms/guns/ammunition	Retirement
Apparel/clothing industry/ textiles	Financial institutions/ investments/securities	Roads/highway
Arts/entertainment	Food industry (safety, labeling, etc.)	Science/technology
Automotive industry	Foreign relations	Small business
Aviation/aircraft/airlines	Fuel/gas/oil	Sports/athletics
Banking	Gaming/gambling/casino	Taxation/internal revenue code
Bankruptcy	Government issues	Telecommunications
Beverage industry	Health issues	Tobacco
Budget/appropriations	Housing	Torts
Chemicals/chemical industry	Immigration	Trade (domestic and foreign)
Civil rights/civil liberties	Indian/Native American affairs	Transportation
Clean air and water (quality)	Insurance	Travel/tourism
Commodities (big ticket)	Labor issues/antitrust/workplace	Trucking/shipping
Communications/broadcasting/ radio/TV	Law enforcement/crime/ criminal justice	Urban development/ municipalities
Computer industry	Manufacturing	Unemployment

(*Continued*)

TABLE A1—LIST OF LOBBYING ISSUES (*Continued*)

Consumer issues/ safety/protection	Marine/maritime/ boating/fisheries	Utilities
Constitution	Media (information/publishing)	Veterans
Copyright/patent/trademark	Medical/disease research/ clinical labs	Waste (hazardous/solid/ interstate/nuclear)
Defense	Medicare/Medicaid	Welfare
District of Columbia	Minting/money/gold standard	
Disaster planning/emergencies	Natural resources	

Source: Senate's Office of Public Records (SOPR)

FIGURE A1. SAMPLE LOBBYING REPORT FOR MICROSOFT (*Continued*)

FIGURE A1. SAMPLE LOBBYING REPORT FOR MICROSOFT (*Continued*)

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