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BANKING DEREGULATIONS, FINANCING CONSTRAINTS, AND FIRM ENTRY  
SIZE

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Working Paper 15499  
<http://www.nber.org/papers/w15499>

NATIONAL BUREAU OF ECONOMIC RESEARCH  
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November 2009

Comments are appreciated and can be sent to [wkerr@hbs.edu](mailto:wkerr@hbs.edu) and [randa@hbs.edu](mailto:randa@hbs.edu). We thank Stefano DellaVigna, an anonymous referee, and participants at the European Economic Association meetings for their very helpful comments. The research in this paper was conducted while the authors were Special Sworn Status researchers of the US Census Bureau at the Boston Census Research Data Center (BRDC). Support for this research from NSF grant (ITR-0427889) is gratefully acknowledged. Research results and conclusions expressed are our own and do not necessarily reflect the views of the Census Bureau, the NSF, or the National Bureau of Economic Research.

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NBER Working Paper No. 15499  
November 2009  
JEL No. E44,G21,L26,L43,M13

**ABSTRACT**

We examine the effect of US branch banking deregulations on the entry size of new firms using micro-data from the US Census Bureau. We find that the average entry size for startups did not change following the deregulations. However, among firms that survived at least four years, a greater proportion of firms entered either at their maximum size or closer to the maximum size in the first year. The magnitude of these effects were small compared to the much larger changes in entry rates of small firms following the reforms. Our results highlight that this large-scale entry at the extensive margin can obscure the more subtle intensive margin effects of changes in financing constraints.

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# 1 Introduction

Do changes in financing constraints for startups impact their entry sizes? Theoretical models like Evans and Jovanovic (1989) predict that financing constraints should impact both the intensive margin of entry (i.e., the initial sizes of startups) and the extensive margin (i.e., the number of new firms). This proposed link of credit access to initial firm employment is further thought to affect broader product market traits. For example, Cabral and Mata (2003) argue that the evolution of the firm size distribution is driven more by startup financing constraints than by subsequent competition and selection among entrants. Michelacci and Silva (2007) find that better financial access explains why local entrepreneurs operate larger firms than entrepreneurs migrating to a region.

This entry size prediction, however, has not been systematically tested with micro-data on firm entry sizes before and after a sharp change in local financial conditions. We use data from the US Census Bureau to examine entry sizes before and after US branch banking deregulations. These reforms were enacted across states at different times. Prior work documents the substantial effects of these deregulations on US product markets. They are linked to changes in entry rates (Black and Strahan, 2002, Kerr and Nanda, 2009), the firm size distribution (Cetorelli and Strahan, 2006), the fragility of new entrants (Cetorelli, 2009), and productivity/growth (Jayaratne and Strahan, 1996). Recent work further associates these reforms with changes in crime rates (Garmaise and Moskowitz, 2008), racial discrimination (Levine et al., 2008), and similar outcomes.

Given this far-reaching bite, the US banking reforms are an ideal laboratory for studying entry size effects. This has yet to be undertaken, however, with the closest work being Cetorelli and Strahan's (2006) investigation of changes in the firm size distribution within manufacturing. They find that average firm size declines. Our work complements theirs by analyzing startup entry sizes, as opposed to average firm size, and by including all sectors of the US economy. Similarly, Kerr and Nanda (2009) examine the dynamics of firm entry and exit around the deregulations. They do not, however, study the intensive margin of entry in detail. Most of our analyses below focus on the particular theoretical

prediction that better credit conditions allow startups to enter closer to their optimal or mature size. We are not aware of any other studies that evaluate this prediction in the context of the US reforms or otherwise.

Prior to these reforms, US banks faced multiple restrictions on geographic expansion both within and across states. The 1970s through the mid 1990s experienced a significant liberalization in US banking regulations. First, intrastate deregulations allowed banks to expand within the passing state if they were licensed to operate there. This allowed for more competition in local banking markets, in some cases breaking-up effective monopolies that existed prior to these liberalizations. Second, interstate deregulations allowed banks to acquire branches in other states with which their home states had negotiated bilateral agreements. This class of reforms further reduced the monopoly power of local banks and improved markets for corporate control.

Our evidence suggests that the US deregulations induced small changes in startup entry sizes or none at all. As a simple statistic, the average size of entrants did not change after the reforms. This test, however, may be biased as the average size metric is also influenced by extensive margin changes. We thus perform several tests using initial employment levels of firms and their subsequent employment growth to their size at maturity. These within-firm comparisons, motivated by models like Evans and Jovanovic (1989), are an attractive way to model intensive margin effects when extensive margin effects are also occurring.

We find that among startups that survived for at least four years, a greater fraction entered at their maximum size after interstate deregulations than around the time of the reform. The remaining long-term entrants also entered closer to their maximum sizes and reached their maximum sizes quicker. These changes, however, are small in magnitude (e.g., a 2% increase in relative entry size) and similar to conditions several years before the reforms. Thus, while our investigation finds evidence of the theoretical link between financing constraints and entry size, the cumulative evidence suggests that the intensive margin channel is relatively small. This is particularly true in comparison to the large changes following US deregulations measured on other economic dimensions noted above.<sup>1</sup>

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<sup>1</sup>Ardagna and Lusardi (2009, 2010) and Da Rin et al. (2009, 2010) undertake related

## 2 Data and Empirical Results

The Longitudinal Business Database (LBD) provides annual employments for every private-sector US establishment with payroll from 1976 onwards. Approximately four million establishments and 70 million employees are included in the average year of our sample. The LBD's complete accounting of very small firms across all sectors of the economy is very important for our analysis of entry sizes following banking deregulations. The LBD assigns unique, time-invariant identifiers for each establishment that can be longitudinally tracked. We use these identifiers to both identify new entrants and track their subsequent employment growth. We include in our sample the entry of new firms but exclude new facilities opened by multi-unit firms. More than 400 thousand new establishments are opened each year in our sample, and about 80% of these startups. Startups enter at smaller sizes than new establishments of existing firms, averaging just six employees compared to 24 workers. Only 15% of startups enter with more than ten employees, compared to 62% of new multi-unit facilities. Glaeser and Kerr (2009) further describe entry patterns in the LBD.

We model the impact of the reforms using a format akin to event studies. We include a series of indicator variables for the timings of both the intrastate and interstate deregulations. We estimate the effects of the two reforms jointly as most states introduced both deregulations during our sample period. The state-level timings are sufficiently different, however, that we obtain similar results when treating each reform individually. Perhaps even more important for our empirical design, one cannot predict the state-level timings of the reforms using pre-existing entry traits. Our indicator variables stretch ten years before and after the associated deregulation. The end points include earlier and later years than our 20-year window. We omit the indicator for the first full year of the deregulation, so that all effects are measured relative to this year. Regressions include state and year fixed effects, cluster standard errors by state, and weight states by their log 1977–1985 startup employment. We find similar results

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intensive margin exercises in their policy evaluations. Most other work regarding financing constraints for entrepreneurship considers individual-level transitions (e.g., Nanda, 2008).

in unweighted regressions, and we have separately confirmed that no state or industry is overly influential in the results reported below.<sup>2</sup>

Figure 1A graphs the log mean entry size of startups around the interstate deregulations using this technique. The solid line provides point estimates, and the dashed lines plot 95% confidence intervals. As the dependent variable is measured in logs, coefficients report the mean percentage change in the average startup size for a forward or lagged year relative to the reform year. Leading into the interstate reforms, there is perhaps a small upward trend in startup entry size. Most years, however, are not statistically different from the reform year. This pattern does not change significantly after the interstate deregulations, and mean entry sizes remain very similar to the time of the reform.

This null response for average entry size stands in sharp contrast to the effect of the interstate reforms on the extensive margin. Figure 1B demonstrates the noticeable change after the interstate deregulations. Entry rates three years or later after the reforms are at least 20% higher than at the time of the deregulation. This shift is also evident in comparison to the pre-period. Combined, Figures 1A and 1B thus suggest that the interstate reforms acted upon states in a timing that was not systematically related to pre-existing changes in entry sizes or entry rates. The reforms, and their associated changes in financial conditions, brought about extensive margin growth but not intensive margin adjustments.

Unreported coefficients for intrastate deregulations do not exhibit meaningful changes in either average entry size or entry counts. As this null finding for intrastate reforms holds true for the other outcomes examined in this paper, we only document the results from interstate reforms. We further discuss this consistent, null effect in the conclusions.

While a starting point, regressions examining average entrant size may be biased for measuring intensive margin effects. Average entry size is appropriate when comparing entry sizes before and after the reforms for firms that would have

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<sup>2</sup>The LBD is collected on March 1 of each year. We thus date reforms such that a passage of the intrastate deregulations in 1987, for example, is coded as changing from zero to one in 1988. Thus, the forward one value may include a partial effect from the reform. Following Autor et al. (2007), we also include an interaction of the reforms with Economic Census years to control for differences in collection procedures.

entered regardless of deregulations. Figure 1B shows, however, large growth in entrant counts after interstate deregulations, and we cannot distinguish which firms would have entered regardless of the reform. We are particularly worried about induced entry at the lower end of the entrant size distribution. Smaller firms are also likely candidates for growth in entry size due to greater bank access.

We therefore depart from prior work by considering within-firm employment patterns. Conditional on surviving four years, startup firms enter on average at 60% of the maximum employment size they will achieve in the first four years. This compares to approximately 70% for new facilities of multi-unit firms. This lower relative entry size for startups may directly reflect financing constraints on the intensive margin, but the differential may include other factors like increased caution due to greater uncertainty or a noisy signal about entrepreneurial ability. Theory suggests that relaxing financing constraints should lead firms to enter closer to their optimal size, and we examine whether entry employment sizes of startups are closer to their maximum sizes following the reforms.

The advantage of this approach is that it can better isolate the effect of reforms on firm entry size because it is less influenced by changes in entrant types. A disadvantage is that it conditions on startups that survive a certain period. Thus, the longer the time frame used to measure maximum or mature sizes of new entrants, the lower the share of entrants that can be analyzed.

Figures 2A and 2B describe these dynamics in greater detail. Figure 2A begins with cumulative failure rates of startups. The solid bars report traits of the total sample, while the lighter bars report traits for manufacturing entrants. While the latter sector represents less than 10% of entrants, many studies of financing constraints focus on this sector. Over 20% of startups fail within their first year (i.e., we only observe a single LBD record). Approximately 50% of entrants fail within four years of entry, and 70% fail by the tenth year. We select for our sample those entrant who survive four years or longer. This group represents about 55% of all entrants.<sup>3</sup>

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<sup>3</sup>Failure rates are calculated over entrants from 1977 to 1986. Failure distributions are quite similar across sectors. The most noticeable deviation is a higher fraction of services entrants

Figure 2B documents for these long-term entrants the fraction that reach their maximum employment size in their first, second, third, and fourth years of operation, respectively. Maximum employment is only calculated over the first four years of the startup's life to maintain a consistent window for each cohort from 1977 to 1996. 37% of long-term entrants begin with the largest employment they will obtain over their first four years of operation. Shares for the second and third years are about 20%, while the fourth year share is 23%. Thus, substantial heterogeneity exists in growth patterns. Manufacturing displays greater within-firm growth, with its initial share being the lowest among sectors at 28%. It is, in fact, the only sector whose fourth year share is greater than the initial share. This difference may be important in comparing studies of entry sizes and growth using manufacturing data to economy-wide studies.

We analyze the within-firm growth in two steps. Figure 3 first plots the share of long-term entrants by state-year that enter at their maximum size in the first year around the interstate deregulations. Relative to the reform year, there is a 1% to 3% higher share of entrants who start at their maximum size. This effect is statistically significant to a 10% level, and it is economically meaningful to the average first year share of 37%. It suggests reduced financing constraints allowed a greater share of firms to enter at their optimal size. Weighing against this conclusion, however, is that the increase after the reforms is comparable to greater shares that existed prior to the reforms. While the reforms are associated with a strong break in the downward trend evident, we cannot say whether this trend would have continued absent the reforms. The structures that econometric specifications place on this pre-trend will govern the extent to which an intensive margin effect is measured.

As a second step, Figures 4A and 4B consider within-firm growth of long-term entrants who do not enter at their optimal sizes. Panel A presents the log ratio of entry size to maximum size, while Panel B considers the log time required to reach the maximal size. These dependent variables are again means by state-year. The entry ratio pattern does suggest some growth in relative

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who reach their tenth year of operation. We have confirmed in unreported estimations that similar results are obtained when conditioning on three-year or five-year survival.



entry size after the reform. The 2% gain in the entry size ratio is statistically significant through about seven years after the reform. The point estimates are also mostly larger than pre-reform values, which are not statistically different from the reform year. There is again, however, a trend leading into the reform that moves in the opposite direction to the results. Panel B shows that long-term entrants obtain their maximum size faster after the reforms. This effect, however, is only in contrast to the rising trend in the time to achieve maximum size that existed prior to the reform.<sup>4</sup>

The patterns documented in these figures, as well as Figures 1 and 2, are representative of a wide range of specifications that we examined. Most importantly, the outcomes are not due to unmodeled industry-level changes. We present our results using state-year aggregates for transparency, but these findings are also evident when using state-industry-year variation and removing industry trends. We have also compared entrants in financially dependent sectors to those in non-financially dependent sectors, and we again find limited differences for changes in entry size. The one dimension on which we find stronger effects is to narrow the sample more around smaller, growth-oriented firms (e.g., entrants with fewer than ten employees who are not at their optimal sizes).

### 3 Conclusions

We find limited evidence for intensive margin effects following the US banking deregulations. No response is evident for intrastate reforms, and evidence for growth in entry sizes after interstate reforms only exists when looking at within-firm employment patterns and growth to optimal sizes. These latter effects are interesting in that they are the margin most strongly predicted by theoretical models of financing constraints. Even here, however, the results are not conclusive due to pre-period effects of similar magnitude to the period after the reform. Moreover, to the extent that intensive margin effects do exist, they are relatively

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<sup>4</sup>As a rough calculation, the 2% higher entry size after the deregulations would have resulted in at most 50,000 created jobs. Note, however, that this effect is temporary as it relative to optimal size reached by the firm. Unreported estimations do not find any systematic changes in optimal entrant size after the deregulations.

small in economic magnitude and ultimately swamped by the large changes in entry rates.

As we noted in the introduction, a large body of research finds substantial product market effects following the US deregulations using empirical approaches more or less similar to our event study diagrams. This large bite, extending from the firm size distribution to racial discrimination, suggests to us that the US experience was an ideal candidate for looking for intensive margin changes. The fact that we do not find stronger evidence in the data with our variety of approaches leads us to conclude that entry size was not a very important channel for how product markets were impacted by branch banking deregulations in the US context. Many studies of US deregulations can be puzzled by why effects are evident after one class of deregulations versus another. Here, the bigger issue is that neither reform greatly influenced entrant size.

We hope that others will also study entry size effects around other sharp changes in financial conditions. Some aspects of the US experience have been shown to be different than in other countries (e.g., incumbent firm effects). While a variety of studies and techniques have documented entry rate changes after financial reforms, more evidence on the intensive margin is required. If the limited response continues to hold relative to other dimensions, this will have important implications for our models of financing constraints and entrepreneurship. It will also suggest that intensive margin changes are second-order for how financial markets impact product markets.

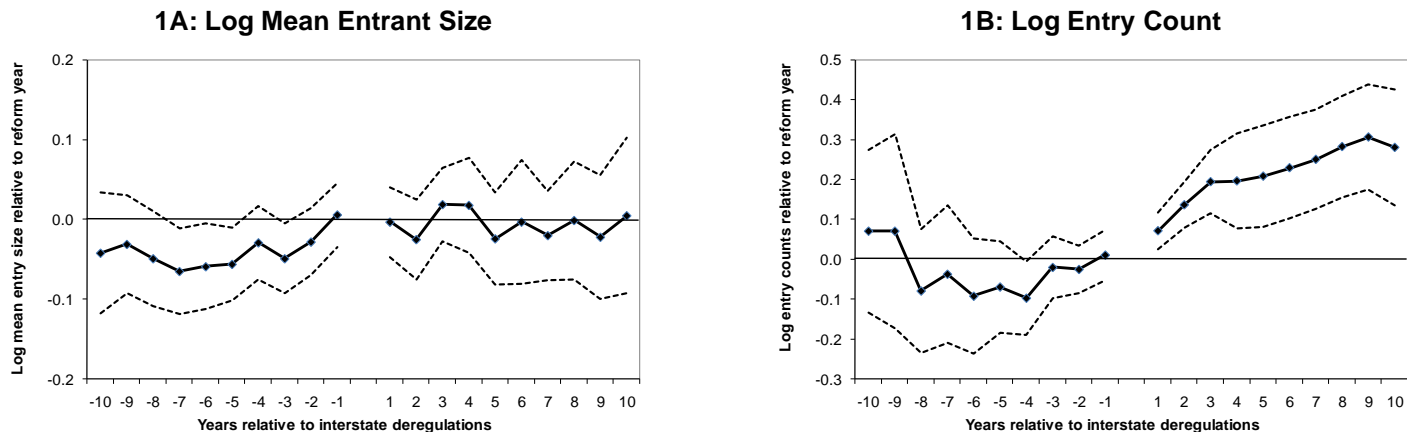
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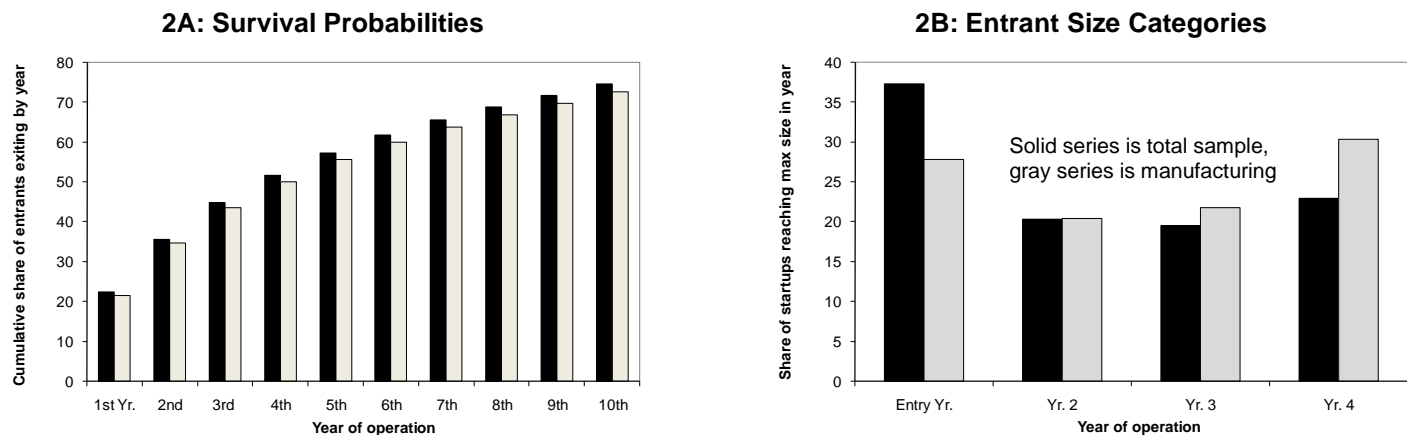
## Fig. 1. Startup entry sizes and counts around interstate reforms

The figures plot coefficients from regressions of log mean entry sizes and log entry counts on annual indicator variables for 10 years before and after US banking deregulations. The end points include all earlier and later years. The indicator variable for the first full year of the reform is omitted, so that coefficients are measured relative to entry sizes and entry rates in that year. State and year fixed effects are included in regressions. Underlying regressions jointly estimate dynamics for intrastate and interstate reforms, but only the latter are reported. The interstate reforms are associated with large increases in entry rates but no substantial changes in mean entrant size. No effect is found on entry sizes or entry counts after intrastate reforms. The dashed lines present 95% confidence intervals, with standard errors clustered by state.



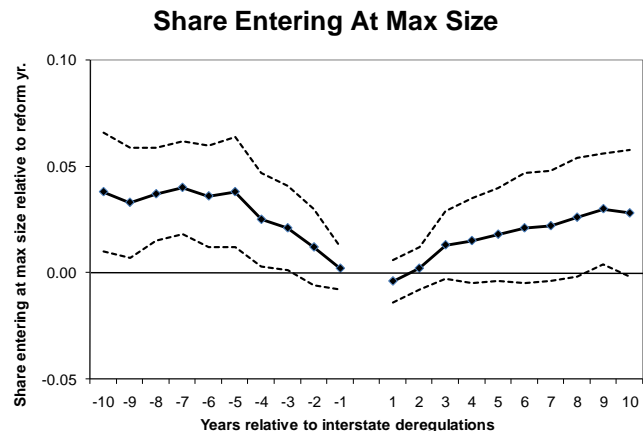
## Fig. 2. Startup entry size and survival probabilities

The figures detail startup survival probabilities and entry sizes. Panel A plots the cumulative share of entrants who exit within a given year of operation or earlier. The black lines are for the total sample; the lighter shaded lines are for manufacturing entrants. For example, approximately 50% of new firms exit within four years of entry. Panel B selects entrants who survive to their fourth year of operation or beyond. For these entrants, we identify the year in which the firm achieved its maximum employment size during its first four years of operation. 37% of all startups who will survive four years or longer enter at their largest employment levels; the fraction for manufacturing is 28%.



### Fig. 3. Share of firms entering at max size around interstate reforms

See Figures 1 and 2. This figure plots coefficients from a regression of entry shares on indicator variables for before and after US banking deregulations. The dependent variable is the fraction of new entrants who enter at the maximum size that they will achieve in their first four years of operation. The sample is restricted to entrants that survive four years or longer. The period after the interstate reforms is associated with more long-term entrants entering at their maximum four-year size compared to the reform period. The higher share is similar to the share that existed two years before the reform and earlier. No effects are evident for intrastate deregulations.



### Fig. 4. Startup entry conditions for growth firms around interstate reforms

See Figures 1 and 2. The figures plots coefficients from regressions of entry conditions for firms growing from their initial entry size on indicator variables for before and after US banking deregulations. The dependent variable in Panel A is the log size of entry in the first year relative to the maximum size that will be achieved over four years. The dependent variable in Panel B is the log time required to achieve this maximum size. The sample is restricted to entrants that survive four years or longer and those entrants that did not enter at their maximum size in the first year. The period after the interstate reforms is associated with entry closer to maximum four-year sizes compared to the reform period. Likewise, the time required to reach the maximum size decreases. Both effects, and especially growth time to max size, are comparable in economic magnitude to conditions existing several years before the interstate reforms. No effects are evident for intrastate deregulations.

