**Churning in Urban and Rural Markets: Evidence from Firm Entry and Exit, 1999-2015**

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**Abstract**

Churning occurs when firms are both entering and exiting a market simultaneously. We present a theoretical argument that churning implies that the same factors that would incentivize firm entry would also lead to greater rates of firm exit. We then present evidence supporting the theory in a variety of markets defined by industry, by size ranging from metropolitan to remote rural counties, and by counties on either side of state borders. The churning rate is greatest in the most agglomerated markets and least in the most remote rural markets.

**Key Words:** churning, firm entry, firm exit, entrepreneur, border, urban, rural

**JEL: R12, L26, M13**

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**I. Introduction**

The United States market system is relatively flexible and dynamic, characterized by fluid firm and worker entry and exit. This enable the US economy to adapt to changing economic circumstances, reallocating resources away from less productive activities and toward more attractive alternatives. Such rapid reallocation of labor and capital across sectors is believed to enable the U.S. to recover more rapidly from recessions (Decker et al., 2014). Therefore, reducing mobility in the U.S. labor market and a slowing pace of new firm entry have slowed productivity growth in the U.S economy (Decker et al., 2017).

The simultaneous entry and exit of firms and workers into a market is called churning. If churning results in the exit of inefficient workers or firms that are replaced by the new workers or ventures with higher productivity, then churning results in higher productivity. While this process has been widely explored in the labor market, less is known of the factors driving the churning of firms. This study investigates the importance of firm churning across industries and across urban and rural markets.

We introduce a model that shows how a healthy local market will attract new entrants but will also have a faster arrival rate of potential replacement entrepreneurs who bid up the opportunity cost of incumbent firms. The faster arrival rate of potential new entrepreneurs encourages a faster pace of exits. In weaker local economies, firm entrants will not have a steady supply of potential replacement entrepreneurs and so they will only enter if they have a higher expected profitability. Hence, markets that are thin in the population of potential entrepreneurs will have slow rates of both firm entry and firm exit. The theory suggests a novel test of churning that predicts that of the same local factors that induce new firm entry will also induce more incumbent firm exits in the same direction. We test the theory using data on private nonfarm establishment entry and exit by industry and county from 1999 – 2015.

The main findings are as follows:

1. The same local market factors that increase the rate of firm entry also lead to higher rate of firm exit. The simultaneous occurrence of firm entry and exit is an indication of churning.

2. Evidence of firm churning is found overall, in metropolitan, urban and rural markets, in all sectors of the economy, and in paired counties on either side of state borders.

3. The extent of firm entry, exit, and churning is greatest in metropolitan markets and least in rural markets.

4. The pace of firm churning has declined significantly in all areas except metropolitan markets.

5. The rate of firm entry is slightly faster than the rate of firm exits so that net firm entry increases. The net rate is largest in metropolitan areas and smallest in remote rural markets.

The remainder of the paper is organized as follows. In the next section, we review the previous research related to churning in the labor market and the dynamics of firms entry and exit. Section 3 presents a theoretical model of firm churning that illustrates how the same factors that encourage firm entry also encourage firm exit. In section 4, we present the data used for the research and define our agglomeration measures. Section 5 provides the empirical strategy and the corresponding estimation results are shown in Section 6. Section 7 concludes.

**II. Literature review**

Most of the research on churnings has focused on the labor market which is characterized by simultaneous hiring and separation in the same market (Burgess et al., 2000; Davis et al., 2006; Lazear and Spletzer, 2012; Lazear and McCue, 2017). The process of churning increases labor productivity as poor firm-worker matches end and are replaced by more productive firm-worker matches. Greater labor market churning speeds up productivity growth (Ilmakunnas et. al, 2005) and fosters innovation through knowledge spillovers among firms and improved job-match quality for R&D workers (Müller and Peters, 2010).

Lazear and Spletzer (2013) estimated that about three-quarters of new hires are for the purpose of replacement (churn) instead of expansion. In their model, hiring and separation should be positively correlated in aggregate, within industries and even within establishments. Lazear and McCue (2017) found that the correlation between aggregate hiring and separations is 0.88. Churning is procyclical (Lazear and Spletzer, 2012; Burgess et al., 2000), rising in expansions and declining during recessions. That suggests that more profitable markets are likely to be characterized by the most churning. Labor market churning is also more common in more densely populated markets (Wheeler, 2001, 2008; Bleakley and Lin, 2012; Stefan, 2017) as lower job search costs result in higher rates of job switching, quits and hires.

The strong positive correlation between hiring and separation rate is consistent with the view that separation and hiring are responding to the same economic factors. Lazear (1990) showed that high firing costs lower both separations and hires. Lazear and McCue (2017) showed that both separations and accessions rise in industries with wage distributions with a low mean but high variance. Hires and separations both decline as firms age or grow larger (Burgess et al., 2000; Ilmakunnas and Maliranta, 2005). There is some evidence that firm entry and exit may also respond to the same economic factors. Several studies have reported a high persistent correlation between entry and exit rates across industries (Dunne et al., 1988; Siegfried et al., 1994; Agarwal and Gort, 1996; Bartelsman et al., 2005). It is possible that more firm start-ups lead to more intense competition, driving inefficient incumbents out. Therefore, entry and exit of firms play a crucial role in explaining rapid productivity growth (Bartelsman and Doms, 2000; Asturias et al., 2017). New firms typically represent newer technology and exiting business generally are older with lower productivity (Ilmakunnas and Topi, 1999; Foster et al., 2008; Haltiwanger, 2012). In that way, firm entry and exit cause a reallocation of resources away from low-productivity business to high-productivity business (Foster et al., 2006; Pe'er and Vertinsky, 2008; Decker et al., 2014).

Numerous studies have associated various local market conditions with more rapid firm entry. Measures of agglomeration encourage the pace of start-ups (Glaeser et al., 1992; Braunerhjelm and Borgman, 2004; Shapiro, 2006; Brixy and Grotz, 2007; Ellison et al., 2010; Freedman and Kosová, 2011; Jofre-Monseny et al., 2011; Artz et al., 2016). Agglomeration matters most in the largest markets (Artz et al, 2020).

Local taxation and government expenditures affect both firm entry and exit (Duranton et al., 2011; Giroud and Rauh, 2019). Taxes discourage entry (Rickman and Wang, 2020) and encourage outmigration (Conroy et al., 2016). Reducing product market regulation increases business dynamism by facilitating firm entry and exit in EU countries, boosting sectoral total factor productivity (Anderton et al., 2018).

To our knowledge, past studies have not formally tied firm churning to a prediction that the same factors should influence firm entry and firm exit in the same direction. We will use a standard empirical model of firm entry using local agglomeration, market strength and tax and expenditure policies commonly used in past studies. We will then use these same factors to explain variation in firm exits from those same markets. As we will demonstrate, the correspondence between the signs on the factors explaining firm entry and firm exit are too consistent to be passed off as random coincidence.

**III. Model**

Firm churning is the simultaneous entry and exit of firms into a local market. Churning can occur within industries or across industries. However, it is not just a consequence that most start-ups fail, and so areas with many entrants will also have some proportion exiting. Rather, firm entrants and exits are responding to the same economic forces that make firms more productive or profitable. The model we present is one way that a firm churning outcome might result in competitive markets.

***Entry***

A risk-neutral entrepreneur in industry *k* would have an incentive to enter county at time *t* provided the expected return was sufficient to equal or exceed the opportunity cost of capital investment, . That is,

1.

where is the expected present value of the stream of net earnings from the venture and is the entry cost commonly faced by new firms at time *t* in county andindustry *k*. We assume that the expected present value of the venture’s profits will depend on the local productive attributes commonly available to firms in the industry and on the skills of the entrepreneur, as defined by

(2) )

County-specific attributes include local fiscal policies such as tax rates, real government expenditure and local market agglomeration measures. County- and sector-specific attributes, , include local industry agglomeration measures. If these attributes are indeed productive, then . There are sector-specific, , and location-specific, fixed factors that raise the profitability of all firms in the relevant market. The talents of the entrepreneur include skills that are transferable to any location, ; and skills that represent the complementarity between the entrepreneur and the location, . These location-specific complementarities include knowledge of the local customer base, relationships with suppliers or financiers, and location-specific knowledge of natural or human resources that would enhance the business. We assume that , , , and are identically and independently distributed with zero mean. There is also an zero mean transitory shock to profitability, , which is known at the time of entry.

The entry costs, , will reflect the cost of land and construction. The land price will reflect the same county- and sector-specific attributes, and , which affect local firms’ profitability. The construction and other entry costs, , are assumed to be the same across counties, and so

(3)

where is the county-specific share of the entry costs that can be recaptured when the venture is sold.

Combining (1-3)[[1]](#footnote-1) and taking logs, the logarithm of the expected rate of return for entrepreneur is

(4)

The entrepreneur has a choice of where to locate. The optimal location decision will maximize the expected rate of return of the firm so that

(5)

There will be a tendency for the most skilled entrepreneurs to locate in areas with the best endowments of local productive amenities. The reason is that agglomeration and entrepreneurial skills complement one another. To see why, note that the expected present value of net profits is increasing in individual entrepreneurial skill,

(6A)

and the magnitude of the partial rises with the level of local agglomeration and other productive attributes,

(6B)

The implication is that the markets with fewer natural productive attributes will attract fewer entrepreneurs who must have large location-specific skills that make up for their weaker general skills.

***Exit***

Over time, the entrepreneur will learn more about the value of the venture and other potential ventures may present themselves. The entrepreneur will exit if the opportunity cost of the site rises above the remaining present value of the stream of operating revenues. Supposethe new current resale price of the site plus improvements is , the realized present value of the venture’s profit stream at a future time is:

(7)

where the first bracketed term on the right-hand-side was the expected present value at the time the entrepreneur entered the market, and is the proportional capital gain or loss by time relative to that initial expectation at time . We assume that has mean zero and variance and its probability density function is

Firms will exit at time when: (1) the realized present value of profit is negative, or (2) the realized present value of profit is positive but another entrepreneur is willing to offer even more to take over the site. The first case is when the realization of so that . The second case occurs when the expected present value of an alternative entrepreneur satisfies the condition,

(8)

so that at time , entrepreneurcan profitably pay entrepreneur more than the period present value of the venture. Note that this does not require that the venture is failing, or even that the returns are below the period *t* expectation provided the entrepreneur is sufficiently skilled.

To derive the probability that entrepreneur decides to exit, let be the combined unobserved location-specific and idiosyncratic skills of the entrepreneur. The probability density function of is with cumulative distribution function is . Equation (8) implies that the entrepreneur will exit by transferring the assets of the operation to entrepreneur . Using (2) and (8) and applying logs, the efficient exit condition implies that

(9)

so that the new entrepreneur must be sufficiently skilled compared to entrepreneur to raise the revenue stream sufficiently to pay for entrepreneur ’s value added to the venture net of the forecast error on the firm’s expected net revenue stream. The probability that a given entrepreneur will take over from entrepreneur is which decreases in the skills of the current entrepreneur.

According to (6B), localities with the most profitable local attributes will attract more potential entrepreneurs, The probability that the incumbent in county exits at time is

(10)

where and are upper and lower boundary of the distribution of and is the upper boundary of the distribution of . increases as increases, which means that the same factors that lead to more firm entry at time will be correlated with a higher probability that the firm will subsequently exit due to the arrival of a more skilled entrepreneur. Thick markets with more potential entrepreneurs, , compared to thin market with fewer potential entrepreneurs, , means that . Hence there will be the most churning (simultaneous entrants and exits) in the denser urban markets than in thinner rural markets.

The theory suggests two hypotheses:

(1) A locational attribute will affect firm entry and firm exit in the same direction.

(2) Metropolitan or urban areas will have more churning than rural markets.

**IV. Data**

***Dependent variable***

The number of establishment births and deaths by county is reported by the U.S. Bureau of the Census *Statistics of U.S. Businesses* (SUSB). This annual series provides national and subnational data for all U.S business establishments by geography, industry and enterprise size since 1999. It covers most of the country’s economic activity, excluding non-employer businesses, private households, railroads, agriculture and most government entities. We also exclude mining because these establishments must locate where the resource is. The Business Information Tracking Series (BITS) includes the number of new establishments and the exits of incumbent establishments. Establishments are divided into 16 industries by two-digit North American Industry Classification System (NAICS) codes.

To test the theory that the same factors that induce local establishment entry would also lead to more incumbent establishment exits, we propose a menu of factors commonly used to measure local market productivity or profitability.

***Agglomeration Measures***

We need measures of the strength of locational or sectoral profitability. We measure these using a series of agglomeration measures. We generated four agglomeration measures that are industry-location-specific: the local cluster of establishments in the sector (; the presence of the monopoly opportunity in the sector ; and local presence of upstream suppliers ) and downstream customers ). We also add a measure of local industry concentration, county-specific Herfindahl Index (. We define each of these in turn.

Cluster specialization, , is the industry *k* share of total establishments in county and year relative to the industry share in the nation as a whole.

(11)

Denser industry clusters are believed to help in sharing common information, innovations and trained workers among establishments. These advantages lower the cost of production and should serve as a source of comparative advantage for establishments entering counties with greater density in sector .

The local monopoly opportunity, , is a dummy indicator, which takes the value of 1 if county has no incumbent establishment in industry in year , and 0 otherwise. The possibility of having a local monopoly opportunity may attract entry, or it may signal a particularly unprofitable economic environment in that sector and discourage entry.

The upstream, and downstream, measures indicate the relative availability of suppliers and customers in industry in county and year , respectively. The two measures are constructed with data on purchases and sales by industry from the 1997 Standard Use Table of Bureau of Economic Analysis. Let be the national share of all sector inputs that come from sector , represents the number of establishments in sector in county and year *.* Across *L* sectors,Then the local establishments devoted to providing inputs to sector in county is

(12)

Because counties vary in size, we standardize these values by dividing by the total number of establishments in county in year . The resulting ratio, , varies between zero and one. To make the measure comparable to others in the country, we divide by the average value of the ratio across all counties in the country, (). The resulting index of upstream industry supply in each county is

(13) .

Values greater than 1 imply a relatively higher than average local density of input suppliers to sector in county.

Following the same strategy, we define the share of all sector *k* demand coming from industry by , where The number of establishments devoted to sector purchasing output from sector in county is

(14)

and the standardized downstream demand is defined in an equivalent manner to upstream supply, namely

(15)

The data used to calculate Herfindahl-Hirschman index is based on the Upjohn Institute’s *WholeData Establishment and Employment* database. The series includes county employment by industry from 1998 to 2015. While greater detail is provided, we had to collapse values down to 9 sectors to avoid missing data. Define the employment share of industry in county and year *t* by. The Herfindahl-Hirschman index in year and county is

(16) ; *K* = 9

Values range between 0 and 1, where values closer to 1 imply greater industry concentration or lower industry diversity. A more diversified industrial base could make the local market less exposed to adverse sectoral shocks and more stable product demand for local establishments which could induce establishment entry and enhance its survival.

We also include other agglomeration measures that have been commonly used in previous studies. , the proportion of residents over age 25 with a college degree in county and year is used to measure the human capital concentration. The education measure was obtained from the 2000 Census. Aggregation of consumer income increases local demand for goods and services, and so we add the real per capita personal income by county in year () from the Bureau of Economic Analysis .

Other factors that have been argued to attract firm entry include local natural amenities. Our measure () was compiled by the USDA Economic Research Service (McGranahan,1999). Real government expenditure per capita is provided by the U.S. Census Bureau, annual Survey of State and Local Government Finances (1999-2015). Better public infrastructure should complement private business climate. We measure the tax bite using the marginal property tax rate in the largest city in each state, a data series compiled by the Government of the District of Columbia, Department of Finance and Revenue. We also include a series of dummy variables to indicate county size using the USDA Rural-Urban continuum codes (RUCC) from 1993. The size categories are (RUCC=0-3), (RUCC=4-5), (RUCC=6-7), (RUCC=8), (RUCC=9).

Summary statistics of key variables are listed in Table 1. Combining all the information, there are 779,255 observations. On average, 14 establishments in a county are born per year while 13 establishments exit and so there has been a slow increase in the number of establishments on average. The average college population share is 44%. Metro areas represent 27% of the observations, 8% are large urban counties and 42% are designated as small urban counties. Twenty-three percent of the counties are designated rural with 8% adjacent and 15% not adjacent to a metropolitan area.

**V. Empirical Strategy**

The entrepreneur will locate in a county with the highest expected return rate (we suppressfor simplicity). For two counties and , the probability of choosing county is:

(17)

Note that the error term will not include any establishment or entrepreneur-specific fixed effect as these would be common across all locations and will be differenced away. If the error term follows the Type-1 extreme value distribution, we can estimate and using a conditional logit regression. Suppose that an entrepreneur is considering entering a market among *X* locations, the probability that an entrepreneur chooses county ( is

(18)

According to Guimaraes et al. (2003), the conditional logit regression is equivalent to a Poisson regression under some simple assumptions[[2]](#footnote-3). In this study, we use a Poisson regression to estimate and by maximizing the likelihood function:

(19)

Where is the number of establishments’ entry at time in county and industry .

We can use a corresponding Poisson regression with the number of establishment’s exit at time in county and industry to estimate and . Recall that the probability of an incumbent entrepreneur leaving the market in county industry at time is determined by

which rises with , the number of potential entrepreneurs. The arrival rate of potential replacement start-ups rises in the profitability of the location which by equation (4) is dependent on the locational attributes and . The count of the establishment exits follows a binomial distribution with the probability of . The binomial distribution approaches the Poisson distribution in the limit,[[3]](#footnote-4) and so we approximate the establishment exit process using a similar specification to (19)

(20)

where is the number of establishments displacing incumbent establishments at time in county and industry .

The empirical corollaries to our hypotheses are:

Hypothesis I: sign= sign and sign= sign

Hypothesis II: Let , , and be the effects of the market measures in a thick urban market and ,, and be the corresponding coefficients in a thin rural market. The same factors will influence entry and exit to the greatest extent in the thick urban markets, and so the hypothesis implies In addition, churning as measured by will be largest in the thickest urban markets.

To test the first hypothesis, we calculate the probability that coefficients for the same factor have the same sign for establishment entry and exit. The random probability that the signs will be equal for a given pair of coefficients is 0.5. If there are *N* elements of vectors *Z* and *W,* the random probability that there will be of the elements with the same sign is given by the binomial distribution

We have fifteen control variables in the estimation and the probability that all fifteen factors have the same sign across the entry and exit equations is 0.003%.[[4]](#footnote-5)

**VI. Empirical Results**

In this section, we assess whether the factors that affect establishment entry also affect incumbent establishment exit in the same direction. Our expectation is that even in cases where the direction of effect on establishment entry is surprising, we will have the same surprising sign on the corresponding equation explaining establishment exits. We assume that the entrepreneur makes the decision on where to locate or whether to close based on information available at the time of entry, and so all our market variables are from the previous year. Contemporaneous data would not have been available to market agents due to delays in government reporting of market information. Our estimation controls for clustering at the county level.

The baseline regression results are shown in Table 2. The null hypothesis that coefficients for the same factor have the same sign for establishment entry and exit holds in 14 of 15 possible coefficient pairs which would occur randomly only 0.046% of the time. The only exception is the possibility of monopoly entry which attracts start-ups, but local monopolists are less likely to exit.[[5]](#footnote-6)

The other factors have the same signed effects on establishment entry and exit. Establishments are more likely to both enter and exit markets with existing establishment clusters in the same industry, with better downstream establishment density, with a greater supply of high skill workers, with better amenity endowments, with greater per capita personal income, and with greater per capita government expenditures. Establishments are less likely to enter and exit markets with greater industry concentration as indicated by a large Herfindahl index, and high local property tax rates. A counterintuitive result that access to upstream suppliers has a significant negative effect on establishment entry, couples with a negative effect on incumbent establishment exits as well.

The time trend is negative for both entry and exit with a faster decline in the pace of exit. The implication is that there is a general decline in the pace of churning which is consistent with past studies that highlight the pace of churning is falling in labor markets (Davis et al., 2006; Davis and Haltiwanger, 2014). Consistent with Hypothesis II, the pace of both establishmententry and exit declines as population density decreases. With the most remote rural markets as the base, the greatest establishment turnover is in metropolitan markets, followed by large urban, small urban and rural adjacent to metro markets. The greatest churning is in the most populated markets and least in the smallest markets.

The coefficient magnitudes in the two columns in Table 2 are not comparable, and so we cannot immediately assess whether the pace of establishment entry is larger or smaller than the pace of its exit. For that reason, we convert the coefficients to elasticities in Table 3. Aggregating across the elasticities, a common proportional shock across all the various agglomeration factors would lead to net establishment entry with a small increase in start-ups and a decrease in exits. For all the metropolitan, large and small urban and rural adjacent markets, we can see the proportional increase of establishment entry exceeds the proportional increase of exit, indicating a net entry increase. However, the net gain in establishment numbers by factor and overall is quite small. Adding the comparative static entry and exit effects together, the greatest churn is in the densest markets and the smallest in the most remote rural markets.

We repeat the analysis at the industry level for 16 sectors and report representative results for 4 industries in Table 4. The analysis for all 16 industries is included in Appendix Table 1. The 4 industries include, manufacturing (the most studied), retail trade (the largest number of establishments), management (the smallest number of establishments), and health care (the sector with the most contrarian results). Except for the management sector, the null hypothesis of equal signs for entry and exit holds in 14 of 15 possible coefficient pairs which would occur with a random probability of 0.046%. Even with unexpected signs in the last 2 columns, the same sign pattern generally holds. For the management sector, the same sign hypothesis holds in 13 of 15 possible coefficient pairs with random probability of 0.32%.

Only professional service has significant evidence of increasing pace of churning over time, as indicated by significantly positive time trends for both establishment entry and exit. Churning is declining in utilities, construction, manufacturing, retail trade, finance insurance, and accommodations, as indicated by significant downward trends in both entry and exit. If churning results in improved productivity, then evidence of reduced churning in industries would suggest slowing productivity growth. In all 16 industries, the extent of establishment turnover increases monotonically with population density, with the least churning in remote rural markets and the most in metropolitan markets.

In Table 5, we report the results separately by size of market. Using RUCC codes to indicate market density, we evaluate metro (RUCC 1-3), large urban (RUCC 4-5), small urban (RUCC 6-7), rural adjacent to metro (RUCC 8), and rural non-adjacent to metro (RUCC 9). The direction of the effect of the agglomeration measures is largely consistent across the metro, urban and rural areas, although the magnitudes differ. One important exception is that accessing upstream and downstream establishments increases both establishment entry and exit only in large urban areas. Regardless of population density, the churning hypothesis holds. The random probability that we would match signs on coefficient pairs in 10 of 11 cases is only 0.54%, which we obtain in our metro, large and small urban and rural nonadjacent counties. For rural adjacent counties, we match signs in 9 of 11 pairs which would occur with random probability of 2.69%.

Holding constant other market conditions, the pace of entry and exit have declined significantly in all areas except for the metropolitan markets, as indicated by the trend coefficients. If churning has a productive externality as more profitable ventures replace less rewarding allocations of resources, the slowdown in churning signals a decrease in the pace of productivity growth for all but the most agglomerated areas.

Hypothesis II predicts that market productive factors would matter more in metropolitan markets than in less densely populated rural areas. In Table 6, we convert the coefficients into elasticities so that we can compare the magnitudes of the effects across thick and thin markets. We generate a single aggregate effect across the 11 elasticities to examine if the estimates are consistent with the predictions that . While there may be some individual departures from the prediction, the aggregate prediction holds well. The pattern is nearly monotonic for establishment entry and monotonic for establishment exits. The largest effects are in the thickest metropolitan markets and the smallest in the most remote rural markets.

We can also compare measures of churning across thick and thin markets, using a churning elasticity, which sums the absolute value of the entry and exit effects. The churning elasticity is 12.5 in the metropolitan markets and 3.4 in the nonadjacent rural markets.

We can convert the aggregate effects into implied net establishment entry numbers by market size. Due to the different business base in each area, the joint elasticity times the mean value of establishment entry and exit generates the change of absolute numbers, which is shown in the bottom of Table 6. A one-percent increases in each agglomeration measures will increase the number of establishments entry by 2.7 or 0.72% in the metropolitan markets and by 0.04 or 0.36% in the rural nonadjacent counties.

It is possible that our results are clouded by unmeasured local factors that affect establishment entry and exit. If we consider adjacent counties on either side of a state border, we can presume that entrants or incumbents on either side of the border face the same unobserved input and output price and other market factors. To correct for these unobserved factors, we repeat the analysis using paired counties on either side of the state borders. We apply the Poisson regression to specifications implied by the comparison of county factors as in equation (17), restricting the sample to contiguous counties at each of 107 state borders. Dummy variables for each county pair control for unobserved market fixed factors. The qualitative results reported in Table 7 are very similar to these in Table 2. The signs correspond in 14 of 15 pairs, an outcome that would occur only 0.046% of the time. We repeat the border analysis for each of the 16 sectors as reported in Appendix Table 2. Again, our findings prove robust to the change in specification.

Table 8 summarizes all the tests of Hypothesis I that there will be sign correspondence between the factors explaining establishment entry and exit. Across every market we analyze, in aggregate, by industry, and by market size, the consistent result is that the same factors that induce establishment entry induce exit as well. The probabilities for the degree of sign correspondence we obtain are quite small, indicating the results are inconsistent with random occurrence. The same factors that attract establishments to enter also drive more incumbent establishment exits, consistent to the importance of churning in local markets.

**VII Conclusion**

The study investigates whether the churning phenomenon of firm start-ups and exits exists in the business market in United States and further checks whether the churning holds in all sectors and areas vary by population density. The key finding is that the same factors attracting new entrepreneurs are also crucial to drive firm exits simultaneously, providing evidence of firm churning nationally, in all industries, in metropolitan, urban and rural counties, and in counties on either side of state borders.

The extent of churning is positively associated with population density, greatest in metropolitan and least in remote rural areas. Incumbent ventures in metropolitan areas, even those that are profitable, face a much higher arrival rate of potential replacement entrepreneurs with even higher expected profitability. The relatively high rate of churning in metro and urban markets serves as an additional source of agglomeration advantages in thick urban markets over thin rural markets.

Our finding imply that the process of churning generates higher productivity by more efficient and profitable firms replacing less productive incumbents. Past studies have demonstrated that labor market churning raises productivity, and that one-quarter of productivity growth is due to firm entry and exit (Bartelsman and Doms, 2000). Government efforts to prevent firm exits also serve as a barrier to entry of potentially better replacement entrepreneurs, slowing productivity growth. Our findings suggest a superior policy alternative is to lower the costs of firm entry to insure a high arrival rate of potential replacement firms.

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| Table 1 Summary Statistics |
|   | N | Mean | Std. Dev. | Min | Max |
| *Dependent variables* |  |  |  |  |  |
| births | 779,255 | 13.87 | 63.70 | 0 | 4073 |
| deaths | 779,255 | 13.17 | 58.58 | 0 | 3619 |
| *Independent variables* |  |  |  |  |  |
| Upstream | 779,255 | 1.01 | 0.19 | 0 | 15.93 |
| Downstream | 779,255 | 1.00 | 0.20 | 0 | 8.46 |
| Cluster | 779,255 | 1.14 | 1.29 | 0 | 106.47 |
| Herfindahl index | 779,255 | 0.21 | 0.06 | 0.13 | 1.00 |
| Monopoly | 779,255 | 0.00 | 0.06 | 0 | 1 |
| College above | 779,255 | 44.39 | 11.75 | 11.7 | 86.00 |
| Amenity | 779,255 | 0.06 | 2.31 | -6.4 | 11.17 |
| real per capita personal income (1000 dollars) | 779,255 | 32.26 | 8.67 | 10.71 | 183.20 |
| real government expenditure per capita | 779,255 | 8.07 | 1.45 | 5.47 | 15.31 |
| effective property tax rate | 779,255 | 1.66 | 0.67 | 0.47 | 4.59 |
| metro (Beale Code=1,2,3) | 779,255 | 0.27 | 0.45 | 0 | 1 |
| large urban (Beale Codes=4,5) | 779,255 | 0.08 | 0.27 | 0 | 1 |
| small urban (Beale Codes=6,7) | 779,255 | 0.42 | 0.49 | 0 | 1 |
| rural adjacent (Beale Codes=8) | 779,255 | 0.08 | 0.27 | 0 | 1 |
| rural nonadjacent (Beale Codes=9) | 779,255 | 0.15 | 0.36 | 0 | 1 |
| year | 779,255 | 2007.06 | 4.90 | 1999 | 2015 |

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| Table 2 New firm entry and exit for the whole sample in U.S. from 1999 to 2015 |
|   | (1) | (2) |
|   | births | deaths |
| Upstream | -0.896\*\*\* | -1.056\*\*\* |
|  | (0.118) | (0.121) |
| Downstream | 1.175\*\*\* | 1.159\*\*\* |
|  | (0.138) | (0.137) |
| Cluster | 0.127\*\*\* | 0.134\*\*\* |
|  | (0.011) | (0.011) |
| Herfindahl index | -13.840\*\*\* | -14.105\*\*\* |
|  | (2.520) | (2.389) |
| Monopoly | 0.870\*\*\* | -20.748\*\*\* |
|  | (0.084) | (0.088) |
| College above | 0.009 | 0.005 |
|  | (0.007) | (0.007) |
| Amenity | 0.129\*\* | 0.126\*\* |
|  | (0.059) | (0.057) |
| real per capita personal income(1000dollars) | 0.017\*\*\* | 0.018\*\*\* |
|  | (0.004) | (0.003) |
| real government expenditure per capita | 0.036\*\* | 0.081\*\*\* |
|  | (0.014) | (0.014) |
| effective property tax rate | -0.014 | -0.074\*\*\* |
|  | (0.010) | (0.011) |
| Year | -0.020\*\*\* | -0.021\*\*\* |
|  | (0.008) | (0.007) |
| metro (Beale Code=1,2,3) | 2.658\*\*\* | 2.556\*\*\* |
|  | (0.150) | (0.139) |
| large urban (Beale Codes=4,5) | 1.594\*\*\* | 1.537\*\*\* |
|  | (0.116) | (0.107) |
| small urban (Beale Codes=6,7) | 1.006\*\*\* | 0.957\*\*\* |
|  | (0.092) | (0.085) |
| rural adjacent (Beale Codes=8) | 0.332\*\*\* | 0.318\*\*\* |
|  | (0.106) | (0.099) |
| Industry dummies | Y | Y |
| State fixed effect | Y | Y |
| constant | 36.084\*\* | 39.667\*\*\* |
|  | (14.658) | (13.752) |
| N | 779255 | 779255 |

*Notes:* Estimates are based on the Poisson regression. Standard errors are in parentheses. \*\*\*significant at 1 percent, \*\*significant at 5 percent, \*significant at 10 percent.

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| Table 3 Elasticities of agglomeration measures on new firm entry and exit in U.S. from 1999 to 2015 |
|   | (1) | (2) |
|  | births | deaths |
| Upstream | -0.905\*\*\* | -1.067\*\*\* |
| Downstream | 1.177\*\*\* | 1.161\*\*\* |
| Cluster | 0.145\*\*\* | 0.153\*\*\* |
| Herfindahl index | -2.940\*\*\* | -2.996\*\*\* |
| Monopoly | 1.387\*\*\* | -1.000\*\*\* |
| College above | 0.410 | 0.223 |
| Amenity | 0.008\*\* | 0.008\*\* |
| real per capita personal income(1000dollars) | 0.550\*\*\* | 0.577\*\*\* |
| real government expenditure per capita | 0.293\*\* | 0.653\*\*\* |
| effective property tax rate | -0.024 | -0.123\*\*\* |
| Year | -0.020\*\*\* | -0.021\*\*\* |
| *Proportional change: reference is rural nonadjacent to metro* |
| Metro | 13.268\*\*\* | 11.884\*\*\* |
| Large urban | 3.923\*\*\* | 3.651\*\*\* |
| Small urban | 1.735\*\*\* | 1.604\*\*\* |
| rural adjacent to metro | 0.394\*\*\* | 0.374\*\*\* |
| N | 779255 | 779255 |

 *Note:* Elasticities based on Poisson regression reported in Table 2. The results for monopoly are the proportional changes in the probability of firm entry going from absence of a monopoly to the presence of a monopoly in the county-sector market. The results for the metro, large urban, small urban, rural adjacent to metro are also the proportional changes in the probability of firm entry going from metro, large urban, small urban, rural areas adjacent to metro to otherwise respectively, calculated by . The reference group is rural areas nonadjacent to metro area.

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| Table 4 New firm entry and exit by sectors in U.S. from 1999 to 2015 |
|   | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|  | births | deaths | births | deaths | births | deaths | births | deaths |
|  | manufacturing | retail trade | management | health care |
| Upstream | -5.549\*\*\* | -6.113\*\*\* | -2.294\*\*\* | -2.359\*\*\* | 1.043\*\* | 1.080\*\* | 0.788\*\*\* | 0.808\*\*\* |
|  | (0.639) | (0.606) | (0.254) | (0.242) | (0.492) | (0.528) | (0.240) | (0.230) |
| Downstream | 2.235\*\*\* | 2.386\*\*\* | 0.997\*\*\* | 0.949\*\*\* | 3.320\*\*\* | 3.504\*\*\* | 2.143\*\*\* | 2.020\*\*\* |
|  | (0.335) | (0.334) | (0.142) | (0.141) | (0.351) | (0.369) | (0.346) | (0.348) |
| Cluster | 0.709\*\*\* | 0.752\*\*\* | -1.677\*\*\* | -1.387\*\*\* | 0.271\*\*\* | 0.294\*\*\* | 1.464\*\*\* | 1.602\*\*\* |
|  | (0.080) | (0.078) | (0.312) | (0.294) | (0.042) | (0.088) | (0.153) | (0.132) |
| Herfindahl index | -9.042\*\*\* | -9.932\*\*\* | -7.168\*\*\* | -7.749\*\*\* | -20.895\*\*\* | -23.015\*\*\* | -14.835\*\*\* | -14.853\*\*\* |
|  | (1.543) | (1.551) | (1.569) | (1.366) | (2.826) | (3.077) | (2.572) | (2.509) |
| Monopoly | 0.701\* | -17.320\*\*\* | -1.021\* | -15.139\*\*\* | 1.223\*\*\* | -18.770\*\*\* | 1.054\*\* | -14.589\*\*\* |
|  | (0.388) | (0.427) | (0.620) | (0.970) | (0.162) | (0.220) | (0.436) | (0.438) |
| College above | 0.011\*\* | 0.005 | 0.002 | <-0.001 | -0.023\*\*\* | -0.028\*\*\* | 0.005 | <0.001 |
|  | (0.005) | (0.005) | (0.005) | -0.005 | (0.009) | (0.009) | (0.007) | (0.007) |
| Amenity | 0.180\*\*\* | 0.186\*\*\* | 0.147\*\*\* | 0.145\*\*\* | 0.025 | 0.005 | 0.121\*\* | 0.124\*\* |
|  | (0.053) | (0.050) | (0.044) | (0.041) | (0.059) | (0.059) | (0.058) | (0.057) |
| real per capita personal income(1000dollars) | -0.005 | -0.004 | -0.003 | -0.001 | 0.010\*\* | 0.010\*\* | 0.013\*\*\* | 0.015\*\*\* |
|  | (0.005) | (0.005) | (0.004) | (0.004) | (0.004) | (0.004) | (0.005) | (0.004) |
| real government expenditure per capita | 0.027\*\* | 0.106\*\*\* | 0.076\*\*\* | 0.113\*\*\* | -0.098\*\*\* | -0.037 | 0.007 | 0.003 |
|  | (0.013) | (0.011) | (0.016) | (0.012) | (0.021) | (0.049) | (0.015) | (0.015) |
| effective property tax rate | -0.072\*\*\* | -0.120\*\*\* | -0.022\*\* | -0.085\*\*\* | -0.064\*\* | 0.021 | -0.040\*\*\* | -0.052\*\*\* |
|  | (0.011) | (0.012) | (0.009) | (0.009) | (0.031) | (0.053) | (0.012) | (0.013) |
| Year | -0.033\*\*\* | -0.046\*\*\* | -0.030\*\*\* | -0.036\*\*\* | 0.008 | 0.018\* | 0.011 | 0.014\* |
|  | (0.007) | (0.006) | (0.006) | (0.005) | (0.009) | (0.009) | (0.008) | (0.008) |
| metro (Beale Code=1,2,3) | 2.224\*\*\* | 2.267\*\*\* | 2.447\*\*\* | 2.299\*\*\* | 2.995\*\*\* | 2.951\*\*\* | 3.144\*\*\* | 3.043\*\*\* |
|  | (0.143) | (0.150) | (0.144) | (0.121) | (0.320) | (0.354) | (0.225) | (0.209) |
| large urban (Beale Codes=4,5) | 1.328\*\*\* | 1.354\*\*\* | 1.522\*\*\* | 1.429\*\*\* | 1.826\*\*\* | 1.740\*\*\* | 2.177\*\*\* | 2.110\*\*\* |
|  | (0.128) | (0.135) | (0.111) | (0.096) | (0.324) | (0.371) | (0.195) | (0.181) |
| small urban (Beale Codes=6,7) | 0.801\*\*\* | 0.811\*\*\* | 0.934\*\*\* | 0.874\*\*\* | 1.172\*\*\* | 1.150\*\*\* | 1.599\*\*\* | 1.541\*\*\* |
|  | (0.104) | (0.111) | (0.088) | (0.076) | (0.286) | (0.324) | (0.177) | (0.163) |
| rural adjacent (Beale Codes=8) | 0.407\*\*\* | 0.409\*\*\* | 0.446\*\*\* | 0.412\*\*\* | 0.532\* | 0.468 | 0.427\* | 0.448\*\* |
|  | (0.126) | (0.126) | (0.112) | (0.099) | (0.291) | (0.323) | (0.238) | (0.220) |
| Industry dummies | Y | Y | Y | Y | Y | Y | Y | Y |
| State fixed effect | Y | Y | Y | Y | Y | Y | Y | Y |
| constant | 69.617\*\*\* | 96.911\*\*\* | 64.948\*\*\* | 77.106\*\*\* | -18.188 | -38.636\*\* | -24.086 | -30.542\* |
|  | (14.103) | (12.225) | (10.632) | (9.488) | (18.003) | (18.630) | (16.285) | (15.724) |
| N | 50160 | 50160 | 51185 | 51185 | 35987 | 35987 | 50901 | 50901 |

*Notes:* Estimates are based on the Poisson regression. Standard errors are in parentheses. \*\*\*significant at 1 percent, \*\*significant at 5 percent, \*significant at 10 percent.

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| Table 5 New firm entry and exit by areas in U.S. from 1999 to 2015 |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|  | Metro | Large urban | Small urban | Rural adjacent | Rural nonadjacent |
|  | births | deaths | births | deaths | births | deaths | births | deaths | births | deaths |
| Upstream | -0.818\*\*\* | -0.972\*\*\* | 0.081 | 0.033 | -0.510\*\*\* | -0.556\*\*\* | -0.575\*\*\* | -0.642\*\*\* | -0.685\*\*\* | -0.732\*\*\* |
|  | (0.167) | (0.175) | (0.095) | (0.088) | (0.048) | (0.047) | (0.061) | (0.057) | (0.051) | (0.049) |
| Downstream | 2.495\*\*\* | 2.526\*\*\* | 0.686\*\*\* | 0.640\*\*\* | 0.276\*\*\* | 0.186\*\*\* | -0.090 | -0.219\*\* | -0.318\*\*\* | -0.476\*\*\* |
|  | (0.320) | (0.313) | (0.140) | (0.129) | (0.070) | (0.068) | (0.111) | (0.109) | (0.071) | (0.074) |
| Cluster | 0.377\*\*\* | 0.384\*\*\* | 0.669\*\*\* | 0.717\*\*\* | 0.363\*\*\* | 0.445\*\*\* | 0.136\*\*\* | 0.179\*\*\* | 0.090\*\*\* | 0.108\*\*\* |
|  | (0.048) | (0.049) | (0.058) | (0.067) | (0.018) | (0.021) | (0.013) | (0.017) | (0.006) | (0.007) |
| Herfindahl index | -20.566\*\*\* | -21.641\*\*\* | -3.799\*\*\* | -3.564\*\*\* | -3.235\*\*\* | -3.178\*\*\* | -1.684\*\*\* | -1.794\*\*\* | -2.078\*\*\* | -2.069\*\*\* |
|  | (4.435) | (4.283) | (0.862) | (0.822) | (0.361) | (0.335) | (0.420) | (0.394) | (0.717) | (0.674) |
| Monopoly | -0.391 | -17.547\*\*\* | 1.294\*\*\* | -13.992\*\*\* | 1.461\*\*\* | -17.520\*\*\* | 1.287\*\*\* | -18.280\*\*\* | 1.240\*\*\* | -19.787\*\*\* |
|  | (0.309) | (0.339) | (0.194) | (0.316) | (0.047) | (0.069) | (0.057) | (0.102) | (0.098) | (0.105) |
| College above | 0.004 | -0.001 | 0.015\*\*\* | 0.009\*\* | 0.033\*\*\* | 0.028\*\*\* | 0.020\*\*\* | 0.015\*\*\* | 0.022\*\*\* | 0.017\*\*\* |
|  | (0.008) | (0.008) | (0.004) | (0.004) | (0.002) | (0.002) | (0.005) | (0.005) | (0.005) | (0.005) |
| Amenity | 0.133\*\* | 0.130\*\* | 0.059\*\*\* | 0.063\*\*\* | 0.062\*\*\* | 0.059\*\*\* | 0.092\*\*\* | 0.085\*\*\* | 0.140\*\*\* | 0.127\*\*\* |
|  | (0.066) | (0.064) | (0.022) | (0.019) | (0.013) | (0.012) | (0.034) | (0.031) | (0.032) | (0.030) |
| real per capita personal income (1000dollars) | 0.011\*\*\* | 0.012\*\*\* | 0.018\*\*\* | 0.017\*\*\* | 0.007\*\*\* | 0.007\*\*\* | 0.011\*\* | 0.009\* | 0.011\*\*\* | 0.006 |
|  | (0.004) | (0.004) | (0.006) | (0.005) | (0.003) | (0.002) | (0.005) | (0.005) | (0.004) | (0.004) |
| real government expenditure per capita | 0.039\*\* | 0.083\*\*\* | 0.018 | 0.072\*\*\* | 0.078\*\*\* | 0.126\*\*\* | 0.052\*\*\* | 0.117\*\*\* | 0.077\*\*\* | 0.100\*\*\* |
|  | (0.017) | (0.016) | (0.013) | (0.013) | (0.008) | (0.008) | (0.019) | (0.020) | (0.017) | (0.017) |
| effective property tax rate | -0.021\* | -0.081\*\*\* | -0.020 | -0.091\*\*\* | -0.033\*\*\* | -0.088\*\*\* | 0.021 | -0.098\*\*\* | -0.074\*\*\* | -0.146\*\*\* |
|  | (0.011) | (0.013) | (0.014) | (0.018) | (0.008) | (0.008) | (0.024) | (0.027) | (0.022) | (0.023) |
| Year | -0.005 | -0.007 | -0.032\*\*\* | -0.030\*\*\* | -0.055\*\*\* | -0.053\*\*\* | -0.043\*\*\* | -0.041\*\*\* | -0.047\*\*\* | -0.039\*\*\* |
|  | (0.010) | (0.009) | (0.004) | (0.004) | (0.002) | (0.002) | (0.006) | (0.005) | (0.005) | (0.005) |
| Industry dummies | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| State fixed effect | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| constant | 10.506 | 13.491 | 61.107\*\*\* | 55.712\*\*\* | 106.173\*\*\* | 100.443\*\*\* | 82.278\*\*\* | 77.497\*\*\* | 91.510\*\*\* | 74.855\*\*\* |
|  | (18.943) | (17.819) | (7.875) | (6.835) | (4.815) | (4.509) | (11.008) | (9.836) | (9.635) | (10.321) |
| N | 213616 | 213616 | 62794 | 62794 | 323677 | 323677 | 59435 | 59435 | 119733 | 119733 |

*Notes:* Estimates are based on the Poisson regression. Standard errors are in parentheses. \*\*\*significant at 1 percent, \*\*significant at 5 percent, \*significant at 10 percent.

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| Table 6 Elasticity of agglomeration measures on firm entry and exit for each area in U.S. from 1999 to 2015 |
|   | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|  | Metro | Large urban | Small urban | Rural adjacent | Rural nonadjacent |
|   | births | deaths | births | deaths | births | deaths | births | deaths | births | deaths |
| Upstream | -0.791\*\*\* | -0.940\*\*\* | 0.078 | 0.031 | -0.509\*\*\* | -0.555\*\*\* | -0.625\*\*\* | -0.698\*\*\* | -0.763\*\*\* | -0.815\*\*\* |
| Downstream | 2.574\*\*\* | 2.606\*\*\* | 0.659\*\*\* | 0.615\*\*\* | 0.267\*\*\* | 0.180\*\*\* | -0.093 | -0.226\*\* | -0.333\*\*\* | -0.497\*\*\* |
| Cluster | 0.374\*\*\* | 0.381\*\*\* | 0.673\*\*\* | 0.721\*\*\* | 0.407\*\*\* | 0.499\*\*\* | 0.181\*\*\* | 0.238\*\*\* | 0.130\*\*\* | 0.157\*\*\* |
| Herfindahl index | -3.754\*\*\* | -3.951\*\*\* | -0.731\*\*\* | -0.686\*\*\* | -0.703\*\*\* | -0.690\*\*\* | -0.410\*\*\* | -0.437\*\*\* | -0.514\*\*\* | -0.512\*\*\* |
| Monopoly | -0.324 | -1.000\*\*\* | 2.647\*\*\* | -1.000\*\*\* | 3.310\*\*\* | -1.000\*\*\* | 2.622\*\*\* | -1.000\*\*\* | 2.456\*\*\* | -1.000\*\*\* |
| College above | 0.201 | -0.047 | 0.699\*\*\* | 0.449\*\* | 1.349\*\*\* | 1.152\*\*\* | 0.790\*\*\* | 0.602\*\*\* | 0.917\*\*\* | 0.725\*\*\* |
| Amenity | 0.040\*\* | 0.039\*\* | 0.025\*\*\* | 0.027\*\*\* | -0.004\*\*\* | -0.004\*\*\* | 0.002\*\*\* | 0.002\*\*\* | -0.027\*\*\* | -0.025\*\*\* |
| real per capita personal income(1000dollars) | 0.406\*\*\* | 0.428\*\*\* | 0.563\*\*\* | 0.532\*\*\* | 0.216\*\*\* | 0.209\*\*\* | 0.314\*\* | 0.268\* | 0.336\*\*\* | 0.174 |
| real government expenditure per capita | 0.325\*\* | 0.693\*\*\* | 0.151 | 0.596\*\*\* | 0.617\*\*\* | 1.007\*\*\* | 0.409\*\*\* | 0.914\*\*\* | 0.610\*\*\* | 0.788\*\*\* |
| effective property tax rate | -0.036\* | -0.137\*\*\* | -0.033 | -0.148\*\*\* | -0.055\*\*\* | -0.147\*\*\* | 0.034 | -0.161\*\*\* | -0.116\*\*\* | -0.230\*\*\* |
| Year | -0.005 | -0.007 | -0.031\*\*\* | -0.030\*\*\* | -0.054\*\*\* | -0.052\*\*\* | -0.042\*\*\* | -0.040\*\*\* | -0.046\*\*\* | -0.038\*\*\* |
| N | 213616 | 213616 | 62794 | 62794 | 323677 | 323677 | 59435 | 59435 | 119733 | 119733 |
| Aggregate elasticity | 6.518 | 5.967 | 6.162 | 2.479 | 6.247 | 1.979 | 4.002 | 0.336 | 3.678 | -0.249 |
| Churning elasticity | 12.485 | 8.641 | 8.226 | 4.338 | 3.429 |
| Mean | 41.55 | 38.97 | 9.08 | 8.93 | 3.02 | 3.06 | 1.33 | 1.37 | 1.01 | 1.04 |
| Aggregate effect (number) | 2.708 | 2.325 | 0.560 | 0.221 | 0.189 | 0.061 | 0.053 | 0.005 | 0.037 | -0.003 |
| Percentage change | (0.72%) | (0.62%) | (0.58%) | (0.23%) | (0.58%) | (0.19%) | (0.40%) | (0.04%) | (0.36%) | (-0.03%) |
| Incumbent firm mean | 377.47 | 96.56 | 32.70 | 13.28 | 10.29 |

*Notes:* Elasticities based on the Poisson regression reported in Table 2. \*\*\*significant at 1 percent, \*\*significant at 5 percent, \*significant at 10 percent. The results for monopoly is the proportional changes in the probability of firm entry going from absence of a monopoly to the presence of a monopoly in the county-sector market, calculated by . The aggregate elasticity is calculated by . The aggregate agglomeration effect equals . Churning elasticity is the sum of the aggregate elasticity for births and deaths. Percentage change is generated by 100%\*aggregate effect/mean of incumbent firms.

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| Table 7 New firm entry and exit at border in U.S. from 1999 to 2015 |
|   | (1) | (2) |
| subject county | births | deaths |
| Upstream | -0.761\*\*\* | -0.884\*\*\* |
|  | (0.173) | (0.187) |
| Downstream | 1.172\*\*\* | 1.192\*\*\* |
|  | (0.253) | (0.264) |
| Cluster | 0.186\*\*\* | 0.194\*\*\* |
|  | (0.018) | (0.020) |
| Herfindahl index | -9.333\*\*\* | -9.690\*\*\* |
|  | (2.397) | (2.297) |
| Monopoly | 0.980\*\*\* | -18.413\*\*\* |
|  | (0.130) | (0.141) |
| College above | 0.019\*\*\* | 0.012\*\* |
|  | (0.006) | (0.006) |
| Amenity | 0.086 | 0.092 |
|  | (0.087) | (0.084) |
| real per capita personal income(1000dollars) | 0.016\*\*\* | 0.017\*\*\* |
|  | (0.004) | (0.004) |
| real government expenditure per capita | 0.049 | 0.061 |
|  | (0.045) | (0.045) |
| effective property tax rate | -0.107 | -0.111 |
|  | (0.080) | (0.082) |
| Year | -0.033\*\*\* | -0.027\*\*\* |
|  | (0.008) | (0.008) |
| metro (Beale Code=1, 2,3) | 2.491\*\*\* | 2.411\*\*\* |
|  | (0.168) | (0.159) |
| large urban (Beale Codes=4,5) | 1.557\*\*\* | 1.509\*\*\* |
|  | (0.132) | (0.127) |
| small urban(Beale Codes=6,7) | 1.006\*\*\* | 0.961\*\*\* |
|  | (0.095) | (0.090) |
| rural adjacent (Beale Codes=8) | 0.383\*\* | 0.357\*\* |
|  | (0.150) | (0.142) |
| Industry dummies | Y | Y |
| State pair fixed effect at border | Y | Y |
| constant | 62.264\*\*\* | 50.458\*\*\* |
|  | (15.930) | (15.570) |
| N | 269930 | 269930 |

*Notes:* Estimates are based on the Poisson regression. Standard errors are in parentheses. \*\*\*significant at 1 percent, \*\*significant at 5 percent, \*significant at 10 percent.

|  |
| --- |
| Table 8 The exist of sign correspondence for firm entry and firm exit in U.S. from 1999 to 2015 |
|   | no. of pair coefficient with same sign | no. of pair coefficient with different sign | random probability |
| ***whole sample*** | 14 | 1 | 0.046% |
| ***sector*** |  |  |  |
| Utility | 11 | 4 | 4.166% |
| Construction | 14 | 1 | 0.046% |
| Manufacturing | 14 | 1 | 0.046% |
| Wholesale trade | 13 | 2  | 0.320% |
| Retail trade | 14 | 1 | 0.046% |
| Transportation | 13 | 2 | 0.320% |
| Information | 11 | 4 | 4.166% |
| Finance insurance | 14 | 1 | 0.046% |
| Management | 13 | 2 | 0.320% |
| Real estate | 12 | 3 | 1.389% |
| Professional service | 14 | 1 | 0.046% |
| Educational service | 13 | 2 | 0.320% |
| Arts | 13 | 2 | 0.320% |
| Health care | 14 | 1 | 0.046% |
| Accommodation service | 15 | 0 | 0.003% |
| Other service | 15 | 0 | 0.003% |
| ***area*** |  |  |  |
| metro | 10 | 1 | 0.537% |
| large urban | 10 | 1 | 0.537% |
| small urban | 10 | 1 | 0.537% |
| rural adjacent to metro | 9 | 2 | 2.686% |
| rural nonadjacent to metro | 10 | 1 | 0.537% |
| ***whole sample at border*** | 14 | 1 | 0.046% |
| ***Sector at border*** |  |  |  |
| Utility | 10 | 5 | 9.164% |
| Construction | 14 | 1 | 0.046% |
| Manufacturing | 14 | 1 | 0.046% |
| Wholesale trade | 13 | 2 | 0.320% |
| Retail trade | 13 | 2 | 0.320% |
| Transportation | 13 | 2 | 0.320% |
| Information | 14 | 1 | 0.046% |
| Finance insurance | 13 | 2 | 0.320% |
| Management | 13 | 2 | 0.320% |
| Real estate | 14 | 1 | 0.046% |
| Professional service | 12 | 3 | 1.389% |
| Educational service | 13 | 2 | 0.320% |
| Arts | 12 | 3 | 1.389% |
| Health care | 14 | 1 | 0.046% |
| Accommodation service | 15 | 0 | 0.003% |
| Other service | 14 | 1 | 0.046% |

*Note:* The probabilities are based on the regression results showed in the previous tables.

1. We use the approximation that when *x* is small. [↑](#footnote-ref-1)
2. We prove this in the appendix. [↑](#footnote-ref-3)
3. The Poisson distribution can be seen as a limit of binomial distributions when the number of trials is greater than 20, and the probability of success *p* is smaller than 0.05. [↑](#footnote-ref-4)
4. 0.515 = 0.000031. [↑](#footnote-ref-5)
5. It may be that the monopoly case is one that does not fit our model well. The mechanism generating the common sign for entry and exit is the arrival rate of new potential entrants, but the case of a single incumbent may mean that the arrival rate of potential entrepreneurs ( is very small. Moreover, the variable measures different things in the entry and exit equations. It represents the absence of an incumbent firm in the entry equation, but it indicates the incumbent firm is a monopolist in the exit equation. [↑](#footnote-ref-6)