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 showing churning exists in a variety of markets defined by industry, by market 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 enables 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 phenomenon of 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. This is the process of Schumpeterian creative destruction that he argued led to economic innovation and growth. While churning 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 attract 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 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 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.

Among our findings:

1. The same local market factors that increase the rate of firm entry also lead to higher rates 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 remote 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 trend net firm entry increases. The net rate is largest in metropolitan areas and smallest in remote rural markets.

6. Firm churning is associated with significantly increased employment growth and improves output per worker, consistent with the presumption that churning involves more productive entrants replacing less productive exiting firms.

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 firm's 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; Leknes, 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). Local taxation and government expenditures affect both firm entry and exit (Duranton et al., 2011; Giroud and Rauh, 2019). Reducing product market regulation increases business dynamism by facilitating firm entry and exit in EU countries (Anderton et al., 2019).

The process of entry and exit is believed to raise productivity growth, consistent with Schumpeter's (1942) concept of creative destruction. 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). Bartelsman and Doms (2000) reported that the exit of inefficient firms and the entry of more productive replacements has been responsible for one-quarter of the productivity growth of the U.S. economy. Asturias et al. (2017) found that firm entry and exit were responsible for an even larger share of productivity growth in faster growing economies such as Chile's and Korea's.[1]

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

[1] Combes et al. (2012) argued that the difference in productivity between urban and rural markets was attributable to the greater agglomeration in urban markets and not to a stronger selection process driving out less efficient firms. These results are consistent with the view that the selection process is equally important in urban and rural markets.

standard empirical model of firm entry using local agglomeration, market strength, 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 is too consistent to be passed off as a 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 from competitive markets.

Entry

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

(1) $$\frac{\pi_{ickt}}{P_{ckt}} \geq r$$

where π_{ickt} is the expected present value of the stream of net earnings from the venture and P_{ckt} is the entry cost commonly faced by new firms at time t in county c and industry 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) $$\pi_{ickt} = Z_{ct}^{\alpha_z} W_{ckt}^{\alpha_w} (1 + \varepsilon_i + \varepsilon_k + \varepsilon_c + \varepsilon_{ic} + \eta_{ickt})$$

County c-specific attributes Z_{ct} include favorable local fiscal policies such as moderate tax rates and local market agglomeration measures. County- and sector-specific attributes, W_{ckt}, include local industry agglomeration measures. The coefficients α_z and α_w reveal whether these attributes raise or lower firm profitability. There are sector-specific, ε_k, and location-specific, ε_c 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, ε_i; and skills that represent the complementarity between the entrepreneur and the location, ε_{ic}. 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 ε_i, ε_k, ε_c, and ε_{ic} are identically and independently distributed with zero mean. There is also an $i.i.d$ zero mean transitory shock to profitability, η_{ickt}, which is known at the time of entry.

The entry costs, P_{ckt}, will reflect the cost of land and construction. The land price will reflect the same county- and sector-specific attributes, Z_{ct} and W_{ckt}, which affect local firms' profitability. The construction and other entry costs, C_t, are assumed to be the same across counties, and so

(3) $$P_{ckt} = \left(Z_{ct}^{\beta_z} W_{ckt}^{\beta_w} C_t\right)^{1-\gamma_c}$$

where $0 < \gamma_c < 1$ is the county-specific share of the entry costs that can be recaptured when the venture is sold.

Combining (1-3)[2] and taking logs, the logarithm of the expected rate of return for entrepreneur i is

$$(4) \qquad V_{ickt} = ln\left({}^{\pi_{ickt}}/_{P_{ckt}}\right) = [\alpha_z - (1-\gamma_c)\beta_z]ln(Z_{ct}) + [\alpha_w - (1-\gamma_c)\beta_w]ln(W_{ckt}) + \varepsilon_i + \varepsilon_k + \varepsilon_c + \varepsilon_{ic} + \eta_{ickt} - (1-\gamma_c)lnC_t$$

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

$$(5) \qquad V_{ickt} \geq V_{ic'kt} \qquad \forall c \neq c'$$

There will be a tendency for the most skilled entrepreneurs to locate in areas with the best endowments of local productive amenities.[3] 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,

$$(6A) \qquad \frac{\partial \pi_{ickt}}{\partial \varepsilon_i} = Z_{ct}^{\alpha_z} W_{ckt}^{\alpha_w} > 0$$

and the magnitude of the partial rises with local market and sectoral agglomeration levels, favorable fiscal policies, and other productive attributes,

$$(6B) \qquad \frac{\partial^2 \pi_{ickt}}{\partial \varepsilon_i \partial W_{ckt}} = \alpha_w Z_{ct}^{\alpha_z} W_{ckt}^{\alpha_w - 1} > 0;$$

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[2] We use the approximation that ln $(1 + x) \approx x$ when x is small.
[3] Behrens et al. (2014) show that more skillful entrepreneurs sort into cities and that their skills complement the agglomeration productivities in metropolitan areas..

$$\frac{\partial^2 \pi_{ickt}}{\partial \varepsilon_i \partial Z_{ct}} = \alpha_Z Z_{ct}^{\alpha_z - 1} W_{ckt}^{\alpha_w} > 0$$

The implication is that the markets with fewer natural productive attributes will attract fewer and less generally skilled entrepreneurs. To enter these less attractive markets, these entrepreneurs must have large location-specific skills to 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. Suppose the realized present value of the venture's profit stream at a future time $\tau > t$ is:

(7) $$\pi_{ick\tau}^R = \left[Z_{ct}^{\alpha_z} W_{ckt}^{\alpha_w}(1 + \varepsilon_i + \varepsilon_k + \varepsilon_c + \varepsilon_{ic} + \eta_{ickt})\right][1 + \theta_{ick\tau}]$$

where the first bracketed term on the right-hand-side was the expected present value at the time the entrepreneur entered the market, and $\theta_{ick\tau}$ is the proportional capital gain or loss by time τ relative to that initial expectation at time t. We assume that $\theta_{ick\tau}$ has mean zero and variance σ^2 and its probability density function is $g(\theta)$.

Firms will exit at time τ 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 $\theta_{ick\tau} \leq -1$ so that $\pi_{ick\tau}^R < 0$. The second case occurs when the expected present value of an alternative entrepreneur $j \neq i$ satisfies the condition,

(8) $$\pi_{ick\tau}^R < P_{ck\tau}^s < \pi_{jck\tau}$$

where $P^{s}_{ck\tau}$ is the new time τ resale price of the site. If (8) is satisfied, entrepreneur j can profitably pay entrepreneur i more than the period τ present value of *i's* venture. Note that this does not require that the i^{th} venture is failing, or even that the returns are below the period t expectation. It just requires that the j^{th} entrepreneur has a sufficiently high expected present value to cover *i'*s opportunity cost.

To derive the probability that entrepreneur i decides to exit, let $\mu_{ic} = \varepsilon_i + \varepsilon_{ic}$ be the combined unobserved location-specific and idiosyncratic skills of the i^{th} entrepreneur. The probability density function of μ_{ic} is $f(\mu_{ic})$ with cumulative distribution function $F(\mu_{ic})$. Equation (8) implies that the i^{th} entrepreneur will exit by transferring the assets of the operation to entrepreneur j. Using (2) and (8) and applying logs, the efficient exit condition implies that

(9) $$\mu_{ic} + \theta_{ick\tau} < \mu_{jc}$$

so that the new entrepreneur j must be sufficiently skilled compared to entrepreneur i to raise the revenue stream sufficiently to pay for entrepreneur i'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 j will take over from entrepreneur i is $1 - F(\mu_{ic} + \theta_{ick\tau})$ which decreases in the skills of the current entrepreneur.

According to (6B), localities with the most profitable local attributes will attract more potential entrepreneurs, $N_{ck\tau}(Z_{c\tau}, W_{ck\tau})$, which is defined as a function of $Z_{c\tau}$ and $W_{ck\tau}$. The probability $G(\mu_{ic}, \theta_{ick\tau}, N_{ck\tau})$ that the i^{th} incumbent in county c exits at time τ is

(10) $$G(\mu_{ic}, \theta_{ick\tau}, N_{ck\tau}) = 1 - \int_{\underline{\mu}}^{\overline{\mu}} \int_{-1}^{\overline{\theta}} f(\mu_{ic})\, g(\theta_{ick\tau}) \left[F(\mu_{ic} + \theta_{ick\tau})\right]^{N_{ck\tau}} d\theta_{ick\tau} d\mu_{ic}$$

where $\overline{\mu}$ and $\underline{\mu}$ are the upper and lower boundary of the distribution of μ and $\overline{\theta}$ is the upper boundary of the distribution of θ. $G(\mu_{ic}, \theta_{ick\tau}, N_{ck\tau})$ increases as $N_{ck\tau}$ increases, which means that the same factors, $Z_{c\tau}$ and $W_{ck\tau}$, that lead to more (less) firm entry at time t will be correlated with a higher (lower) probability that the firm will subsequently exit due to the arrival of a more skilled entrepreneur. Thick markets with more potential entrepreneurs, $N_{Uk\tau}$, compared to thin markets with fewer potential entrepreneurs, $N_{Rk\tau}$, means that $G(\mu_{iU}, N_{Uk\tau}) > G(\mu_{iR}, N_{Rk\tau})$. Hence the most churning (simultaneous entrants and exits) will be in the densest urban markets and the least in the thinnest rural markets.

While one would expect more firm deaths when there are more firm births, there is no requirement that the rate of firm exits would be higher where there is a greater rate of firm entry. Firm entry is conditioned on an expected positive profit in all markets, thick and thin. Similarly, the exit rate of incumbents is determined by their profitability relative to opportunity cost, and not the past entry rate. If the distribution of $\theta_{ick\tau}$ were the same across urban and rural markets, and the only factor causing exit was negative profit, the probability of exit would be the same across all markets. To have a greater exit rate in urban markets, there must be other sources of exit, and the faster arrival rate of potential replacements in urban markets explains why the rate of exit would be higher in urban markets. Rural markets require an atypically strong match productivity ($\varepsilon_{iR} > \varepsilon_{iU}$), which implies that it will be harder to find another entrepreneur with a larger locational match than the rural incumbents, so we expect to have less establishment firm turnover in rural market.

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 data for most U.S business establishments that have employees by county, industry and enterprise size since 1999. The SUSB excludes 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 generated four agglomeration measures that are industry-location-specific: the local cluster of establishments in the sector (CLU_{kct}); the presence of the monopoly opportunity in the sector (MON_{kct}); and local presence of upstream suppliers (UP_{kct}) and downstream customers ($DOWN_{kct}$). We also add a measure of local industry concentration, county-specific Herfindahl Index (HHI_{ct}). Note that the measures reflect the status of the local market in the year prior to either the entrance or the exit of the firm, and so they do not reflect the consequence of the firm's entry or exit decisions.

Cluster specialization, CLU_{kct}, is the industry k share of total establishments in county c and year $t-1$ relative to the industry k share in the nation as a whole.

(11) $CLU_{kct} = \frac{Establishments\ in\ k,c,t-1}{All\ Establishments\ in\ c,t-1} / \frac{Establishments\ in\ k,t-1\ in\ the\ United\ States}{All\ Establishments\ in\ t-1\ in\ the\ United\ States}$

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 k.

The local monopoly opportunity, MON_{kct}, is a dummy indicator, which takes the value of 1 if county c has no incumbent establishment in industry k in year $t-1$, 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, UP_{kct} and downstream, $DOWN_{kct}$ measures indicate the relative availability of suppliers and customers in industry k in county c and year $t-1$. 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 $S_{l \to k}$ be the national share of all sector k inputs that come from sector l , E_{lct-1} represents the number of establishments in sector l in county c and year $t-1$. Across L sectors, $\sum_{l=1}^{L} S_{l \to k} = 1$. Then the local establishments devoted to providing inputs to sector k in county c is

(12) $E_{kct}^{U} = \sum_{l=1}^{L} S_{l \to k} * E_{lct-1} \quad \forall l \neq k$

Because counties vary in size, we standardize these values by dividing by the total number of establishments in county c in year $t-1$. The resulting ratio, (E^U_{kct-1}/E_{ct-1}), 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, $(\overline{E^U_{kct-1}/E_{ct-1}})$. The resulting index of upstream industry supply in each county c is

$$(13)\ UP_{kct} = {(E^U_{kct-1}/E_{ct-1})}\Big/{(\overline{E^U_{kct-1}/E_{ct-1}})}.$$

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

Following the same strategy, we define the share of all sector k demand coming from industry l by $S_{l\leftarrow k}$, where $\sum_{l=1}^{L} S_{l\leftarrow k} = 1$. The number of establishments devoted to sector purchasing output from sector k in county c is

$$(14)\ E^D_{kct} = \sum_{l=1}^{L} S_{l\leftarrow k} * E_{lct-1} \quad \forall l \neq k$$

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

$$(15)\ DOWN_{kct} = {(E^D_{kct-1}/E_{ct-1})}\Big/{(\overline{E^D_{kct-1}/E_{ct-1}})}$$

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 k in county c and year

$t-1$ by $S_{kct-1} = \frac{Employment_{kct-1}}{Employment_{ct-1}}$. The Herfindahl-Hirschman index in year $t-1$ and county c is

(16) $HHI_{ct} = \sum_{k=1}^{K}(S_{kct-1})^2$; $K = 9$

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. EDU_{ct}, the proportion of residents over age 25 with a college degree in county c and year $t-1$ 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 c in year $t-1$ (INC_{ct}) from the Bureau of Economic Analysis.

Other factors that have been argued to attract firm entry include local natural amenities. Our measure ($AMENITY_{ct}$) 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 $Metro_c$(RUCC=0-3), $Large\_urban_c$(RUCC=4-5), $Small\_urban_c$(RUCC=6-7), $Rural\_adj_c$(RUCC=8), $Rural\_nonadj_c$(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 V_{ckt}. Combing equations 4 and 5, for two counties c and c', the probability of choosing county c is:

(17) $P(V_{ckt} > V_{c'kt}) = P[\delta_z(z_{ct} - z_{c't}) + \delta_w(w_{ckt} - w_{c'kt}) + \epsilon_{ckt} - \epsilon_{c'kt} > 0]$

where we have suppressed i and used lower case *z* and *w* to indicate log values to simplify notation. The error term will be

$$\epsilon_{ckt} - \epsilon_{c'kt} = (\varepsilon_c - \varepsilon_{c'}) + (\varepsilon_{ic} - \varepsilon_{ic'}) + (\eta_{ickt} - \eta_{ic'kt})$$

Note that the error term will not include any establishment or sector-specific fixed effects as these would be common across all locations and will be differenced away. However, the errors will still include county-specific effects and an effect capturing the complementarity between the entrepreneur’s skill and the location, a potential source of bias that we will address later using our border regressions. Our results are not sensitive to these alternative specifications.

Suppose that an entrepreneur is considering entering a market among X locations, the probability that an entrepreneur chooses county $c_x (x = 1, \dots, X)$ equals:

$$P_x = P\left[\epsilon_{c_{x'}kt} - \epsilon_{c_x kt} < \delta_z \left(z_{c_x t} - z_{c_{x'}t}\right) + \delta_w \left(w_{c_x kt} - w_{c_{x'}kt}\right) \text{ for all } x' \neq x\right]$$

If the error term follows the Type-1 extreme value distribution, Mcfadden (1973) proves that

(18) $P_x = \frac{exp(V_{c_x kt})}{\sum_{x=1}^{X} exp(V_{c_x kt})}$

McFadden suggests using conditional logit model to estimate δ_z and δ_w[4] in the value function V_{ckt}.

According to Guimaraes et al. (2003), the conditional logit regression is equivalent to a Poisson regression under some simple assumptions[5]. In this study, we use a Poisson regression to estimate δ_z and δ_w by maximizing the likelihood function:

(19) $L(\delta_z, \delta_w) = \sum_c \sum_k \sum_t [-log(n_{ckt}!) - exp(\delta_z z_{ct} + \delta_w w_{ckt}) + n_{ckt}(\delta_z z_{ct} + \delta_w w_{ckt})]$

Where n_{ckt} is the number of establishments' entry at time t in county c and industry k.

We can use a corresponding Poisson regression with the number of establishment's exit at time t in county c and industry k to estimate δ_z' and δ_w'. Recall that the probability of an incumbent entrepreneur leaving the market in county c industry k at time t is determined by

$$G(\mu_{ic}, \theta_{ickt}, N_{ckt}) = 1 - \int_{\underline{\mu}}^{\overline{\mu}} \int_{-1}^{\overline{\theta}} f(\mu_{ic})\, g(\theta_{ickt}) \left[F(\mu_{ic} + \theta_{ickt})\right]^{N_{ckt}} d\theta_{ickt} d\mu_{ic}$$

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[4] $\delta_z = \alpha_z - (1 - \gamma_R)\beta_z$, and $\delta_w = [\alpha_w - (1 - \gamma_c)\beta_w]$ from equation (4).
[5] We prove this in the appendix.

which rises with N_{ckt}, 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 Z_{ct} and W_{ckt}. The count of the establishment exits follows a binomial distribution with the probability of $G(\mu_{ic}, \theta_{ickt}, N_{ckt})$. The binomial distribution approaches the Poisson distribution in the limit,[6] and so we approximate the establishment exit process using a similar specification to (19)

(20) $L(\delta_z', \delta_w') = \sum_c \sum_k \sum_t [-log(m_{ckt}!) - exp(\delta_z' z_{ct} + \delta_w' w_{ckt}) + m_{ckt}(\delta_z' z_{ct} + \delta_w' w_{ckt})]$

where m_{ckt} is the number of establishments displacing incumbent establishments at time t in county c and industry k.

The empirical corollaries to our hypotheses are:

Hypothesis I: sign(δ_z) = sign(δ_z') and sign(δ_w) = sign(δ_w')

Hypothesis II: Let δ_Z^U, $\delta_{Z\prime}^U$, δ_W^U and $\delta_{W\prime}^U$ be the summed effects of the market measures in a thick urban market and δ_Z^R, $\delta_{Z\prime}^R$, δ_W^R and $\delta_{W\prime}^R$ be the corresponding summed 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 $|\delta_v^U| > |\delta_v^R| \ \forall \ v = Z, Z', W, W'$.

We can propose a third hypothesis that follows from the theory.

Hypothesis III: Churning, as measured by the summed effects of the entry and exit coefficients $\Psi^m = |\delta_v^m| + |\delta_{v\prime}^m|;\ \mathrm{m} = U, R$, will be the 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

[6] 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.

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 K of the N elements with the same sign is given by the binomial distribution

$$\binom{N}{K}(0.5)^K\left(1-(0.5)\right)^{N-K}=\frac{N!}{K!(N-K)!}(0.5)^N$$

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%.[7]

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

[7] $0.5^{15} = 0.000031$.

the possibility of monopoly entry which attracts start-ups, but local monopolists are less likely to exit.[8]

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 upstream 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 accesses to downstream demanders has a significant negative effect on establishment entry, couples with a negative effect on incumbent establishment exit 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 establishment entry 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.

[8] 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 (N_{ck} in equation (10)) 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.

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 in metropolitan and urban markets, but a small net decline in rural markets. 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 and health care have 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 the 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 $|\delta_v^U| > |\delta_v^R| \; \forall \; v = z, z', w, w'$. The largest churning 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 13.5 in the metropolitan markets and 5.4 in the nonadjacent rural markets.

We can convert the aggregate effects into implied net establishment entry numbers, and entry and exit rates 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 of establishments. Dividing by the number of incumbents provides the implied entry and exit rates reported at the bottom of Table 6. A one-percent increases in each agglomeration measures will increase the number of entrants by 3.0 or 0.78% in the metropolitan markets and by 0.04 or 0.43% in the rural nonadjacent counties. The corresponding exit rates are 0.66% and 0.10% for the metro and remote rural areas, respectively.

Border Regressions

It is possible that our results are clouded by unmeasured local factors that affect establishment entry and exit. We propose a border regression to address that concern. Referring to equation (17) let counties c and c' represent counties on either side of a state border. We assume that the two counties have the same unobserved local market attributes so that $\varepsilon_c = \varepsilon_{c'}$ and $\varepsilon_{ic} = \varepsilon_{ic'}$. Then the remaining error is $\epsilon_{ckt} - \epsilon_{c'kt} = (\eta_{ickt} - \eta_{ic'kt})$ which has been purged of the potential correlation between unobserved entrepreneur and county factors and the regressors. 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 state 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 with the importance of churning in local markets.

The effect of churning on productivity growth

If churning results in the exit of less efficient firms and the entry of more productive establishments, markets with greater churning rates should experience greater productivity growth. In this subsection, we examine whether we can associate our churning rates with more rapid productivity growth. We embed our churning measure into the local economic growth models used by Bunten et al. (2015) and Stephens et al., (2013).

The growth associated with churning should be apparent over a long period, and so we measure local growth over the period that spans our data, 1999-2015:

(21) $$(Y_{c2015} - Y_{c1999})/Y_{c1999} = \alpha + \gamma \widehat{churning}_{c1999} + \boldsymbol{X}'_{\boldsymbol{c1999}}\boldsymbol{\beta_2} + \varepsilon_{c1999}$$

Y_{ct} is measured, alternatively, as total employment, wage and salary employment, per capita personal income, or wage and salary per job for year *t* in county c. All measures are based on data from the U.S. Bureau of Economic Analysis. The left-hand side formulation converts the various measures into growth rates from 1999 to 2015. The right-hand side variables include the base period values of the control variables from Bunten et al. (2015) and Stephens et al., (2013): local amenities, human capital measures, the share of individuals in creative occupations[9], government policies, and population[10]. To these, we add the predicted churning rate, measured as the predicted local entry count from equation (19) plus the predicted exit count from equation (20) divided by the number of incumbent establishments. The coefficient on the churning measure will tell us if local churning of establishments is correlated with faster growth, controlling for other factors believed to affect employment, wages, or productivity.

In table 9, the 1999 predicted churning rate has a significant, positive effect on all four growth measures.[11] The first two columns imply that a one standard deviation increase in churning leads to 3% higher employment growth. Income per capita rises by 0.4% and wages by 0.5% with a one standard deviation higher churning rate. Simultaneously entry and exit of establishments into a local market does appear to increase long-term employment, wage and productivity growth, consistent with a presumed replacement of less productive establishments by more productive start-ups.

VII Conclusion

The study investigates whether the churning phenomenon of firm start-ups and exits exists in the business market in the 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

[9] This county-level creative measure is compiled by the USDA Economic Research Service.
[10] The county-level population data comes from U.S. Bureau of the Census.
[11] We bootstrap the standard errors to correct for the use of generated regressors to create the churning measure. We use 100 replications using random samples of the counties with replacement.

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 findings are consistent with Schumpeter's contention that the process of creative destruction, the entry of new firms replacing older firms in the same market, is an important source of economic growth. We find corresponding evidence that local firm churning is associated with faster local growth in jobs, per capita income, and wages. 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
Growth measures, 1999-2015					
Total employment growth	2,973	0.09	0.26	-0.51	3.64
Wage and salary employment growth	2,973	0.06	0.27	-0.50	4.78
Per capita personal income growth	2,973	0.81	0.36	0.05	7.03
Wage and salary per worker growth	2,973	0.68	0.20	-0.04	2.54
Independent variables					
Upstream	779,255	1.00	0.18	0	4.63
Downstream	779,255	1.00	0.15	0	3.54
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 (RUCC Code=1,2,3)	779,255	0.27	0.45	0	1
large urban (RUCC Codes=4,5)	779,255	0.08	0.27	0	1
small urban (RUCC Codes=6,7)	779,255	0.42	0.49	0	1
rural adjacent (RUCC Codes=8)	779,255	0.08	0.27	0	1
rural nonadjacent (RUCC Codes=9)	779,255	0.15	0.36	0	1
Share of individual in creative occupation in 2000	2,973	0.17	0.06	0.04	0.54
Churning rate, 1999	2,973	0.28	0.38	0	8.63

Table 2: New firm entry and exit for the whole sample in U.S. from 1999 to 2015

	(1) births	(2) deaths
Upstream	2.126***	2.109***
	(0.239)	(0.235)
Downstream	-0.548***	-0.710***
	(0.111)	(0.118)
Cluster	0.155***	0.159***
	(0.011)	(0.011)
Herfindahl index	-13.085***	-13.378***
	(2.278)	(2.149)
Monopoly	0.909***	-19.673***
	(0.094)	(0.096)
College above	0.009	0.005
	(0.007)	(0.007)
Amenity	0.130**	0.127**
	(0.058)	(0.055)
real per capita personal income (1000dollars)	0.014***	0.015***
	(0.004)	(0.003)
real government expenditure per capita	0.046***	0.090***
	(0.013)	(0.012)
effective property tax rate	-0.020**	-0.080***
	(0.009)	(0.010)
Year	-0.020***	-0.022***
	(0.007)	(0.007)
metro (RUCC Code=1,2,3)	2.410***	2.347***
	(0.108)	(0.101)
large urban (RUCC Codes=4,5)	1.397***	1.377***
	(0.091)	(0.085)
small urban (RUCC Codes=6,7)	0.826***	0.811***
	(0.066)	(0.063)
rural adjacent (RUCC Codes=8)	0.159*	0.165**
	(0.086)	(0.081)
Industry dummies	Y	Y
State fixed effect	Y	Y
constant	34.852**	38.382***
	(14.179)	(13.299)
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.

Table 3: Elasticities of agglomeration measures on new firm entry and exit in U.S. from 1999 to 2015

	(1) births	(2) deaths
Upstream	2.116***	2.100***
Downstream	-0.547***	-0.710***
Cluster	0.177***	0.181***
Herfindahl index	-2.779***	-2.842***
Monopoly	1.482***	-1.000***
College above	0.391	0.206
Amenity	0.008**	0.008**
real per capita personal income (1000dollars)	0.455***	0.479***
real government expenditure per capita	0.372***	0.729***
effective property tax rate	-0.033**	-0.132***
Year	-0.020***	-0.022***
Proportional change: reference is rural nonadjacent to metro		
Metro	10.134***	9.454***
Large urban	3.043***	2.963***
Small urban	1.368***	1.250***
rural adjacent to metro	0.172***	0.179***
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 $E = \exp(\beta_j) - 1$. The reference group is rural areas nonadjacent to metro area.

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	2.909***	2.922***	3.936***	3.813***	3.760***	3.896***	4.170***	4.076***
	(0.403)	(0.394)	(0.437)	(0.399)	(0.371)	(0.386)	(0.438)	(0.432)
Downstream	-3.981***	-4.755***	-1.439***	-1.541***	1.758***	1.760***	2.218***	2.307***
	(0.594)	(0.590)	(0.268)	(0.253)	(0.538)	(0.572)	(0.330)	(0.322)
Cluster	0.753***	0.789***	-0.110	0.108	0.277***	0.301***	2.038***	2.182***
	(0.081)	(0.079)	(0.389)	(0.344)	(0.042)	(0.088)	(0.132)	(0.118)
Herfindahl index	-9.585***	-10.495***	-7.331***	-7.914***	-19.562***	-21.558***	-11.653***	-11.753***
	(1.549)	(1.550)	(1.331)	(1.169)	(2.755)	(3.006)	(1.950)	(1.872)
Monopoly	0.608*	-16.651***	-1.232***	-15.090***	1.360***	-18.427***	2.315***	-12.872***
	(0.351)	(0.386)	(0.430)	(0.819)	(0.129)	(0.154)	(0.398)	(0.428)
College above	0.011**	0.005	-0.005	-0.007	-0.026***	-0.031***	-0.006	-0.011
	(0.005)	(0.005)	(0.005)	(0.005)	(0.009)	(0.009)	(0.007)	(0.007)
Amenity	0.187***	0.191***	0.134***	0.133***	0.023	0.003	0.114**	0.116**
	(0.053)	(0.049)	(0.045)	(0.043)	(0.059)	(0.059)	(0.052)	(0.051)
real per capita personal income(1000dollars)	-0.006	-0.005	-0.009**	-0.007*	0.008**	0.008**	0.004	0.005
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
real government expenditure per capita	0.020	0.102***	0.083***	0.120***	-0.087***	-0.028	0.025*	0.021
	(0.013)	(0.011)	(0.018)	(0.013)	(0.020)	(0.048)	(0.015)	(0.014)
effective property tax rate	-0.068***	-0.118***	-0.032***	-0.096***	-0.069**	0.015	-0.025**	-0.037***
	(0.012)	(0.012)	(0.012)	(0.010)	(0.030)	(0.052)	(0.012)	(0.011)
Year	-0.033***	-0.048***	-0.023***	-0.029***	0.004	0.014	0.017**	0.021***
	(0.007)	(0.006)	(0.006)	(0.005)	(0.009)	(0.009)	(0.008)	(0.008)
metro (RUCC Code=1,2,3)	2.590***	2.659***	2.184***	2.085***	2.301***	2.217***	2.355***	2.278***
	(0.150)	(0.150)	(0.120)	(0.106)	(0.162)	(0.191)	(0.180)	(0.166)
large urban (RUCC Codes=4,5)	1.754***	1.799***	1.342***	1.300***	1.145***	1.017***	1.502***	1.465***
	(0.127)	(0.129)	(0.096)	(0.088)	(0.174)	(0.213)	(0.162)	(0.150)
small urban (RUCC Codes=6,7)	1.107***	1.135***	0.802***	0.784***	0.542***	0.487***	1.038***	1.005***
	(0.098)	(0.101)	(0.076)	(0.070)	(0.138)	(0.168)	(0.146)	(0.135)
rural adjacent (RUCC Codes=8)	0.458***	0.477***	0.289***	0.276***	0.059	0.007	0.378**	0.378**

	(0.127)	(0.125)	(0.097)	(0.090)	(0.173)	(0.195)	(0.161)	(0.149)
State fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
constant	67.954***	97.100***	46.159***	58.524***	-10.691	-30.513*	-39.977**	-48.118***
	(13.737)	(11.937)	(10.414)	(9.463)	(16.991)	(17.497)	(15.639)	(15.140)
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.

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	2.638***	2.663***	0.753***	0.714***	0.693***	0.609***	0.543***	0.376***	0.325***	0.116
	(0.313)	(0.306)	(0.134)	(0.123)	(0.070)	(0.068)	(0.138)	(0.138)	(0.114)	(0.121)
Downstream	-0.516***	-0.667***	0.207**	0.154*	-0.031	-0.115***	-0.112	-0.244***	-0.134**	-0.269***
	(0.146)	(0.155)	(0.089)	(0.083)	(0.044)	(0.042)	(0.069)	(0.065)	(0.053)	(0.049)
Cluster	0.385***	0.391***	0.682***	0.729***	0.398***	0.484***	0.147***	0.190***	0.082***	0.094***
	(0.048)	(0.048)	(0.059)	(0.068)	(0.019)	(0.022)	(0.014)	(0.019)	(0.008)	(0.008)
Herfindahl index	-20.145***	-21.252***	-3.798***	-3.561***	-3.466***	-3.409***	-1.874***	-2.030***	-2.540***	-2.667***
	(4.335)	(4.186)	(0.832)	(0.790)	(0.351)	(0.326)	(0.427)	(0.406)	(0.731)	(0.710)
Monopoly	-0.167	-17.387***	1.316***	-13.724***	1.488***	-18.507***	1.196***	-17.973***	1.031***	-19.013***
	(0.285)	(0.320)	(0.193)	(0.318)	(0.047)	(0.069)	(0.066)	(0.107)	(0.096)	(0.106)
College above	0.003	-0.001	0.014***	0.009**	0.033***	0.028***	0.021***	0.016***	0.021***	0.017***
	(0.008)	(0.008)	(0.004)	(0.004)	(0.002)	(0.002)	(0.005)	(0.005)	(0.005)	(0.005)
Amenity	0.132**	0.129**	0.059***	0.063***	0.062***	0.060***	0.096***	0.090***	0.152***	0.141***
	(0.065)	(0.063)	(0.022)	(0.019)	(0.012)	(0.012)	(0.035)	(0.032)	(0.032)	(0.031)
real per capita personal	0.011**	0.011***	0.017***	0.016***	0.006***	0.006***	0.009*	0.008*	0.013***	0.008**
income (1000dollars)	(0.004)	(0.004)	(0.006)	(0.005)	(0.002)	(0.002)	(0.005)	(0.004)	(0.004)	(0.004)
real government	0.039**	0.083***	0.019	0.072***	0.077***	0.126***	0.054***	0.119***	0.070***	0.092***
expenditure per capita	(0.017)	(0.016)	(0.013)	(0.013)	(0.008)	(0.008)	(0.018)	(0.018)	(0.016)	(0.017)
effective property tax rate	-0.022*	-0.081***	-0.020	-0.090***	-0.032***	-0.087***	0.015	-0.105***	-0.075***	-0.148***
	(0.011)	(0.012)	(0.014)	(0.018)	(0.008)	(0.008)	(0.023)	(0.026)	(0.022)	(0.023)
Year	-0.006	-0.007	-0.032***	-0.030***	-0.056***	-0.053***	-0.044***	-0.042***	-0.048***	-0.040***
	(0.010)	(0.009)	(0.004)	(0.003)	(0.002)	(0.002)	(0.005)	(0.005)	(0.005)	(0.006)
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	10.944	14.008	60.871***	55.420***	105.319***	99.467***	82.418***	77.489***	92.174***	75.292***
	(18.724)	(17.615)	(7.824)	(6.764)	(4.764)	(4.477)	(10.704)	(9.564)	(9.786)	(10.797)
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.

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	2.839***	2.867***	0.756***	0.717***	0.676***	0.595***	0.522***	0.361***	0.298***	0.106
Downstream	-0.519***	-0.671***	0.206**	0.154*	-0.031	-0.116***	-0.112	-0.245***	-0.130**	-0.261***
Cluster	0.381***	0.388***	0.686***	0.733***	0.446***	0.543***	0.196***	0.253***	0.118***	0.136***
Herfindahl index	-3.678***	-3.880***	-0.731***	-0.685***	-0.753***	-0.741***	-0.456***	-0.494***	-0.629***	-0.660***
Monopoly	-0.154	-1.000***	2.728***	-1.000***	3.428***	-1.000***	2.307***	-1.000***	1.804***	-1.000***
College above	0.177	-0.071	0.687***	0.438**	1.345***	1.152***	0.819***	0.630***	0.898***	0.693***
Amenity	0.040**	0.039**	0.025***	0.027***	-0.004***	-0.004***	0.003***	0.002***	-0.030***	-0.027***
real per capita personal income (1000dollars)	0.388**	0.411***	0.555***	0.523***	0.192***	0.185***	0.263*	0.224*	0.390***	0.244**
real government expenditure per capita	0.324**	0.690***	0.156	0.600***	0.611***	1.001***	0.424***	0.925***	0.551***	0.725***
effective property tax rate	-0.037*	-0.137***	-0.032	-0.146***	-0.053***	-0.146***	0.024	-0.174***	-0.118***	-0.233***
Year	-0.006	-0.007	-0.031***	-0.030***	-0.054***	-0.052***	-0.043***	-0.041***	-0.047***	-0.039***
N	213616	213616	62794	62794	323677	323677	59435	59435	119733	119733
Aggregate elasticity	7.111	6.389	6.467	2.701	7.309	2.899	4.859	1.429	4.363	1.004
Churning elasticity	13.500		9.168		10.208		6.288		5.367	
Mean	41.55	38.97	9.08	8.93	3.02	3.06	1.33	1.37	1.01	1.04
Aggregate effect (number)	2.955	2.490	0.587	0.241	0.221	0.089	0.065	0.020	0.044	0.010
Percentage change	(0.78%)	(0.66%)	(0.61%)	(0.25%)	(0.68%)	(0.27%)	(0.49%)	(0.15%)	(0.43%)	(0.10%)
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 $E = \exp(\beta_i) - 1$. The aggregate elasticity is calculated by $upstream + downstream + cluster + (-1) * hhi + Monopoly + college\ above + amenity + real\ per\ capital\ personal\ income + real\ government\ expenditure\ per\ capita + effective\ property\ tax\ rate + year$. The aggregate agglomeration effect equals $mean * aggregate\ \ elasticity$. 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.

Table 7: New firm entry and exit at state borders in the U.S. from 1999 to 2015

	(1) births	(2) deaths
Upstream	1.479***	1.485***
	(0.310)	(0.310)
Downstream	-0.432***	-0.553***
	(0.154)	(0.170)
Cluster	0.189***	0.197***
	(0.018)	(0.019)
Herfindahl index	-9.166***	-9.567***
	(2.294)	(2.196)
Monopoly	1.028***	-18.966***
	(0.140)	(0.150)
College above	0.018***	0.012**
	(0.006)	(0.006)
Amenity	0.087	0.093
	(0.085)	(0.082)
real per capita personal income (1000dollars)	0.015***	0.016***
	(0.004)	(0.004)
real government expenditure per capita	0.054	0.065
	(0.044)	(0.044)
effective property tax rate	-0.107	-0.111
	(0.078)	(0.079)
Year	-0.033***	-0.028***
	(0.008)	(0.008)
metro (RUCC Code=1, 2,3)	2.398***	2.333***
	(0.162)	(0.153)
large urban (RUCC Codes=4,5)	1.472***	1.440***
	(0.136)	(0.130)
small urban (RUCC Codes=6,7)	0.945***	0.913***
	(0.095)	(0.091)
rural adjacent (RUCC Codes=8)	0.344**	0.321**
	(0.149)	(0.142)
Industry dummies	Y	Y
State pair fixed effect at border	Y	Y
constant	61.698***	50.100***
	(15.699)	(15.349)
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: Sign correspondence for firm entry and firm exit in the U.S. from 1999 to 2015

	Paired coefficients with same sign	Paired coefficients with different sign	random probability
whole sample	14	1	0.046%
sector			
Utility	10	5	9.164%
Construction	15	0	0.003%
Manufacturing	14	1	0.046%
Wholesale trade	13	2	0.320%
Retail trade	14	1	0.046%
Transportation	14	1	0.046%
Information	14	1	0.046%
Finance insurance	14	1	0.046%
Management	13	2	0.320%
Real estate	13	2	0.320%
Professional service	14	1	0.046%
Educational service	14	1	0.046%
Arts	14	1	0.046%
Health care	14	1	0.046%
Accommodation service	14	1	0.046%
Other service	14	1	0.046%
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	11	4	4.166%
Construction	14	1	0.046%
Manufacturing	14	1	0.046%
Wholesale trade	14	1	0.046%
Retail trade	14	1	0.046%
Transportation	14	1	0.046%
Information	13	2	0.320%
Finance insurance	13	2	0.320%
Management	13	2	0.320%
Real estate	14	1	0.046%
Professional service	13	2	0.320%
Educational service	14	1	0.046%
Arts	14	1	0.046%

Health care	14	1	0.046%
Accommodation service	14	1	0.046%
Other service	14	1	0.046%

Note: The coefficient signs and estimated probabilities are based on the regression results shown in tables 4,5, and 7.

Table 9: The effect of churning on employment growth and personal income growth, 1999-2015

	Growth Measure over the period 1999 to 2015			
	(1)	(2)	(3)	(4)
	Total employment	Wage and salary employment	Per capita personal income	Wage and salary per job
Predicted churning rate, 1999	0.082***	0.080***	0.011***	0.013***
	(0.010)	(0.008)	(0.004)	(0.001)
percent of people in creative class occupations, 2000	1.699***	1.569***	-2.598***	-0.923***
	(0.036)	(0.029)	(0.015)	(0.003)
percent college graduates, 2000	-0.003**	-0.003**	0.020***	0.006***
	(0.000)	(0.000)	(0.000)	(0.000)
percent some college, 2000	0.005***	0.006***	0.006***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)
percent HS graduates, 2000	-0.005***	-0.004***	-0.005***	-0.007***
	(0.000)	(0.000)	(0.000)	(0.000)
Natural Amenity score, 1999	0.008***	0.006**	0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
log of real government expenditure per capita, 1999	-0.265***	-0.215***	0.252***	0.033
	(0.001)	(0.001)	(0.000)	(0.000)
log of population, 2000	-0.002***	-0.016***	-0.094***	-0.047***
	(0.001)	(0.001)	(0.000)	(0.000)
constant	0.397***	0.361***	1.384***	1.310***
	(0.004)	(0.003)	(0.002)	(0.001)
Effect of a one standard deviation increase in the churning rate	3.08%	3.00%	0.41%	0.49%
N	2973	2973	2973	2973
R-square	0.234	0.146	0.243	0.179

Note: Bootstrapped standard errors are reported in parentheses. ***significant at 1 percent, **significant at 5 percent, *significant at 10 percent.

Appendix A. Equating Conditional Logit with Poisson Regression

Consider N investors, $i = 1, \ldots, N$, each of whom choose their business location from C spatially differentiated choices, $c = 1, \ldots, C$. The profit of the establishment i from industry k entering in year t at area c is given by

$$\pi_{ickt} = \boldsymbol{\beta}'\boldsymbol{Z_{ickt}} + \varepsilon_{ickt}$$

Where $\boldsymbol{Z_{ickt}}$ is a vector of explanatory variables including area-specific, industry-specific attributes, and entrepreneur's characteristics. Without loss of generality, we focus on one industry and subtract the subscript k in profit function. The profit function will be:

(A1) $\pi_{ict} = \boldsymbol{\beta}'\boldsymbol{Z_{ict}} + \varepsilon_{ict}$

Establishment i will choose the site c that gives the highest expected profit. When the shocks ε_{ict} have standard Type I extreme value distributions, the probability of choosing site c, P_{ict} is given by

(A2) $P_{ict} = \frac{exp(\pi_{ict})}{\sum_{c=1}^{C} exp(\pi_{ict})}$

From Guimaraes et al. (2003), the conditional logit model is equivalent to Poission regression in two situations.

1. $\boldsymbol{Z_{ict}} = \boldsymbol{Z_{ct}}$, the conditional logit model is equivalent to Poisson regression model (Guimaraes et al., 2003). This is a strong assumption assuming individual choice is exclusively determined by a set of choice-specific variables common to all decision-makers. This assumption can be relaxed by assuming the choice-specific variables are common to groups of individuals.

2. $\boldsymbol{Z_{ict}} = \boldsymbol{Z_{gct}}$, with $g = 1,2, \ldots, G$.

where G is the number of different groups of investors. There could be107 groups of investors as that is the number of pairs of states that share a border. Or we could specify 1212 groups of investors, that is the number of paired counties who border one another on either side of a state line.

Let $d_{ict} = 1$ in the case investor i picks choice c at time t, and $d_{ict} = 0$ otherwise. Then we can write the log likelihood of the conditional logit model as

(A3) $\log L = \sum_{t=1}^{T} \sum_{i=1}^{N} \sum_{c=1}^{C} d_{ict} log(P_{ict}) = \sum_{t=1}^{T} \sum_{g=1}^{G} \sum_{c=1}^{C} n_{gct} log\left(P_{gct}\right)$

Where n_{gct} is the number of establishments from group g that select location c at time t. Alternatively, we can let n_{gct} be independently Poisson-distributed with

$E\left(n_{gct}\right) = \lambda_{gct} = exp\left(\boldsymbol{\alpha}' \boldsymbol{d_{gct}} + \boldsymbol{\beta}' \boldsymbol{Z_{gct}}\right)$

Where $[\boldsymbol{\alpha}, \boldsymbol{\beta}]$ is the vector of parameters to be estimated and $\boldsymbol{d_{gct}}$ is a vector of G group's dummy variables, each one assuming the value 1 if the observation that locates in *c* at time *t* belongs to group *g*. Consequently, the log likelihood for the Poisson model is

(A4) $\log L_p = \sum_{t=1}^{T} \sum_{g=1}^{G} \sum_{c=1}^{C} \left(-\lambda_{gct} + n_{gct} \log \lambda_{gct} - \log n_{gct}\,!\right) =$

$\sum_{t=1}^{T} \sum_{g=1}^{G} \sum_{c=1}^{C} \left(-exp\left(\boldsymbol{\alpha}' \boldsymbol{d_{gct}} + \boldsymbol{\beta}' \boldsymbol{Z_{gct}}\right) + n_{gct}\left(\boldsymbol{\alpha}' \boldsymbol{d_{gct}} + \boldsymbol{\beta}' \boldsymbol{Z_{gct}}\right) - \log n_{gct}\,!\right)$

From the first-order conditions with respect to the α_g, we obtain

(A5) $\frac{\partial \log L_p}{\partial \alpha_g} = \sum_{t=1}^{T} \sum_{c=1}^{C} \left[n_{gct} - exp\left(\alpha_g + \boldsymbol{\beta}' \boldsymbol{Z_{gct}}\right)\right] = 0$

And so, $exp\left(\alpha_g\right) = \frac{\sum_{t=1}^{T} \sum_{c=1}^{C} n_{gct}}{\sum_{t=1}^{T} \sum_{c=1}^{C} exp\left(\boldsymbol{\beta}' \boldsymbol{Z_{gct}}\right)}$. We can substitute α_g in (A4) to get

(A6) $\log L_p = \sum_{t=1}^{T} \sum_{g=1}^{G} \sum_{c=1}^{C} \left(-exp\left(\boldsymbol{\alpha}' \boldsymbol{d_{gct}} + \boldsymbol{\beta}' \boldsymbol{Z_{gct}}\right) + n_{gct}\left(\boldsymbol{\alpha}' \boldsymbol{d_{gct}} + \boldsymbol{\beta}' \boldsymbol{Z_{gct}}\right) - \log n_{gct}\,!\right)$

$$= \sum_{g=1}^{G} \frac{\sum_{t=1}^{T}\sum_{c=1}^{C} n_{gct}}{\sum_{t=1}^{T}\sum_{c=1}^{C} exp(\boldsymbol{\beta}'\boldsymbol{Z_{gct}})} \sum_{t=1}^{T}\sum_{c=1}^{C} -exp\left(\boldsymbol{\beta}'\boldsymbol{Z_{gct}}\right)$$

$$+ \sum_{t=1}^{T}\sum_{g=1}^{G}\sum_{c=1}^{C}\left(n_{gct}\left(\boldsymbol{\alpha}'\boldsymbol{d_{gct}} + \boldsymbol{\beta}'\boldsymbol{Z_{gct}}\right) - \log n_{gct}\,!\right)$$

$$= -N$$

$$+ \sum_{t=1}^{T}\sum_{g=1}^{G}\sum_{c=1}^{C}\left\{n_{gct}\left[\log\left(\sum_{t=1}^{T}\sum_{c=1}^{C} n_{gct}\right) - \log\left(\sum_{t=1}^{T}\sum_{c=1}^{C} exp\left(\boldsymbol{\beta}'\boldsymbol{Z_{gct}}\right)\right) + \boldsymbol{\beta}'\boldsymbol{Z_{gct}}\right]\right.$$

$$\left. - \log n_{gct}\,!\right\}$$

$$= -N + \sum_{t=1}^{T}\sum_{g=1}^{G}\sum_{c=1}^{C}\left(n_{gct}\log n_g\right) + \sum_{t=1}^{T}\sum_{g=1}^{G}\sum_{c=1}^{C}\left(n_{gct}\log P_{gct}\right)$$

$$- \sum_{t=1}^{T}\sum_{g=1}^{G}\sum_{c=1}^{C}\left(n_{gct}\log n_{gct}\,!\right)$$

Where $n_g = \sum_{t=1}^{T}\sum_{c=1}^{C} n_{gct}$ measures the number of establishments of group g in the sample, and $N = \sum_{t=1}^{T}\sum_{g=1}^{G}\sum_{c=1}^{C} n_{gct}$, represents the total number of establishments in the sample. Compare this with the likelihood function of the conditional logit model

(A7) $\log L = \sum_{t=1}^{T}\sum_{i=1}^{N}\sum_{c=1}^{C} d_{ict} log(P_{ict}) = \sum_{t=1}^{T}\sum_{g=1}^{G}\sum_{c=1}^{C} n_{gct} log\left(P_{gct}\right)$

Comparing (A7) and (A3), it is apparent that the solutions to $[\boldsymbol{\alpha}, \boldsymbol{\beta}]$ are identical because the two probability functions are identical except that the Poisson probability function has a constant term, $-N + \sum_{t=1}^{T}\sum_{g=1}^{G}\sum_{c=1}^{C}\left(n_{gct}\log n_g\right) - \sum_{t=1}^{T}\sum_{g=1}^{G}\sum_{c=1}^{C}\left(n_{gct}\log n_{gct}\,!\right)$. Hence, the conditional logit is equivalent to the Poisson model under some simplifying assumptions.

Appendix B. The equivalence between the Binomial and Poisson distributions in large samples

The binomial distribution with parameters *n* and *p* is the probability distribution of the number of successes in a sequence of *n* independent Bernoulli trials with the chance of success equal to *p*. The number of successes is denoted as *X*, and binomial distribution probability function is:

(B1) $P(X = k) = \binom{n}{k} p^k (1-p)^{n-k}$

Define a parameter, λ, as the product of the number of trials and chance of success.

(B2) $\lambda = np \equiv E(X)$

This parameter provides some information about the average number of successes in *n* trials. Substituting *p* with $\frac{\lambda}{n}$ in (B1) gives

$$P(X = k) = \binom{n}{k} \left[\frac{\lambda}{n}\right]^k \left[1 - \frac{\lambda}{n}\right]^{n-k}$$

Take the limit as *n* goes to positive infinity,

(B3) $\lim_{n\to\infty} \binom{n}{k} \left[\frac{\lambda}{n}\right]^k \left[1 - \frac{\lambda}{n}\right]^{n-k} = \lim_{n\to\infty} \frac{n!}{k!(n-k)!} \left[\frac{\lambda}{n}\right]^k \left[1 - \frac{\lambda}{n}\right]^{n-k}$

$$= \frac{\lambda^k}{k!} \lim_{n\to\infty} \frac{n!}{(n-k)!n^k} \cdot \left[1 - \frac{\lambda}{n}\right]^{-k} \cdot \left[1 - \frac{\lambda}{n}\right]^{n}$$

Since $\lim_{n\to\infty} \left[1 - \frac{\lambda}{n}\right]^{-k} = 1$, $\lim_{n\to\infty} \left[1 - \frac{\lambda}{n}\right]^{-n} = \lim_{n\to\infty} \left[1 + \left(\frac{1}{\frac{-n}{\lambda}}\right)\right]^{-\frac{n}{\lambda}\cdot(-\lambda)} = e^{-\lambda}$, and $\lim_{n\to\infty} \frac{n!}{(n-k)!n^k} = 1$, the limit can be simplified to

$$\lim_{n\to\infty}\binom{n}{k}\left[\frac{\lambda}{n}\right]^{k}\left[1-\frac{\lambda}{n}\right]^{n-k}=\frac{\lambda^{k}}{k!}e^{-\lambda}$$

Which is exactly the Poisson distribution probability function. Therefore, the binomial distribution is equivalent to the Poisson distribution in the limit.

Appendix Tables

Appendix Table 1 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
	Utility		Construction		Manufacturing		Wholesale trade	
Upstream	0.046	-0.081	1.096***	1.024***	2.909***	2.922***	6.330***	6.321***
	(0.117)	(0.120)	(0.340)	(0.319)	(0.403)	(0.394)	(0.462)	(0.466)
Downstream	0.018	0.272	1.614	1.357	-3.981***	-4.755***	-1.729***	-1.796***
	(0.341)	(0.338)	(1.214)	(1.118)	(0.594)	(0.590)	(0.216)	(0.212)
Cluster	-0.015	0.053***	-0.141	-0.141	0.753***	0.789***	2.011***	2.036***
	(0.020)	(0.007)	(0.150)	(0.142)	(0.081)	(0.079)	(0.182)	(0.161)
Herfindahl index	-8.141***	-9.314***	-10.894***	-11.534***	-9.585***	-10.495***	-10.140***	-10.840***
	(1.334)	(1.462)	(1.260)	(1.214)	(1.549)	(1.550)	(2.124)	(1.962)
Monopoly	1.720***	-17.025***	-0.330	-17.486***	0.608*	-16.651***	2.449***	-16.379***
	(0.136)	(0.169)	(0.331)	(0.360)	(0.351)	(0.386)	(0.406)	(0.373)
College above	0.012***	0.010**	0.023***	0.018***	0.011**	0.005	-0.024***	-0.026***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)	(0.007)	(0.006)
Amenity	0.036	0.019	0.137***	0.130***	0.187***	0.191***	0.170***	0.161***
	(0.050)	(0.053)	(0.038)	(0.036)	(0.053)	(0.049)	(0.052)	(0.046)
real per capita personal income(1000dollars)	0.017***	0.020***	0.009*	0.010**	-0.006	-0.005	-0.013***	-0.012***
	(0.005)	(0.006)	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)	(0.004)
real government expenditure per capita	-0.067***	0.086***	0.134***	0.289***	0.020	0.102***	0.034	0.038*
	(0.024)	(0.023)	(0.011)	(0.011)	(0.013)	(0.011)	(0.024)	(0.021)
effective property tax rate	-0.198***	0.109***	-0.038***	-0.192***	-0.068***	-0.118***	-0.007	-0.072***
	(0.033)	(0.041)	(0.009)	(0.014)	(0.012)	(0.012)	(0.017)	(0.014)
Year	-0.036***	-0.051***	-0.048***	-0.058***	-0.033***	-0.048***	0.001	-0.001
	(0.006)	(0.006)	(0.004)	(0.004)	(0.007)	(0.006)	(0.008)	(0.007)
metro (Beale Code=1, 2,3)	1.527***	1.824***	2.124***	2.118***	2.590***	2.659***	2.987***	2.879***
	(0.100)	(0.095)	(0.088)	(0.084)	(0.150)	(0.150)	(0.295)	(0.265)
large urban (Beale Codes=4,5)	0.815***	1.144***	1.144***	1.176***	1.754***	1.799***	2.234***	2.161***

	(0.122)	(0.113)	(0.098)	(0.092)	(0.127)	(0.129)	(0.272)	(0.248)
Small urban (Beale Codes=6,7)	0.396***	0.648***	0.709***	0.712***	1.107***	1.135***	1.457***	1.411***
	(0.109)	(0.106)	(0.071)	(0.069)	(0.098)	(0.101)	(0.255)	(0.237)
rural adjacent (Beale Codes=8)	0.067	0.089	0.354***	0.353***	0.458***	0.477***	0.827***	0.816***
	(0.121)	(0.118)	(0.091)	(0.088)	(0.127)	(0.125)	(0.248)	(0.231)
State fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
constant	71.696***	99.602***	94.269***	113.867***	67.954***	97.100***	-6.175	-2.760
	(11.223)	(10.955)	(7.194)	(6.740)	(13.737)	(11.937)	(16.600)	(14.543)
N	46614	46614	51035	51035	50160	50160	50404	50404

Notes: Estimates are based on the conditional logit estimation. Standard errors are in parentheses. ***significant at 1 percent, **significant at 5 percent, *significant at 10 percent.

Appendix Table 1 New firm entry and exit by sectors in U.S. from 1999 to 2015--continued

	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	births	deaths	births	deaths	births	deaths	births	deaths
	Retail trade		Transportation		Information		Finance insurance	
Upstream	3.936***	3.813***	7.869***	7.710***	2.962***	2.730***	4.374***	4.435***
	(0.437)	(0.399)	(0.684)	(0.632)	(0.565)	(0.556)	(0.387)	(0.384)
Downstream	-1.439***	-1.541***	-4.752***	-4.698***	3.593***	3.830***	4.170***	3.995***
	(0.268)	(0.253)	(0.453)	(0.419)	(1.363)	(1.344)	(0.746)	(0.746)
Cluster	-0.110	0.108	0.460***	0.494***	1.066***	1.212***	1.766***	2.120***
	(0.389)	(0.344)	(0.035)	(0.034)	(0.264)	(0.224)	(0.175)	(0.158)
Herfindahl index	-7.331***	-7.914***	-7.261***	-7.773***	-17.656***	-18.164***	-14.292***	-14.665***
	(1.331)	(1.169)	(1.237)	(1.132)	(2.836)	(2.663)	(2.227)	(2.240)
Monopoly	-1.232***	-15.090***	0.520**	-17.128***	3.046***	-13.712***	2.961***	-12.428***
	(0.430)	(0.819)	(0.240)	(0.246)	(0.501)	(0.465)	(0.471)	(0.535)
College above	-0.005	-0.007	-0.022***	-0.023***	-0.012	-0.014	-0.021***	-0.026***
	(0.005)	(0.005)	(0.006)	(0.006)	(0.011)	(0.011)	(0.008)	(0.008)
Amenity	0.134***	0.133***	0.091*	0.091**	0.147**	0.133**	0.088*	0.089*
	(0.045)	(0.043)	(0.048)	(0.044)	(0.060)	(0.057)	(0.050)	(0.049)
real per capita personal income(1000dollars)	-0.009**	-0.007*	-0.012***	-0.011***	0.005	0.005	<-0.001	-0.001
	(0.004)	(0.004)	(0.005)	(0.004)	(0.006)	(0.006)	(0.004)	(0.004)
real government expenditure per capita	0.083***	0.120***	0.024	0.085***	0.020	0.049***	0.108***	0.161***
	(0.018)	(0.013)	(0.015)	(0.012)	(0.020)	(0.013)	(0.022)	(0.021)
effective property tax rate	-0.032***	-0.096***	-0.058**	-0.098***	-0.028	-0.056***	-0.031	-0.083***
	(0.012)	(0.010)	(0.026)	(0.015)	(0.021)	(0.016)	(0.023)	(0.024)
Year	-0.023***	-0.029***	0.018**	0.006	-0.018	-0.002	-0.029***	-0.015*
	(0.006)	(0.005)	(0.008)	(0.006)	(0.012)	(0.011)	(0.008)	(0.008)
metro (Beale Code=1, 2,3)	2.184***	2.085***	1.963***	1.904***	3.428***	3.607***	2.652***	2.756***
	(0.120)	(0.106)	(0.107)	(0.106)	(0.682)	(0.677)	(0.127)	(0.143)
large urban (Beale Codes=4,5)	1.342***	1.300***	1.286***	1.279***	2.366***	2.590***	1.740***	1.852***

	(0.096)	(0.088)	(0.097)	(0.096)	(0.625)	(0.632)	(0.126)	(0.145)
Small urban (Beale Codes=6,7)	0.802***	0.784***	0.800***	0.804***	1.583***	1.786***	1.068***	1.133***
	(0.076)	(0.070)	(0.087)	(0.088)	(0.546)	(0.561)	(0.106)	(0.127)
rural adjacent (Beale Codes=8)	0.289***	0.276***	0.275***	0.288***	0.606	0.772*	0.166	0.221
	(0.097)	(0.090)	(0.103)	(0.102)	(0.436)	(0.457)	(0.139)	(0.165)
State fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
constant	46.159***	58.524***	-37.348**	-13.828	29.626	-3.018	51.400***	22.215
	(10.414)	(9.463)	(15.012)	(12.393)	(24.016)	(22.750)	(15.656)	(15.685)
N	51185	51185	50699	50699	49599	49599	51017	51017

Notes: Estimates are based on the conditional logit estimation. Standard errors are in parentheses. ***significant at 1 percent, **significant at 5 percent, *significant at 10 percent.

Appendix Table 1 New firm entry and exit by sectors in U.S. from 1999 to 2015--continued

	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
	births	deaths	births	deaths	births	deaths	births	deaths
	Real estate		Professional service		Management		Educational service	
Upstream	5.706***	5.988***	6.826***	6.707***	3.760***	3.896***	4.352***	4.126***
	(0.679)	(0.664)	(0.675)	(0.664)	(0.371)	(0.386)	(0.488)	(0.478)
Downstream	8.588***	9.181***	-2.444***	-2.361***	1.758***	1.760***	6.514***	6.496***
	(0.932)	(0.917)	(0.783)	(0.769)	(0.538)	(0.572)	(0.893)	(0.867)
Cluster	2.248***	2.415***	2.490***	2.592***	0.277***	0.301***	0.329***	0.348***
	(0.157)	(0.153)	(0.253)	(0.254)	(0.042)	(0.088)	(0.040)	(0.039)
Herfindahl index	-12.153***	-12.822***	-14.744***	-15.282***	-19.562***	-21.558***	-15.049***	-16.021***
	(2.109)	(2.064)	(2.271)	(2.209)	(2.755)	(3.006)	(2.361)	(2.293)
Monopoly	1.225**	-18.640***	1.327**	-15.996***	1.360***	-18.427***	1.322***	-16.957***
	(0.533)	(0.526)	(0.524)	(0.523)	(0.129)	(0.154)	(0.118)	(0.119)
College above	-0.013*	-0.020***	-0.014*	-0.018**	-0.026***	-0.031***	0.012*	0.007
	(0.007)	(0.007)	(0.008)	(0.008)	(0.009)	(0.009)	(0.006)	(0.006)
Amenity	0.105*	0.100*	0.104**	0.100**	0.023	0.003	0.117**	0.113**
	(0.061)	(0.060)	(0.051)	(0.050)	(0.059)	(0.059)	(0.051)	(0.050)
real per capita personal income(1000dollars)	0.003	0.003	-0.007	-0.006	0.008**	0.008**	0.001	0.002
	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
real government expenditure per capita	0.070***	0.180***	0.085***	0.106***	-0.087***	-0.028	0.120***	0.110***
	(0.022)	(0.019)	(0.020)	(0.018)	(0.020)	(0.048)	(0.019)	(0.016)
effective property tax rate	0.017	-0.110***	-0.028*	-0.075***	-0.069**	0.015	-0.041**	-0.098***
	(0.014)	(0.014)	(0.016)	(0.015)	(0.030)	(0.052)	(0.016)	(0.017)
Year	0.009	0.005	0.021**	0.029***	0.004	0.014	0.007	0.019***
	(0.008)	(0.007)	(0.009)	(0.009)	(0.009)	(0.009)	(0.007)	(0.006)
metro (Beale Code=1, 2,3)	2.105***	2.056***	2.421***	2.307***	2.301***	2.217***	2.319***	2.362***
	(0.177)	(0.172)	(0.221)	(0.199)	(0.162)	(0.191)	(0.204)	(0.216)
large urban (Beale Codes=4,5)	1.147***	1.135***	1.467***	1.389***	1.145***	1.017***	1.248***	1.341***
	(0.162)	(0.160)	(0.211)	(0.191)	(0.174)	(0.213)	(0.185)	(0.197)

Small urban (Beale Codes=6,7)	0.749***	0.756***	0.989***	0.934***	0.542***	0.487***	0.820***	0.933***
	(0.149)	(0.148)	(0.196)	(0.175)	(0.138)	(0.168)	(0.172)	(0.186)
rural adjacent (Beale Codes=8)	0.203	0.240	0.356*	0.305	0.059	0.007	0.485**	0.697***
	(0.169)	(0.170)	(0.204)	(0.186)	(0.173)	(0.195)	(0.196)	(0.209)
State fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
constant	-31.262**	-24.668*	-45.391**	-59.897***	-10.691	-30.513*	-26.241*	-48.955***
	(15.263)	(14.309)	(18.600)	(17.618)	(16.991)	(17.497)	(14.743)	(13.228)
N	49209	49209	50751	50751	35987	35987	41402	41402

Notes: Estimates are based on the conditional logit estimation. Standard errors are in parentheses. ***significant at 1 percent, **significant at 5 percent, *significant at 10 percent.

Appendix Table 1 New firm entry and exit by sectors in U.S. from 1999 to 2015--continued

	(25) births	(26) deaths	(27) births	(28) deaths	(29) births	(30) deaths	(31) births	(32) deaths
	Health care		Arts		Accommodation service		Other service	
Upstream	4.170***	4.076***	4.835***	4.417***	-0.032	-0.075	9.176***	9.284***
	(0.438)	(0.432)	(0.658)	(0.627)	(0.294)	(0.281)	(0.647)	(0.649)
Downstream	2.218***	2.307***	3.022*	3.290*	6.773***	6.797***	-9.077***	-9.271***
	(0.330)	(0.322)	(1.756)	(1.703)	(0.658)	(0.639)	(0.628)	(0.629)
Cluster	2.038***	2.182***	0.370***	0.395***	0.890***	1.079***	-1.131***	-0.768***
	(0.132)	(0.118)	(0.119)	(0.107)	(0.200)	(0.182)	(0.178)	(0.177)
Herfindahl index	-11.653***	-11.753***	-13.470***	-14.034***	-10.555***	-10.531***	-9.950***	-10.625***
	(1.950)	(1.872)	(4.693)	(4.540)	(1.992)	(1.762)	(1.425)	(1.406)
Monopoly	2.315***	-12.872***	1.538***	-17.585***	0.642*	-30.271***	-0.294	-16.027***
	(0.398)	(0.428)	(0.240)	(0.225)	(0.330)	(0.358)	(0.419)	(0.482)
College above	-0.006	-0.011	-0.022	-0.026	0.012**	0.009*	-0.017***	-0.020***
	(0.007)	(0.007)	(0.017)	(0.017)	(0.005)	(0.005)	(0.006)	(0.006)
Amenity	0.114**	0.116**	0.203***	0.198***	0.131**	0.131***	0.081*	0.078*
	(0.052)	(0.051)	(0.071)	(0.070)	(0.052)	(0.050)	(0.046)	(0.045)
real per capita personal income(1000dollars)	0.004	0.005	0.001	0.002	0.020***	0.021***	-0.010***	-0.010***
	(0.005)	(0.005)	(0.007)	(0.007)	(0.004)	(0.004)	(0.004)	(0.004)
real government expenditure per capita	0.025*	0.021	0.043***	0.085***	0.126***	0.102***	0.037*	0.064***
	(0.015)	(0.014)	(0.016)	(0.017)	(0.014)	(0.011)	(0.019)	(0.015)
effective property tax rate	-0.025**	-0.037***	-0.015	-0.073***	-0.029***	-0.078***	-0.044***	-0.062***
	(0.012)	(0.011)	(0.016)	(0.014)	(0.011)	(0.011)	(0.014)	(0.013)
Year	0.017**	0.021***	0.022	0.018	-0.022***	-0.019***	0.003	-0.002
	(0.008)	(0.008)	(0.019)	(0.018)	(0.006)	(0.005)	(0.006)	(0.006)
metro (Beale Code=1, 2,3)	2.355***	2.278***	2.371***	2.346***	2.100***	2.005***	2.105***	2.046***
	(0.180)	(0.166)	(0.534)	(0.506)	(0.124)	(0.115)	(0.112)	(0.105)
large urban (Beale Codes=4,5)	1.502***	1.465***	1.486***	1.528***	1.103***	1.055***	1.274***	1.253***
	(0.162)	(0.150)	(0.442)	(0.423)	(0.103)	(0.099)	(0.106)	(0.099)
Small urban (Beale Codes=6,7)	1.038***	1.005***	0.978**	1.002**	0.678***	0.653***	0.812***	0.771***

	(0.146)	(0.135)	(0.410)	(0.389)	(0.082)	(0.078)	(0.092)	(0.086)
rural adjacent (Beale Codes=8)	0.378**	0.378**	0.291	0.369	0.195*	0.164	0.302***	0.259**
	(0.161)	(0.149)	(0.347)	(0.331)	(0.109)	(0.113)	(0.111)	(0.105)
State fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
constant	-39.977**	-48.118***	-51.566	-43.542	37.886***	32.249***	-0.753	8.115
	(15.639)	(15.140)	(38.183)	(36.380)	(11.721)	(10.252)	(11.907)	(11.439)
N	50901	50901	48135	48135	51087	51087	51070	51070

Notes: Estimates are based on the conditional logit estimation. Standard errors are in parentheses. ***significant at 1 percent, **significant at 5 percent, *significant at 10 percent.

Appendix Table 2 New firm entry and exit by sectors at state borders in U.S. from 1999 to 2015

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	births	deaths	births	deaths	births	deaths	births	deaths
	Utility		Construction		Manufacturing		Wholesale trade	
Upstream	-0.128	-0.163	1.152***	0.986**	1.322***	1.405***	4.943***	5.014***
	(0.153)	(0.135)	(0.394)	(0.386)	(0.310)	(0.350)	(0.662)	(0.675)
Downstream	0.563	0.617	2.636***	2.387**	-3.751***	-4.528***	-1.022***	-1.198***
	(0.475)	(0.428)	(1.023)	(1.059)	(0.627)	(0.714)	(0.318)	(0.320)
Cluster	-0.022	0.067***	0.006	0.063	0.720***	0.776***	1.587***	1.747***
	(0.017)	(0.008)	(0.146)	(0.144)	(0.093)	(0.102)	(0.191)	(0.172)
Herfindahl index	-4.787***	-6.560***	-9.104***	-9.885***	-7.098***	-8.517***	-7.247***	-7.538***
	(1.036)	(1.111)	(1.375)	(1.373)	(1.155)	(1.261)	(1.776)	(1.813)
Monopoly	1.726***	-15.562***	0.348	-15.337***	0.633	-15.779***	1.558***	-14.843***
	(0.207)	(0.250)	(0.382)	(0.443)	(0.480)	(0.549)	(0.360)	(0.392)
College above	0.011**	0.007	0.035***	0.023***	0.021***	0.015***	-0.003	-0.009
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)
Amenity	0.041	0.062	0.110*	0.114*	0.102	0.121*	0.086	0.114
	(0.056)	(0.051)	(0.064)	(0.062)	(0.068)	(0.068)	(0.076)	(0.072)
real per capita personal income(1000dollars)	0.020***	0.019***	0.003	0.007	0.005	0.003	<-0.001	<-0.001
	(0.005)	(0.005)	(0.006)	(0.006)	(0.005)	(0.005)	(0.004)	(0.005)
real government expenditure per capita	-0.003	0.069*	0.093**	0.122***	0.100**	0.123**	0.143***	0.133***
	(0.039)	(0.036)	(0.039)	(0.042)	(0.044)	(0.049)	(0.050)	(0.048)
effective property tax rate	-0.039	0.031	-0.127*	-0.156**	-0.097*	-0.105*	-0.019	-0.052
	(0.071)	(0.064)	(0.069)	(0.073)	(0.054)	(0.058)	(0.052)	(0.053)
Year	-0.041***	-0.041***	-0.048***	-0.032***	-0.064***	-0.064***	-0.036***	-0.032***
	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.008)	(0.010)	(0.010)
metro (Beale Code=1, 2,3)	1.375***	1.699***	2.107***	2.128***	2.450***	2.516***	2.405***	2.387***
	(0.152)	(0.149)	(0.137)	(0.129)	(0.160)	(0.170)	(0.224)	(0.222)
large urban (Beale Codes=4,5)	0.733***	1.028***	1.159***	1.216***	1.575***	1.595***	1.457***	1.467***
	(0.164)	(0.158)	(0.142)	(0.134)	(0.149)	(0.154)	(0.192)	(0.208)
small urban (Beale Codes=6,7)	0.426***	0.552***	0.786***	0.775***	1.028***	1.050***	1.015***	1.042***

	(0.133)	(0.119)	(0.109)	(0.101)	(0.105)	(0.113)	(0.136)	(0.151)
rural adjacent (Beale Codes=8)	0.181	0.180	0.446***	0.416***	0.616***	0.571***	0.148	0.167
	(0.194)	(0.180)	(0.166)	(0.158)	(0.199)	(0.191)	(0.299)	(0.300)
State pair fixed effect at border	Y	Y	Y	Y	Y	Y	Y	Y
constant	79.737***	80.069***	92.949***	62.261***	130.145***	130.525***	68.222***	60.677***
	(15.647)	(16.057)	(13.115)	(13.404)	(14.440)	(15.990)	(19.760)	(20.064)
N	16297	16297	17684	17684	17384	17384	17473	17473

Notes: Estimates are based on the conditional logit estimation. Standard errors are in parentheses. ***significant at 1 percent, **significant at 5 percent, *significant at 10 percent.

Appendix Table 2 New firm entry and exit by sectors at state borders in U.S. from 1999 to 2015 (continued)

	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	births	deaths	births	deaths	births	deaths	births	deaths
	Retail trade		Transportation		Information		Finance insurance	
Upstream	3.502***	3.436***	6.511***	6.453***	0.168	-0.225	3.263***	3.333***
	(0.591)	(0.579)	(0.919)	(0.894)	(0.644)	(0.634)	(0.421)	(0.423)
Downstream	-1.337***	-1.405***	-3.385***	-3.524***	8.433***	8.998***	3.922***	3.296***
	(0.283)	(0.264)	(0.617)	(0.601)	(1.791)	(1.733)	(1.038)	(1.071)
Cluster	0.782**	0.909***	0.423***	0.504***	0.825***	1.123***	1.626***	2.070***
	(0.338)	(0.303)	(0.061)	(0.053)	(0.142)	(0.116)	(0.243)	(0.211)
Herfindahl index	-5.994***	-6.640***	-6.683***	-6.951***	-11.538***	-12.563***	-10.408***	-10.441***
	(1.341)	(1.190)	(1.260)	(1.172)	(2.081)	(1.919)	(1.563)	(1.582)
Monopoly	0.364	-19.227***	1.003***	-16.579***	2.619***	-13.478***	2.392***	-11.841***
	(0.465)	(0.822)	(0.235)	(0.276)	(0.258)	(0.305)	(0.738)	(0.951)
College above	0.011**	0.007	-0.004	-0.009	0.020***	0.017**	0.001	-0.007
	(0.005)	(0.005)	(0.006)	(0.006)	(0.008)	(0.007)	(0.008)	(0.008)
Amenity	0.112	0.116*	0.072	0.073	0.110*	0.123*	0.083	0.097
	(0.069)	(0.065)	(0.085)	(0.075)	(0.066)	(0.065)	(0.076)	(0.080)
real per capita personal income(1000dollars)	-0.006	-0.004	-0.012**	-0.010*	0.018***	0.016***	0.008*	0.005
	(0.005)	(0.004)	(0.006)	(0.006)	(0.005)	(0.004)	(0.004)	(0.004)
real government expenditure per capita	0.135***	0.134***	0.102*	0.118**	0.080*	0.087**	0.098**	0.130***
	(0.046)	(0.045)	(0.058)	(0.056)	(0.042)	(0.041)	(0.047)	(0.050)
effective property tax rate	-0.071	-0.079	-0.101	-0.077	-0.116*	-0.090	-0.024	-0.020
	(0.054)	(0.055)	(0.084)	(0.068)	(0.062)	(0.063)	(0.058)	(0.067)
Year	-0.045***	-0.043***	-0.005	-0.008	-0.061***	-0.036***	-0.046***	-0.023**
	(0.008)	(0.008)	(0.011)	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)
metro (Beale Code=1, 2,3)	2.154***	2.042***	1.799***	1.795***	2.572***	2.714***	2.438***	2.584***
	(0.161)	(0.148)	(0.164)	(0.152)	(0.268)	(0.264)	(0.156)	(0.171)
large urban (Beale Codes=4,5)	1.274***	1.222***	1.008***	1.062***	1.583***	1.741***	1.531***	1.642***
	(0.146)	(0.139)	(0.145)	(0.139)	(0.232)	(0.234)	(0.143)	(0.158)
small urban (Beale Codes=6,7)	0.835***	0.801***	0.655***	0.706***	1.077***	1.173***	0.981***	1.039***

	(0.097)	(0.094)	(0.112)	(0.105)	(0.167)	(0.180)	(0.097)	(0.112)
rural adjacent (Beale Codes=8)	0.336**	0.289**	0.065	0.056	0.236	0.270	0.121	0.182
	(0.147)	(0.140)	(0.195)	(0.175)	(0.213)	(0.249)	(0.186)	(0.188)
State pair fixed effect at border	Y	Y	Y	Y	Y	Y	Y	Y
constant	89.572***	85.233***	8.170	13.414	111.879***	61.309***	83.928***	38.943**
	(16.123)	(15.738)	(22.564)	(18.575)	(19.677)	(18.611)	(18.808)	(19.604)
N	17694	17694	17581	17581	17271	17271	17627	17627

Notes: Estimates are based on the conditional logit estimation. Standard errors are in parentheses. ***significant at 1 percent, **significant at 5 percent, *significant at 10 percent.

Appendix Table 2 New firm entry and exit by sectors at state borders in U.S. from 1999 to 2015 (continued)

	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
	births	deaths	births	deaths	births	deaths	births	deaths
	Real estate		Professional service		Management		Educational service	
Upstream	3.638***	4.321***	4.986***	4.809***	2.619***	2.654***	2.963***	2.922***
	(0.668)	(0.658)	(0.696)	(0.738)	(0.410)	(0.441)	(0.583)	(0.546)
Downstream	9.134***	9.466***	-1.728	-1.648	2.225***	1.969***	5.939***	5.784***
	(1.294)	(1.240)	(1.228)	(1.260)	(0.650)	(0.692)	(0.854)	(0.848)
Cluster	1.769***	1.974***	1.944***	2.128***	0.892***	1.263***	0.645***	0.835***
	(0.160)	(0.176)	(0.318)	(0.338)	(0.093)	(0.088)	(0.104)	(0.114)
Herfindahl index	-8.261***	-8.992***	-10.541***	-10.664***	-9.898***	-10.937***	-9.302***	-9.819***
	(1.270)	(1.277)	(1.659)	(1.680)	(1.795)	(2.104)	(1.927)	(1.838)
Monopoly	1.153***	-16.662***	1.413***	-15.134***	2.255***	-16.172***	1.916***	-16.001***
	(0.366)	(0.406)	(0.440)	(0.439)	(0.150)	(0.159)	(0.141)	(0.156)
College above	0.015***	0.001	0.007	<0.001	0.006	-0.003	0.019**	0.012
	(0.006)	(0.006)	(0.007)	(0.007)	(0.009)	(0.010)	(0.008)	(0.008)
Amenity	0.067	0.077	0.087	0.100	0.067	0.069	0.079	0.082
	(0.086)	(0.085)	(0.073)	(0.071)	(0.074)	(0.068)	(0.074)	(0.070)
real per capita personal income (1000dollars)	0.011***	0.010***	0.002	0.002	0.013***	0.006	0.007	0.008*
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)
real government expenditure per capita	0.090*	0.123***	0.091*	0.096*	0.036	0.045	0.090*	0.090*
	(0.046)	(0.047)	(0.047)	(0.050)	(0.057)	(0.056)	(0.047)	(0.047)
effective property tax rate	-0.051	-0.070	-0.050	-0.036	-0.043	-0.062	-0.093	-0.103
	(0.068)	(0.070)	(0.064)	(0.069)	(0.079)	(0.068)	(0.067)	(0.070)
Year	-0.022**	-0.007	-0.005	0.008	-0.037***	-0.017	0.001	0.017*
	(0.009)	(0.009)	(0.010)	(0.011)	(0.013)	(0.013)	(0.010)	(0.010)
metro (Beale Code=1, 2,3)	2.167***	2.073***	2.611***	2.437***	2.203***	2.500***	2.557***	2.649***
	(0.157)	(0.156)	(0.247)	(0.226)	(0.219)	(0.297)	(0.276)	(0.302)
large urban (Beale Codes=4,5)	1.157***	1.100***	1.658***	1.499***	1.176***	1.478***	1.479***	1.655***
	(0.165)	(0.166)	(0.242)	(0.223)	(0.228)	(0.297)	(0.250)	(0.277)
Small urban (Beale Codes=6,7)	0.875***	0.825***	1.240***	1.118***	0.673***	1.015***	1.053***	1.281***

	(0.137)	(0.138)	(0.208)	(0.185)	(0.202)	(0.270)	(0.220)	(0.253)
rural adjacent (Beale Codes=8)	0.289	0.320*	0.570**	0.405*	0.067	0.357	0.370	0.776***
	(0.192)	(0.189)	(0.244)	(0.224)	(0.277)	(0.337)	(0.265)	(0.286)
State pair fixed effect at border	Y	Y	Y	Y	Y	Y	Y	Y
constant	29.281*	-0.587	7.165	-18.881	67.861***	27.221	-13.081	-45.292**
	(17.497)	(17.976)	(19.557)	(20.640)	(25.960)	(26.177)	(19.825)	(18.782)
N	17022	17022	17597	17597	12316	12316	14233	14233

Notes: Estimates are based on the conditional logit estimation. Standard errors are in parentheses. ***significant at 1 percent, **significant at 5 percent, *significant at 10 percent.

Appendix Table 2 New firm entry and exit by sectors at state border in U.S. from 1999 to 2015 (continued)

	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
	births	deaths	births	deaths	births	deaths	births	deaths
	Health care		Arts		Accommodation service		Other service	
Upstream	3.847***	3.611***	2.669***	2.793***	-0.058	-0.128	6.826***	6.988***
	(0.470)	(0.490)	(0.468)	(0.478)	(0.316)	(0.299)	(0.747)	(0.797)
Downstream	0.636	0.819*	3.733***	3.105***	6.596***	6.682***	-6.339***	-6.690***
	(0.449)	(0.447)	(0.858)	(0.836)	(1.119)	(1.081)	(0.845)	(0.872)
Cluster	2.129***	2.123***	0.046	0.267***	1.430***	1.559***	-0.686***	-0.346
	(0.185)	(0.187)	(0.088)	(0.059)	(0.274)	(0.256)	(0.223)	(0.224)
Herfindahl index	-7.379***	-7.479***	-6.665***	-7.582***	-7.062***	-7.248***	-8.394***	-8.901***
	(1.941)	(1.855)	(1.078)	(1.114)	(2.021)	(1.801)	(1.205)	(1.218)
Monopoly	3.211***	-11.570***	1.035***	-15.662***	1.124**	-16.522***	0.380	-13.228***
	(0.474)	(0.679)	(0.192)	(0.196)	(0.549)	(0.623)	(0.362)	(0.556)
College above	0.014**	0.007	0.007	0.002	0.018***	0.015**	-0.004	-0.007
	(0.007)	(0.007)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
Amenity	0.058	0.059	0.122**	0.118**	0.104	0.102	0.036	0.037
	(0.069)	(0.068)	(0.058)	(0.057)	(0.067)	(0.065)	(0.072)	(0.072)
real per capita personal income(1000dollars)	0.013***	0.014***	0.014***	0.012***	0.021***	0.021***	-0.004	-0.005
	(0.005)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.003)	(0.003)
real government expenditure per capita	0.034	0.059	0.090***	0.107***	0.086**	0.071	0.103**	0.102**
	(0.047)	(0.044)	(0.034)	(0.033)	(0.044)	(0.044)	(0.050)	(0.052)
effective property tax rate	-0.125*	-0.100	-0.088*	-0.084	-0.141**	-0.155**	-0.018	-0.017
	(0.066)	(0.066)	(0.051)	(0.053)	(0.067)	(0.069)	(0.059)	(0.060)
Year	-0.002	-0.003	-0.021***	-0.014**	-0.024***	-0.020**	-0.018*	-0.016*
	(0.009)	(0.008)	(0.007)	(0.007)	(0.009)	(0.009)	(0.010)	(0.010)
metro (Beale Code=1, 2,3)	2.376***	2.236***	1.917***	1.935***	2.158***	2.060***	2.061***	2.018***
	(0.273)	(0.253)	(0.166)	(0.152)	(0.221)	(0.207)	(0.137)	(0.132)
large urban (Beale Codes=4,5)	1.502***	1.434***	1.123***	1.198***	1.256***	1.200***	1.216***	1.189***
	(0.246)	(0.229)	(0.153)	(0.144)	(0.184)	(0.176)	(0.139)	(0.134)
small urban (Beale Codes=6,7)	1.131***	1.030***	0.699***	0.749***	0.801***	0.755***	0.814***	0.781***
	(0.223)	(0.200)	(0.123)	(0.117)	(0.128)	(0.124)	(0.105)	(0.099)

rural adjacent (Beale Codes=8)	0.520**	0.443*	0.121	0.226	0.325	0.313	0.290*	0.238
	(0.261)	(0.237)	(0.163)	(0.159)	(0.206)	(0.209)	(0.164)	(0.152)
State pair fixed effect at border	Y	Y	Y	Y	Y	Y	Y	Y
constant	-1.504	0.085	34.610**	21.938	41.225**	33.601*	37.596*	35.149*
	(17.285)	(16.467)	(14.714)	(14.013)	(17.970)	(18.085)	(19.665)	(19.328)
N	17651	17651	16752	16752	17686	17686	17662	17662

Notes: Estimates are based on the conditional logit estimation. Standard errors are in parentheses. ***significant at 1 percent, **significant at 5 percent, *significant at 10 percent.