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FIRM ENTRY AND EXIT IN IOWA, 1992-2004

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Abstract

This paper uses the pattern of firm entry and exit to develop a classification system for industries. The classifications include urban-rural bias; long-term growth; and firm survival patterns. The first captures the fact that sector-specific economic growth may be favored in urban areas for some industries and may benefit from low population density for others. Some industries have experienced long-term expansion in firm numbers while others have experienced a decline. Finally, some industries are characterized by high rates of both entry and exit while others have low rates of both. A taxonomy classifying industries according to those three criteria is developed in this paper. The taxonomy is applied to the Iowa subset of the National Establishment Time-Series (NETS) database over the period from 1992 to 2004. County level entry and exit rates are shown to be positively correlated across nearly all 2 digit NAICS code industries. Industry growth is found to be biased against rural areas. Not all of the industries experienced expansion or have a positive net entry rate. Entry of new firms replaces old incumbent firms in each industry but to different degrees. Understanding firm entry - exit pattern can help design customized policies of fostering expansion of specific industries in Iowa according to their location bias, industry growth patterns and development dynamics.

Key Words: Entry – Exit Pattern, Taxonomy, Location Bias, Expansion, Churning, Entrepreneurship, Economic Development

I. INTRODUCTION

There is a growing consensus among economists that entrepreneurship is essential for sustained economic growth and competiveness. The creation of new businesses is one of the primary indicators of entrepreneurial activities.[1] Firm entry or birth rates in a region, as Audretsch (2007) argues can provide a measure of entrepreneurship capital - the local acceptance and valuation of entrepreneurial behavior. Firm entry, however, is only half of the story. We need to take into account the rate at which firms exit a given region or industry as well. Examining the entry or birth rates of firms across industries and regions in comparison with exit or death rates can provide some insight into the potential sources of economic growth.

Industry-based investigations of entry and exit suggest that industries with high entry also have high exit (Dunne, *et al* 1988 and Cable and Schwalbach, 1991). For example, exit barriers can also retard entry because firms need to consider the possibility of exit costs when deciding whether to start a firm. (Eaton and Lipsey, 1980).

There is only limited previous evidence on the the relationship between entry and exit rates across rural and urban areas in a specific industry. Nevertheless, this is a critical dimension for understanding the role of entrepreneurship in fostering economic development. Several recent papers document that new businesses are more likely to be established in rural areas because they can explore more opportunities by providing differentiated product. At the same time, it is expected that the failure rate in rural areas is relatively lower due to lower competitive pressures, rents and wages (Arenius and Clercq, 2005). Acs and Malecki (2003) find that there is a higher percentage of high growth firms in smaller Labor Market Areas as defined by the US Department of Labor. On the contrary, enterprises in urban markets may benefit from

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[1] Carree and Thurik(2003) provide a survey and Audretsch(2007), Acs(2006), Fairlie (2006) and Wong, Ho and Autio(2005) present more recent studies.

agglomeration economies including knowledge spillovers, better information flows, and more immediate access to suppliers, customers, and skilled workers (Moretti, 2004, Glaeser, 2001). However, it is not clear that the higher entry rates and lower exit rates in some rural markets will hold more generally across all industries and regions. In fact, we find that locations attracting more entries also have more exits in all industries using our dataset described in the next section.

A cross sectional analysis of entry - exit patterns within an industry should also indicate net growth of the industry. If the entry rate is higher than the exit rate during a period, the industry gains in number of firms. In contrast, if the exit rate exceeds the entry rate, the industry experiences contraction. Nevertheless, expanding industries may have very different entry-exit patterns. New firm entry may bring innovation and technological advancement which displaces mature firms using older technologies. In other cases, new firms may enter using existing technologies, relying on expanding market demand rather than improved products to create market share.

In this paper, a taxonomy classifying specific industries based on the degree of urbanization, net growth and development dynamics is developed. Some industries favor firms in urban areas while others have balanced growth in both urban and rural areas. The difference between entry and exit rates indicates industry expansion or contraction. In addition, new firms compete with or replace mature firms at different rates. When exits of mature firms coincide with the entry of new firms in an industry, the industry is characterized as churning.

Our analysis focuses on firm entry and exit in Iowa. Compared to its neighboring states and the US average, Iowa has experienced relatively slow economic growth and population growth (Figure 1(a) and Figure 1(b)). Iowa's annual population growth rate during the last 28 years was 1.9%, 0.2% lower than the average rate for the US. The annual per capita income

growth rate in Iowa was 0.6%, significantly below the U.S. average rate of 1.3%. Iowa's

economic performance reflects its relatively rural population with a larger than average

agricultural sector, but it also has several metropolitan counties. For that reason, Iowa provides

the broad range of population densities needed to illustrate which industries fall each cell in the

taxonomy.

Figure 1(a) Annual population growth rates, Iowa and neighboring states, 1980 -2007

Annual Population Growth, 1980-2007

Data source: Bureau of Economic Analysis
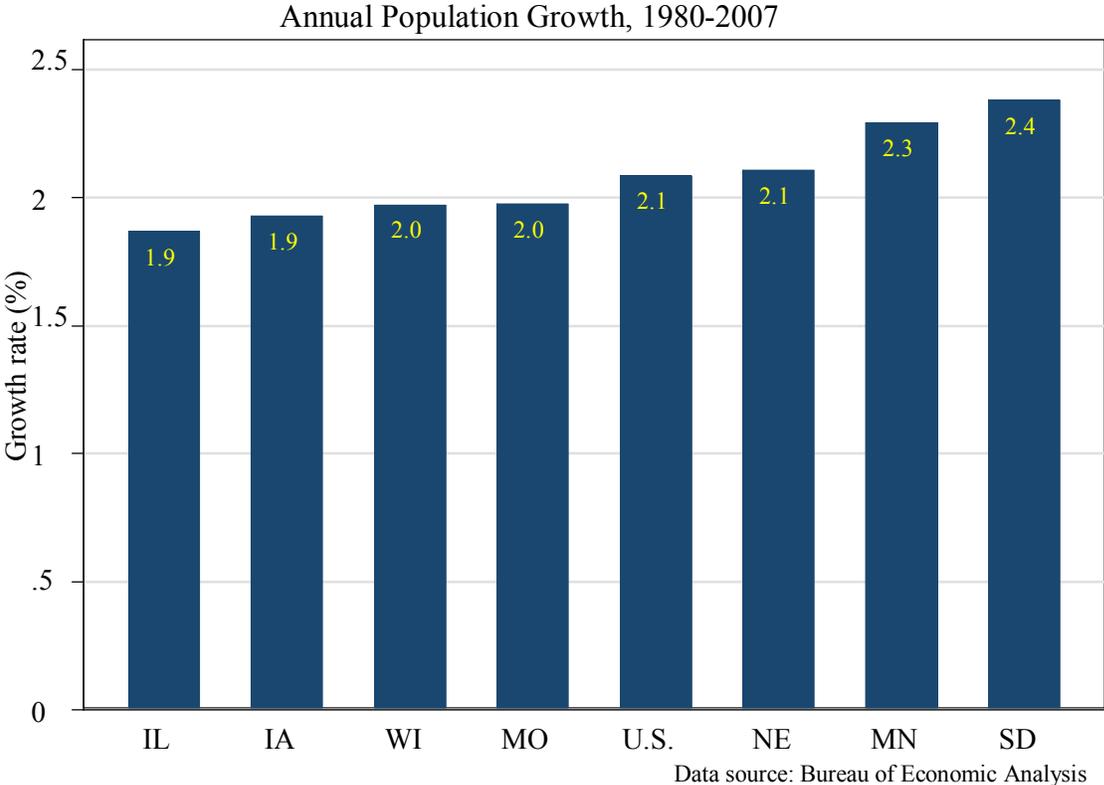
Figure 1(b) Annual growth rate of real income per capita, Iowa and neighboring states, 1969-2006

Annual Growth Rate of Per Capita Income, 1969-2006

Data source: Bureau of Economic Analysis
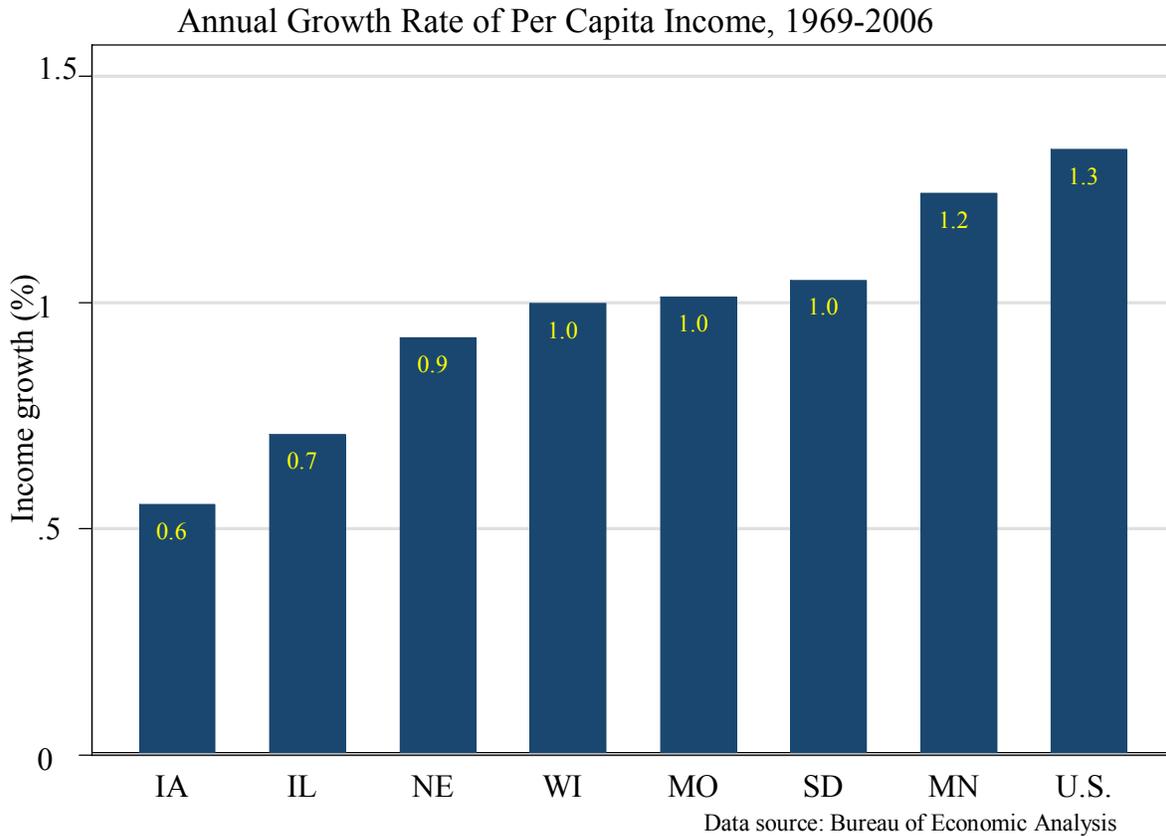
The next section describes the data set and discusses the measures of entry and exit rates in Iowa from 1992 to 2004 used in this analysis. Section three describes the taxonomy in detail. In section four, we explore specific industry dynamics by applying the taxonomy and studying cross sectional entry rates and exit pattern. The final section concludes the paper and provides policy implications.

II. DATA

Our estimates of entry and exit rates are derived from the Iowa subset of the National Establishment Time-Series (NETS) database (Walls and Associates, 2006). Iowa is particularly appropriate for our purposes because of the large variation in population across the 99 counties:

from under 5 thousand in Adams county to 375 thousand in Polk county. The NETS database identifies each establishment using a unique Dun and Bradstreet (D&B) DUNS ID number. The firm information which we exploit in our analysis includes the firm's year of birth, the county in which the firm conducts business, the firm's primary industrial classification, whether the firm is still in operation by the end of 2004, and if not, when the firm shut down. In our analysis, if the year a firm was established in a county between 1992 and 2004, it is treated as an entrant. If the year a firm died in a county between 1992 and 2004, excluding the cases where the firm migrated to another county inside or outside Iowa, then it is designated as an exiting firm[2]. After annual county-by-industry entry and exit rates were computed, a period-long measure is defined as the weighted average of these annual entry and exit rates. The use of the averaged rates allows us to smooth out spurious variation in entry or exit due to short-lived or atypical local economic expansions or contractions. Details of the calculation methods and mathematical description are given in the Appendix A.

The categorization into different types of industries relies on the eight-digit Standard Industrial Classification (SIC) codes in the dataset. Because the US Census Bureau switched to the North American Industrial Classification System (NAICS) in place of the SIC codes during our sample period, a firm may change industrial classifications even if the firm's product line does not change. For this reason, Walls and Associates generated a table that provides a one-to-one translation between SIC codes and NAICS codes. Using that translation, we are able to provide a consistent two-digit NAICS code to every establishment over the full sample period.

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[2] Establishments which disappeared because of a merger or acquisition but that did not relocate are treated as continuing establishments.

Since only a small subset of farms have DUNS numbers, we restrict our attention to non-agricultural firms[3].

III. CONCEPTUAL FRAMEWORK

Throughout this paper, we rely on a simple graphical model for our analysis of entry - exit pattern in each two digit NAICS code industry. The model is illustrated in Figure 2. In this case, we plot the entry rate of firms across the entire non-farm sector in Iowa against the corresponding exit rate from 1992 to 2004. Each circle represents a county in Iowa and the area of the circle is proportional to the county's population. We also categorize the counties into three types: small, medium and large according to the county population density in 2000 (BEA)[4]. Our methodology for measuring the entry and exit rates is presented in the Appendix A for readers seeking additional details.

We include two lines to assist in interpreting the results. The 45° line provides a visual benchmark showing where rates of entry and exit are equal. The diagonal dashed line is obtained by the regression of the entry rate on the exit rate weighted by the population of the county. Consequently, more weight is given to populated counties than to counties with a lower population density. The coefficients from the weighted regression equation of entry rates on exit rates are shown in the lower left corner of Figure 2. The numbers in parentheses are the t-values of the estimated coefficients. Finally, the horizontal and vertical dashed lines in Figure 2 give the mean entry and exit rate in Iowa for all non-farm businesses over the period of study.

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[3] Mining industry (NAICS=21), utilities (NAICS=22), management of companies and enterprises (NAICS=55) and administrative and waste services (NAICS =56) have few firms in Iowa and even fewer in some counties with sparse population, which creates too volatile entry or exit rates. They are also excluded from the analysis.
[4] Counties are defined as large when their population is greater than 100,000. Counties are defined as medium when their population is greater than 25,000 but fewer than 100,000. The remaining counties with population less than 25,000 are defined small.

Figure 2 Entry exit patterns for aggregated nonfarm industry by counties in Iowa, 1992-2004

Entry = -0.06 + 2.02Exit, R-square = 0.51
      (-2.54) (5.79)

Data source: NETS_IOWA
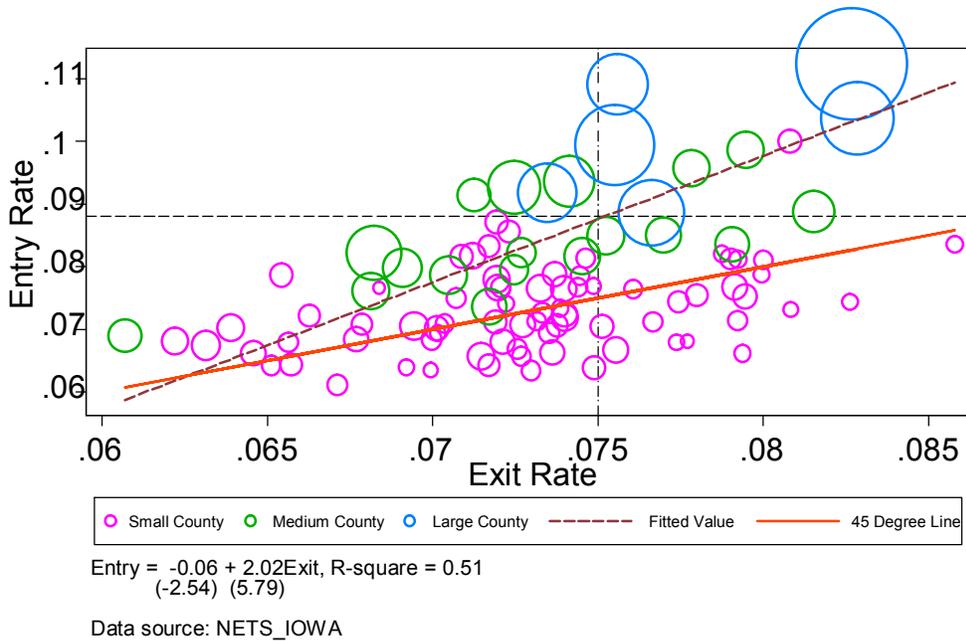
We can use Figure 2 to illustrate the taxonomy for characterizing entrepreneurial activity in a specific industry or at an aggregated industry level. Each industry is characterized into a point in a three dimensional space, indicating if its growth is rural or urban biased, if it is expanding or contracting and if its development dynamics is high churning, low churning, stable, stagnant or declining. Table 1 shows the taxonomy we will elaborate in the following example that defines the classification variables.

Table 1 Taxonomy for characterizing entrepreneurial activities in an industry

Dimensions	Evidence
Bias in Geographical Location	
Urban	The majority of larger counties are located above the fitted line and smaller counties lie below the fitted line.
Neutral	Large and small counties are evenly located around the fitted line.
Rural	Smaller counties locate disproportionately above the fitted line.

Long-term industry growth	
Expanding	The fitted line lies well above the 45° line in the data range.
Balanced	Counties have various entry and exit rates, evenly distributed around the 45° line.
Contracting	The fitted line lies below the 45° line in the data range.
Development dynamics	
High churning	The slope of the fitted line is greater than 1.
Low churning	The slope of the fitted line is positive and less than 1.
Stable	The slope of the fitted line is not significantly different from 1.
Stagnant	The slope of the fitted line is not significantly different from 0.
Declining	The slope of the fitted line is negative.

First, if the entry-exit coordinate of the majority of larger counties are located above the fitted line and smaller counties lie below the fitted line, the industry is said to be urban biased in attracting entrepreneurial activities. If instead, it is the smaller counties that locate disproportionately above the fitted line, then the industry is rural biased. If large and small counties are evenly located around the fitted line, the industry is said to be geographically neutral.

Secondly, by comparing the location relationship between the fitted line and the 45° line, we can define an industry as expanding or contracting in the long term. If the fitted line lies well above the 45° line in the data range, no matter if they are parallel or intersecting, the industry is expanding. In other words, entrants rather than exiters are attracted in most of the counties. If instead, the fitted line lies below the 45° line in the data range, no matter if they are parallel or intersecting, the industry is said to be contracting. If counties have entry and exit rates evenly distributed around the 45° line, the industry is said to be balanced from 1992 to 2004.

Finally, the slope from the regression of entry rates on exit rates indicates the industry's development dynamics. If the slope is greater than 1, higher exit rates are associated with even larger entry rates. In this case, we define the industry to be high churning - the net gain in number of firms results from replacing mature firms by even more new firms. If the slope is not different from 1, the entry rate is equal to exit rate and the industry is defined as stable. If the slope is positive but less than 1, the industry gains new firms by replacing a larger number of exiting mature firms, a pattern we label "low churning". If the slope is zero, we define the industry as stagnant with entry unrelated to exit. Finally, if the slope is negative, a case we do not find in our data, then high firm exit rates are associated with lower firm entry. That pattern would suggest that the industry is in decline.

Figure 2 shows the county entry and exit rates for all industries. The dashed regression line clearly shows that entry rates are positively correlated with exit rates across Iowa counties. Because the larger circles tend to lie above the dashed line and the vast majority of smaller circles are below the dashed line, we can see that the number of firms in larger counties tends to be increasing faster than the number in sparsely populated counties. The number of firms is expanding because the fitted line lies above the 45° line in the data range. We can also see that the mean entry rate of 8.8% exceeds the mean exit rate of 7.5% across the 99 counties – the horizontal and vertical dashed line, respectively.

The estimated slope for the weighted regression of entry on exit is 2.02, and so aggregated industry in Iowa is high churning. Counties with the highest net gain in firm numbers tend to have the highest exit rates. The net gain in firm numbers is correlated with a high firm exit rate. In addition, there is considerable variation in the pattern of entry and exit across

counties. Many counties lie above the 45° line, indicating that firm entry exceeds entry while others lie below the 45° line - they have more exits than entry.

IV. RESULTS

Figure 3 summarizes the entry - exit pattern for each of the two digit NAICS industry in Iowa, aggregated across counties. Table 2 presents the entry and exit rates and the NAICS code that corresponds to the numbers reported in Figure 3. Retail sector, private services sector are the largest sectors in Iowa, having more than 24,000 firms annually during the year 1992 to 2005. Construction sector and Professional and technical services sector are also big, having more than 10,000 firms. Information sector and public administration sector are the smallest sectors, having fewer than 3,000 firms on average during the same period.

As shown in Figure 3, the 45° line represents the steady state combinations where entry and exit rates are equal. The size of the circle indicates the size of the industry, measured by the number of establishments in that industry in the beginning of 1992. It is apparent that most sectors have faster entry than exit, and so they are characterized by net growth in the number of establishments. Only the retail sector has exit rates that exceed entry rates by an appreciable degree. Entry and exit rates are positively correlated across industries, albeit only weakly so.

Figure 3 Entry - exit pattern by industries in Iowa, 1992-2004
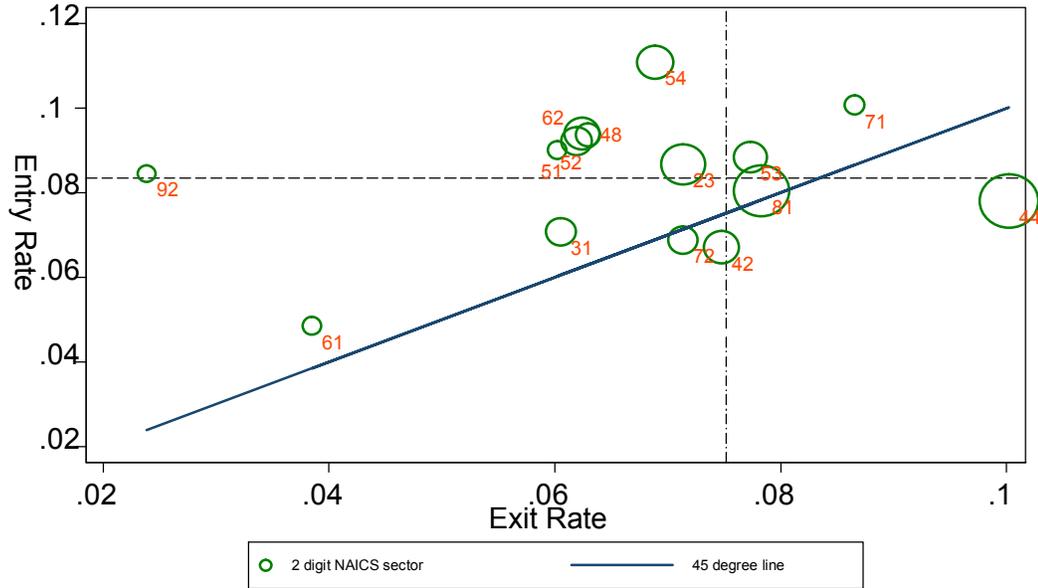
Data source: NETS_IOWA

Table 2 Industry description and entry exit pattern

NAICS Code	Major Industry Title	Entry rate[b]	Exit rate[b]	Annual Average Number of Firms[c]
23	Construction	8.68%	7.13%	14,691
31-33[a]	Manufacturing	7.07%	6.05%	7,123
42	Wholesale trade	6.71%	7.48%	9,464
44-45[a]	Retail trade	7.80%	10.02%	24,877
48-49[a]	Transportation and warehousing	9.38%	6.29%	5,511
51	Information	9.01%	6.02%	2,845
52	Finance and insurance	9.22%	6.19%	7,735
53	Real estate and rental and leasing	8.84%	7.73%	9,518
54	Professional and technical services	11.08%	6.89%	10,190
61	Educational services	4.85%	3.85%	3,101
62	Health care and social assistance	9.40%	6.24%	9,874
71	Arts, entertainment, and recreation	10.07%	8.65%	3,356
72	Accommodation and food services	6.89%	7.13%	7,270
81	Other services, except public administration	8.04%	7.83%	24,733
92	Public administration	8.45%	2.39%	2,297

a: The manufacturing sector has three codes: 31, 32 and 33. We use 31 to code the manufacturing sector in graphs for convenience. Similarly, code 44 represents retail and trade sector and 48 represents the transportation and warehousing sector.

b: The derivation is defined in equation (A5) and (A6) in the Appendix A.

c: The industry size is represented by the average number of existent firms in different industries from 1992 to 2005.

In Appendix B, we report the patterns of entry and exit across counties within a single industry based on the taxonomy presented in the Figure 2. A summary of entry - exit patterns for each industry in Iowa is shown in Table 3. It turns out that regression coefficients for all industries are positive or zero. None of industries are declining. In three cases, the coefficient is significantly larger than one[5]. All are in services: information, finance and insurance and professional and technical services. In six cases, the coefficient is significantly less than one but significantly positive and these industries are defined as low churning. In four cases, the slope is not significantly different from one. The industries are construction, educational services, health care and other services. In the remaining two cases, real estate and public administration, exits and entrances appear to be unrelated.

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[5] We perform a one side student test on the hypothesis if the slope is greater than one.

Table 3: Characterization of industries based on analysis of firm entry - exit patterns by county in Iowa, 1992-2004

Development Dynamics

Net Growth	High Churning			Stable			Low Churning			Stagnant		
	Rural	*Neutral*	*Urban*	*Rural*	*Neutral*	*Urban*	*Rural*	*Neutral*	*Urban*	*Rural*	*Neutral*	*Urban*
Contracting									42			
									44			
Balanced									72			
						81						
Expanding		51			62	23		31	71		92	53
		54	52			61		48				

Note: The number is the 2 digit NAICS codes for industries. Industries that the codes represent are shown in Table 2. If large counties are mainly located above the regression line compared to the small counties, the industry is urban biased. On the contrary, the industry is rural biased. At the same time, if most of counties are located above the 45° line and the fitted line lies above the 45° line in the data range, the industry is expanding. If the slope of fitted line is significantly greater than one, the industry is high churning. If the slope is significant smaller than one, the industry is low churning. If the slope is significantly positive but indifferent from one, the industry is stable. If the slope is statistically indifferent from zero, the industry is stagnant. Statistically negative slopes never occur in the dataset.

We also show in Table 3 that 9 out of 15 industries exhibit a bias toward urban counties where entry exit ratio is relatively higher than in rural counties. None of the industries have faster entry rate in rural counties than in urban counties. At the same time, 10 industries are expanding, having a net gain in the number of firms. Only retail and wholesale industries are contracting during the thirteen years.

In 11 of 15 industries, the R^2 from these simple regressions are above 0.2. Entry and exit rates are more strongly positively correlated across counties within a specific industry than was apparent in the cross industry correlation where R^2 is only (0.05 in unweighted and 0.01 in weighted regressions respectively). This result suggests that the cross-sectional correlation is driven by differences in entry and exit rates across counties and not by differences across industries[6].

V. CONCLUSION

We examined the patterns of firm entry and exit for fifteen two-digit NAICS code industries in Iowa. Entrepreneurial activities are biased away from rural counties and 9 out of 15 industries are biased toward urban areas where urban counties have higher firm entry rates than rural counties. None of the industries grow faster in rural counties than in urban areas. Industries with high entry rates tend to have high exit rates. Nevertheless, this pattern is not uniform across all industries.

As summarized in Table 3, 11 out of 15 industries are expanding, having a net gain in the number of firms from 1992 to 2004 in the vast majority of counties. Only retail and wholesale industries are contracting during the thirteen years. Three of the expanding industries are high churning will have more net gains of firms generated by replacing existent firms: information,

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[6] The greater variation of entry rates and exit rates (or the differences between the two rates) among counties than across sectors can be also statistically verified by the variance analysis.

finance and professional services industries. In other expanding industries such as manufacturing, transportation and entertainment, net growth in firm numbers is enhanced by low churning environments in which the growth is slower than the average industry but it still has a positive net growth. The real estate industry in Iowa is neither expanding nor contracting and firm creation is unrelated with firm destruction.

One of the key implications of this analysis is that policies to foster industry expansion cannot be uniform. High churning industries such as information, finance and insurance, and professional and technical services benefit by low barriers to entry. The competition among firms is also intense. Low barriers to entry and implied low barriers to exit help attract potential entrepreneurs and motivate incumbent entrepreneurs to innovate. Efforts to prevent the demise of firms in high churning industries through tax concessions or public subsidies may be counterproductive. Low churning industries such as manufacturing, transportation and warehousing require policies to encourage entry along with technical assistance at the time of entry to increase the likelihood of success. In these low churning industries, public intervention to limit the loss of firms may be more effective, although local governments may want to concentrate on providing an economic climate favorable to business and avoid making concessions on a case by case basis.

Our analysis also shows where industry expansion has been occurring. Not surprisingly, urban counties have the advantage in most industries, particularly those that rely heavily on human capital or consumer demand, such as finance and insurance, educational services, construction and entertainment and recreation. Even for two contracting industries: wholesale trade and retail trade, the urban areas tend to lose fewer firms than rural counties. However, enterprises in some industries that benefit from low land prices and relatively less congested

traffic patterns are also likely to be located in rural areas. These industries are neutral to the geographical location. For example, industries such as professional and technical services and health care and social assistance have similar growth patterns regardless of population density. In contrast to the hypothesis advanced by Acs and Malecki (2003) and Lee, Florida and Acs (2004), entrepreneurial activities in Iowa do not necessarily occur around metropolitan areas.

APPENDIX A

We focus our analysis on firm entry and exit in the 99 counties in Iowa. The county-level analysis is appropriate because Iowa's counties are almost identical in geographic size, and so we can view them as 99 geographic experiments in which economic activity is taking place. A key variable across these counties which we will evaluate is the population density: some industries may be complementary with more concentrated populations while others may be compatible with more sparsely distributed populations. We evaluate the patterns across counties of growth or decline of firm numbers by industry. The U.S. Census Bureau divides firms into 20 broad industry classifications.[7] We define each county's entry rate and exit rate in an industry in the following way.

The entry rate δ_{ijt}^{entry} for industry j in county i during a year t is defined as

$$\delta_{ijt}^{entry} = \frac{n_{ijt}^{entry}}{N_{ijt}} \qquad (A1)$$

where n_{ijt}^{entry} is the number of firms in industry j that newly entered county i during this period and N_{ijt} is the total number of firms in county i in industry j at the beginning of this period. Similarly, the exit rate δ_{ijt}^{exit} for industry j in county i during the same period is defined as

$$\delta_{ijt}^{exit} = \frac{n_{ijt}^{exit}}{N_{ijt}} \qquad (A2)$$

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[7] The North American Industrial Classification System (NAICS) sorts firms into sectors based on similar production methods. The NAICS system replaced the previous Standard Industrial Classification (SIC) in 2002, but the NAICS classifications were applied retrospectively in the NETS data base. Details on the NAICS can be found at http://www.naics.com/info.htm.

where n_{ijt}^{exit} is the number of firms in industry j that exited county i during the period.

The average entry rate for industry j in county i from 1992 to 2004 is defined as

$$\delta_{ij}^{entry} = \sum_{t=1992}^{2004} \frac{n_{ijt}^{entry}}{N_{ijt}} \cdot \frac{N_{ijt}}{\sum_{t=1992}^{2004} N_{ijt}} = \frac{\sum_{t=1992}^{2004} n_{ijt}^{entry}}{\sum_{t=1992}^{2004} N_{ijt}} \tag{A3}$$

and the corresponding average exit rate is

$$\delta_{ij}^{exit} = \frac{\sum_{t=1992}^{2004} n_{ijt}^{exit}}{\sum_{t=1992}^{2004} N_{ijt}}. \tag{A4}$$

Equations (A3) and (A4) are used to estimate entry and exit rates across counties within an industry and hence illustrate the entry – exit pattern for aggregate economy shown in Figure 1 and for specific industries shown in Appendix B.

Industry specific state level entry rate Δ_j^{entry} is aggregated from the county level entry rates. Similar to the definition in equation (A3), the state level entry rate in industry j is defined as the following

$$\Delta_j^{entry} = \frac{\sum_{t=1992}^{2004} n_{jt}^{entry}}{\sum_{t=1992}^{2004} N_{it}}. \tag{A5}$$

The state exit rate in the industry j is

$$\Delta_j^{exit} = \frac{\sum_{t=1992}^{2004} n_{jt}^{exit}}{\sum_{t=1992}^{2004} N_{it}} \tag{A6}$$

where n_{jt}^{entry} and n_{jt}^{exit} are the total number of firms entering or exiting from Iowa during

the analyzed period t respectively.

Entry - Exit Pattern in Iowa Counties, 1992 - 2004
2 digit_NAICS = 23: Construction

Entry = .02 + .91 Exit, R-square = .27
(2.05) (5.98)

Data source: NETS_IOWA
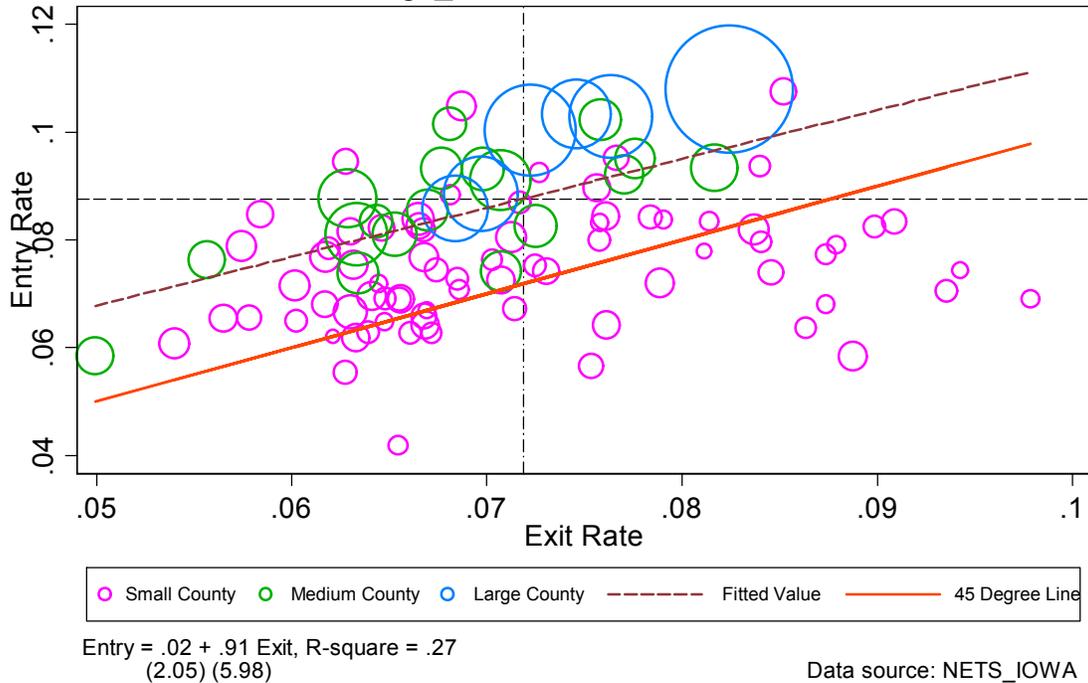
Nearly half of the establishments in the construction sector in Iowa belong to the residential building construction sub-sector and building equipment contractors sub-sector at the 4 digit NAICS level. Another quarter of them are building finishing contractors or foundation, structure and building exterior contractors. The vast majority of counties locate above the 45° line, and so most counties are gaining construction firms. The average entry rate, 8.7%, exceeds the exit rate 7.1% for a net entry rate of 1.5% per year over thirteen years in Iowa. The larger counties tend to have faster than average entry rates, while some smaller counties locate below the 45° line, experiencing a net loss of construction establishments. The slope is not statistically significantly different from one, meaning that construction industry gains and loses firms at the same rate. The construction industry in Iowa is characterized to be stable, expanding and growing biased toward the urban areas from 1992 to 2004.

## Entry - Exit Pattern in Iowa Counties, 1992 - 2004
2 digit_NAICS = 31: Manufacturing

Entry = .03 + .71 Exit, R-square = .32
  (4.47) (6.78)

Data source: NETS_IOWA
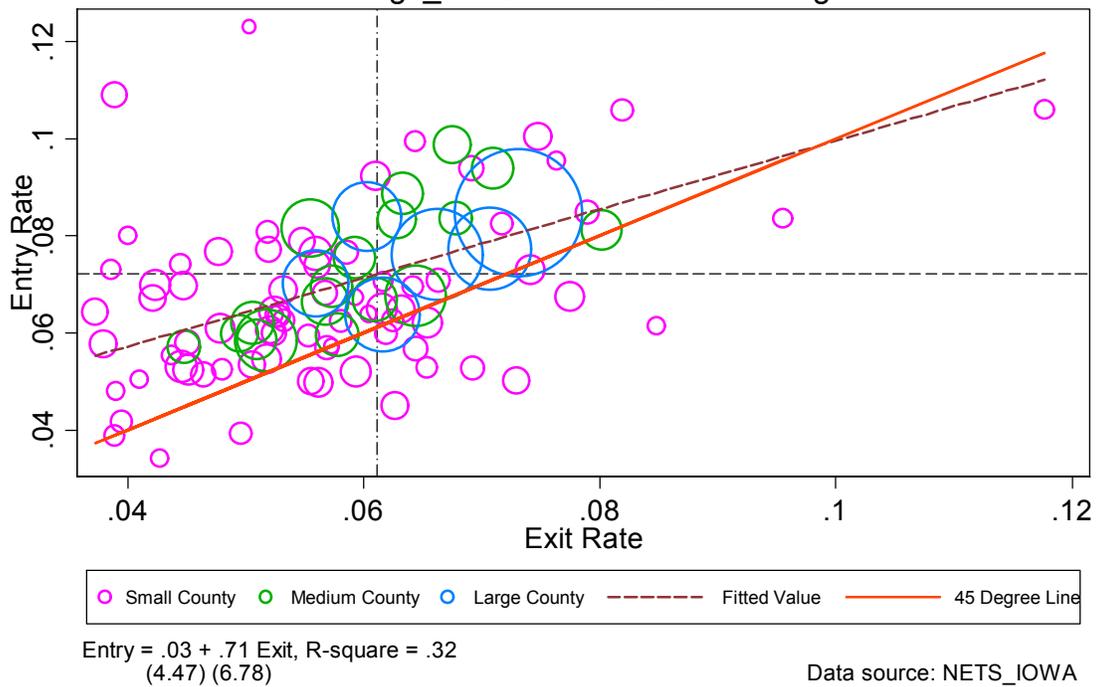
The most important subsectors in manufacturing in Iowa are in printing and related support activities; machine shops; turned products, and cement or concrete product manufacturing. On net, the state has had slow gains in the number of manufacturing establishments with the annual entry rate (7.1%) slightly larger than the annual exit rate (6.1%) over the period. The vast majority of counties locate above the 45° line, and so most counties have gained manufacturing establishments. There is no evidence of urban or rural bias in net growth, although the only counties lying below the 45° line are small. The slope is significantly smaller than 1, the industry gains net number of firms by new firms' replacing more existing firms. The manufacturing industry in Iowa is low churning, expanding but growing neutral toward the geographic locations.

## Entry - Exit Pattern in Iowa Counties, 1992 - 2004
2 digit_NAICS = 42: Wholesale trade

Entry = .02 + .61 Exit, R-square = .22
(2.51) (5.25)

Data source: NETS_IOWA
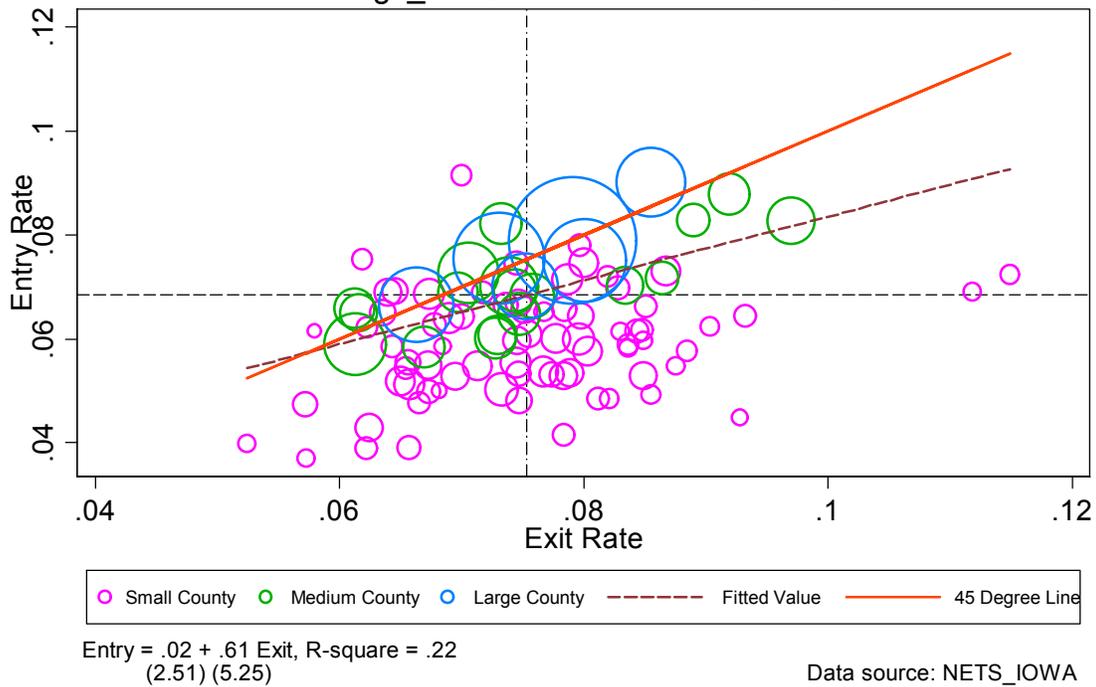
Wholesalers of machinery and equipment, and supply merchant constitute about 20% of number of establishments in the wholesale trade sector in Iowa. The next most important subsectors are wholesalers of miscellaneous nondurable goods and of farm product raw materials. The 45° line lies above the regression line for most of the relevant range of exit rates, and so the state is a net loser of establishments in the wholesale trade sector. The average state exit rate of 7.5% over 12 years is higher than the entry rate of 6.7%. Larger counties are concentrated above the regression line, indicating that the larger counties have had more success than average in retaining firms and inviting entry. The smaller counties are concentrated below the regression line, and so the sector is contracting in rural areas. The slope of the fitted line is 0.61, significantly smaller than one, indicating the industry is low churning. The patterns suggest that the wholesale trade industry is urban biased in Iowa.

## Entry - Exit Pattern in Iowa Counties, 1992 - 2004

2 digit_NAICS = 44: Retail trade

Entry = .02 + .58 Exit, R-square = .09
(1.17) (3.14)

Data source: NETS_IOWA
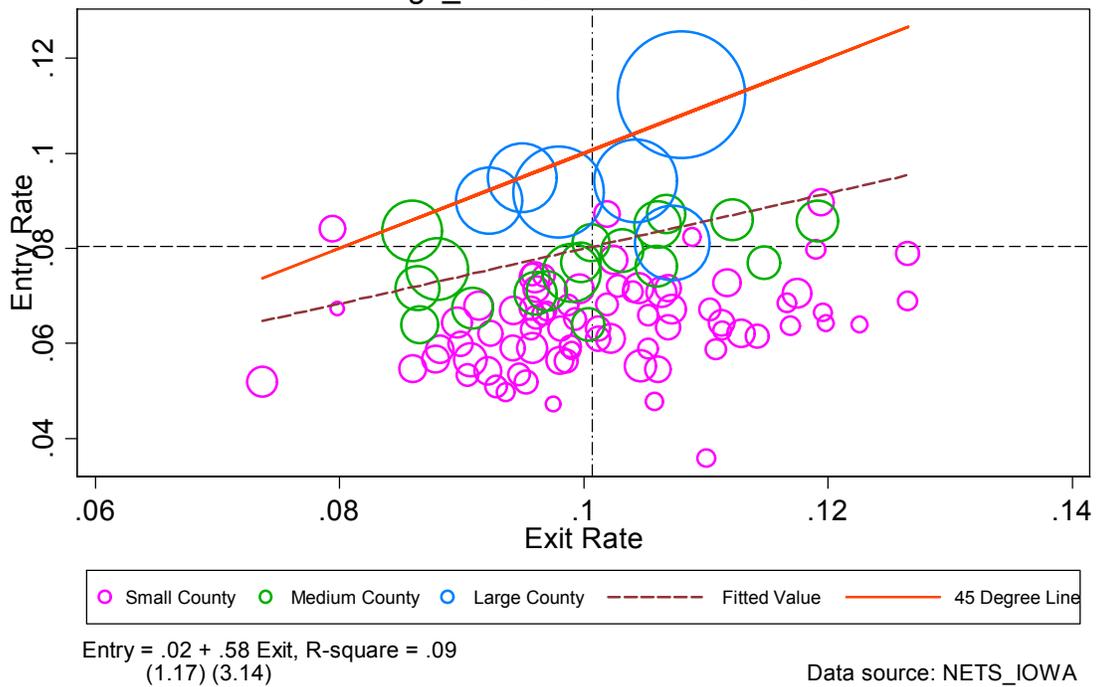
Grocery stores, sporting goods, hobby, and musical instrument stores, office supplies, stationery, and gift stores and automobile dealers are the most important subsectors of Iowa's retail trade industry. The regression line lies below the 45° line throughout the relevant range of exit rates, and so the state is a net loser of retail firms. The average state level exit rate is 10%, well above the average entry rate of 7.8%. Nearly all counties lie below the 45° line indicating a net loss of establishments. The pattern is most apparent for the smaller counties which also lie below the fitted line. Urban counties generally lie above the fitted line and several are on the 45° line, bucking the general trend of declining numbers. A 1% of increase in the exit rate is only related with 0.6% of increase in firm entry rate. We can conclude that the retail trade sector in Iowa is low churning, contracting but urban biased.

Entry - Exit Pattern in Iowa Counties, 1992 - 2004

2 digit_NAICS = 48: Transportation and warehousing
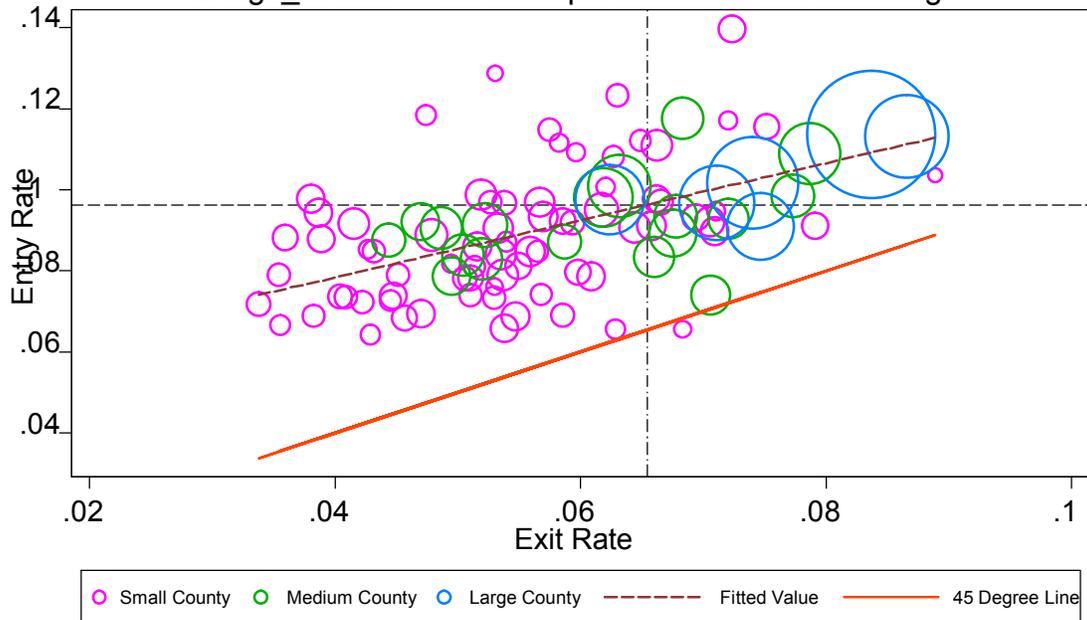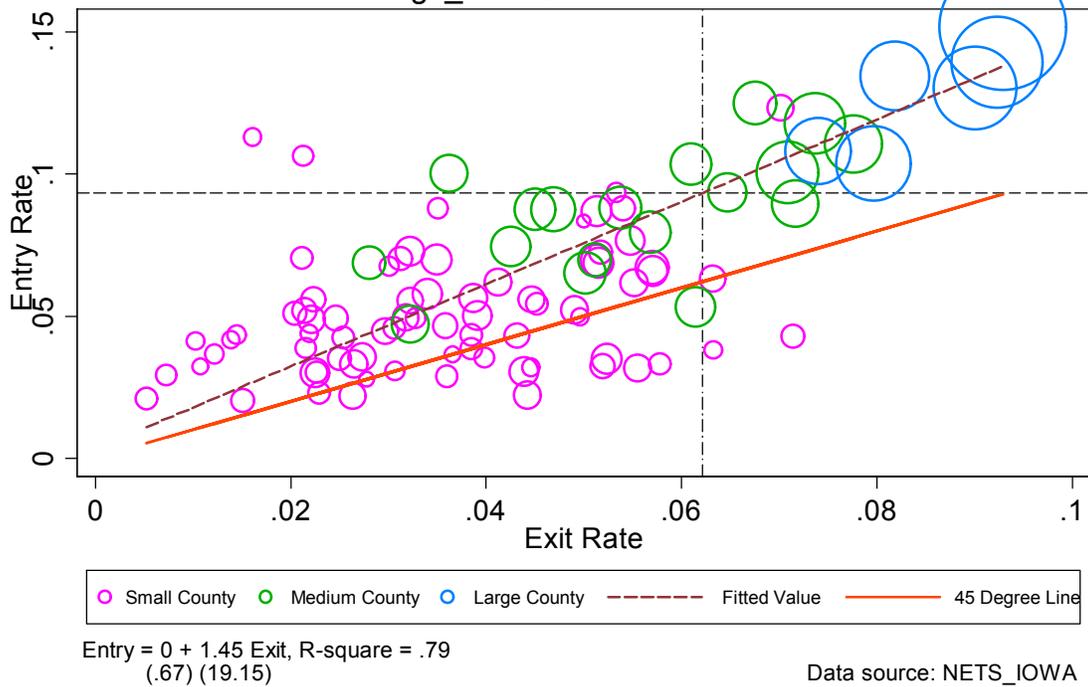
Entry = .05 + .71 Exit, R-square = .5
(10.42) (9.79)

Data source: NETS_IOWA

The two most important subsectors in transportation and warehousing industry are general freight trucking and specific freight trucking. The third largest sub-sector is warehousing and storage. This sector clearly has more entrants than exits: the fitted line lies above the 45° line throughout the relevant range of the data. Counties of different sizes are concentrated above the 45° line, and so the pattern of net gain in the transportation/warehousing industry is almost universal. The average state level entry rate is 9.4%, exceeding the state level exit rate by 3% over the period. The growth of number of firms in this industry is low churning: new firms replace existing firms at a ratio 0.7. Transportation/warehousing industry in Iowa is expanding and low churning. Larger and smaller counties are found on the fitted line, so there is no pattern of urban or rural bias in industry growth.

## Entry - Exit Pattern in Iowa Counties, 1992 - 2004

2 digit_NAICS = 51: Information

Legend: Small County, Medium County, Large County, Fitted Value, 45 Degree Line

Entry = 0 + 1.45 Exit, R-square = .79
(.67) (19.15)

Data source: NETS_IOWA

Newspaper, periodical, book, and directory publishers, wired telecommunications carriers, radio and television broadcasting are among the largest subsectors in the information industry in Iowa. The fitted line lies above the 45° line with a slope bigger than one (1.45). The average state level entry rate is 9%, 3% above the average exit rate of 6%. This is clearly a high churning industry. The largest counties have both high entry and exit rates and consequently have experienced the fastest growth in net establishment numbers. However, both small and large counties locate on the fitted line, and so there is no apparent urban or rural bias in the net growth rate of the information industry.

Entry - Exit Pattern in Iowa Counties, 1992 - 2004

2 digit_NAICS = 52: Finance and insurance
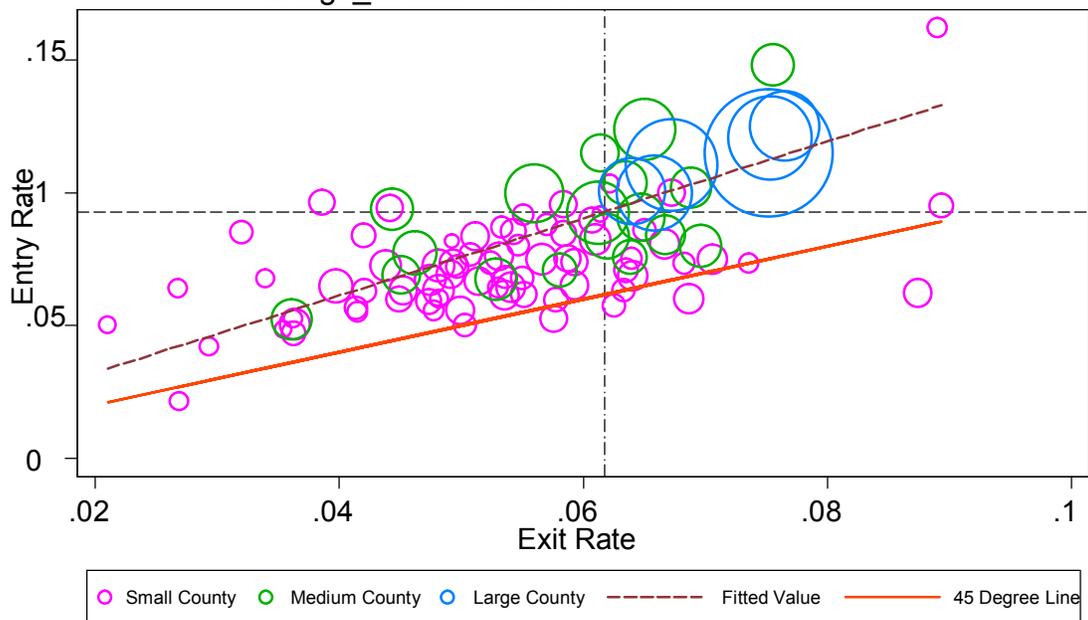
Entry = 0 + 1.45 Exit, R-square = .56
(.4) (11.15)

Data source: NETS_IOWA

More than half of the establishments in the finance and insurance sector in Iowa are agencies brokerages, and depository credit intermediation. Nearly all of counties, regardless of size, experienced more entrants than exiters. The fitted line lies above the 45° line throughout the relevant range, and so the state has been a net gainer of financial and insurance firms. The average state level entry rate is 9.2% and the average exit rate is 6.2%. Larger counties are all found on or above the fitted line, while the smaller counties tend to lie below the fitted line. We conclude that the information industry is slightly biased toward urban areas, expanding and churning.

Entry - Exit Pattern in Iowa Counties, 1992 - 2004
2 digit_NAICS = 53: Real estate and rental and leasing

Entry = .08 + .1 Exit, R-square = 0
     (6.41) (.57)

Data source: NETS_IOWA
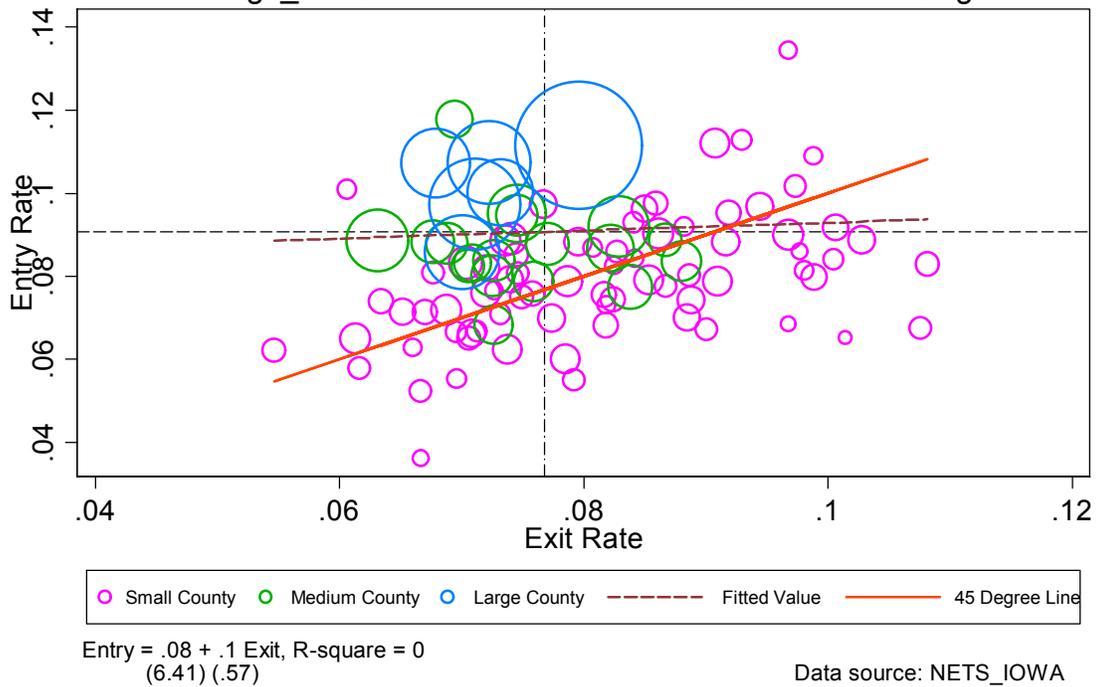
The largest subsectors in the real estate and rental and leasing sector in Iowa are the real estate leasing and brokerages and consumer goods rental agencies. The fitted line is virtually flat. There is no relationship between exits and entries. Counties lie above and below the 45° line. The average state level entry rate is 8.8% and the average exit rate is 7.7%. The fitted line lies above the 45° line in the most of data range. This industry is expanding. The entry rate is unrelated with the exit rate. The industry is neither churning nor declining. The largest counties almost all lie on or above the fitted line while small counties locate below, suggesting that the real estate industry can be characterized as urban biased.

Entry - Exit Pattern in Iowa Counties, 1992 - 2004

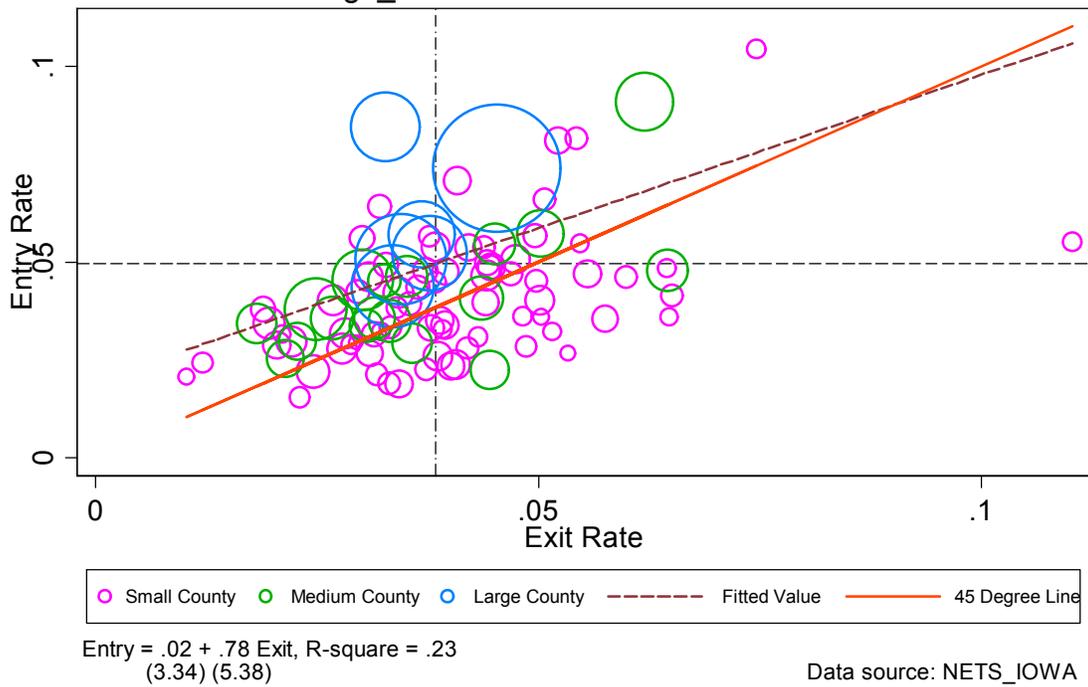### 2 digit_NAICS = 54: Professional and technical services
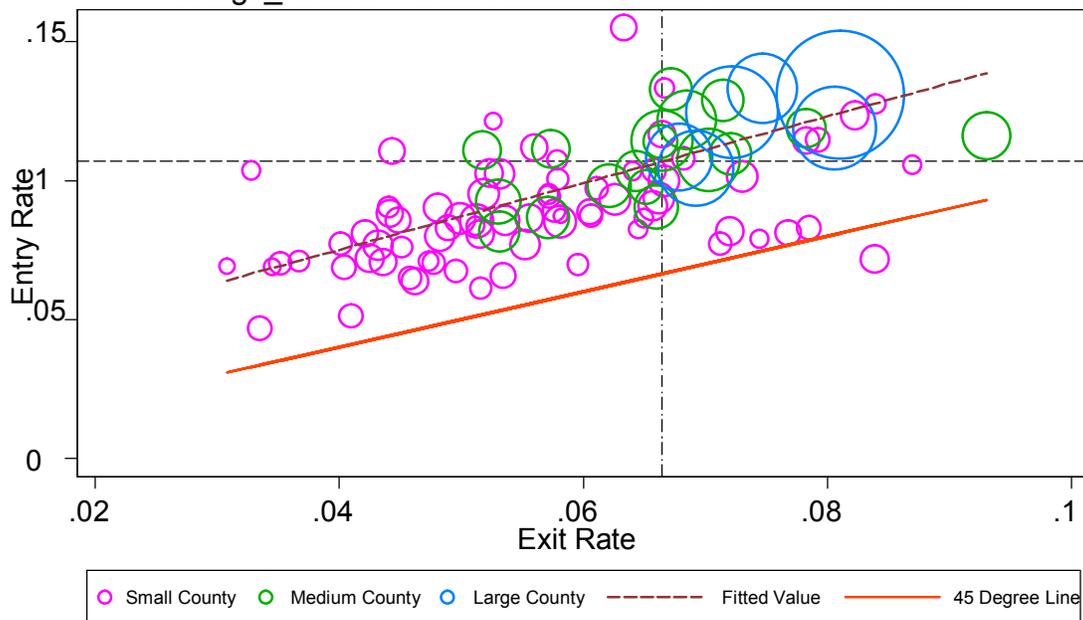
Entry = .03 + 1.2 Exit, R-square = .56
(3.71) (11.11)

Data source: NETS_IOWA

Legal, accounting, market research and polling services are the biggest subsectors in the professional services industry in Iowa. Almost all counties locate above the 45° line which indicates that there is a net gain of firm numbers. The average entry rate is 11.1% which far exceeds the average exit rate 6.9%. The largest counties have both the highest entry and exit rates, but there is no real pattern of relative success related to county size. Both large and small counties locate on or near the fitted regression line, suggesting no urban or rural bias in industry success. The slope of the fitted line is significantly greater than one and so high exits are associated with even higher entry rate. The professional and technical services industry is high churning, neutral and expanding.

## Entry - Exit Pattern in Iowa Counties, 1992 - 2004
2 digit_NAICS = 61: Educational services

Legend: ○ Small County ○ Medium County ○ Large County ----- Fitted Value —— 45 Degree Line

Entry = .02 + .78 Exit, R-square = .23
(3.34) (5.38)

Data source: NETS_IOWA

Technical and trade schools, fine arts schools, sports and recreation instruction and language schools are the major subsectors in educational services industry. It also includes elementary schools, junior colleges, universities and professional schools. The fitted line lies above the 45° line and the majority of counties have more entrants than exiters, and so the industry is characterized by a net gain in firm numbers. The average state level entry rate is 4.9% which exceeds the average exit rate by 1%. The industry is stable. The largest counties lie on or above the fitted lines, but intermediate and smaller sized counties lie below the line, suggesting that sectoral growth is urban biased.

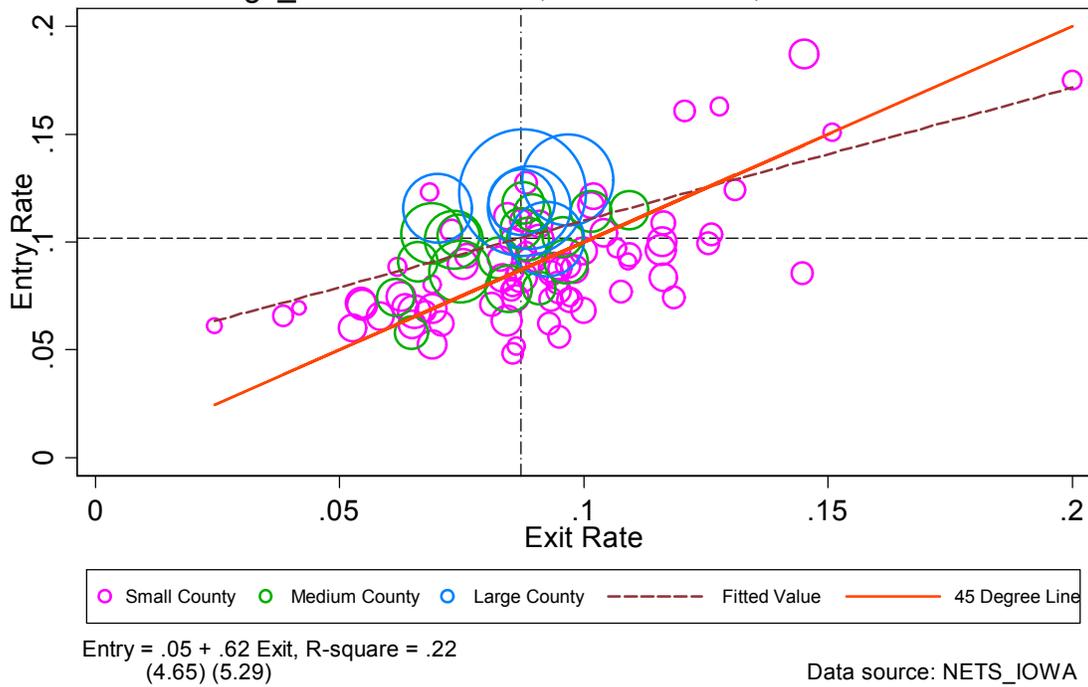## Entry - Exit Pattern in Iowa Counties, 1992 - 2004
2 digit_NAICS = 62: Health care and social assistance

Entry = .04 + .83 Exit, R-square = .35
(5.81) (7.17)

Data source: NETS_IOWA
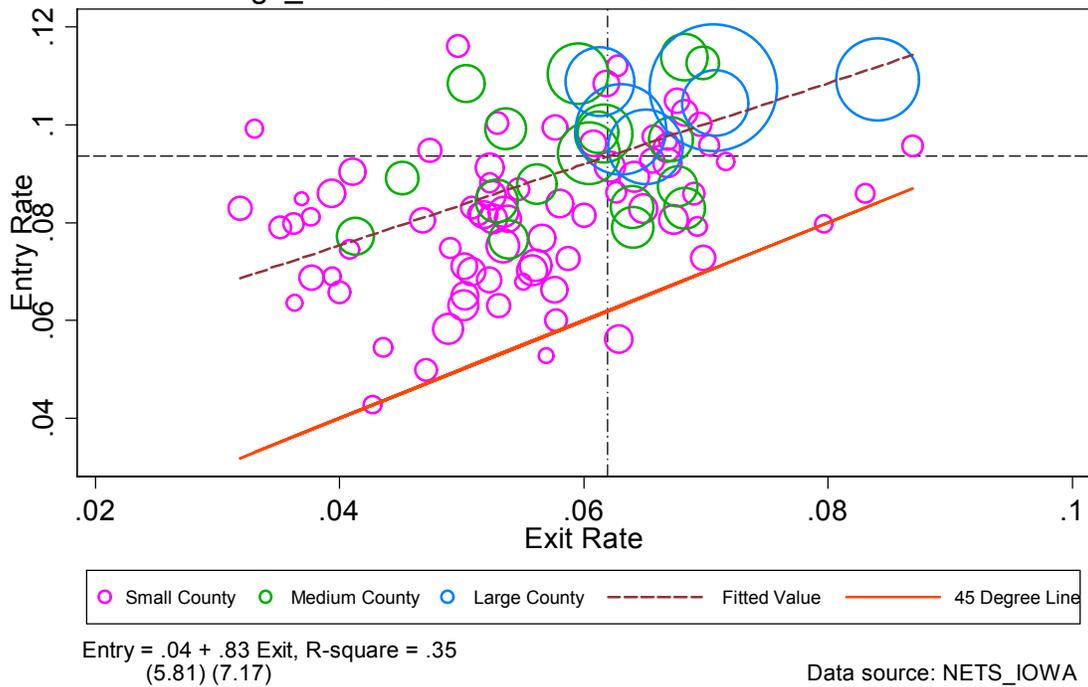
Offices of physicians, dentists and other health practitioners are the major subsectors in Iowa's health care and social assistance industry. The next largest subsector includes individual and family services and child day care services. Almost all counties locate well above the 45° line, and so firm entrants outpace exits. The average entry rate is 9.4% whereas the exit rate is 6.2%. Counties of different sizes are roughly evenly located around the fitted line, and so the sectoral growth is basically balanced in urban and rural areas. The slope of the fitted line is not significantly different from one, indicating the growth of the industries is stable.

## Entry - Exit Pattern in Iowa Counties, 1992 - 2004
2 digit_NAICS = 71: Arts, entertainment, and recreation

| ○ Small County | ○ Medium County | ○ Large County | – – – – – Fitted Value | —— 45 Degree Line |

Entry = .05 + .62 Exit, R-square = .22
(4.65) (5.29)

Data source: NETS_IOWA

More than 60% of the establishments in the arts, entertainment and recreation industry are in the amusement and recreation industries such as golf courses, country clubs, marinas, fitness and recreational sports centers and bowling centers. Museums, historical sites, and similar institutions are the next most important. This is a sector with clear urban bias. Large counties lie above both the fitted line and the 45° line. Most of the smaller counties locate below the fitted line and many of these lie below the 45° line too. Average state level entry rate (10.1%) exceeds its average exit rate (8.7%). The slope of the fitted line is 0.62, significantly smaller than one. The arts, entertainment and recreation industry in Iowa is expanding and low churning but primarily in its urban areas.

Entry - Exit Pattern in Iowa Counties, 1992 - 2004
2 digit_NAICS = 72: Accommodation and food services

Entry = .04 + .38 Exit, R-square = .09
(4.75) (3.09)

Data source: NETS_IOWA
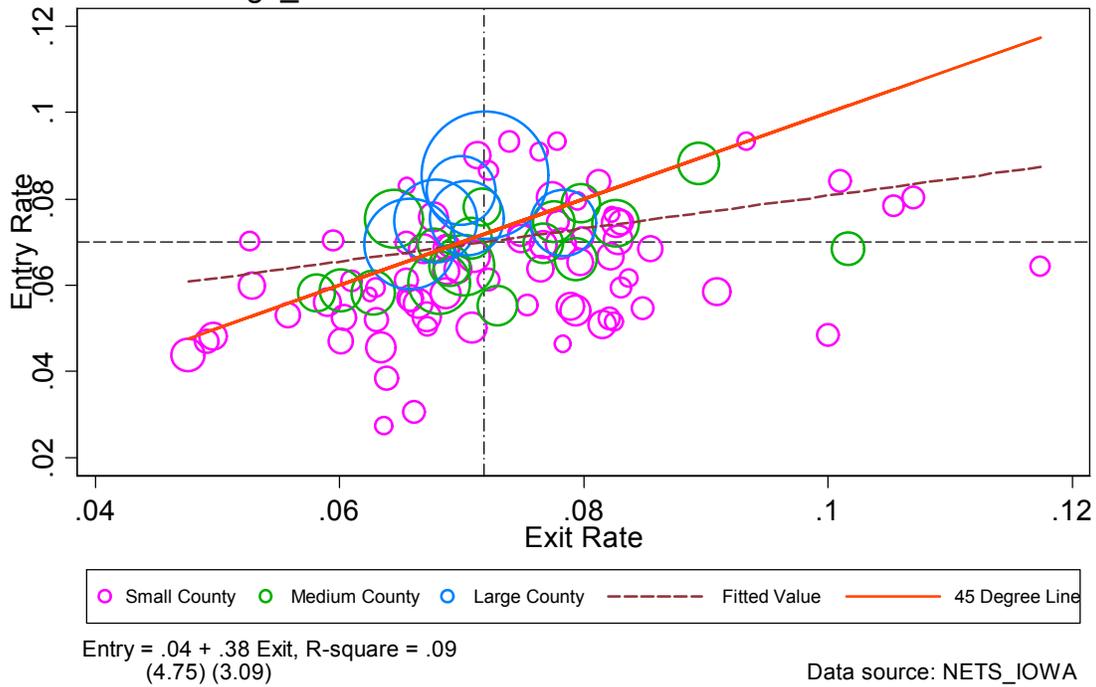
Full- and limited- service restaurants drinking establishments are the main subsectors of the accommodation and food services industry in Iowa. The average state level exit rate of 6.9% is slightly higher than the entry rate of 7.1%, indicating a slight net loss of establishments. The largest counties tend to locate above both the fitted and the 45° lines, and so there is some net gain in urban areas. Most of the other counties are below both lines, and so there is an urban bias in the pattern of sectoral growth. The estimated slope is 0.38, significantly below one. The accommodation and food services industry is low churning, balanced and biased toward urban counties.

Entry - Exit Pattern in Iowa Counties, 1992 - 2004

2 digit_NAICS = 81: Other services, except public administration

Entry = 0 + 1.1 Exit, R-square = .26
(-.28) (5.86)

Data source: NETS_IOWA
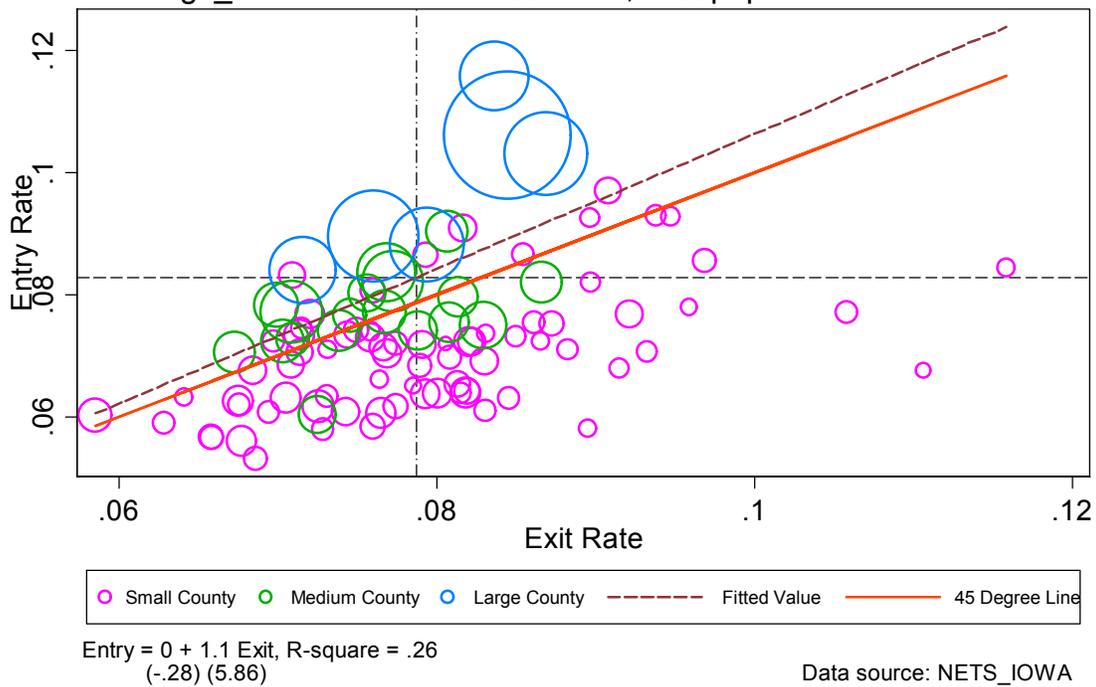
The main subsectors in the private services industry are automotive repair and maintenance; personal care; and business, professional, labor, and political organizations. The average entry rate is 8.1%, slightly bigger than the average exit rate of 7.8% over the thirteen years. The sector is stable because the entry rates are insignificantly different from exit rate. However, these net gains are concentrated among the largest counties. The vast majority of small counties is found below both the fitted line and the 45° line, and is losing establishments. The industry's growth is heavily biased toward urban areas and neither expanding nor contracting.

Entry - Exit Pattern in Iowa Counties, 1992 - 2004
2 digit_NAICS = 92: Public administration
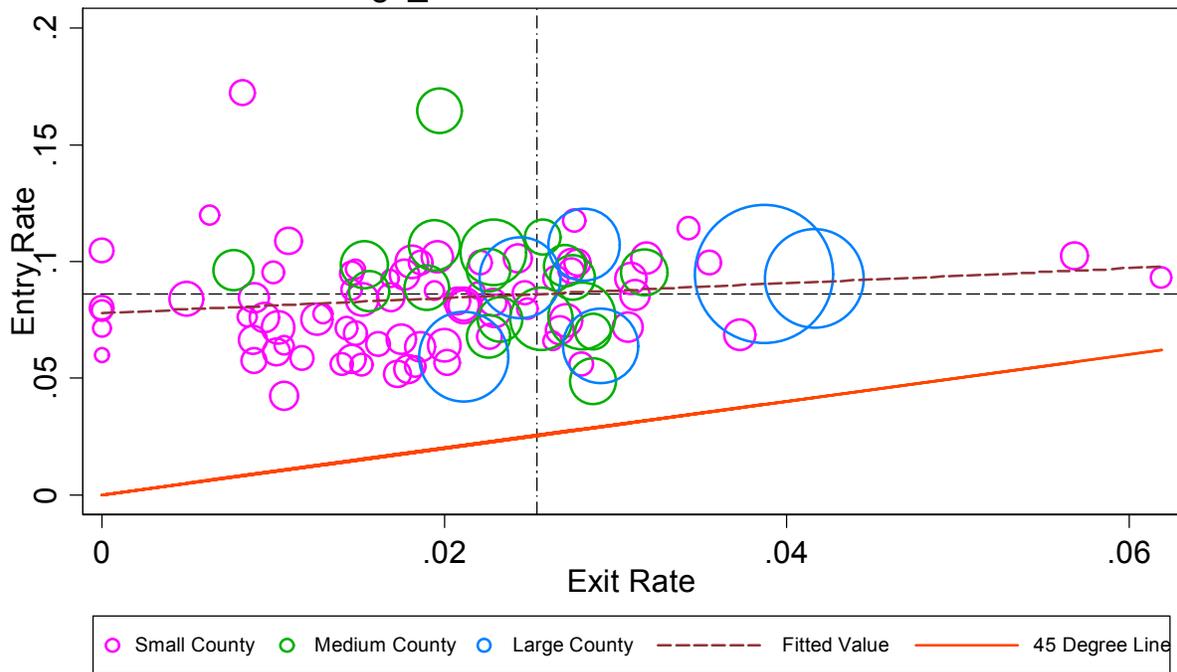
Entry = .08 + .32 Exit, R-square = .03
(14.77) (1.65)

Data source: NETS_IOWA

As the name implies, establishments in the public administration industry are state and local agencies. There is a net gain in number of establishments as every county is found above the 45° line. There is no discernible relationship between entry and exit. On average, entry rates of 8.5% swamp the small exit rate of just 2.4%. Large and small counties locate equally along the fitted line, and so there is no evidence of urban or rural bias in sectoral growth. The slope of the regression is positive but insignificantly different from zero. The industry is stagnant, 1% of more firm exits will not be replaced by entries.

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