Firm Exits as a Determinant of New Entry: 
Is There Evidence of Local Creative Destruction?

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ABSTRACT  This study posits that a local process of creative destruction provides an impetus to regional industrial renewal. We argue that exits of older firms release resources thus enhancing the opportunity landscape facing entrepreneurs and stimulating local entry. We test our hypotheses using a unique longitudinal database encompassing the entry and exit of Canadian manufacturing enterprises. We find that exits of old firms increase entry and that on average new entrants are more productive. Persistent high local rates of exit, however, deter entry.

1. Executive Summary

Research supports the idea that technological and industrial renewal occurs through a dual process where long periods of incremental evolutionary changes in technology and industrial structure are punctuated by radical discontinuous technological innovations that reshape the industrial landscape. Schumpeter (1942) argued that a process of creative destruction is the key driver of change of technology and industrial landscapes in the market economy. In this process, entering entrepreneurs introduce new technologies, products or services to markets and force the exit of incumbents whose offerings become obsolete.

We argue that a complementary but distinct process of creative destruction operates at the local level. Unlike the Schumpeterian process where significant part of the value of knowledge and other resources employed by incumbents get destroyed, this process not just conserves but enhances their productivity. The exit (destruction) of older firms stimulates the entry (creation) of new enterprises that are not constrained by inertial forces as the older incumbents were, and can combine their released resources in new ways so as to increase productivity.

We hypothesize that exits of old incumbents in a location stimulate entry of new, more productive, enterprises to the same location. To test our hypotheses we have estimated zero-inflated Poisson models of sectoral entry at the census subdivision level. We have also estimated and compared the productivity levels of firms which exited and those of new entrants. We have used a unique database developed by Statistics Canada that accurately identifies all entry and exits of Canadian firms between 1984 and 1998 in five manufacturing sectors and provides information about firm level performance. Controlling for agglomeration economies, competition, diversity of the economic environment, economic region, industry and time fixed effects, and accounting for the possibility of endogeneity and
cyclical effects, we find that exits of older incumbents in a location and neighboring locations increase entry levels. Exit of younger firms (with few resources to release) also contributes to increases in entry but the impact is significantly lower. Persistent higher exit rates in a location, however, deter entry, while higher persistent exit rates in neighboring locations increase its attractiveness to new entrants. This suggests that information about relative location risk levels helps calibrating location choices of entrepreneurs within the region, preventing the process of local creative destruction from perpetuating suboptimal location patterns. The effects of local exit levels of old firms upon entry to the location were found to be stronger than the effects of exits in more distant locations. The effects of exits of younger firms upon entry were purely local. The results are consistent with our articulation of a local creative destruction process. We also show that this process is anchored in relatively small geographical areas.

The results of our study have an important policy implication. They suggest that exit and turnover of firms may have some positive economic welfare benefits that could be lost by shoring up failing companies through subsidies and tax concessions.

2. Introduction

“The market must clean itself out by taking resources away from the losers, so it creatively destroys the losing companies and reallocates resources to new companies”.

Former US House of Representatives Majority Leader Dick Armey (March 2002)

The 21st Century ushered a shift from an economy where innovative activities by large established firms were the prime cause of economic development (Schumpeter 1954), to an economy where entrepreneurs play a key role in economic growth and renewal (Schumpeter 1942, Audretsch and Thurik 2001). This new economy, ‘the entrepreneurial economy’, is driven by innovation processes where entrepreneurs entering the market constantly seek to fill unmet demands or meet demands in more effective ways. Schumpeter (1942) suggested that through their innovations entrepreneurs that enter the market render their rivals obsolete, destroy their profits and lead them to exit. This process of creative destruction, facilitated by episodic switches in technological regimes and markets throughout the economy, was posited by Schumpeter to be the key endogenous driver of economic growth in capitalistic systems. Recently, several studies linked measures of regional entrepreneurial activity to regional economic growth (e.g. Audretsch and Fritsch 2002, Acs and Armington 2004), suggesting the possibility that in addition to the global Schumpeterian process of creative destruction, there are processes of industrial renewal at the local level driven by entrepreneurial entry.
The overarching research questions of this paper are: does a process of creative destruction, distinct from the Schumpeterian process, exist at a local level? What are the dynamics of this process? Is it bounded geographically? We integrate perspectives from evolutionary economics, organizational ecology, and entrepreneurship to articulate the characteristics of a process of local creative destruction, its spatial boundaries and its temporal underpinning (i.e., short-run versus long-run drivers). We test our key assumptions through three interrelated hypotheses. To test the hypotheses we estimate zero inflated Poisson models of entry events belonging to five manufacturing sectors in Canada between 1984 and 1998 at the census subdivision level. We use a unique database made available by Statistics Canada that accurately identifies firm entries and exits. In addition we compare estimates of productivity of firms which enter and exit.

We find that a local process of exit of older firms causes entry of new firms, and that such process is associated with release of resources that create opportunities that attract new entry. We show that this process is distinct from processes involving excess entry and churn (i.e., a process of shake-up and selection such as described by Knott and Posen, 2005). We find that the process increases productivity in the region enough to compensate for the cost of churning. We argue that the effectiveness of the local creative destruction process may be enhanced through a calibration process that helps to shift entry within a region away from micro-locations where failure is endemic. We find that persistent high failure rates in a location shift entry to neighboring locations in the region thus preventing the emergence of inferior regional spatial pattern of industrial locations.

Our study informs several important areas of investigation in the entrepreneurship literature. First, we contribute to the debate over whether failure is good (Knott and Posen 2005). Davidsson (2003: 42) argues that “…one of the first things entrepreneurship scholars should try to get rid of is the bias against failure…both theory and empirical evidence suggest that experimentation that may end in failure as well as the demise of less effective actors are necessary parts of a well-functioning market economy.” Knott and Posen (2005: 617) explore whether “…the same creative destruction process fueled by successful ventures may also be fueled by unsuccessful ventures.” In this paper we provide evidence that failure of older firms promotes birth and that new entrants contribute to improvement in productivity\(^1\). We show that this process operates in small geographical areas.

Second, we provide some insight into the question of why locations differ in their propensity for entrepreneurial activity (Low and MacMillan 1988, Shane and Venkataraman 2000). We estimate the

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\(^1\) Examination of our data suggests that the majority (78%) of the old firms that exit endured losses during the last two years of operation. While the exit of enterprises that entered to exploit a temporary opportunity cannot be regarded a failure, we can assert that in the population studied most exits can be regarded as failures.
magnitude of the impact of some key location characteristics (e.g., agglomeration, competition) and the characteristics of neighboring locations on entry. We show that localization economies (resulting from sectoral co-location) dominate urbanization economies (derived from industrial diversity) in attracting entrepreneurial entry to a location, and that in most sectors local competition tends to reduce entry.

Third, we contribute to key issues in the emergent fields of entrepreneurial geography and cluster dynamics (e.g., Baum and Sorenson 2003, Audretsch and Feldman 1996). The existence of high correlation between entry and exit rates in many countries is well documented (e.g., Dunne, et al. 1988, Eaton and Lipsey 1980, Cable and Schwalbach 1991). These correlations are attributed, in the organizational ecology and economic literature, to causal links flowing from entry to exit (Geroski 1995). These links include the ‘liability of newness’, the relationship between entry and exit barriers, and adverse selection. We show that in small geographical areas other links between exit and entry exist and that these links may operate differently depending on their temporal dimension.

Understanding both why firms choose specific locations and the dynamics of exit and entry, particularly its spatial dimensions, may help policymakers understand better the process of regional growth and renewal. Our results highlight the positive aspects of firms’ exits in improving regional productivity, effects that could be suppressed when government support is provided to failing firms.

3. Conceptual development and hypotheses

Transformation of the regional economy can be caused by changes in the social and natural environment of a region “that by its change alters the data of economic action” (Schumpeter 1942). Regional transformations can also be brought about by change in the larger economic environment in which the region is embedded (e.g., through a Schumpeterian process of creative destruction that makes some technologies and products obsolete). There is, however, increasing evidence that entrepreneurial activity that takes place within a region plays a prime role in shaping the regional economy, providing a fundamental impulse to processes of growth and renewal (Audretsch and Thurik 2001). Such entrepreneurial activity helps to accommodate knowledge diffusion and spillovers and facilitates the recycling of resources of mature firms which often exit because environmental changes erode their fit (e.g., Acs and Audretsch 2003).

Unlike the Schumpeterian process where the act of creation destroys incumbents, the process of local creative destruction is one where exit and failure of incumbents lead to creation of value at the local level. It is an endogenous evolutionary process of renewal where value is created in a location through incremental innovation. Much of this innovation involves recombination of existing resources (including intangible resources such as knowledge) in new ways to produce more effectively existing
products and services, modifying products and services to reflect better local tastes, and/or introducing products and services that are new to the location. Unlike the Schumpeterian creative destruction process that makes resources obsolete, the local process of creative destruction is triggered by the local availability of released resources and leads to increase in their productivity.

There are three important characteristics that define the process. First, it is a local process bounded in small geographical areas; Second, the process is triggered by the release of resources by mature firms; Third, the process attracts entrepreneurial entry which contributes to increases in regional productivity.

There is ample evidence that entrepreneurs tend to stay in the immediate area where they have local connections and familiarity with local institutions (e.g., Cooper 1984, Klepper 2002, Reynolds 1997, Sorenson and Audia 2000, Zucker, Darby and Brewer 1998). Indeed, Delmar and Davidsson (2000) found, on the basis of a study of Swedish nascent entrepreneurs, that “[p]eople stay where they are, and do not move to where new jobs are (or could be) created.” (p. 14). The majority of new entrants into the chip sub-sector in the Silicon Valley emerged from employees of spatially proximate firms (Boeker 1989); the same was true for new law firms (Jaffee 2003). More than seventy percent of the founders of biotechnology firms in the state of Washington founded their firms near their residence (Haug 1995). Employees of a given organization gain knowledge of how to operate its production technology (Sorenson and Audia 2000), including explicit knowledge learned through instruction and tacit knowledge learned through experience. Through their normal work, employees have low-cost access to a stock of knowledge that outsiders can obtain only at great cost (Greve 2000). American and European studies provide evidence that one third of new manufacturing firms were established by unemployed individuals (Storey 1985, Tveteras and Eide 2000). Since some of the knowledge and the social capital (such as local credibility, established relationships with venture capitalists, potential strategic partners, suppliers and customers) that entrepreneurs have accumulated are anchored in the location of their former employers, they may have an advantage in locating new enterprises in those locations (Shane and Stuart 2002). Furthermore, work practices, culture and technical terminology are often particular to a region and vary dramatically across regions (Saxenian 1994), creating additional incentives for potential entrepreneurs to search for opportunities in the location where they have been previously employed. More generally, the costs of search are lower when local social networks are used since spatial proximity greatly facilitates relationship formation, the exchange of information and diffusion of local knowledge (Krugman 1991, Porter 2000, Saxenian 1994). Similarly, entrepreneurs who plan to start an enterprise for other reasons are likely to establish organizations in which they can draw on their experience in a particular industry and location (Klepper 2002, 2003, Dahlqvist, et al.
2000). Thus, the theoretical account that sees an entrepreneur scanning vast areas for the best economic opportunity do not tell an accurate story of perhaps the most significant part of entrepreneurial activity.

The exits of mature firms release resources. Some of these resources are immobile (e.g., plants, machinery) or partially immobile (e.g., skilled workers who prefer to stay in the same location). These immobile resources present opportunities as their prices may fall to clear the market\(^2\). The knowledge about opportunities may not spread far from the location where exit occurs. Information about opportunities usually travels faster through local social and professional networks. “The central role of social networks in attaining the resources to parlay an idea into an organization affects the geography of new venture formation. It is well documented that the density of individuals’ social networks declines as the geographic expanse between an individual and the members of his or her contact network increases” (Stuart and Sorenson 2003:185). Some information may be disseminated through other channels (e.g., advertising), but information obtained from such channels requires more evaluation. To evaluate opportunities, entrepreneurs often rely on advice and information received through professional networks. There is evidence that nascent entrepreneurs’ professional networks are geographically localized (Sorenson and Stuart 2001).

To sum up, the opportunities created by the exit of mature firms and the release of resources stimulate entry of new enterprises. The process is local because (1) immobility of resources; (2) the increase in local search for entrepreneurial opportunities; and (3) the lower search and transaction costs for local entrepreneurs.

Hypothesis 1A. \textit{Increases in local exits of mature firms are likely to cause a higher level of new entry to the location.}

Hypothesis 1B. \textit{Exits of mature firms in neighboring locations and in more distant locations are likely to have a lower impact on the level of new entry to a location than local exits.}

For the process of local creative destruction to be a driver of regional renewal the benefits that result from entry of new enterprises must offset the losses of exits. An important theme of organizational ecology research is the effect of aging on exit. The dominant view is the ‘liability of newness’ that was articulated by Stinchcombe (1965). Young firms are more vulnerable because they have to acquire knowledge, resources, and gain endorsement and legitimacy from their stakeholders. Local entrepreneurs who start firms by acquisition and recombination of released resources of mature firms

\(^2\) The attraction of released resources to potential entrants is likely to be lower, however, in sectors that undergo a major technological change, making some of the resources of exiting firms obsolete.
may suffer significantly less from the liability of newness than firms that start from scratch. For example, reemployed skilled workers that were released when their firm exited can bring to the new entrant, in addition to know-how related to the technical aspects of their skills, relationships capital, ideas about best practices and operating procedures, and perhaps more importantly, the lessons from failures that might have caused the exit of their former employer (see McGrath 1999).

The complementary story to the ‘liability of newness’ is the ‘liability of aging’ hypothesis which states that organizations exit as their fit with a changing environment erodes due to inertial tendencies (Stinchcombe 1965). Environmental change undermines the competitive position of mature organizations that either do not perceive the need to change or find change to be highly costly. Baum (1996: 83) observed that attempts to realign an organization with its environment may carry hazards that result from the “constraints on the ability of individuals [in mature organizations] to conceive and implement changes successfully and the potential for major change attempts to lower organizational performance reliability and disrupt key external relationships” (see also Hannan and Freeman 1984).

Exits facilitate the emergence of new organizations which are not constrained by their external relationships and internal routines and procedures and therefore can recombine and deploy resources released by exiting mature firms to respond agilely to new environments. Indeed, there is some preliminary evidence that successful ventures can be fueled by unsuccessful ones (Knott and Posen 2005: 617). The deployment by new entrants of released resources of exiting mature firms that embody knowledge capital accumulated through their life-spans, free of constraints which resist change, may result in increases in productivity.

Hypothesis 2. *The average productivity of new entrants is likely to be significantly higher than the average productivity of mature incumbents that exit.*

Hypotheses 1 and 2 provide description of the key elements of the process of local creative destruction. An important issue that may be raised is the temporal relationships between exits as a driver of entry and the long-term renewal of the regional economy. It is possible that some locations are not suitable for a particular type of enterprise. Without some mechanism of feedback the process of creative destruction may settle in less than optimal equilibria. To be effective the process must reflect some form of system learning. We argue that the information about persistent exit rates reflects risks of failure in a particular location and may serve to calibrate location choices of new enterprises within a region so as to minimize their risks of failure. Persistent rate of failure in a location may reduce its attraction to new entrants who may locate in neighboring areas that have lower long-term risks.
Hypothesis 3. *The higher the persistent risk of exit in a location, the lower the likelihood of new entry.*

### 4. Research Methods

#### 4.1. Sample

Our sample is comprised from two different Canadian databases. The first database, the Longitudinal Employment Analysis Program (LEAP), is used to identify new entrepreneurial entry and count of firms’ exits. The second database is the Annual Survey (Census) of Manufactures – the Longitudinal Manufactures Research File (LRMF). This database is used to assess agglomeration covariates.

LEAP is a unique, firm-level database that includes all employers in Canada, both incorporated and unincorporated. The database tracks the employment and payroll characteristics of individual firms from their year of entry to their year of exit. The employment record of each firm is derived from administrative taxation records that each Canadian employer must file. The payroll data are associated with a Revenue Canada employer identification number. Accordingly, firms enter the LEAP database in the year they first hire employees, and record their last entry in the database in the last year they have employees. For each year, total payroll and employment are calculated. The latter is the average annual count of employees within the firm, or average labor unit (ALU). This payroll and employment information is then organized longitudinally; each observation in the database corresponds to a particular firm whose employment, payroll and industry characteristics are recorded at different points in time.

The longitudinal nature of LEAP allows entry and exit times to be measured with precision. Births in any given year are firms that have current payroll data, but did not have payroll data in the previous year. In our empirical estimation, we include only entrepreneurial entry (also referred as ‘de novo’, independent, or new entry); we do not include births of establishments that are owned by a firm that had establishments in previous years (also referred as dependent, subsidiary), or firms that were classified as belonging to another industry at time $t-1$. An event where a legal entity becomes active after a period of being inactive is not classified as birth. Entrepreneurial entry in our data accounts for 85% to 94% of all newly created establishments, depending on the sector (see also Baldwin and Goreski 1991). Note that establishment is defined as an enterprise which has at least one employee in addition to

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3 Every employer in Canada is required to register a payroll deduction account (for the purpose of unemployment insurance), and issue a T4 slip to each employee that summarizes earnings received in a given fiscal year. The LEAP database includes every business that issues a T4 taxation slip.

4 Entrepreneurs may establish a firm for a ‘hit and run opportunities’ (Baumol 1990). Enterprises which *temporality* do not hire employees are not counted in the data as exits and when they rehire employees they are not counted as new entrants. The number of such enterprises in our data is negligible.
the founder. Self employed entrepreneurs are not included and we have no information about the frequencies of their entries and exits. Similarly, deaths (exits) in any given year are identified by the absence of current payroll data, where such data had existed in the previous year (see Appendix A for further description of a labor tracking method that allows accurate measure of entry and exit).

The LEAP database tracks the postal-codes of firms. To operationalize our geographic units of analysis we transform this information into various geographic disaggregated levels: Economic Region (ER), Census Division (CD) and Census Subdivision (CSD). This geographic classification divides Canada to 5,260 CSDs, 289 CDs, and 71 ERs (ER is a unit which is parallel to the U.S. Labor Market Area). Following our theoretical arguments, the analyses are done at CSD level – the most disaggregated level available representing a micro-location with median area of 182 square miles (about the same mean area as the U.S. zip code). This classification provides a good fit to examine our hypotheses since by using the CSD as a level of analysis we ensure that different parts of it are not subjected to different regulatory regimes. The CSD represents the smallest administrative geographic unit in Canada for which disaggregated economic data is available. We have excluded from our risk set those CSDs that did not exhibit any existing manufacturing activity over fifteen years (within all 3 digit SIC-E codes), or a new birth\(^5\).

The second database that is used to measure location of manufacturing activity is the Annual Survey (Census) of Manufacturing. It contains data about physical entities (establishments, plants)\(^6\), irrespective of whom owns them or how they relate to each other. The data are derived from a survey that is sent to large plants and from administrative tax data for small plants, combined with the full census of manufacturing every five years.

We selected industries with substantial turnover that are important enough to have been the focus of other studies. Specifically, we estimate the determinants of entrepreneurial location choice of the food, apparel, fabricated metal, machinery and electronic sectors at the 3-digit Standard Industrial Classification (SIC-E) level (the selection is detailed in Appendix B)\(^7\). The industries are a mix of traditional industries with established products (fabricated metals and machine industries) and more innovative industries (fashion and food). Additionally, the industries studied are a mix of heavy and

\(^5\) We excluded 1,352 CSDs, which leave us with a choice set of 3,908 active CSDs or 58,620 location-year observations.
\(^6\) We will use plants and establishments interchangeably throughout the paper. Note, the vast majority of firms are single establishments. Thus, as a robustness check we ran our models measuring the control variables using the LEAP database. Our results do not materially change.
\(^7\) SIC-E was replaced by the North American Industry Classification System (NAICS). NAICS identifies hundreds of new, emerging, and advanced technology industries and reorganizes industries into more meaningful sectors. Our databases do not report NAICS. Nevertheless, major differences between the classification systems exist especially in the service-producing segments of the economy which are not included in our data.
light industries. The data covers 34,449 births, and 58,620 location-year observations between the years 1983 to 1998.

4.2 Testing Hypotheses 1 and 3
To test hypotheses 1 and 3 we use a basic econometric model assuming that the number of births of new enterprises in a CSD follows a Poisson process. The expected number of births in a particular period is a linear function of some key characteristics of the focal location (CSD) and its neighbors (other CSDs in the same CD), the economic region (ER) in which the CSD is embedded, and some controls. The characteristics of the focal location and its neighbors that we operationalize below which are used to test hypotheses 1 and 3 are exit levels and persistent risk of exit of older firms. Other local characteristics which may affect entry to the location include localization and urbanization economies, local competition, and area. These are used as controls.

There are, however, many attributes that the economic regions have that may affect location choices of new entrants. These include macroeconomic and political stability, fiscal policies, labor market policies, intellectual property rules, quality of workforce, public infrastructure systems, legal system, efficiency of local authorities, wage rates, and natural attributes such as climate. Given the wide range of such attributes the likelihood that our model will suffer from an omitted variable bias is high. Since these attributes cut across all industries and are common factors to the ER, we control for their effects by introducing ER-specific fixed effects in our estimation.

Accordingly, we can write the expected number of births (B) in a census subdivision (CSD) j at time t in sector i as:

\[
B_{CSD,j,t} = \alpha y_{CSD,j,t-1,i} + \delta C_{j,t-1} + d_{ER} + d + d_i
\]

where \( y_{CSD,j,t-1,i} \) are the location characteristics of CSD j and neighboring locations at time \( t-1 \) for sector \( i \); and \( C_{j,t-1} \) is a vector of controls. The rest of the variables are dummies for various unmeasured effects: \( d_{ER} \) are the ER specific fixed effects that absorb permanent heterogeneity at the ER level; \( d \) is a time fixed effect for each of the years which picks up the time-varying trend in the error which may come from business cycles or general trends in technology; \( d_i \) is 2-digit SIC-E industry fixed effects that absorb industry permanent heterogeneity\(^8\). Fixed effect estimation assumes that the RHS variables are uncorrelated with the unobserved error in order to avoid biased estimators.

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\(^8\) Since some of the repressors vary by 3-digit SIC level we use 2-digit SIC level fixed effects. Moreover, industry fixed effects are expected to operate at higher aggregation level than 3-digit.
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4.2.1 Dependent and independent variables

Our dependent variable is the number of births in a census subdivision $j$ at time $t$ in industrial sector $i$. Our primary independent variables (for testing Hypotheses 1A, 1B) are the measures of exit levels of older firms at the CSD $j$ and neighboring CSDs within the same CD in the sector $i$. Exits at the CSD level are measured as the lagged count of exits by older firms (i.e. firms that were established four or more years prior to exit) in the focal sector (CSD EXIT). This measure is unlikely to pick up cyclical effects since the majority of entrants exit within the first three years. Because it may take some time to release assets and other resources from exiting enterprises to the market we use in our estimation exit levels with several lags, $E_{CSD,j,t-r,i}, r=1,...,4$. The influence of exits of old firms ($\geq 4$ years old) from the same focal sector in neighboring CSDs within the same CD (CD EXIT – OTHER CSDs) is represented by the vector $E_{CD,t-r,i}, r=1,...,4$. ER EXIT – OTHER CSDs ($E_{ER,t-1,i}$) counts exits in all other locations in the economic region.

To test Hypothesis 3 we included covariates which reflect the risks associated with the focal location as well as its neighboring locations. The local persistent risk of exit (CSD EXIT RATE), $P_{CSD,j,t-1,i}$, is the sum of the number of all exits (younger and older firms) over the three years prior to the observed entry in the focal sector at the CSD, divided by the relevant population at risk (i.e., CSD’s incumbents in the sector at time $t-4$), $P_{CSD,j,t-1,i} = \frac{\sum_{r=1}^{3} E_{CSD,j,t-r,i}}{incumbents_{CSD,j,t-4,i}}$. This variable is introduced to capture the impact of risk in the location. We also include persistent exit rates for neighboring CSDs within the same CD in the focal sector (CD EXIT RATE - OTHER CSDs) $P_{CD,t-1,i}$.

4.2.2 Control variables

Other factors affect the location decision process and thus the birth of new enterprises. These factors are introduced as controls and are presented in the vector $C_{j,t-1,i}$.

Agglomeration economies are a form of scale economies external to any one firm but internal to regions containing clusters of the same type of enterprises (Krugman 1991). Agglomeration economies imply positive returns to scale at the regional level such that the advantage to an organization of locating in a particular region increases with the number of other firms in the area. There are two types of externalities: localization economies which arise from the scale of the local focal industry and

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9 For the sake of brevity we do not report the results of lags $t-3, t-4$ since their coefficients are positive but not significant.
urbanization economies where firms benefit from local information spillovers from all firms and employees in a region outside their own industry through industrial cross-fertilization (Ellison and Glaeser 1997, Henderson 2000). New establishments located in areas with strong agglomeration economies will benefit from lower costs and superior access to skilled workers, higher productivity, knowledge spillovers (Henderson 1994, Marshall 1920), reduced resource constraints, the existence of specialized input providers and business services all particularly tailored to the specific industry (Porter 1998), and the availability of financial and managerial support. If an industry is subject more to urbanization economies, new establishments will seek more diverse and hence usually a larger local economic environment (Henderson 2000). To control for localization externalities, we employ measures of CSD NUMBER OF PLANTS (e.g., Head et al., 1995), or CSD EMPLOYMENT level (e.g., Henderson 2000). The AREA of each CSD is included to control for differences in CSD sizes and land supply and therefore land prices (e.g., Head and Mayer 2004). Urbanization externalities are measured at the CD level in order to account for CD-wide industrial cross-fertilization through information spillovers, social networks and other sources due to diversity of the census division base. Following Henderson (2000: 12) these are measured through the total number of plants or employment levels in other sectors (NUMBER OF PLANTS / EMPLOYMENT - OTHER INDUSTRIES).

Competition affects entry in two important but opposing ways. On the one hand, high levels of competition represent pressures on prices and entrepreneurial profit margins. On the other hand, the existence of many small firms rather than a few large ones may reduce entry costs, making a location more welcoming and open to new enterprises (Porter 2000). To control for local competition, following Glaeser et al. (1992) and Rosenthal & Strange (2003), we include the number of ESTABLISHMENTS PER WORKER at the CSD (and neighboring CSDs within the same CD) level in the focal sector. As this ratio decreases, the local environment in a given industry in the CSD is thought to become more competitive.

To control for unobserved local shocks we include the vector $E_{CD,j-1,j}$ - the lagged number of older exiting firms ($\geq 4$ years old) from other sectors (CD EXIT – OTHER IND). CD EXIT RATE –

\[^{10}\text{Note, our urbanization covariate pools across two different dimensions: all industrial sectors excluding the focal sector, and all neighboring CSDs within the same CD.}\]
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OTHER IND. captures the CD’s probability of exit in other sectors, 

\[ P_{CD,t-1,i} = \frac{\sum_{r=1}^{3} E_{CD,t-r,i}}{\text{incumbents}_{CD,t-4,i}} \], where

\( \hat{i} \) represents all other manufacturing sectors.\(^{11}\)

Since we employ ECONOMIC REGION FIXED EFFECTS in all of our models, the above covariates capture the influence of within economic region variation in the industrial environment. Accordingly, we can rewrite the expected number of births as:

\[
B_{CSD,t,i} = \sum_{r=1}^{2} (\beta_{1,r} E_{CSD,t-r,i} + \beta_{2,r} E_{CD,t-r,i}) + \beta_{3} E_{ER,t-1,i} + \beta_{4} E_{CD,t-1,i} + \chi_{1} P_{CSD,t-1,i} + \chi_{2} P_{CD,t-1,i} +
\]

\[
(\chi_{3} P_{CD,t-1,i} + \delta C_{j,t-1} + d_{ER} + d_{t} + d_{i})
\]

Under this specification, positive coefficients of \( \beta_{1,1}, \beta_{1,2} \) will support Hypothesis 1A; positive yet lower magnitude of the coefficients \( \beta_{2,1}, \beta_{2,2}, \beta_{3} \) relative to \( \beta_{1,1}, \beta_{1,2} \) will support Hypothesis 1B; and negative sign on the coefficient \( \chi_{1} \) will support Hypothesis 3.

4.2.3 Empirical model

A Poisson regression model is typically used to estimate the count of births. However, because each year there are zero births in the majority of the census subdivisions,\(^{12}\) we need to use a method which can handle count data with “excess zero” (Greene 1997, Kennedy 1992). In our analysis we used a Zero-Inflated Poisson (ZIP) model because it fit our data better than the alternative count models that deal with excess zeros.\(^{13}\) All covariates were updated annually and lagged one or two years in the analysis to avoid simultaneity problems. Since the variance of the unobservables changes across different clusters of the population (3-digit SIC-E industries) all regressions use the Huber/White method to correct for heteroskedasticity.

We also estimated a Tobit model as a robustness check since our data are censored as well as to obtain elasticities of the variables.\(^{14}\) The estimation of these models is done using the maximum

\(^{11}\) For both levels and persistent rates of exit in other sectors we experimented with excluding the focal CSD. The results do not materially change.

\(^{12}\) The maximum number of annual births in a CSD is 67 for the electronic sector.

\(^{13}\) The likelihood-ratio test of the zero-inflated negative binomial model versus the nested zero-inflated Poisson model suggests that the Poisson version provides a better fit (STATA).

\(^{14}\) In our model the number of entrants to a location is assumed to reflect the ‘strength’ of opportunities (i.e., the expected profits from entering it). Locations without entry were coded 0 since there are no observations of the magnitude of losses that
likelihood method (Maddala 2001). Part of the variation in births across locations may arise from the
correlation between births and exits over time or due to reasons not controlled for in our models. We use
a standard method to address these issues estimating first differences models in addition to our ZIP
models (Greene 1997, Woolridge 2002). Since differences in counts of births may assume negative
values we estimate the model using Ordinary Least Squares.

4.3 Testing Hypothesis 2

Hypothesis 2 is tested directly by comparing average productivities estimates of new entrants and
mature firms that exited (excluding the year of exit) over a period of four years after entry and before
exit respectively. We derive a measure of Approximate Total Factor Productivity (ATFP) from a simple
Cobb-Douglas production function (Griliches and Mairesse 1990). Suppose that firm $i$ has a certain
productivity level $A_i$ and produces output $Y_i$ using capital $K_i$ and labour $L_i$. The firm’s production
function is:

\[ Y_i = A_i K_i^{\alpha} L_i^{1-\alpha}. \]

If we solve for productivity, $A_i$, and take the natural log of both sides, the equation can be rewritten as:

\[ \ln(A_i) = \ln \left( \frac{Y_i}{L_i} \right) - \alpha \ln \left( \frac{K_i}{L_i} \right). \]

Equation (6) describes the efficiency of the firm at turning inputs into outputs. This is comprised of the
firm’s labor productivity and the amount of capital each worker has at their disposal. Labor productivity
is measured as total sales divided by the number of employees (ALU). We use total assets minus
closing inventory and divide the result by the number of employees. Removing closing inventories
leaves us with a good measure of the efficiency with which workers turn inputs into outputs, using their
available resources. The optimal capital share $-\alpha$, varies significantly from industry to industry in the
manufacturing sector. The Annual Survey of Manufactures is used to derive this share. The natural log
of ATFP for a given firm is defined as:

\[ \ln(\text{ATFP}_i) = \ln \left( \frac{\text{sales}_i}{\text{alu}_i} \right) - \alpha \ln \left( \frac{\text{assets}_i - \text{inventories}_i}{\text{alu}_i} \right) \]

where $alu_i$ is the average labor units (i.e., total employees) of the firm, $sales_i$ is its total
sales, $assets_i$ is its total assets, and $inventories_i$ is the closing inventories of the firm (all measured by
the end of the first year of operation).
Hypothesis 2 is supported when the four years average productivity of entering firms is higher than the four year average productivity of mature firms excluding the year of exit.

5. Analysis and results

Table 1 presents descriptive statistics for independent and control variables.

Insert Table1 here

5.1. Control variables

Our first zero-inflated Poisson fixed-effect model (Table2 column 1) serves as a baseline for statistical tests and identifies the impact of agglomeration effects on the birth of new establishments using the annual levels of new establishments at a census subdivision as dependent variables. Our analysis based on within economic region variation in the data yields results that are broadly consistent with prior research that was based on variation between economic regions.

The control variables receive the expected signs and reasonable magnitudes. Specifically, localization effects (measured as own-sector number of plants at the CSD level) are more important than urbanization effects (measured as other sectors number of plants at the CD level). Column 2 represents alternative measures to localization and urbanization economies which are based on employment levels. The coefficients on the localization variable are at least two orders of magnitude larger than the coefficients on the corresponding urbanization variables. The result that localization economies are more important than urbanization economies is consistent with Henderson (2000), and Rosenthal & Strange (2003).

Insert Table 2 here

Localization economy effects are expected to be positive at small geographic units as they reflect the ability of new establishments to share supply channels of intermediate inputs, supporting services developed by existing firms, and a labor market pool. In choosing a location, founders of new establishments would consider the externalities offered by different potential locations and, all else being equal, would prefer locations that provide higher agglomerative benefit.

Running the ZIP estimates for the separate sectors shows that urbanization effects are not all positive and that there is a significant variation among sectors. Urbanization effects include tradeoffs between the benefits of locating near densely developed areas and the economies and amenities that the urban environment offers and congestion costs. Industries differ in the net benefits they derive from proximity to large and diverse metropolitan areas. Some enterprises prefer more densely developed areas while others prefer outlying locations. Some benefit from information spillovers due to cross-industrial-fertilization while others benefit from sector specific externalities. We have found that more births are generated in CSDs within more diverse CDs in the apparel and electronic sectors; the opposite is true for...
food and machinery sectors, which generate more births in less diverse CDs. The coefficients for CSD AREA were positive but marginally significant in most specifications. Using CSD land rents as an alternative measure yielded non significant results. It may be the case that the variation in prices of land is correlated with unobserved location attributes.

Specification 3 adds covariates of local competition in two geographic levels. We find that ESTABLISHMENTS PER WORKER in a sector at the CSD has a significant and negative influence on arrivals. Higher competition for resources in census subdivisions is associated with lower expected profits and thus deters arrival. The impact of competition in the census division is also negative.

5.2. Focal variables
Specifications 4, 5, and 6 add the primary variables of interest for testing our hypotheses - exit levels and persistent exit rates. Adding those covariates significantly improves the explanatory power of the regression equation. The likelihood ratio tests (five and three degrees of freedom respectively) reject the hypotheses that the added terms have no explanatory power at the 0.005 level. Model 4 reports the effects of local levels of exits by older firms (i.e., firms which are four years or older) controlling for agglomeration, competition, area, time, industry, and economic-region fixed effects. Lagged levels of exits of older firms \((t-1)\) and \((t-2)\) are large, significant and positive, while the coefficients of the control variables are almost unaffected. This finding supports hypothesis 1A – increases in local exits of mature firms seem to create a transitioning trigger (or opportunities) which increase local births. This result is not consistent with Sorenson and Audia (2000), who found no relationship between lagged exits and future organization founding in the U.S. footwear production sector. The magnitude and significance of our measurement of the level of exits at \((t-2)\) suggests that the response of entry to opportunities created by exits might be slow as it takes time for some opportunities to be realized. The coefficients of the CD levels of exits imply that some mobile resources or laid-off workers that are available elsewhere within the CD provide positive externalities to the entry process at the CSD level.

The magnitude of the coefficient for the number of exits in the CSD (the focal location) is much larger than the coefficients of the CD (the neighboring locations) or ER (the more distant locations) levels. Indeed the significance of the impacts of exits in distant locations is marginal (significant only at the 10% level, column 6). As we have noted the coefficients of the Tobit model (specification 7) can be interpreted as elasticities. We use them to provide further confirmation to the estimated differences in

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15 Land rents were obtained from the Census of Population and were interpolated between census years.
16 However, since the footwear manufacturing industry is characterized by lack of strong scale economies, barriers to entry, and limited importance of human capital it may not necessarily represent other manufacturing sectors.
Impacts of exits in different locations. These findings support Hypothesis 1B - exit-level effects are stronger within the focal location than in neighboring locations. The magnitude of the effect of exits of older firms in more distant locations is much smaller than the effect of local or neighboring locations. Exits in other sectors in the CD have a negative impact on births to the focal sector (significant at the 10% level) as they may capture random shocks that depress all entries but do not release relevant resources.

We tested the correlation between exits of older firms and entry. The correlations between exits at \( t-1 \) and entry at \( t-2 \) and \( t-3 \) are low and insignificant, while the correlations between exits at \( t-1 \) and entry at \( t \) and \( t+1 \) are positive, indicating that causality flows from exit to entry. To further check this proposition we also estimated the first difference model reported in Table 3. The results confirm the direction of causality.\(^{17}\)

*Insert Table 3 here*

We also introduced alternative specifications of the model to consider the impact of exits by younger firms (less than 4 years) in the focal sector at the CSD, and lagged levels of exit by all firms (younger and older). As exits of younger firms may reflect churning we employed first difference specification. Table 4 reports the main effects of interest while other covariates are omitted from the table for brevity. We find that the impact of exits by younger firms at the CSD on entry is significantly lower than the impact of exits of older firms. We cannot reject the hypothesis that the impacts of exits by younger firms at the CD and ER levels are different than zero. These results suggest that exits of younger firms (typically smaller and endowed with very limited amounts of tangible and intangible assets) create fewer opportunities for entry. These findings support the suggestion that resource recycling is key to the local renewal process.

*Insert Table 4 here*

To examine Hypothesis 3, Model 5 adds the covariates of persistent exit rates. The negative and significant sign of exit rate in the census subdivisions implies that entrepreneurs are less attracted to locations with high persistent exit rates (risk), supporting hypothesis 3. We did not find risk reputation spillovers from neighboring locations that damage and reduce entry to the focal location. It appears that the impact of persistent risks in neighboring locations increased the location attractiveness. This suggests that entrepreneurs may use such information to refine their location choices within an area,

\(^{17}\) This is not strictly a first differenced version of equation 2 as we use fixed effects, CSD area, and drop the time trend, whose effect is picked up in the constant when annual local birth changes are the dependent variable.
choosing, ceteris paribus, the location with the lower relative risk. The persistent probability of exits in other sectors has a negative and significant coefficient suggesting that exit rates in all sectors in the region damage its reputation and affect the perceived riskiness of locations within it. Note that this effect is much smaller than the effect of own sector’s risk at the CSD.

Hypothesis 2 suggests that new entrants are more fit (creative) than enterprises that exited (i.e., supporting the argument that creative destruction exists at the local level). In order to examine this hypothesis we compared the productivity of entering and exiting firms (over their first and last 4 years respectively, excluding the year of exit). For new entrants we coded zero the productivity of cohort firms that failed during the first four years. This is a conservative test of our model as it excludes the local improvements in productivity that result from the selection process that happens soon after entry (i.e. survival of the fittest). We find that entrants are on average 18% more productive than those firms that exit (mean - 2.353, 1.929, Std. – 0.342, 0.401 for entering and exiting firms respectively). The results of a mean differences test reject the null hypothesis that the two samples have similar means (p<0.001), the results of the Wilcoxon-Mann-Whitney test suggest that the two samples have different median (Chi-Square =33.56, P<0.001) (Greene, 1997). These findings suggest that exits of older firms have a positive impact on improving local productivity and thus contribute to local renewal. It is plausible to assume that firms with new technologies or improved products (attracted by released resources to a location) replace less productive incumbents. Resources of firms that exit such as machinery and skilled employees may be recycled by new entrants leading to cost-reducing investments. The value of knowledge accumulated by firms that exit may be captured by new entrants (and existing incumbents). These knowledge externalities (spillovers) are transferred to new (and existing) enterprises through mobility of skilled employees.

Model 6 adds simultaneously the covariates of exit levels and rates. As we move from specification 5 to specification 6, the coefficient on the CSD and CD exit rates moved to the 0.05 significance level. When compared to either specification 4 or specification 5 other coefficients retain their statistical significance and are quite stable.

6. Alternative Specifications and Robustness of Results

In this section we consider several alternative empirical models and experiment with different measures of the covariates. Tobit estimation (Specification 7) provides results where the primary effects of interests are consistent with the zero inflated Poisson model (specification 6). Our empirical methodology raises a technical issue. Imprecise estimates of the fixed effects in nonlinear models
typically lead to inconsistent estimates of the slope coefficients (Haiso 1986). This may not be a significant problem since the bias resulting from noisy estimates of fixed effects in nonlinear models goes to zero as the number of observations per fixed effect becomes arbitrarily large. Given that our sample has over 80 census subdivisions per fixed effect, we expect that this inconsistency is small. As a robustness check, however, we ran an OLS fixed-effect specification in which all census subdivisions with zero births in a given year were omitted. In linear fixed-effect models noisy estimates of the fixed effects do not bias estimates of the slope coefficients. Of course, these results have a potential sample selection problem since most of the census subdivisions are eliminated. Nevertheless, the qualitative nature of the results is similar to results from the zero-inflated Poisson and the Tobit models.

It is possible that some release of resources of firms that plan to exit may take place before the time of exit. Analysis of assets of all cohorts of mature firms that exit revealed that more than 80% of all resources, on average, are disposed during or after exit. Robustness checks revealed that alternative patterns of time lags did not improve the explanatory power of our models.

We have also experimented with other measures of the covariates. For the count of exits in other industries at the CD level we experimented with a measure that excludes the focal CSD. For exit rates we tested the one year lagged number of exits in the focal sector at the CSD over the population of incumbents at \((t-2)\), 

\[
P_{CSD,t-1,j} = \frac{E_{CSD,t-1,i}}{incumbents_{CSD,t-2,j}}.
\]

This measure may capture information about recent risks associated with a location rather than persistent risks. For regional exits of older firms and persistent risk of exit in other industries we also experimented with measures that include only neighboring CSDs.

For localization effects we included several alternative regressors: a measure of the spatial concentration of industrial sectors using CSD’s market share\(^{18}\), Gini coefficients\(^{19}\), measures of density such as the number of plants and level of employment per CSD’s area, and Location Quotients\(^{20}\). For urbanization economies we experimented with alternative measures such as total employment per square kilometer (e.g., Guimaraes et al. 2002), and inverse Herfindahl index of employment share with 2-digit

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\(^{18}\) Theories of agglomeration economies have been based on the idea that an increase in the absolute scale of activity has a positive effect. However, this effect (measured as local number of plants and employment levels) does not make direct predictions regarding the impact of the industry’s market share in a particular location relative to other locations. We generate this variable by dividing the aggregated manufacturing shipments of a given sector over all existing establishments within the CSD by the total (national) shipments for the sector.

\(^{19}\) The Gini coefficient is an index of agglomeration that takes on a value of zero when an industry is allocated across space in exactly the same way as total employment. It takes on a value close to one when the industry is completely concentrated in one location (Krugman 1991, Audretsch and Feldman 1996).

\(^{20}\) Location Quotients are defined as the percentage of local employment in a particular industry divided by the percentage of national employment in that industry.
industries at the CD level (e.g., Henderson 2000). Our results do not materially change when we use these alternative measures.

Our most robust models include industry x year effects ($d_{it}$) to capture industry and year specific shocks such as the introduction of an industry-specific new technology, ER x year ($d_{ER,t}$) or CD x year effects ($d_{CD,t}$) to absorb shock that are shared by all firms in the region such as construction of a rail or opening of an airport. The coefficients retain the same level of statistical significance and approximate magnitude.

7. Limitations of the Study

There are several limitations to this study. High exit levels in a CSD may result from repeated entry attempts by less competent entrepreneurs (serial exits) who prefer to re-establish new ventures in the same location. Thus exit levels may be a proxy for other phenomena not accounted for in our model such as lack of networks, capabilities, talent, and industry experience of failing entrepreneurs\(^{21}\). Given that our population consists of all CSDs in Canada, we believe that the magnitude and significance of the results is not driven by some unobserved heterogeneity. More detailed economic environmental measures would allow more specific tests of the local process through which exits trigger employment transition, search for opportunities and entrepreneurial entry to a location.

The dynamics of manufacturing spin-offs represents another intriguing alternative explanation for the differential in entrepreneurial entry levels across locations. Klepper (2002, 2003) finds that an important determinant of geographic concentration in the U.S. automobile industry involves the role of spin-offs of automobile manufacturers. We cannot differentiate between entrepreneurial entry through spin-off and unaffiliated entry. This remains for future research.

Finally, our study examined only entry within five manufacturing industries. Immobility of some tangible assets and partial immobility of employment may better characterize the manufacturing sector than the service sector. Moreover, in sectors with rapid technological changes obsolescence may reduce the importance of the existence of a market for used assets. Consequently, we cannot generalize the effects of exit on entry to all service or manufacturing industries.

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\(^{21}\) Note, however, Dahlqvist, et al. (2000) found that the start-up of a firm from unemployment reasons does not affect the survival or the performance level of the firm.
8. Discussion and conclusions

There is general recognition that business creation is an important element of economic growth and regional innovation. In this paper we contribute to the understanding of the role that enterprise exit plays in the industrial regional renewal process. Entrepreneurs must recognize, interpret and take an action to follow an opportunity (Gartner 2001, Shane and Cable 2002). The probability of opportunity recognition depends on the intensity of the search, the attention and alertness to new opportunities (Hayek 1952, Kirzner 1979), the costs of such a search, unemployment (Delmar and Davidsson 2000), and on the entrepreneur's prior experience (Shane 2000, Shane and Venkataraman 2000)²². Our study suggests that exits of firms in a location may intensify the search for entrepreneurial opportunities and/or generate more opportunities in that location and therefore attract new entry. The study shows that this phenomenon is essentially local, with weaker spillovers to neighboring locations and little if any impact in more distant locations, highlighting the role of local knowledge and social networks in finding and acting on opportunities.

The major research objectives of the study were to examine whether a local creative destruction process does exists? and what are its prime drivers and characteristics? The process of local creative destruction we uncovered in our study is complementary but distinct from the process of technological change and industrial renewal articulated by Schumpeter.

“[R]search supports the idea that technologies evolve over time through cycles of long periods of incremental change, which enhance and institutionalize an existing technology, punctuated by technological discontinuities in which new, radically superior technologies displace old, inferior ones” (Baum, 1996: 97). While the Schumpeterian process of creative destruction explains the consequences of radical technological shifts where new entrants introduce new superior technologies or products making technologies and products of incumbents obsolete and forcing them to exit (or innovate), the local creative destruction process explains the process through which technologies change incrementally. In this process new technologies are built on know-how and inputs embodied in existing technologies. Inertial forces constrain change processes and adaptive capabilities of some older incumbents, leading to erosion of their fit with their environment. Unable to maintain their competitive position they exit.

We show that their exit creates a stimulus for entry of new firms. We also demonstrate that exit of new entrants (i.e., exit that can be attributed to the liabilities of newness and smallness) does not create as significant stimulus for entry. This suggests that while churn may correct for mistaken entry

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²² Entrepreneurs can be categorized as either opportunity (pull factors), or necessity motivated (push factors). Opportunity motivated entrepreneurs establish new ventures as a response to opportunities for creating new products and services (Baumol 1990). Necessity motivated entrepreneurs establish new ventures out of the need to find suitable work. From a risk perspective, being unemployed will influence people to take higher risks (Delmar and Davidsson 2000).
decisions and thus enhances regional productivity, the creation of stimulus for new business can be attributed mainly to the exits of more mature firms that release resources (including knowledge resources) that new entrants can use. The succession of exiting old firms, which find it difficult to change, by young ones, unconstrained by inertial forces, that can recombine released resources in new ways, is an effective process where value of released resources is not only conserved but also enhanced. Our results show that productivity is increased through the process sufficiently to compensate for those new entrants who fail soon after entry.

A process where failure stimulates entry may lead, however, to a suboptimal location pattern within the region as some locations with high failure rates may not be suitable for some types of enterprises. We found that a persistent high failure rate in a location reduces entry to that location. Indeed lower long-term failure rates in neighboring locations encourage a shift of entry to them from the focal location, thus minimizing risks.

The existence of local competitive markets implies pressure on prices and elimination of abnormal entrepreneurial profits, thus a reduction in the attractiveness of a place. Our study found that local competition in micro-clusters deters entrepreneurs from entry into the location. Prior research results showed that agglomeration economies matter to location selection between economic regions; our results suggest that they matter also to within region choices. We also show that localization economies are more important than urbanization economies. Our results contribute to a better understanding of the spatial dimensions of economic activities, in particular the dynamics of entry and exit in micro-locations and the interrelationships between different micro-locations within a region. Consistent with the sociological literature highlighting the importance of local social and professional networks to the formation of new enterprises, our study suggests that a variety of key economic processes which influence entry and exit are centered in micro-locations, and that regional spillovers, while important, do not have as strong an impact as processes operating within the location. We show that spatial sectoral specialization has some distinct advantages (strong localization versus urbanization economies and strong impact of same sector exits on entry). These results suggest that regional policy makers must craft their policies with sensitive attention to the characteristics and processes of small geographical areas. Furthermore, our results suggest that diversity in the metropolitan region and specialization within a sub-region create an attractive environment for new enterprises. Given the higher impact of localization economies on attracting new entrants, policies should emphasize the concentration of resources around one sector within small regions rather than the dispersion of resources among a variety of sectors, while promoting diversity across the economic region.
Our results concerning the local nature of creative destruction suggest that regional policies should be careful not to suppress evolutionary processes of local creative destruction that increase local productivity. In particular, policies aimed to support failing companies through subsidies and tax concessions should be carefully evaluated.

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Firm Exits as a Determinant of New Entry


Firm Exits as a Determinant of New Entry


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Firm Exits as a Determinant of New Entry


Table 1: Means, Standard Deviations, and Definitions of Key Variables

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std Dev</th>
<th>Definition</th>
<th>Underlying Concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSD number of plants (t-1)</td>
<td>4.81</td>
<td>17.36</td>
<td>Lagged number of plants in the focal sector operating in the CSD</td>
<td>Localization economies</td>
</tr>
<tr>
<td>CSD employment (t-1)</td>
<td>184.42</td>
<td>551.73</td>
<td>Lagged level of employment in the focal sector operating in the CSD</td>
<td></td>
</tr>
<tr>
<td>CD number of plants (t-1)</td>
<td>287.24</td>
<td>765.75</td>
<td>Lagged number of plants in other manufacturing sectors operating in the CD</td>
<td>Urbanization economies</td>
</tr>
<tr>
<td>CD employment (t-1)</td>
<td>8485.32</td>
<td>25741.53</td>
<td>Lagged level of employment in other manufacturing sectors operating in the CD</td>
<td></td>
</tr>
<tr>
<td>CSD area</td>
<td>201.13</td>
<td>543.15</td>
<td>Area measured in square miles</td>
<td>Rents</td>
</tr>
<tr>
<td>CSD establishments per worker (t-1)</td>
<td>0.185</td>
<td>0.423</td>
<td>Lagged number of plants in the focal sector divided by level of employment in the CSD</td>
<td>Local competition</td>
</tr>
<tr>
<td>CD establishments per worker (t-1) [other CSDs within the same CD]</td>
<td>0.09</td>
<td>0.205</td>
<td>Lagged number of plants in the focal sector divided by level of employment in the CD (excluding focal CSD)</td>
<td>Competition in neighboring locations</td>
</tr>
<tr>
<td>CSD exit (t-1)</td>
<td>0.54</td>
<td>1.52</td>
<td>Lagged levels of exit firms within the focal sector that existed at least four years at the CSD level</td>
<td>Local exits of older firms</td>
</tr>
<tr>
<td>CSD exit (t-2)</td>
<td>0.53</td>
<td>1.52</td>
<td>Two years lagged levels</td>
<td></td>
</tr>
<tr>
<td>CD exit (t-1)</td>
<td>2.13</td>
<td>3.98</td>
<td>Lagged levels of exit firms within the focal sector that existed at least four years in neighboring CSDs within the same CD</td>
<td>Exits of older firms in neighboring locations</td>
</tr>
<tr>
<td>CD exit (t-2)</td>
<td>2.15</td>
<td>4.11</td>
<td>Two years lagged levels</td>
<td></td>
</tr>
<tr>
<td>ER exits (t-1)</td>
<td>4.63</td>
<td>6.93</td>
<td>Lagged levels of exit firms within the focal sector that existed at least four years in other CSDs within the same ER (excluding the focal CD)</td>
<td>Exits of older firms in more distant locations</td>
</tr>
<tr>
<td>CD exit (t-1) [other ER]</td>
<td>8.46</td>
<td>14.98</td>
<td>Lagged levels of exit firms within other sectors that existed at least four years in the CD</td>
<td>Regional exits of older firms in other sectors</td>
</tr>
<tr>
<td>CSD exit rate (t-1)</td>
<td>0.12</td>
<td>0.04</td>
<td>Three years aggregated number of lagged exits in the CSD from the focal sector divided by the number of CSD's incumbents at t-4</td>
<td>Persistent local risk of exit</td>
</tr>
<tr>
<td>CD exit rate (t-1) [other CSDs within the same CD]</td>
<td>0.19</td>
<td>0.11</td>
<td>Three years aggregated number of lagged exits in neighboring CSDs (within the from the focal sector divided by the number of CSD’s incumbents at t-4</td>
<td>Persistent risk of exit in neighboring locations</td>
</tr>
<tr>
<td>CD exit rate (t-1) [other ind]</td>
<td>0.38</td>
<td>0.17</td>
<td>Three years aggregated number of lagged exits in the CD from other sectors divided by the number of CD's incumbents at t-4</td>
<td>Persistent regional risk of exit in other sectors</td>
</tr>
</tbody>
</table>
Table 2: Estimates of New Entry: Investigating the Impact of Exits
Dependent variable: births count in a census subdivision $j$, at time $t$, belonging to sector $i$

<table>
<thead>
<tr>
<th>Specification</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Zero-inflated Poisson</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSD number of plants (t-1)</td>
<td>0.03654***</td>
<td>0.03705***</td>
<td>0.03641***</td>
<td>0.03627***</td>
<td>0.03554***</td>
<td>0.04107***</td>
<td>(3.591)</td>
</tr>
<tr>
<td>CSD employment (t-1)</td>
<td>0.00205**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(2.481)</td>
</tr>
<tr>
<td>CD number of plants (t-1) [other ind.]</td>
<td>0.00017**</td>
<td>0.00017**</td>
<td>0.00017**</td>
<td>0.00017**</td>
<td>0.00017**</td>
<td>0.00009**</td>
<td>(2.405)</td>
</tr>
<tr>
<td>CD employment (t-1) [other ind.]</td>
<td>0.00006**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(2.301)</td>
</tr>
<tr>
<td>CSD area</td>
<td>0.00009*</td>
<td>0.00009*</td>
<td>0.00009*</td>
<td>0.00008*</td>
<td>0.00008*</td>
<td>0.00005</td>
<td>(1.856)</td>
</tr>
<tr>
<td>CSD establishments per worker (t-1)</td>
<td>-1.15730**</td>
<td>-1.15667**</td>
<td>-1.16035**</td>
<td>-1.15002**</td>
<td>-1.26816**</td>
<td></td>
<td>(2.468)</td>
</tr>
<tr>
<td>CD establishments per worker (t-1) [other CSDs within the same CD]</td>
<td>-1.00282**</td>
<td>-1.00273**</td>
<td>-1.00214**</td>
<td>-1.00048**</td>
<td>-1.00034*</td>
<td></td>
<td>(2.311)</td>
</tr>
<tr>
<td><strong>Zero-inflated Poisson</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1A:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSD exit (t-1)</td>
<td>0.41085***</td>
<td>0.43613***</td>
<td>0.39005***</td>
<td></td>
<td></td>
<td></td>
<td>(4.501)</td>
</tr>
<tr>
<td>CSD exit (t-2)</td>
<td>0.30148***</td>
<td>0.28007***</td>
<td>0.31071***</td>
<td></td>
<td></td>
<td></td>
<td>(3.891)</td>
</tr>
<tr>
<td>H1B:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD exit (t-1) [other CSDs within the same CD]</td>
<td>0.06190**</td>
<td>0.05459**</td>
<td>0.07936**</td>
<td></td>
<td></td>
<td></td>
<td>(2.311)</td>
</tr>
<tr>
<td>CD exit (t-2) [other CSDs within the same CD]</td>
<td>0.07954***</td>
<td>0.08391**</td>
<td>0.11153***</td>
<td></td>
<td></td>
<td></td>
<td>(3.573)</td>
</tr>
<tr>
<td>ER exits (t-1) [other CSDs within the same ER]</td>
<td>0.014224**</td>
<td>0.010061*</td>
<td>0.02307**</td>
<td></td>
<td></td>
<td></td>
<td>(2.247)</td>
</tr>
<tr>
<td>CD exit (t-1) [other ind.]</td>
<td>-0.00043*</td>
<td>-0.00041*</td>
<td>-0.00021*</td>
<td></td>
<td></td>
<td></td>
<td>(1.881)</td>
</tr>
<tr>
<td>H3:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSD exit rate (t-1)</td>
<td>-0.98754***</td>
<td>-0.91473***</td>
<td>-0.942107**</td>
<td></td>
<td></td>
<td></td>
<td>(4.218)</td>
</tr>
<tr>
<td>CD exit rate (t-1) [other CSDs within the same CD]</td>
<td>0.60284**</td>
<td>0.59004**</td>
<td>0.58772***</td>
<td></td>
<td></td>
<td></td>
<td>(2.364)</td>
</tr>
<tr>
<td>CD exit rate (t-1) [other ind.]</td>
<td>-0.20647***</td>
<td>-0.18465**</td>
<td>-0.15823**</td>
<td></td>
<td></td>
<td></td>
<td>(2.781)</td>
</tr>
<tr>
<td>Economic region effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Time effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>2-digit industry effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Number of Births</td>
<td>34,449</td>
<td>34,449</td>
<td>34,449</td>
<td>34,449</td>
<td>34,449</td>
<td>34,449</td>
<td>34,449</td>
</tr>
<tr>
<td>Number of CSD-year</td>
<td>58,620</td>
<td>58,620</td>
<td>58,620</td>
<td>58,620</td>
<td>58,620</td>
<td>58,620</td>
<td>58,620</td>
</tr>
<tr>
<td>Likelihood Ratio Index</td>
<td>0.169</td>
<td>0.154</td>
<td>0.222</td>
<td>0.284</td>
<td>0.331</td>
<td>0.368</td>
<td>0.389</td>
</tr>
</tbody>
</table>

Adjusted R-sq
Absolute value of z-statistics in parentheses. Robust standard errors were used in all specifications (Huber/White/sandwich estimator of the variance)
* significant at 10% level; ** significant at 5% level; ***significant at 1% level
intercept is omitted from all specifications

Firm Exits as a Determinant of New Entry
Firm Exits as a Determinant of New Entry

Table 3: Estimates of New Entry: Investigating the Impact of Exits
Dependent variable: \( \Delta \) births count in a census subdivision \( j \), between time \( t \) and \( t-1 \), belonging to sector \( i \)

<table>
<thead>
<tr>
<th>Specification</th>
<th>OLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regressors</td>
<td></td>
</tr>
<tr>
<td>( \Delta ) CSD number of plants</td>
<td>0.029834***</td>
</tr>
<tr>
<td></td>
<td>(5.387)</td>
</tr>
<tr>
<td>( \Delta ) CD number of plants [other ind.]</td>
<td>0.00325**</td>
</tr>
<tr>
<td></td>
<td>(2.247)</td>
</tr>
<tr>
<td>CSD area</td>
<td>0.00021</td>
</tr>
<tr>
<td></td>
<td>(1.601)</td>
</tr>
<tr>
<td>( \Delta ) CSD establishments per worker</td>
<td>-0.374102**</td>
</tr>
<tr>
<td></td>
<td>(2.302)</td>
</tr>
<tr>
<td>( \Delta ) CD establishments per worker [other CSDs within the same CD]</td>
<td>0.02481</td>
</tr>
<tr>
<td></td>
<td>(0.842)</td>
</tr>
<tr>
<td>( \Delta ) CSD exit ( (t-1)-(t-2) )</td>
<td>0.045710***</td>
</tr>
<tr>
<td></td>
<td>(8.173)</td>
</tr>
<tr>
<td>( \Delta ) CD exit ( (t-1)-(t-2) ) [other CSDs within the same CD]</td>
<td>0.023416**</td>
</tr>
<tr>
<td></td>
<td>(2.325)</td>
</tr>
<tr>
<td>( \Delta ) ER exits ( (t-1)-(t-2) ) [other CSDs within the same ER]</td>
<td>0.000362*</td>
</tr>
<tr>
<td></td>
<td>(1.903)</td>
</tr>
<tr>
<td>( \Delta ) CD exit [other ind.]</td>
<td>-0.00813</td>
</tr>
<tr>
<td></td>
<td>(1.470)</td>
</tr>
<tr>
<td>( \Delta ) CSD exit rate</td>
<td>-0.12381***</td>
</tr>
<tr>
<td></td>
<td>(4.701)</td>
</tr>
<tr>
<td>( \Delta ) CD exit rate [other CSDs within the same CD]</td>
<td>0.18025*</td>
</tr>
<tr>
<td></td>
<td>(2.087)</td>
</tr>
<tr>
<td>( \Delta ) CD exit rate [other ind.]</td>
<td>-0.00711**</td>
</tr>
<tr>
<td></td>
<td>(2.308)</td>
</tr>
<tr>
<td>Economic region effects</td>
<td>Yes</td>
</tr>
<tr>
<td>2-digit industry effects</td>
<td>Yes</td>
</tr>
<tr>
<td>Number of Births</td>
<td>34449</td>
</tr>
<tr>
<td>Adjusted R-sq</td>
<td>0.146</td>
</tr>
</tbody>
</table>

Absolute value of z-statistics in parentheses. Robust standard errors were used in all specifications (Huber/White/sandwich estimator of the variance)
* significant at 10% level; ** significant at 5% level; ***significant at 1% level

Table 4: Estimates of New Entry: Investigating the Impacts of Exits of Older and Younger Firms

<table>
<thead>
<tr>
<th>Specification</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regressors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \Delta ) CSD exit ( (t-1)-(t-2) )</td>
<td>0.045710***</td>
<td>0.018535***</td>
<td>0.021732***</td>
</tr>
<tr>
<td></td>
<td>(8.173)</td>
<td>(10.756)</td>
<td>(10.013)</td>
</tr>
<tr>
<td>( \Delta ) CD exit ( (t-1)-(t-2) ) [other CSDs within the same CD]</td>
<td>0.023416**</td>
<td>0.010064</td>
<td>0.014371*</td>
</tr>
<tr>
<td></td>
<td>(2.325)</td>
<td>(1.532)</td>
<td>(1.973)</td>
</tr>
<tr>
<td>( \Delta ) ER exits ( (t-1)-(t-2) ) [other CSDs within the same ER]</td>
<td>0.000362*</td>
<td>0.000114</td>
<td>0.000301*</td>
</tr>
<tr>
<td></td>
<td>(1.903)</td>
<td>(0.837)</td>
<td>(1.973)</td>
</tr>
<tr>
<td>Adjusted R-sq</td>
<td>0.146</td>
<td>0.122</td>
<td>0.157</td>
</tr>
</tbody>
</table>

Absolute value of z-statistics in parentheses. Robust standard errors were used in all specifications (Huber/White/sandwich estimator of the variance)
* significant at 10% level; ** significant at 5% level; ***significant at 1% level
Appendix A - Labor Tracking Procedure

Obtaining accurate measurements of births and deaths is not trivial due to the need to distinguish ‘real’ births and deaths from ‘false’ ones. In many files (e.g., the LRD at the U.S. Bureau of the Census, or Dun and Bradstreet records), entry is measured as the appearance of a new entity. Thus, when a merger or a change in control occurs, an ongoing entity falsely appears to die and then reborn. Real births and deaths reflect actual entry and exit events (the creation of new forms and the exit of existing ones); false births and deaths may simply reflect organizational restructuring within a firm, merger or acquisition, or a change in its reporting practices. A ‘labor tracking’ method was used in our database. This procedure relies on tracking the workforce of firms over time. Employees are followed from one payroll account to another and the percentage of workers present in a firm in one year that can be found in another is calculated. Labor is tracked from one firm to another and this path is used to establish whether a business was potentially linked to another. If a firm is falsely identified as dying, a substantial number of its workers should be found in another unit the following year. This is referred to as the pass-through rate. The firm with the largest pass through rate is chosen as the target firm with which the originating business unit had the closest affiliation – the dominant link. When a no-longer-identified firm that had more than 10 employees had pass-through-rate of 75% or more, these cases are reclassified as continuing firms. Similarly, where more than 75% of a birth came from another firm, it is classified as a false birth. A more restrictive rule is employed for smaller firms since there is less difference in pass-through rates between small continuing and no-longer identified firms. For example, if firm A merged with firm B in year $t$, then a new firm, C, is created and given a synthetic history aggregated from the histories of firms A and B. The individual histories of A and B disappear from the data and firm C represents their joint operations.
### Appendix B - Industries

**Capital Goods or Machinery Industries**

<table>
<thead>
<tr>
<th>Description</th>
<th>SIC-E Code</th>
<th>Number of Births</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Industries</td>
<td>101,102,103,104,105,106,108,109</td>
<td>11,046</td>
</tr>
<tr>
<td>Apparel (Fashion)</td>
<td>243,244,245,249</td>
<td>3,647</td>
</tr>
<tr>
<td>Fabricated Metal Products Industries (except Machinery and Transportation Equipment industries)</td>
<td>301,302,303,304,305,306,307,308,309</td>
<td>11,053</td>
</tr>
</tbody>
</table>

**ICT / SCI industries**

<table>
<thead>
<tr>
<th>Description</th>
<th>SIC-E Code</th>
<th>Number of Births</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machinery Industries (expect Electrical Machinery)</td>
<td>311,312,319</td>
<td>5,943</td>
</tr>
<tr>
<td>Electrical and Electronic Products Industries</td>
<td>334,335,336</td>
<td>2,760</td>
</tr>
</tbody>
</table>