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New Business Survival in Georgia: Exploring the Determinants of Survival Using Regional Level Data

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FRC Report No. 233
April 2011

Georgia State University | ANDREW YOUNG SCHOOL OF POLICY STUDIES

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Acknowledgments

This report has benefitted from the valuable comments of Dave Sjoquist, Rachana Bhatt, Andrew Hanson and James Marton. Further acknowledgment must be made to the Georgia Department of Labor and Lakshmi Pandey for their assistance in obtaining data used in this study.

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Executive Summary

The formation of new businesses is an important stimulant to economic activity and a major driving force behind economic growth and development. The state of Georgia has offered various incentives such as investment and job tax credits to encourage the development of business enterprises within the state. However, not only is it important to have new businesses locate in the state, but the viability and successful operation of such ventures also matters for the extent to which they are able to contribute to economic development.

Previous research has shown that some 20 percent of new firms die within the first year of operation (Fritsch *et al.*, 2006; Mata and Portugal, 1994). In Georgia, for the period 2001-2006, this figure was 14 percent. As a matter for regional development policy and entrepreneurship promotion, it is important for local policy makers to know what specific factors affect new firm survival so as to be able to design policies and programs which will facilitate the overall success of new businesses. The aim of this study is, therefore, to examine the determinants of survival for new firms in the state of Georgia. We use detailed establishment level data provided by the Georgia Department of Labor.

We start by exploring some of the salient features of new business formation in Georgia between 2001 and 2004. Of the 65,352 establishments founded during 2001-2004, the majority were in the service sectors (particularly Professional Services), followed by Construction and Retail. However, the greatest employment creation was in the Accommodation sector, followed by Waste Management and Manufacturing.

Survival rates for the new firms that came into existence between 2001 and 2004, tracked until the last quarter of 2006, show that approximately 14 percent of all new start-ups failed after only one year. By the end of the third year, 37 percent of new businesses had failed. At the end of the study period, only 44 percent of new start-ups remained in existence. Broadly speaking, the highest rates of failure were in service-based industries, whereas natural-resource based firms had the strongest likelihood of surviving.

We use duration analysis to examine the factors which affect the survival of new firms in Georgia. The richness of the dataset allows us to measure and test the influence of several factors that have proved important to the likelihood of firm survival in other regions. Specifically, we examine firm-specific, industry-related, macroeconomic and geographic factors.

We find that larger establishment size is a consistent positive determinant of the likelihood of firm survival, with current size being more influential than starting size. This implies that early growth and expansion of new firms appreciably increases their chances of survival. The importance of firm location is also reinforced in this study. The findings suggest that while urban areas have specific advantages for business development, new firms locating in the Atlanta metropolitan area experience a greater risk of failure. However, further de-classification according to county tiers ranked by the Georgia Department of Community Affairs demonstrates that this risk is mitigated for firms located in richer, more economically developed counties. Improved survival chances in top-ranked counties may be explained by access to more resources and infrastructure, as well as larger market size in these areas. The results also show that upswings in the national macroeconomic environment improved the likelihood of survival, while greater intra-industry competition reduced the probability.

New Business Survival in Georgia: Exploring the Determinants of Survival Using Regional Level Data

I. Introduction

The formation of new businesses is an important stimulant to economic activity and a major driving force behind economic growth and development. New businesses not only generate employment and investment, but also improve productivity through new ideas and innovations. Governments, at various levels, have long recognized this potential and make special attempts to bring new firms to their jurisdictions. This effort may be at the international level, where national governments offer various tax and investment incentives to attract foreign direct investment (FDI) to their countries. It may also occur between different regions within a country as state and local governments compete to pull new businesses to their local jurisdictions. However, not only is it important to have new businesses locate in an area, but the viability and successful operation of such ventures also matters in determining the extent to which new firms are able to contribute to the economic development of a particular country or region.

Previous research has shown that approximately 20 percent of new firms die within the first year of operation (Fritsch *et al.*, 2006; Mata and Portugal, 1994). In the state of Georgia, for the period 2001-2006, this figure was 14 percent. As a matter for regional development policy and entrepreneurship promotion, therefore, it is important for local policy makers to know what specific factors affect new firm survival so that they can design policies and programs which will facilitate the overall success of new businesses. This report examines the determinants of survival for new firms in the state of Georgia. We have the advantage of using detailed sub-state level data to better inform policies specific to Georgia and its counties.

The industrial organization literature offers some insights on the most consistent determinants of new firm survival, distinguishing between factors that are specific to the firm (internal) and factors that relate to the environment in which the firm operates (external). Of the internal factors, age and size are the most consistent determinants of firm survival. Larger and older firms have a much higher probability of surviving than their smaller, younger counterparts (Agarwal and Audretsch, 2001; Manjón-Antolín and Arauzo-Carod, 2008). Other firm-specific characteristics such as managerial skill and competence have also proved influential (Saridakis, Mole and

Storey, 2008). Ownership structure has often been found to be related to the risk of failure of new firms, but the effect varies depending on the type of ownership structure (Audretsch and Mahmood, 1994; Mata and Portugal, 1994).

The external determinants typically encompass industry, spatial and macroeconomic factors. Industry-specific characteristics such as technology, scale economies, entry rates and sector growth rates have been well researched. Firms opening in high technology industries, with a high minimum efficient scale and increased competition from high entry rates have a lower likelihood of survival (Agarwal and Audretsch, 2001; Audretsch, 1995). The increased risk, however, may be offset by strong industry growth (Disney *et al.*, 2003; Mahmood, 2000). Other studies have emphasized the importance of macroeconomic factors such as changes in the business cycle. Firm survival has been shown to be higher in the upswings and lower in economic recessions (Caves, 1998; Geroski, 1995). The macroeconomic environment at the time the firm is founded has also proved significant, as evidenced by generation or period effects from studies observing multiple birth cohorts of firms (Box, 2008; Mata, Portugal and Guimaraes, 1995). While there is some convincing evidence to suggest that spatial and geographical factors are also important determinants of firm survival (Falck, 2007; Fotopoulos and Louri, 2000; Fritsch *et al.*, 2006), work in this area has been severely constrained by data limitations.

This study conducts an analysis of the determinants of survival for new enterprises in the state of Georgia. While we include firm-specific, industry-related and macroeconomic factors, special emphasis is placed on the importance of sub-state factors using detailed data on new business establishments which our dataset allows to be identified at the county level. Taking advantage of a unique detailed longitudinal data set provided by the Georgia Department of Labor, we examine the survival rates of different birth cohorts of new enterprises started during the period 2001-2004 and observed until 2006.

The paper proceeds with a discussion of the salient trends in new business formation and survival in Georgia for birth cohorts during 2001 to 2004. This is followed in Section III by a description of the empirical procedure employed. The

findings and conclusions of the study are presented in Section IV. An appendix provides details of the data and the empirical methodology used.

II. Trends in Business Formation and Survival in Georgia, 2001-2006

A. Business Formation

We start by exploring some of the salient trends in new business formation in Georgia. Table 1 reports the number of new enterprises per year, decomposed by industrial sector (according to two-digit NAICS codes). The corresponding number of new jobs created is presented in Table 2. Of the 65,352 establishments founded during 2001-2004, the majority were in the service sectors (particularly Professional Services), followed by Construction and Retail. However, the greatest employment creation was in Accommodation, Waste Management and Manufacturing. The share of new firms in the accommodation sector averaged less than 10 percent of the total per year, but new businesses in this industry accounted on average for more than

TABLE 1. NUMBER OF NEW PRIVATE ESTABLISHMENTS IN GEORGIA BY SECTOR, 2001-2004

NAICS code		2001	2002	2003	2004	Average	Percent
11	Agriculture	145	129	146	170	148	0.9
21	Mining	20	13	8	10	13	0.1
22	Utilities	12	6	5	10	8	0.1
23	Construction	2,416	2,183	2,192	2,477	2,317	14.2
31-33	Manufacturing	497	443	428	614	496	3.0
42	Wholesale	1,445	1,231	1,200	1,275	1,288	7.9
44-45	Retail	1,986	1,885	2,002	2,164	2,009	12.3
48-49	Transportation	591	564	559	630	586	3.6
51	Information	438	240	204	272	289	1.8
52	Finance	805	907	800	938	863	5.3
53	Real Estate	813	777	906	1032	882	5.4
54	Professional Services	2,731	2,592	2,566	2,744	2,658	16.3
55	Management	31	28	43	45	37	0.2
62	Waste Management	1,158	1,142	1,226	1,287	1,203	7.4
71	Entertainment	272	235	276	317	275	1.7
72	Accommodation	1,462	1,447	1,655	1,679	1,561	9.6
81	Other Services	1,741	1,798	1,572	1,717	1,707	10.4
	Total	16,563	15,620	15,788	17,381	16,338	100.0

TABLE 2. INITIAL EMPLOYMENT OF NEW PRIVATE ESTABLISHMENTS IN GEORGIA BY SECTOR, 2001-2004

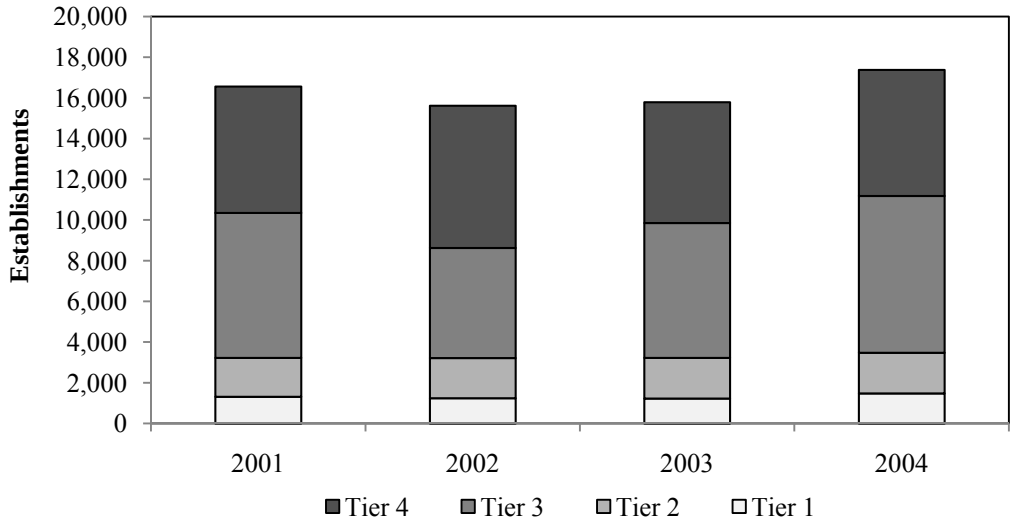
NAICS code		2001	2002	2003	2004	Average	Percent
11	Agriculture	1,329	933	655	1,152	1,017	1.1
21	Mining	220	67	90	48	106	0.1
22	Utilities	37	46	48	87	55	0.1
23	Construction	9,119	7,547	7,941	9,255	8,466	8.9
31-33	Manufacturing	14,370	5,053	6,405	15,586	10,354	10.8
42	Wholesale	6,150	4,174	7,783	6,265	6,093	6.4
44-45	Retail	9,157	9,357	8,283	9,553	9,088	9.5
48-49	Transportation	3,831	3,749	3,160	3,673	3,603	3.8
51	Information	12,105	1,445	1,138	3,468	4,539	4.8
52	Finance	3,411	3,309	3,700	4,616	3,759	3.9
53	Real Estate	3,306	2,796	2,418	2,450	2,743	2.9
54	Professional Services	7,707	7,081	6,765	8,704	7,564	7.9
55	Management	746	95	444	651	484	0.5
62	Waste Management	7,535	10,152	13,709	12,874	11,068	11.6
71	Entertainment	1,952	1,163	2,090	3,089	2,074	2.2
72	Accommodation	22,728	17,723	18,967	19,475	19,723	20.7
81	Other Services	4,762	4,642	3,826	5,545	4,694	4.9
	Total	108,467	79,333	87,423	106,489	95,428	100.0

20 percent of job creation per year among new firms. Similarly, the manufacturing sector had only 3 percent of new establishments per year, but accounted for almost 11 percent of new jobs created. This implies that firms in these sectors, on average, had a larger start-up size, which has been shown to correlate positively with firm survival.

In addition to significant disparity across sectors, there was also wide geographical variation in the number of start-ups for each year. Not surprisingly, the majority of new businesses are concentrated in the metropolitan areas of the state. Specifically, more than 92 percent of enterprises were founded in counties designated as part of a metropolitan statistical area (MSA) in the 2002 Census, with just over two-thirds of all enterprises located in the Atlanta MSA.

Georgia's 159 counties are grouped into four tiers by the Georgia Department of Community Affairs (DCA) based on economic conditions in the county.[1] Figure 1A shows the number of establishments founded during 2001-2004 by county tiers. The overwhelming majority of new firms was started in counties with tier designation 3 or 4, the most economically developed. The average number of entrants in counties in the two bottom tiers remained fairly constant over the four-year period. Figure 1B shows the corresponding number of employees at founding, we see that the highest number of new jobs was also in tiers 3 and 4, with considerable variation across years in employment creation evident across all tiers. Finally, Table 3 breaks down the number of new establishments by county tiers and industrial sector. Only the natural resource-based (Agriculture and Mining) sectors have a concentration of firms in tier 1 counties. For all other sectors most new firms are established in tiers 3 and 4.

FIGURE 1A. NUMBER OF NEW ESTABLISHMENTS BY COUNTY TIERS



[1] Each year, the Georgia DCA ranks counties according to income, unemployment and poverty rates. It then divides them into four tiers, tier 1 being the most economically disadvantaged. Since county tier designations may change from year to year, the current analysis uses the county tier at the time of firm formation.

FIGURE 1B. NUMBER OF INITIAL EMPLOYMENT BY COUNTY TIERS

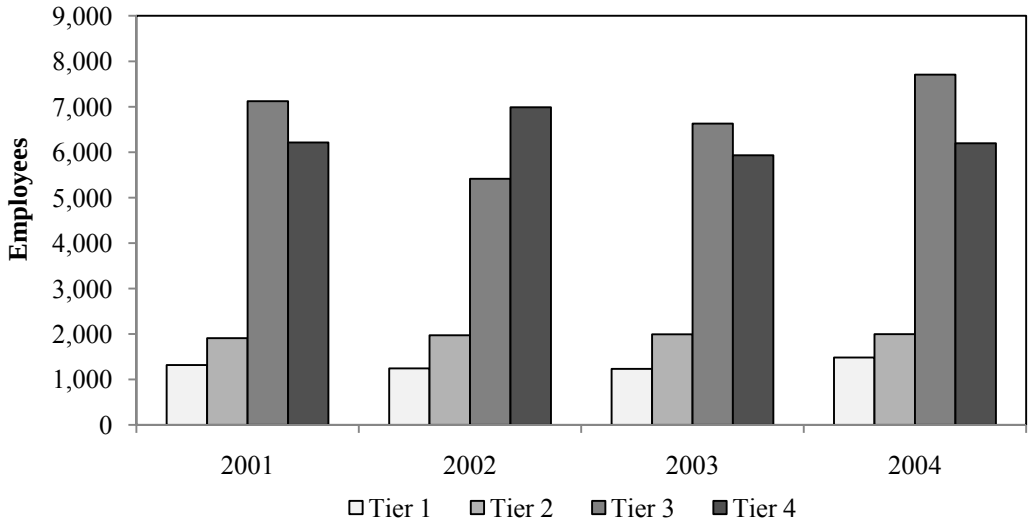


TABLE 3. NUMBER OF NEW ESTABLISHMENTS BY COUNTY TIER AND SECTOR, 2001-2004

NAICS code		Tier 1	Tier 2	Tier 3	Tier 4
11	Agriculture	304	107	113	66
21	Mining	18	9	11	13
22	Utilities	2	9	14	8
23	Construction	728	1,194	3,236	4,110
31-33	Manufacturing	247	304	702	729
42	Wholesale	262	389	2,039	2,461
44-45	Retail	998	1,360	3,176	2,503
48-49	Transportation	326	313	982	723
51	Information	57	102	564	431
52	Finance	177	385	1,522	1,366
53	Real Estate	185	333	1,581	1,429
54	Professional Services	343	698	4,903	4,689
55	Management	6	11	82	48
62	Waste Management	273	516	1,955	2,069
71	Entertainment	81	141	483	395
72	Accommodation	592	947	2,655	2,049
81	Other Services	677	1,053	2,855	2,243
	Total	5,276	7,871	26,873	25,332

B. Business Survival Rates

We estimate the survival function and hazard function for the new firms started in Georgia between 2001 and 2004, tracked until the last quarter of 2006.[2] The survival function gives the share of new establishments that still exist at the end of each time period (calendar quarter). The hazard function gives the risk of failure, that is, the probability that an establishment will close in the next quarter, on the condition that this establishment has survived up to the beginning of the current quarter.

On average, for the full sample, approximately 14 percent of all new start-ups failed after only one year (4 quarters). By the end of the third year (12 quarters), only 63 percent of new businesses remained in existence. At the close of the study period, 56 percent of new start-ups had failed (Figure 2). Correspondingly, estimates of the hazard function indicate a high rate of failure in the initial period after firm formation and a resultant decline in the likelihood of failure as firms mature. For example, according to Figure 2 14 percent of firms failed in the first year, but of the firms that survived two years, only 9 percent failed in the subsequent year. This effect is consistent with findings in the theoretical and empirical literature (e.g. see Jovanovic, 1982; Mata and Portugal, 1994).

We next compare survival rates by starting size, as measured by the initial number of employees in the firm. We divide the firms into four size categories (0-5, 6-10, 11-50, >50). Figure 3 shows that survival rates do vary by initial size of the firm. Firms starting with five employees or less (more than 80 percent of the full sample) have the lowest survival rates. By the end of the second year, 28 percent of the smallest firms had failed, while only 21 percent of firms starting with more than 50 employees had closed. Interestingly, the largest firms seemed to lose any advantage associated with size after about 4 years of existence.

[2] This means that the firms founded in 2001 are followed for potentially 6 years (24 quarters) if they have not closed prior to the end of the study period. Firms started in 2004 have a maximum observed duration of 3 years (12 quarters).

FIGURE 2. SURVIVAL ESTIMATES OF NEW BUSINESSES

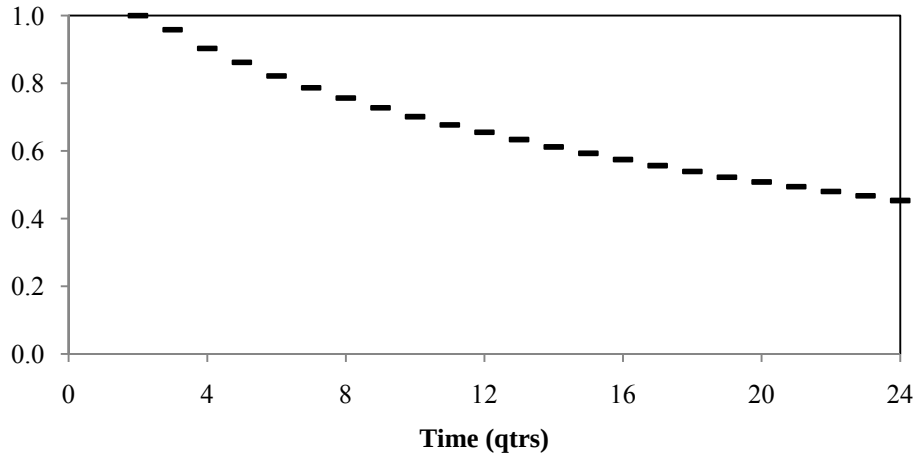


FIGURE 3. SURVIVAL ESTIMATES STRATIFIED BY INITIAL SIZE

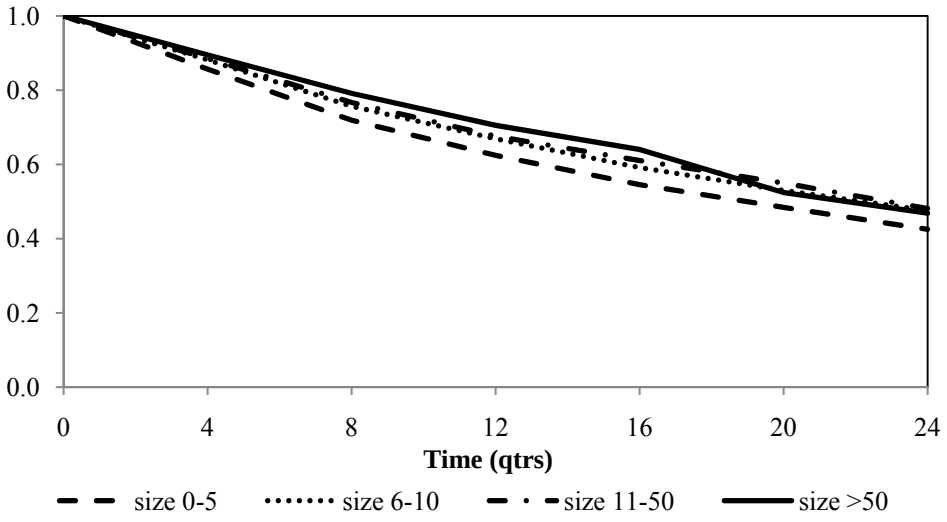
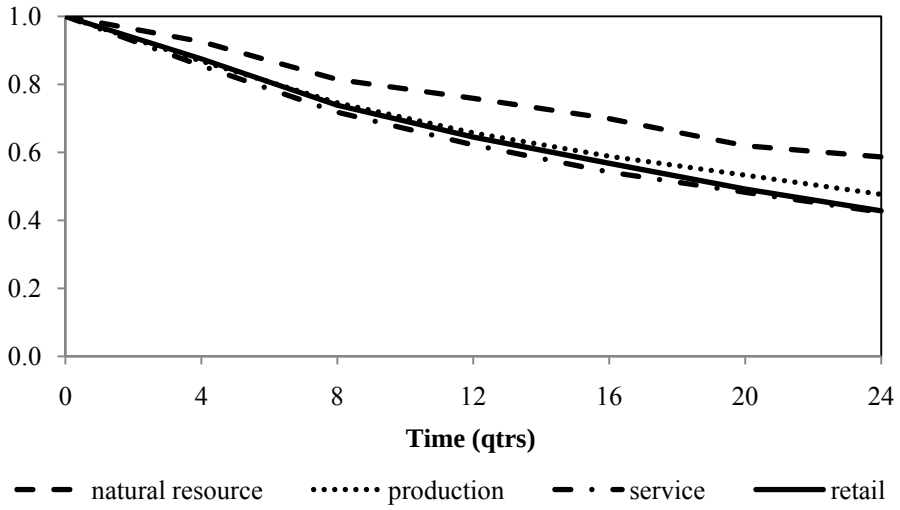


FIGURE 4. SURVIVAL ESTIMATES STRATIFIED BY SECTOR GROUPS

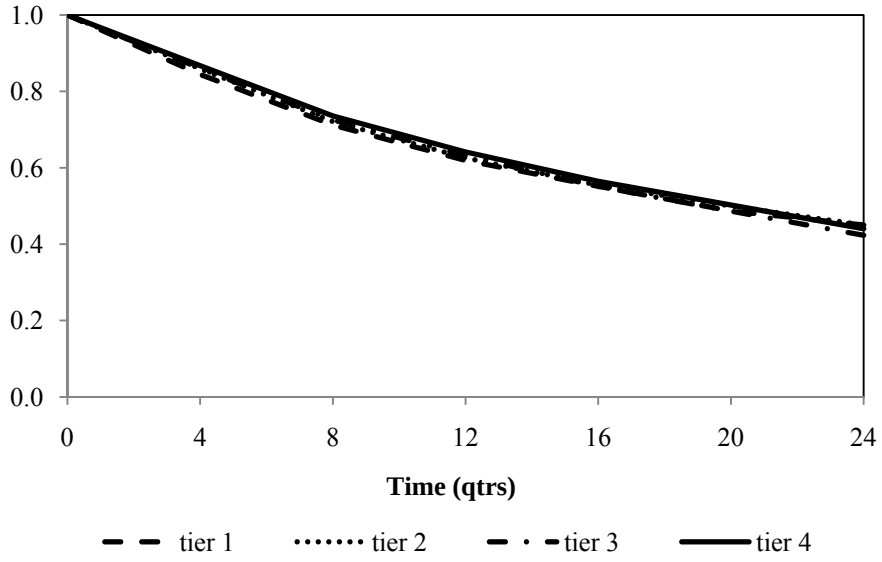


We also test for trends in the survival rates among industrial sectors. To gain meaningful insight among the many and varied sectors, we first divide the sample into four broad industrial sector groupings.[3] The highest survival rates (Figure 4) are among natural resource-based firms which are relatively few in number and heavily concentrated in more rural counties. The survival rates of production-based firms and wholesale/retail-based firms are roughly equivalent until about four years after existence, when the latter category starts to experience higher failure rates. At the end of five years only about half (49 percent) of wholesale/retail-based firms are still in existence, compared to about 53 percent of production-based firms. Service-based firms, while the most predominant, have the lowest rates of survival.

Looking at survival rates of new firms according to geographical location, there appears to be no difference between firms situated in the Atlanta MSA and the rest of the state. On the other hand, decomposition by county tiers shows that firms

[3] The groups are formed so as to be comparable with Forsyth (2005) who conducts a similar analysis on the survival of new firms in Washington State. The groups are: (1) natural resource-based firms (Agriculture, Forestry, Fishing and Hunting; Mining), (2) production-based firms (Construction; Manufacturing), (3) service-based firms (Utilities; Transportation and Warehousing; Information; Finance and Insurance; Real Estate and Rental and Leasing; Professional, Scientific and Technical Services; Management of Companies and Enterprises; Waste Management and Remediation Services; Arts, Entertainment and Recreation; Accommodation and Food Services; Other Services), and (4) wholesale/retail-based firms (Wholesale Trade; Retail Trade).

FIGURE 5. SURVIVAL ESTIMATES STRATIFIED BY RANKED COUNTY TIERS



located in tier 4 have slightly higher survival rates over most of the study period. However, the difference among firms in tiers 1-3 is statistically negligible (Figure 5).

The foregoing analysis shows how survival rates vary, conditional on one specific factor at a time. In reality, all these factors come into play simultaneously and in the next section we report on techniques which allow us to conduct a multivariate analysis to determine the relative influence of each factor.

III. Multivariate Analysis of Determinants of New Business Survival

We use duration analysis to investigate the determinants of new firm survival.[4] Survival is measured as the length of time a new enterprise remains in operation, given by the number of calendar quarters since the firm was established. It is calculated using establishment data provided by the Georgia Department of Labor.[5]

The explanatory variables included in the analysis are those which have been found to be consistent determinants of new firm survival in the empirical literature. Among firm-specific variables we include measures for both the start-up and current size of the establishment. We measure size by the monthly average (in logs) over the quarter of the number of employees in the establishment. A larger size is expected to reduce the likelihood of failure, but the literature is not clear on whether the initial size or the current size is more important. The richness of the data allows us to explore both measures. We also include a variable for the annual change in employment to explicitly capture the effects of employment growth.

We account for ownership structure with a dummy variable indicating if the enterprise is part of a multi-establishment firm. While a new firm with multiple establishments would be expected to have a better chance of survival, owners may be more likely to close an individual subsidiary and consolidate resources in a smaller number of more profitable branches than the owner of a single-establishment firm would be (Baden-Fuller, 1989; Reynolds, 1988). We therefore expect the multi-establishment variable to increase the hazard rate.

Industry-related variables are computed from aggregated data at the state level, sourced from the US Bureau of Economic Analysis (BEA). Therefore, while they vary over time, they are constant across establishments of the same industry in a given time period. The industry variables controlled for are entry rates and growth rates. Entry rates are used as a proxy for competition in an industry; a larger entry rate is expected to increase the probability that an individual firm will fail. We measure industry entry rates as the number of entrants divided by the total number of

[4] An elaboration of this estimation procedure is provided in the Appendix.
[5] A detailed description of the data is presented in the Appendix.

establishments in the industry for a given year. The effects of high competition may be offset by growth in the industry, signaling increased demand. We measure industry growth as the log difference of industry employment in two consecutive calendar years. We also include sector dummies to capture any unobserved individual sector effects.

The influence of the wider macroeconomic environment is captured in two ways. Fluctuations in the business cycle are captured by the yearly growth rate of real gross domestic product (GDP) and the national unemployment rate. Expansionary periods in the business cycle characterized by strong real GDP growth and low unemployment are expected to lower the hazard rate, i.e., the probably of failure. The macroeconomic conditions at founding have also proved influential as evidenced by generation or period effects. The multiple birth cohorts comprising our sample allow us to control for generation effects using indicator variables. Each regression also includes a set of time dummies for each calendar year to capture unobserved time effects.

The dataset permits us to identify the location of each establishment by county, facilitating the investigation of state regional factors. We reclassify the 159 counties in Georgia in two ways to facilitate meaningful analysis. First, we divide the counties according to whether they are part of a metropolitan statistical area (MSA). Second, we divide the counties into four tiers according to the Georgia Department of Community Affair's classification.[6] Categorical variables are used for each classification. Start-up rates in poorer or rural areas are seen to be lower, leading to less competition. The lack of competition may thus result in higher survival rates among new and existing firms in rural areas (Hansen *et al.*, 2009). However, more populated and richer areas have the advantage of larger markets, with more consumers to demand products and services. Furthermore, firms are better

[6] See footnote 1.

positioned to take advantage of agglomeration effects when located in a densely populated area.[7] The resulting effect on the likelihood of survival is *a priori* ambiguous.

Summary statistics and data sources for all the variables used are available in the Appendix. The average starting size for the 65,352 establishments under study is about 6 employees, but this masks the influence of a few extremely large outlier firms.[8] The average current employment is 6.8 and the average employment growth is less than 1 employee per quarter. Only about 2 percent of establishments are a part of a multi-establishment firm. In terms of industry factors, the overall growth across sectors and time is about 1 percent, while entry rates are 13 percent, on average. At the macroeconomic level, the U.S. economy experienced positive real GDP growth over the sample period with average national unemployment rates hovering around the natural rate.

[7] Agglomeration advantages like access to a large differentiated job market, availability of and desire for specialized services, proximity to research centers or proximity to a large number of consumers can compensate for the negative effects of a particular region's higher cost, wages or rents (Falck, 2007: 2041).

[8] Over 80 percent of the new firms start with 0-5 employees. The median size is under 2 and the 75th percentile is less than 4.

IV. Empirical Results and Conclusions

In this section we summarize the results of the regression analysis. The Appendix provides details of the methodology and empirical results.

- Holding other things constant, the size of a new firm was found to be a consistent determinant of its survival. Interestingly, the current size had a notably larger effect on increasing survival rates than the initial size. This implies that enterprise growth matters for survival, suggesting a partial adjustment process for firm size in the post-entry period. Further analysis confirmed that high employment growth itself also served to reduce the risk of failure.

- The ownership structure of the firm was also a significant determinant of firm survival. We identified whether Georgia enterprises were affiliated with a multi-establishment firm. Controlling for other factors, we found such enterprises to have higher hazard rates, implying a greater likelihood of failure for the individual establishment. This is in line with the hypothesis that owners of a multi-establishment firm may be more inclined to close an individual subsidiary in order to consolidate resources in a smaller number of more profitable branches.

- With respect to industry factors, stiffer competition in an industry—signaled by higher entry rates—considerably reduced the firm's chances for survival. For the sample, the anticipated offsetting effect of growth in the sector was not evident and may be attributable to the low overall industry growth rates in Georgia during the study period.

- The broader national macroeconomic environment was a significant determinant of firm survival in Georgia. Growth of real GDP and low national unemployment rates, characteristic of business cycle expansions, were correlated with a lower probability of firm failure.

- Geographical factors also proved to be significant determinants of firm survival after controlling for firm, industry and macroeconomic factors. Being located in the Atlanta MSA raised the hazard rate of new firms, signaling the relevance of urbanization diseconomies.

- Similarly, a firm's chances of survival were influenced by the level of economic development of the county in which it was located. Using counties in tier 1 as the base case, the results consistently showed that after controlling for all other factors, being in a county with a higher tier designation improved the chances for survival. The effect was most pronounced in tier 4 counties, the most economically developed.

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Appendix

The Data and Measurement Issues

The primary data source used for this study is the Employer File (formerly, the ES-202 employment data) collected by the Georgia Department of Labor (DOL), for the purposes of administering the state's Unemployment Insurance program. This dataset has several characteristics which make it appropriate for the analysis of firm survival in Georgia. First, it has almost comprehensive coverage. The dataset is compiled from quarterly tax and wage information submitted to the DOL by every employer covered by Georgia unemployment insurance since 1977.[9] Second, the data are at the establishment level, with unique identifiers at both the establishment and firm levels.[10] The identifying scheme allows us to track a business enterprise over the duration of its life. Furthermore, we are able to distinguish between totally new establishments (the subject of interest) and new branches or subsidiaries of existing firms. Moreover, it is possible to identify and control for new firms with multiple establishments. Other relevant information available from the dataset includes the number of paid employees per month, the six-digit North American Industry Classification System (NAICS) industry code and the county in which the enterprise is physically located.

For the purposes of this study, we are interested in measuring the duration, from birth to death, of totally new firms and identifying the factors which affect how long an enterprise is likely to last. Given the panel nature of our dataset, we are able to track the survival rates of multiple birth cohorts over a long period of time. We narrow our sample to four birth cohorts of enterprises started during the period 2001-2004 and tracked until the last quarter of 2006. Firms started in any quarter of the calendar year are regarded as being in the birth cohort of that year. A new firm is assumed to be born when both the firm and establishment identifiers appear in the dataset for the first time. We, therefore, exclude new establishments which are branches or subsidiaries of existing firms and focus solely on establishments of

[9] Only firms with paid employees are legally required to report to the DOL, which means that this source does not consider very small firms with only self employed people or family workers.
[10] Establishment refers to an economic unit in a single physical location. A business enterprise may be composed of multiple establishments under the same firm.

totally new firms. The majority of these new firms have single establishments, but we are also able to identify new firms with multiple establishments.

The treatment of firms' death is somewhat more delicate and we employ procedures that have been widely used in previous studies. An establishment is assumed to close either when it disappears from the database altogether or has zero reported employees for more than three consecutive quarters. The closure of a business is not easily discerned from the database. An establishment may disappear from the database for a number of reasons other than permanent closure. It may merge with or be acquired by another company. It may change name, location or industry. It may temporarily suspend operations, but not go out of business. We treat any permanent exit from the database as a closure. In any case, the time of exit is recorded as the last quarter for which information is available and number of employees is non-zero. It may be the case that an establishment disappears from the dataset for a short period and then later reappears. If the establishment remains in the same industry and location, this is treated as a temporary exit. Only the final exit is used for the calculation of duration. If there are many years of missing observations, the firm is excluded from the sample.

Other refinements were made to the sample of new businesses. We are interested only in the performance of private enterprises and so government agencies, as well as educational and healthcare facilities, were excluded.[11] Since our main focus is on the effect of geographical factors, establishments which had no county and industry information available were dropped from the sample. Also excluded were establishments with the same start and end dates and establishments which had zero monthly employees for the first four quarters of existence as this might indicate some administrative irregularity. The final sample comprised 65,352 new establishments, constituting 64,305 firms formed during the period 2001-2004.

[11] These organizations were identified based on the NAICS code at the two digit level. Government agencies, educational facilities and health care facilities are represented by codes 91, 61 and 62, respectively.

Estimation Procedure for Multivariate Analysis

We employ duration analysis techniques in the investigation of the determinants of new firm survival. Specifically, we use the Cox proportional hazards model (Cox, 1972; Keifer, 1988) which is the standard method for survival data used in the empirical literature. Denoting T as the length of time (in quarters) that a firm has been in existence and t as the current time, the probability that this firm fails or ceases operations this period, given that it has not yet failed is $P(t \leq T \leq t + \Delta \mid T \geq t)$, where Δ represents a small increment of time. The limit of $[P(t \leq T \leq t + \Delta \mid T \geq t)] / \Delta$ as Δ goes to zero is the hazard rate. T is assumed to have a continuous probability distribution function, $f(t)$, and an associated cumulative distribution function of $F(t) = \int_0^t f(s)ds = P(T \leq t)$.

We are interested in the probability that a spell lasts at least as long as some length t, which is given by the survivor function: $S(t) = 1 - F(t) = P(T \geq t)$. The hazard rate $h(t)$, which is the rate at which spells are completed immediately after t given that they have lasted at least until t, is related to the survivor function as follows:

$$h(t) = \lim_{\Delta \to 0} \frac{P(t \leq T \leq t + \Delta \mid T \geq t)}{\Delta} = \frac{f(t)}{S(t)} \qquad (1)$$

Empirically, hazard models express the hazard rate as a multiplicative function of a baseline hazard, $h_0(t)$, and an exponential function of a set of covariates:

$$h_i(t) = h_0(t)\exp(X_i\beta), \qquad (2)$$

where β represents the usual vector of coefficients and X_i is a vector of explanatory variables. A positive coefficient increases the value of the hazard function and therefore indicates a negative relationship with survival. A negative coefficient has the reverse interpretation.

TABLE A1. VARIABLE DEFINITION AND SOURCE

Variable name	Mnemonic	Definition	Source
Firm Level			
Start-Up Size	*start_size*	Average monthly employment in start-up year	ES202 (GDOL)
Current Size	*curr_size*	Average monthly employment in calendar year	ES202 (GDOL)
Employment Change	*emp_chg*	Change in monthly average employment between two calendar years.	ES202 (GDOL)
Multi-Establishment Firm	*mlt_est_dv*	Dummy variable=1 if enterprise is part of a multi-establishment firm	ES202 (GDOL)
Industry Factors			
Growth Rate	*ga_sec_growth*	Log difference of industry employment in 2 consecutive years.	REIS, BEA
Entry Rate	*ga_ent_rate*	Number of entrants divided by total number of plants in an industry (log).	REIS, BEA
Macroeconomic Factors			
US GDP Growth	*US_GDP_growth*	Annual real US GDP growth rate	BEA
Unemployment (US)	*US_unemployment*	US unemployment rate	BLS
Regional Factors			
Atlanta MSA	*atl_msa*	Dummy variable=1 if establishment located in Atlanta MSA	ES202 & US Census Bureau, Census 2000
Georgia MSA	*ga_msa*	Dummy variable=1 if establishment located in Georgia MSA	ES202 & US Census Bureau, Census 2000
Tier	*Tier*	County tier at time of establishment formation.	ES202 &GDOR

TABLE A2. SUMMARY STATISTICS 2001-2006

Variable		Obs	Mean	S. D.	Min	Max
Firm Level						
start_size	*e*	65,352	5.8	30	0.1	2,493
curr_size	*e,t*	233,341	6.8	32	0	2,915
emp_chg	*e,t*	167,465	0.6	12	-912	1,928
mlt_est_dv	*e*	65,352	0.02	0.13	0	1
Industry Factors						
ga_sec_growth	*t, s*	102	0.01	0.04	-0.13	0.12
ga_ent_rate	*t,s*	102	0.13	0.04	0.02	0.22
Macroeconomic Factors						
US_GDP_growth	*t*	6	2.4	0.9	1.1	3.6
US_unemployment	*t*	6	5.3	0.6	4.6	6.0
Regional Factors						
atl_msa	*e*	65,352	0.67	0.47	0	1
ga_msa	*e*	65,352	0.92	0.26	0	1
Tier (founding)						
tier1	*e*	65,352	0.08	0.27	0	1
tier2	*e*	65,352	0.12	0.33	0	1
tier3	*e*	65,352	0.41	0.49	0	1
tier4	*e*	65,352	0.39	0.49	0	1

TABLE A3. RESULTS OF COX PH REGRESSION

Variables	(1)	(2)	(3)	Variables	(1)	(2)	(3)
start_size	-0.133***			atl_msa	0.059***	0.046***	0.071***
	(0.006)				(0.017)	(0.017)	(0.021)
curr_size		-0.288***	-0.330***	tier2	-0.055**	-0.043	-0.029
		(0.006)	(0.008)		(0.027)	(0.027)	(0.034)
lemp_chg			-0.0617***	tier3	-0.059**	-0.049*	-0.060*
			(0.007)		(0.026)	(0.026)	(0.032)
mlt_est_dv	0.488***	0.697***	0.827***	tier4	-0.105***	-0.100***	-0.117***
	(0.042)	(0.041)	(0.060)		(0.028)	(0.028)	(0.035)
US_GDP_growth	-0.192***	-0.206***	-0.059***	cohort_2002	0.241***	0.242***	0.174***
	(0.020)	(0.020)	(0.022)		(0.021)	(0.021)	(0.030)
US_unemployment	0.130***	0.138***	0.486***	cohort_2003	0.385***	0.399***	0.330***
	(0.032)	(0.032)	(0.064)		(0.033)	(0.033)	(0.048)
ga_sec_growth	0.184	0.300	0.409	cohort_2004	0.489***	0.505***	0.484***
	(0.396)	(0.396)	(0.526)		(0.046)	(0.046)	(0.069)
ga_ent_rate	2.846***	2.701***	0.272	No. of Establishments	65,352	65,352	57,165
	(0.783)	(0.784)	(1.09)	Observations	233,341	228,226	141,978

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.
All regressions include sector and time dummies.

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Publisher(s): Fiscal Research Center of the Andrew Young School of Policy Studies

Author(s): Tamoya A. L. Christie

Date Published: 2011-04-10

Subject(s): Community and Economic Development