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Abstract

This paper presents preliminary results on the survival, dissolution, and growth patterns of residential remodeling establishments located in metropolitan areas in the United States by region. The findings show that five-year dissolution rates for these establishments between 1987 and 1992 were 53.3 percent. Controlling for a variety of establishment-specific and contextual variables, models discussed in the paper reveal that probability of dissolution is inversely related to establishment age, establishment size, and growth in residential construction demand. Surprisingly, amount of work subcontracted out, diversification into new construction, and the size of the metropolitan area where the establishment is based show no significant or consistent effects across the four census regions of the country. Employment growth of surviving establishments for this same period is also inversely related to establishment age and establishment size, but also to MSA size. The research presented here relies primarily upon a recently created database linking establishment level data collected from Census of Construction Industries (CCI) and establishment level data available from the Standard Statistical Establishment List (SSEL), both housed at the Census Bureau's Center for Economic Studies.

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I. Introduction

The residential remodeling industry accounts for $120 billion in expenditures by consumers and other agents, about half of which is received by construction contractors. While we know a good deal about the consumer side of this industry (see Bodgon 1992 and references therein), less is known about the establishments that provide these services and in particular, their dynamics, i.e., their formation, dissolution and growth.

Dominated by small establishments, the residential remodeling industry is characterized by high rates of business formation and dissolution. Very little is known about the factors that influence survivorship and growth of remodeling establishments. Until now, efforts to better understand change in the industry have been hampered by a lack of data on the establishments that provide residential remodeling services. This paper is the first to overcome these data constraints. We use a new data set linking residential establishments appearing in the 1987 Census of Construction Industries (CCI) to the 1992 Standard Statistical Establishment List (SSEL).

This paper is divided into five parts. In the first part, we specify which establishments are remodeling establishments and provide an overview of the industry. In the second, we briefly review the literature on survivorship and employment change at the establishment level. In the third, we discuss our data sources, describe our econometric approach to analyzing survivorship and change, and describe the variables we used in both our logit model of the probability of survival and our linear, ordinary-least-squares regression model of employment change conditional on survival. We then present results of the econometric model estimations. In the final section, we summarize the results and their implications, discuss the principal limitations of the estimated models, and suggest avenues for future research.

II. The Remodeling Industry

The residential remodeling industry is composed of general contractors and special trade contractors that specialize in construction. The Standard Industrial Classification (SIC) code does not break out construction establishments that specialize in remodeling from those that specialize in new construction. It also does not break out special trade establishments that specialize in residential construction from those that specialize in nonresidential construction. As a result, there is no accepted definition of which establishments comprise the industry. Nevertheless, it is possible to identify residential remodeling activity for establishments using information collected for the CCI. We define residential remodeling establishments as:

Residential general contractors (SIC 1521, 1522, 1531) with at least 50 percent of their construction receipts in additions, alterations, maintenance, or repair *plus*

Special trade contractors (SIC 17) with at least 50 percent of their construction receipts in residential additions, alterations, maintenance, or repair.

Residential remodeling establishments as defined above account for about three-quarters of the $43 billion of residential remodeling billings in 1992.[1] In 1992, there were 117,000 residential remodeling establishments with payroll, while in 1987 there were nearly 97,000 (Figure 1). In addition to these establishments with payroll, there were more than 80,000 in each year that did not specialize but did report at least some residential remodeling receipts. We exclude these establishments from our analysis, as well as hundreds of thousands of self-employed contractors who did at least some remodeling.

The overwhelming majority of residential remodeling establishments are small, single, young businesses. Nearly seven-tenths reported revenues of less than $250,000 in 1992. Of these, more than half reported revenues of less than $100,000.

Ease of entry and the small size of most remodeling establishments is attributable to low capital requirements and few regulatory barriers. In fully one-third of the states, no licensing or certification is required to enter into general remodeling (NAHB, 1996). Only plumbers and electricians are licensed in every state.

Figure 1: Nearly 120,000 Establishments Specialize in Remodeling

Activity Generating More Than 50% of Recipients	Number of Establishments	Total Receipts ($ Millions)	Cost of Materials, Supplies ($ Millions)	Number of Employees In 1992: Q3
Residential General Contracting and Total:	**52,694**	**16,845**	**5,206**	**143,511**
Additions & Alterations	**42,384**	**14,348**	**4,419**	**115.011**
Maintenance & Repair	**10,310**	**2,497**	**787**	**28,500**
Single-Trade Contracting Total:	**64,692**	**15,331**	**5,392**	**190,364**
Additions & Alterations	**27,299**	**7,614**	**2,808**	**85,045**
Maintenance & Repair	**37,393**	**7,717**	**2,584**	**105,319**
TOTAL	**117,385**	**32,176**	**10,598**	**333,875**

In many states with licensure, obtaining a license entails nothing more than registering and paying a fee; no examination is required.

Under such conditions, it is not surprising that business formation rates are high in residential remodeling. Nor is it surprising that survival rates are low. It is well established that the greater risks of dissolution occur in the first few years that a business is in operation (Nucci, 1999). Nationally, five-year survival rates for residential remodeling establishments that were in business in 1987 were 46.7 percent. High formation and dissolution rates are also evident in the skewed age distribution of residential remodeling establishments, where the modal establishment is less than two years of age (Figure 2).

Figure 2: Variable definitions for Logit Regressions

ESTABS@	1=multiestablishment enterprise, 0=single
REG1DUM@	1=census region 1, 0=otherwise
REG2DUM@	1=census region 2, 0=otherwise
REG3DUM@	1=census region 3, 0=otherwise
REG4DUM@	1=census region 4, 0=otherwise
AGE1#	1=year of birth 1986 or 1987, 0=otherwise
AGE2#	1=year of birth 1985, 0=otherwise
AGE3#	1=year of birth 1984, 0=otherwise
AGE4#	1=year of birth 1983 or 1982, 0=otherwise
AGE5#	1=year of birth 1981, 1980, 1979, or 1978, 0=otherwise
AGE6#	1=year of birth 1977 or prior, 0=otherwise
CVDUM1@	1=Construction Receipts (1987) less than $100,000, 0=otherwise
CVDUM2@	1=Construction Receipts (1987) $100,000 to $249,999, 0=otherwise
CVDUM3@	1=Construction Receipts (1987) $250,000 to $499,999, 0=otherwise
CVDUM4@	1=Construction Receipts (1987) $500,000 to $999,999, 0=otherwise
CVDUM5@	1=Construction Receipts (1987) $1,000,000 or greater, 0=otherwise
POPDUM1^	1=MSA population (1987) less than 750,000, 0=otherwise
POPDUM2^	1=MSA population (1987) 750,000 to 1,249,999, 0=otherwise
POPDUM3^	1=MSA population (1987) 1,250,000 to 1,999,999, 0=otherwise
POPDUM4^	1=MSA population (1987) 2,000,000 or greater, 0=otherwise
AACHG*	Percentage change in Residential Remodeling Permits, 1987 to 1992
CAACHG*	Percentage change in Commercial Remodeling Permits, 1987 to 1992
COMCHG*	Percentage change in New Commercial Construction Permits, 1987 to 1992
RESCHG*	Percentage change in New Residential Construction Permits, 1987 to 1992
PCTCEMP^	Construction employment as a share of total employment (1987)
SO@	Percent of Work Subcontracted to Others
NEW@	Percent of Work on New Construction
SURVIVE#	1=establishment in business in 1992, 0=otherwise

III. Theory and Empirical Study of Establishment Survival and Growth

There is a growing body of literature on employment growth and change of individual manufacturing establishments (Leonard, 1987; Evans, 1987; Hall, 1987; Dunne, Roberts and Samuelson, 1988, 1989a, and 1989b; Baldwin and Gorecki, 1991; Davis, Haltiwanger, and Schuh, 1996) and a limited literature examining financial, insurance, and real estate (Troske, 1992, 1996) and retail firms (Pakes and Ericson, 1989; Mayo and Flynn, 1989). This stands in contrast to the lack of comparable studies of residential remodeling establishments.

Dynamic models that explicitly focus on firm entry and exit may be traced to Brock (1972) and Vernon and Smith (1974). These models make the simplifying assumption that all firms are of identical size and there is no entry or exit in the limit. Jovanovic (1982) incorporates firm-specific stochastic variables in an equilibrium model of firm entry and exit. Jovanovic's model assumes that firms enter without knowing their ability to produce output. As firms learn their ability to efficiently produce, inefficient producers scale back and eventually exit the industry, while efficient producers remain active. In contrast Jovanovic's model, Ericson and Pakes (1995) assume that entrants know their ability to produce and that the driving force behind entry and exit is instead the uncertain outcomes of investment.

Jovanovic's learning model has more appeal than Ericson and Pakes' model in the case of residential remodeling because capital (both human and financial) investment in the industry is low. Furthermore, the ease of entry in the industry increases the probability that producers will in fact not know their ability to produce ahead of time. Instead, entry is likely to be opportunistic. Indeed, Pakes and Ericson (1989) themselves concluded that their model is better suited to manufacturing and Jovanovic's better suited to retail, which, like remodeling, involves greater ease of entry and uncertainty about profit and productive efficiency.

Jovanovic's model predicts that survival rates will increase with firm age if size is held constant. Dunne, Roberts and Samuelson (1989) point out, Jovanovic's model also predicts that the mean growth rate of surviving plants that do not fail should be a decreasing function of current size, holding age fixed. His model further predicts that the variance in

growth rates should be decreasing with increases in plant age.

Several studies have lent support to Jovanovic's predictions, where surviving firms' growth is based on employment or output. Evans (1987a, 1987b), Hall (1987), Dunne, Roberts, and Samuelson (1988), and Troske (1996) all find that firm growth decreases with size. Evans also finds that the variance of firm growth rates declines with age. Further, Troske (1996, 732) finds that "firm entry is characterized by a fall in the first two moments of the growth rate distribution and a rise in the first two moments of the relative firm size distribution for a number of periods after entry." His results hold for both the manufacturing and the finance, insurance and real estate industries. Davis and Haltiwanger (1992) and Dunne, Roberts, and Samuelson (1989a) find that plant growth falls with age, with the latter set of authors also finding that the variance of plant growth rates falls with age.

IV. Model Specification, Data Construction, and Variable Definition

Data

We use a new data set linking residential establishments appearing in the 1987 Census of Construction Industries (CCI) to the 1992 Standard Statistical Establishment List (SSEL), both housed at the Census Bureau's Center for Economic Studies (see Calabria 1998 for a detailed discussion of the CCI). The CCI is conducted every five years as part of the quinquennial Economic Census. The CCI covers all establishments with payroll that are engaged primarily in contract construction or construction on their own account for sale and defined in the Standard Industrial Classification Manual as building construction, heavy construction and special trade contractors.[2] The CCI is a partial census including all multi-establishments and all establishments with payroll above $480,000, one out of every five establishments with payroll between $480,000 and $120,000 and one out of eight remaining establishments. Our extract from the 1987 CCI database of approximately 200,000 establishments includes establishments defined above as remodeling specialists.

We use the Bureau of the Census 1992 Standard Statistical Establishment List (SSEL).[3] The SSEL is an annual register of establishments and the mail register for economic census years since 1977, including the CCI. Hence it is a datafile consisting of all

construction establishments with payroll operating in the 50 states, the District of Columbia, Puerto Rico, and other territories (e.g., Guam) for a given year.

We follow residential remodeling specialists from the 1987 CCI by identifying their presence on the 1992 SSEL. (As stated above, the CCI is a partial census and hence the 1992 CCI cannot be used for this purpose.) We define a surviving establishment as one appearing on the 1987 CCI for which we find a Census File Number (CFN) or Permanent Plant Number (PPN) on the 1992 SSEL.[4] Otherwise a 1987 CCI establishment is considered a dissolution.

Specification

Our interest is in seeing how establishment characteristics and market conditions influence survival probabilities and the growth of survivors in the remodeling industry. To do so, we separately model survival probabilities and the growth rates of survivors, controlling for establishment and market characteristics.[5] We study the determinants of survivorship and growth not on a cohort-of-entry, or generational, basis but on a survey cohort basis, that is appearance on the 1987 CCI. That is, given the fact that some establishments survive up to or are created in 1987, what factors influence their subsequent survival over the next five years? And, given their survival over five years, what factors determine the rate and direction of their payroll and revenue changes? Posing these sorts of questions enables us to gain insights into how much longevity influences survivorship and change, and if it gives establishments an advantage in competing with younger establishments for market share.

The construction industry, like many other nonmanufacturing industries such as retail trade and services, depends heavily upon local market demand. Because of the relatively immobile nature of construction products, we argue that construction establishments depend on local demand factors for their success. The period under review corresponds to one in which remodeling expenditures nationally rose steadily through 1990 before falling sharply in 1991 and recovering in 1992 (Figure 3). It therefore spans a period of some distress in the industry. Nevertheless, local conditions in the remodeling industry deviated significantly from the national average.

Figure 3: Logistic Regression Results for Establishment Failure

Variables	Northeast Coefficient		S.E.	Midwest Coefficient		S.E.	South Coefficient		S.E.	West Coefficient		S.E.
INTERCPT	-2.2920	*	0.1518	-0.8507	*	0.1927	-1.1691	*	0.1594	-1.1713	*	0.1918
AVEMP87	0.0094	**	0.0043	0.0071		0.0068	0.0019		0.0045	0.0203	*	0.0053
SICDUM	0.2284	*	0.0289	0.1943	*	0.0364	0.2501	*	0.0340	0.0305		0.0362
SPECDUM	0.0197		0.0748	0.0895		0.0894	-0.2572	*	0.0811	0.4123	*	0.0929
ESTABS	1.0165	*	0.3007	0.6590	*	0.2242	1.4706	*	0.2954	0.8283	*	0.2984
NEW	-0.0021		0.0020	-0.0013		0.0025	-0.0068	*	0.0022	0.0060	**	0.0025
AA	-0.0003		0.0004	-0.0024	*	0.0005	-0.0012	*	0.0004	-0.0006		0.0004
SO	0.0001		0.0001	-0.0002		0.0002	0.0000		0.0000	0.0003	***	0.0001
AGE1	0.8535	*	0.0412	0.5041	*	0.0552	0.8950	*	0.0479	0.4522	*	0.0594
AGE2	0.6557	*	0.0510	0.4085	*	0.0672	0.8059	*	0.0582	0.2188	*	0.0702
AGE3	0.5400	*	0.0550	0.2690	*	0.0709	0.7373	*	0.0607	0.2152	*	0.0687
AGE4	0.2781	*	0.0486	0.1756	*	0.0612	0.4735	*	0.0547	0.0601		0.0625
AGE5	0.1863	*	0.0480	-0.2739	*	0.0598	0.3284	*	0.0533	-0.2577	*	0.0641
PROD	0.0014	*	0.0002	0.0006	*	0.0002	0.0022	*	0.0003	0.0007	*	0.0002
CVDUM1	1.8463	*	0.1005	1.2312	*	0.1417	1.4121	*	0.1088	1.2519	*	0.1248
CVDUM2	1.0692	*	0.0955	0.3108	**	0.1347	0.5110	*	0.1033	0.8007	*	0.1186
CVDUM3	0.6314	*	0.0935	0.0438		0.1293	0.2968	*	0.1015	0.3264	*	0.1150
CVDUM4	0.4745	*	0.0938	-0.1785		0.1240	0.2156	**	0.0997	0.2848	**	0.1126
AGESIZE	-0.0012	*	0.0004	-0.0033	*	0.0007	-0.0008	***	0.0005	-0.0035	*	0.0007
POPDUM1	0.1345	**	0.0550	-0.0335		0.0590	-0.1339	**	0.0605	-0.1835	**	0.0783
POPDUM2	0.1288	**	0.0514	0.1250		0.0848	-0.0715		0.0608	-0.5354	*	0.0919
POPDUM3	0.1379	*	0.0512	0.1130	***	0.0609	0.1766	*	0.0646	-0.2381	*	0.0732
POPCHG	0.3622		0.7792	0.5797		0.6655	1.3756	*	0.3090	1.2631	*	0.4257
PCTCEMP2	4.7793	*	0.9111	-1.7197		1.1961	0.2193		0.6929	-0.4026		1.3751
AACHG2	-0.0871		0.0548	-0.0613		0.0413	-0.0045		0.0305	-0.0854	**	0.0340
NEWCHG2	-0.4246	*	0.0849	-0.2499	*	0.0532	-0.0410		0.0438	-0.0685	*	0.0252
AASTD	0.0000	**	0.0000	0.0000	**	0.0000	0.0000	*	0.0000	0.0000	*	0.0000
NEWSTD	0.0000	*	0.0000	0.0000	***	0.0000	0.0000		0.0000	0.0000	*	0.0000
-2 LOG L	33949.1			21518.4			25936.0			21665.1		
Chi-Square	3212.099*			1959.956*			2074.247*			1130.596*		

*= significant at 1%
**= significant at 5%
***= significant at 10%

In order to test for the effects of local demand, we include variables on MSA population growth and on the mean and standard deviations for residential remodeling and home building permit growth.[6] One would expect growth in permits to be positively correlated with formation and growth, and volatility in permit growth to be negatively correlated with formation and growth. Also to control for location, we run separate models for each of the four-census regions and included MSA-size as dummy variables.

We use the following two specifications to study survival and growth patterns.[7] To model dissolution probabilities, we use a logit model[8] that takes the following form:

$$P(F) = (\exp bZ)/(1+\exp bZ)$$

where P(F) is the probability of establishment dissolution and Z is a vector of variables both on establishment specific characteristics and local market conditions over the period.

To model growth and change, conditional on survival, we use an ordinary least squares regression of the form:

$$PGROWTH = b_0+b_iZ$$

where PGROWTH is the rate of growth in construction employment of establishment *n*, b_0 is an intercept, and b_i is a vector of coefficients on a subset of the Z variables used in the logit.[9]

Variable Definition

The variables used are presented in Figure 2. In the logit, age and size of establishment are included. Age and size are treated as both continuous and categorical variables.[10] Construction receipts are used as the measure of establishment size for the categorical treatment of size. Construction employment is used as the measure of size for the continuous treatment of size, as well as in the interaction term that controls for nonlinearities in the relationship between establishment size and age. Theory predicts (Jovanovic 1982) and empirical studies (Dunne, Roberts, and Samuelson 1989; Troske 1992) have find that age and establishment size are inversely related to survival and directly related to dissolution. Therefore, we expect these variables to have positive coefficients in the logit predicting dissolution. We include an SIC code dummy to measure the influence of contractor type on dissolution probabilities. In general, the industry views specialty trade

remodeling contracting establishments as more stable than general remodeling contractors, so we expect the dummy, which takes a value of 1 for general contractors, to have a positive sign in the logit. To test to see if establishments that specialize in remodeling have higher or lower dissolution probabilities than others, we include several variables that capture information on that specialization. These include a dummy variable for degree of specialization within remodeling and two continuous variables on percent of work in new construction and in additions and alterations. We also include a continuous variable on the share of work subcontracted out to test its effect.

We restrict our analysis to metropolitan areas, as defined by 1990 Decennial Census geography. All information is derived from the SSEL and CCI, except for construction permit activity, MSA population and employment shares. County-level permit data on residential new construction and remodeling is derived from the Bureau of the Census's survey of permit-issuing places. MSA population size is used as an indirect control for urbanization economies (Henderson 1986). The decennial census and the post-censal county population estimates are the source of county population. Construction employment is also included as an indirect control for returns to localization (Henderson 1986). County-level employment is based on data from the Regional Economic Information System, Bureau of Economic Analysis. Along with variable definitions, Figure 2 also lists the data sources for each variable.

The dependent variable, FAILURE, in our regressions is defined as "0" for any 1987 CCI surviving establishment. We set FAILURE equal to "1" for non-surviving establishments.

V. Regression Results and Discussion

Failure Regression Results

The results from the probability of dissolution regressions, by region, are presented in Figure 3. The control group for the logit regression is a single-establishment, general remodeling contractor with 50 to 84.9 percent of its receipts from remodeling. Control group establishments are also those established in 1977 or earlier, generating more than $1 million in construction receipts, and located in an MSA with a 1987 population of 2 million or more. Parameter coefficients are estimated relative to this control group.

The age dummies in the logit regressions display the expected signs and relationships across all four census regions and age classes, with the exception of establishments five to nine years old in the Midwest and West. More specifically, the younger the establishment, the higher the probability of dissolution, as demonstrated by both the increasing magnitude of the parameter estimates as age decreases and the increasing odds ratio for these dummies as age decreases. The size dummies display the same relationship: probability of dissolution declines with increases in the 1987 value of construction work in all cases except for Midwestern establishments with receipts between $500,000 and $1 million. Employment as a measure of size has an ambiguous and mostly insignificant impact on establishment dissolution, probably owing to the use of subcontracting and its correlation with receipts. The interaction of age and (employment) size, however, has a significant, small, and consistently negative impact on dissolution rates across all four regions.

Ownership by a firm with multiple establishments consistently increases the probability of dissolution in the four census regions. Apparently, multiple-establishment residential remodeling firms are more apt to shut down an office than single-establishments, while controlling for age and size. Davis, Haltiwanger, and Schuh (1996), Dunne, Roberts, and Samuelson (1989), and Nucci (1999) report estimates of either higher job destruction rates or higher dissolution rates among single establishment enterprises, when not controlling for size. Dunne, Roberts, and Samuelson do, however, find that multi-establishment plants have higher dissolution rates when controlling for size, as is done here. The Davis, Haltiwanger, and Schuh, and the Dunne, Roberts, and Samuelson results apply only to

manufacturing establishments, whereas Nucci's results apply to all establishments within the SSEL. Nucci did not statistically control for variations by age and size, and this may account for the difference between our findings and his.

Of the other variables that capture establishment characteristics, the degree of remodeling specialization dummy has no significant effect in the Northeast and Midwest regions, a statistically significant and positive relationship in West region, and a statistically significant and negative relationship in the South region. The relative shares of new construction receipts and additions and alterations receipts also have ambiguous and mostly statistically insignificant effects on dissolutions.[11] However, most of the signs on new construction are negative, suggesting that establishments with a higher share of new construction have lower dissolution probabilities. The share of work subbed out by an establishment was also statistically insignificant with respect to dissolution rates. The dummy for type of contractor came in statistically significant in three regions and had a positive sign in all four. As expected, controlling for age, size and establishment type, general contractors exhibit higher dissolution rates than special trade contractors.

Dissolution rates were highest, at 57.0 percent, in the Northeast and lowest, at 47.0 percent, in the Midwest. This is consistent with variations in conditions of housing and labor markets in the different census regions over the 1987 to 1992 period and underscores the importance of local market conditions to establishment survivorship in the industry.[12] Much of the difference in the dissolution rates among the regions is indeed driven by large differences in residential new and remodeling permit change. Changes in remodeling permits varied from a decline of 2.4 percent in the Northeast, for example, to a growth of 58.0 percent in the West. New construction permit changes ranged from a decline of 52.6 percent in the Northeast to a decline of only 4.1 percent in the Midwest. Within region variation in MSA permit growth is much smaller than between region variation. As a result, the estimated coefficients on the measures of local market condition for each region are significantly different from each other. One way to show the cumulative effect of these differences is to run the means of the local market conditions from each region through the parameters of each of the others while holding the establishment means constant. Figure 4 shows the results of this exercise. Reading down the columns shows how the parameter

differences drive fairly large differences in expected incidence of dissolution over a five-year period.

Figure 4: Probability of Failure with Establishment Means Held Constant

		Local Market Means			
		NE	MW	S	W
Regional Parameters	NE	**57.83%**	49.38%	55.39%	67.06%
	MW	41.17%	**46.42%**	49.60%	52.40%
	S	41.27%	51.84%	**54.03%**	46.73%
	W	55.56%	52.72%	51.73%	**53.22%**

Figure 5 shows the influence of the independent variables on the probability of dissolution over a five-year period. To create the figure, all variables except the one in question are set at their means to observe the impact of: (1) an upward shift of 10 percent in the continuous variables and (2) all dummy variables set to 0 but the one in question (which is set to 1). As expected, age and size exert especially strong influences on dissolution probabilities. In the Northeast, for example, the probability of dissolution varies from 46.2 percent for establishments 10 years or older to 66.9 percent for establishments less than two years old. Expected five-year dissolution rates vary from 29.0 percent for those with $1 million or more in receipts to 72.1 percent for those with less than $100,000 in receipts. In contrast, the probability of dissolution by MSA size ranges in a narrow band between 56.1 percent and 59.4 percent. Although a 10 percent increase in any one of the measures of permit change brings about less than a 1 percent change in probability from the baseline case, as we have seen, differences among MSAs in permit change over the period examined are several orders of magnitudes larger.

Figure 5: Independent Influences of Variables on Failure Probabilities

	NE	MW	S	W
Expected value	**57.83%**	**46.42%**	**54.03%**	**53.22%**
AVEMP87	57.92%	46.49%	54.05%	53.43%
SICDUM	60.93%	49.33%	57.58%	53.59%
SICDUM0	55.38%	44.49%	51.39%	52.83%
SPECDUM	57.96%	47.02%	51.95%	55.95%
SPECDUM0	57.48%	44.80%	58.30%	45.68%
ESTABS	57.83%	46.43%	54.04%	53.23%
NEW	57.77%	46.38%	53.82%	53.37%
AA	57.79%	46.15%	53.89%	53.14%
SO	57.84%	46.40%	54.03%	53.25%
AGE1	66.85%	54.01%	62.74%	59.86%
AGE2	62.33%	51.63%	60.63%	54.15%
AGE3	59.58%	48.14%	58.98%	54.06%
AGE4	53.15%	45.82%	52.48%	50.19%
AGE5	50.86%	35.04%	48.86%	42.31%
AGE0	46.21%	41.50%	40.75%	48.69%
PROD	58.09%	46.52%	54.40%	53.36%
CVDUM1	72.12%	62.23%	67.91%	63.61%
CVDUM2	54.32%	39.62%	46.22%	52.68%
CVDUM3	43.42%	33.44%	40.95%	40.93%
CVDUM4	39.61%	28.69%	39.01%	39.93%
CVDUM0	28.99%	32.47%	34.01%	33.33%
AGESIZE	57.76%	46.20%	53.97%	53.03%
POPDUM1	59.38%	45.28%	51.85%	52.84%
POPDUM2	59.24%	49.23%	53.41%	44.08%
POPDUM3	59.46%	48.93%	59.50%	51.48%
POPDUM0	56.10%	46.11%	55.18%	57.38%
POPCHG	57.84%	46.47%	54.30%	53.58%
PCTCEMP2	58.51%	46.21%	54.07%	53.16%
AACHG2	57.83%	46.34%	54.03%	53.10%
NEWCHG2	58.37%	46.44%	54.04%	53.27%
AASTD	57.63%	46.20%	53.93%	53.53%
NEWSTD	58.39%	46.62%	54.02%	52.78%

Note: Change in probabilities for continuous variables estimated at a 10 percent increase.
Change in probabilities for dummy variables estimated at 1 for the variable in question and 0 for the others.

Employment Regression Results

The results from the probability of dissolution regressions, by region, are presented in Figure 6. Coefficients on average employment, age, and construction receipts all have the expected negative sign and are significant across all four regions, with the exception of construction receipts on employment growth for establishments in the South. Consistent with predictions of Jovanovic (1982) and findings by Evans (1987a and 1987b), Davis and Haltiwanger (1992), and Troske (1992) both age and size are negatively correlated with employment growth. Age interacted with size has a positive and significant influence on growth across all regions. Unlike in the dissolution logits, the amount of work subcontracted out is statistically significant, but its impact on growth rates varies across the four regions. Establishments in smaller metropolitan areas, all else equal, have lower growth rates. Increases in remodeling permits at the metropolitan level were associated with increases in establishment growth rates in all regions but the South, but were not statistically significant.

Figure 6: OLS Regression Results for Construction Employment Growth

	Northeast		Midwest		South		West	
Variables	**Coefficient**	**S.E.**	**Coefficient**	**S.E.**	**Coefficient**	**S.E.**	**Coefficient**	**S.E.**
INTERCEP	1.168023 0 *	0.1276	1.4500 *	0.1248	0.8256 *	0.1350	1.3399 *	0.1081
AVEMP87	-0.0559 *	0.0033	-0.0359 *	0.0033	-0.0388 *	0.0029	-0.0115 *	0.0007
SICDUM	0.0716 *	0.0259	0.0547 *	0.0290	0.0669 **	0.0316	0.1346 *	0.0267
CV	-0.0001 *	0.0000	-0.0005 *	0.0001	0.0002 *	0.0000	0.0000 *	0.0000
ESTABS	0.2002	0.2207	-0.2836 ** *	0.1639	-0.4138 **	0.2091	-0.5930 *	0.1174
NEW	-0.0013 ** *	0.0008	-0.0006	0.0009	-0.0029 *	0.0010	-0.0047 *	0.0009
NEWCHG2	0.2062 *	0.0761	-0.1766 **	0.0860	0.1991 *	0.0533	0.1719 *	0.0375
SO	-0.0003 *	0.0001	0.0005 *	0.0001	-0.0002 **	0.0001	0.0000 *	0.0000
AGE	-0.0352 *	0.0033	-0.0341 *	0.0034	-0.0191 *	0.0038	-0.0142 *	0.0029
AGESIZE	0.0046 *	0.0003	0.0039 *	0.0003	0.0018 *	0.0003	0.0003 *	0.0001
POP87	0.0000 ** *	0.0000	0.0000 *	0.0000	0.0000	0.0000	0.0000 **	0.0000
AACHG2	0.0029	0.0435	0.0917	0.0804	-0.0895 ***	0.0495	0.0679	0.0557
PCTCEMP2	0.0994	2.0727	-6.6020 *	2.3778	1.8586	1.9548	-1.6972	1.0653
Adjusted R2	0.1937		0.2192		0.1359		0.1613	
N	4870.2117		2951.2353		3045.2015		3380.9788	
*=	significant at 1%							
**=	significant at 5%							
***=	significant at							

10%

VI. Conclusions and Future Directions

Residential remodeling establishments have high dissolution rates that vary significantly by region. As Jovanovic predicted, and many empirical studies on manufacturing firms and plants have found, both establishment size and age are inversely related to dissolution rates in the remodeling industry. Age and size are also inversely related to employment growth of surviving establishments, as predicted by theory and confirmed by studies of manufacturing plants. Though metropolitan area size has no clear relationship with dissolution rates across regions, it did have a direct relationship with employment growth.

Although local market conditions may have little effect on survival of manufacturing plants, they have powerful effects on survival of residential remodeling establishments. Small changes in local demand for residential construction have relatively modest effects on dissolution rates in the remodeling industry, but large changes, which are common at the local level, have significant effects.

The amount of work that remodeling establishments subcontract, the degree to which they specialize in remodeling, and the share of their work that is devoted to new construction or additions and alterations as opposed to maintenance and repair has no significant or consistent relationship with dissolution across regions. Special trade contractors principally engaged in residential remodeling, however, do have significantly lower dissolution rates than general remodeling contractors, all else equal.

The findings from this paper are provisional. Coefficient estimates across the four region equations are significantly different, suggesting that omitted variables that vary systematically by region influence regional dissolution rates and employment growth rates of survivors. These include the age of the housing stock and the composition and demographic characteristics of households, all of which influence demand for professional remodeling services and which vary significantly across regions. They also include unobserved characteristics of firms, such as their capital structure, that may also vary from region to region. Finally, some of the difference may be caused by mismeasurement of included variables. There may, for example, be regional differences in the types of activities that

require a permit and the share of homeowners who file a permit when one is required.

The data used to fit the models in this paper permit the first glimpse at the incidence and drivers of establishment dissolution in the residential remodeling industry. Further empirical study will clarify the nature of the forces that influence establishment survival and growth in the remodeling industry and allow us to conduct comparable studies on other detailed construction industries. The same data can be used to examine these factors in home building, nonresidential construction, and heavy construction industries, controlling for these and other characteristics.

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[1] Residential remodeling is essential to preserving and improving the nation's nearly $8 trillion investment in residential structures. The Commerce Department estimated that remodeling expenditures on residential properties and grounds increased from $94 billion in 1987 to $104 billion in 1992 (the corresponding value for 1997 is about $118 billion). Although the residential remodeling receipts of remodeling contractors that year are unknown, homeowners reported that 85 percent of their spending was for work done by contractors. Extrapolating to spending by rental property owners, contractors received at least $100 billion in remodeling receipts from residential property owners. The remodeling industry therefore plays an important role in maintaining, repairing, altering, and adding to the standing housing stock.

[2] It should be noted the CCI does not identify establishments as individual work sites, but rather as relatively permanent offices from which construction is managed.

[3] For details on the SSEL see U.S. Bureau of the Census 1979.

[4] The IRS assigns a CFN as a tax identifier for single establishments that have paid employees. In the case of an ownership change, the CFN will change. The PPN, however, should not change. By using the double matching procedure, we should catch establishments that survived but changed ownership. Previous studies show that such matching methods are reliable, but still leave measurement error.

[5] The approach we take deviates from other approaches to empirically estimating establishment survivorship and change functions. Past studies have deployed various techniques to examine employer growth and change in manufacturing. Until Evans and Hall (1987a and 1987b) examined establishments that failed as well as succeeded, most studies were restricted to examining growth rates only of survivors (Hart and Prais, 1956; Mansfield, 1962; Hymer and Pashigian, 1962; Singh and Whittington, 1975; Ijiri and Simon, 1977; Leonard 1987). Dunne, Roberts, and Samuelson (1989) rejected the implicit presumption in these papers that the growth process of successful plants is independent of the failure of unsuccessful plants. They also rejected the use of Tobit models and Heckmann procedures as an instrument for the latent distribution of potential growth rates because these require assumptions about that distribution that are known not to hold. Dunne and his colleagues opted instead to take a cell-based regression modeling approach to consistently estimate parameters of the growth rates (means and variances) for failing and nonfailing plants in each cell. Troske (1996) decided not to take a cell-based or a Tobit approach. Instead, he ran regressions on firm growth and the log of relative firm growth just after entry for all and continuing firms and then of firm and relative firm growth before exit for failing firms.

[6] Data on new construction permits are included to overcome some of the well-known shortcomings of the remodeling permit series.

[7] The single equation specification is a reduced form equation of a more general explanatory structure.

[8] After an initial investigation of the characteristics of the distributions of many of the independent variables, such as value of work performed and percentage of work that is new, we concluded that the logistic function represents a more accurate picture of the underlying data than the cumulative normal distribution. Accordingly, we concluded that a logit model would more accurately capture the properties of the theoretical model than would a probit. For a fuller discussion of the merits and limitations of the logit model, the reader is referred to Chapter 11 of Kmenta (1986) and Maddala (1983).

[9] For the OLS regression on survivors, we used a pared down set of these variables. We dropped the dummy variables and entered them as continuous variables. The switch away from dummy variables was to avoid violating Bureau of the Census disclosure rules.

[10] Age is estimated based on the year the establishment first appeared in the SSEL. Age is left-censored at age 10, as all establishments formed before 1977 do not have pre-1977 formation date. Therefore, all establishments greater than ten years old in 1987 were assigned the age of ten for the purposes of our estimations.

[11] The ambiguous results observed for new construction is likely to be influenced by our sample design, that

is new construction is right-censored at 50%.

[12] House prices, housing production, and employment in much of the Northeast plummeted whereas the Midwest was relatively stable. The business cycle also took a heavy toll in the South and West, but not quite as large a toll as in the Northeast.