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Business Dynamics on American Indian Reservations: Evidence from Longitudinal Datasets

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Abstract

We use confidential US Census Bureau data to analyze the difference in business establishment dynamics by geographic location on or off of American Indian reservations over the period of the Great Recession, and subsequent recovery (2007-2016). We geocoded U.S. Census Bureau's Longitudinal Business Database, a dataset with records of all employer business establishments in the U.S. for location in an American Indian Reservation and used it to examine whether there are differences in business establishment survival rates over time by virtue of their location. We find that business establishments located on American Indian reservations have higher survival rates than establishments located in comparable counties. These results are particularly strong for the education, arts and entertainment, wholesale and retail, and public administration industries. While we are not fully able to explain this result, it is consistent with the business establishments being positively selected with respect to survival given the large obstacles necessary to start a business on a reservation in the first place. Alternatively, there may be certain safeguards in a reservation economy that protect business establishments from external economic shocks.

Keywords*: Entrepreneurship, Great Recession, American Indians, Employment, Business Deaths

1 Introduction

In the United States, employment growth is driven primarily by new business start-up and entrepreneurship activities. Entrepreneurship activities have often been seen as an important pathway to employment creation and economic development in particular for parts of the country that have persistent unemployment. One important example of this is American Indian reservations, which have historically had some of the highest rates of unemployment and under-employment in the U.S. Generations of policy-makers, tribal leaders and academics have explored various obstacles to business development on reservations. The lack of economic opportunity on American Indian reservations was an important justification for the passage of the Indian Gaming Regulatory Act (1988), for instance, which was intended to stimulate revenue but also employment opportunities on American Indian reservations. However, a relative shortage of reliable business data for reservations has presented substantial limitations.

Indeed, Cornell and Kalt (1992) discuss the possibility of establishing micro-enterprises as a viable strategy for American Indian economic development on reservation lands. The authors view private micro-enterprises as a strategy that is consistent with the scarcity of capital in Indian reservations. The authors acknowledge that this is similar to the economy of much of the rural and small town United States, where raising large amounts of capital is difficult, but capital tends to be even scarcer in reservations.

In their pioneering work, Cornell and Kalt established a connection between tribal governance, institutions and economic development success in their influential book, "What Can Tribes Do?" This book discussed two findings that have permeated much of their work: the separation and limitation of political powers; and the separation of electoral politics from day-to-day management of business enterprises (Cornell and Kalt, 1992, p.21 and 26). In subsequent work, Cornell and Kalt (1995) examined differences across the Apache and Sioux tribes and their economic development success. They arrived at the conclusion that constitutional form and cultural match was an important determinant in the political legitimacy and eventual long-run economic development outcomes. In the case of the Apache, there was a fortuitous match between political and legal authority at the tribal level and cultural norms; for the Sioux there was no match and poor economic development outcomes have ensued. This analysis, based on case studies, reinforced their prior findings.

Following their conceptual models and case studies, Cornell and Kalt (2000) embarked upon an empirical analysis of American Indian economic development. Cornell and Kalt examined the determinants of economic development on American Indian reservations using data from the U.S. Census and the Bureau of Indian Affairs. Their analysis serves as the foundation for all subsequent research which takes as a basis that the separation of powers, checks on tribal government authority over business operations authority are important factors for long-run success. They have shown that there is an important link between reservation institutions and economic development success on reservations. In their seminal empirical analysis, they identified several characteristics that tend to describe the most successful American Indian reservations, governments and economic activities. Examining 67 of the largest American Indian tribes, they find that there is a strong relationship between having a strong executive and a strong legislative branch on reservation-level employment. Additionally, they found that

a congruence in the political institutions at the tribal level and cultural institutions are often associated with better economic outcomes.

Building upon this research, others have identified potential obstacles to business creation, expansion and success. For instance, trust lands are notoriously difficult to use as collateral with commercial mortgage lenders. As a result, land ownership does not necessarily imply that tribal or individual American Indian landowners are able to access the capital necessary for investment in new business ventures (Carlson, 1981). However, Akee (2009); Akee and Jorgensen (2014) have found that tribes are able to innovate and devise solutions that allow for housing and business development to converge in value to that of non-reservation areas.

Nevertheless, many untested hypotheses and questions about reservation-based firms remain unanswered. While economists have been able to study minority or other small population-base entrepreneurship in the past (Fairlie and Meyer, 1996; Fairlie and Robb, 2010) this has not been possible for the American Indian population due to small sample sizes or the lack of firm or establishment location information. As a result, very little is known about the determinants of business start-up and success for American Indians in general. Many of the established findings and results for other groups on business-start up and determinants of entrepreneurship are woefully understudied in the American Indian context. For instance, it is well-established that parent's prior entrepreneurship is an important determinant in business success; additionally access to capital is an important input as well.

In recent years, improvements in data infrastructure has made it easier to identify and track firm and establishment creation, expansion and closures. For instance, the the Census Bureau's Longitudinal Business Database and Integrated Longitudinal Business Databases have made it possible to reliably observe birth and longevity for almost all employer and non-employer establishments nationwide. In this study we are using an version of the LBD that was augmented with better geospatial data to make it possible to identify whether these firms or individual establishments are located on or off of American Indian reservations. Previously, data was only available at the county or state-level, which obscured reservation location of business establishments. It is now possible to test a series of hypotheses about the viability, composition and competitiveness of firms on and off of reservation lands using national-level data.

Our current analysis focuses on a core question that results from the Cornell and Kalt research agenda. Specifically, we ask whether there is any difference in establishment survival on or off of American Indian reservations. We examine business establishment survival over the period of the Great Recession and subsequent recovery (2007-2016) for establishments located on American Indian reservations as compared to establishments in all other counties. Given the lessons learned from the Cornell and Kalt research regarding the differences in institutional political structures, accountability and access to finance for tribal governments and reservations, we expect there to be significant differences in business survival for reservation-based establishments. There are significant obstacles to business start-up on reservations in terms of access to capital and, potentially, additional bureaucracy at the tribal level. This would imply that there is positive self-selection at birth; only the viable ideas are able to get off the ground. On the other hand, customer loyalty and the lack of competitors may improve establishment success for those that are able to open up on reservations. Both of these factors would argue for higher

survival rates among existing firms in reservations. Conversely, access to capital during operations and other institutional factors may inhibit reservation firms' ability to overcome shocks and cause lower survival rates.

In order to conduct this analysis, we link the U.S. Census Bureaus Standard Statistical Establishment List (SSEL) and Longitudinal Business Database (LBD) of establishments with employees (employer establishments).[1] We geocode (i.e., assign longitude and latitude coordinates to) the address of each establishment and use the location coordinates to create new variables that identify whether an establishment is located in an American Indian reservation (and if so, which one). We were able to geocode establishments in existence between 2007 and 2012 and are able to use the LBD as a geocoded panel data set for this time-frame. As a result, we can examine whether firms have a differential probability of going out of business by virtue of their location on or off of reservation lands.

In this analysis, we find that, on average, location on a reservation is associated with higher business establishment survival rates than is location off of reservations. These results are robust to the inclusion of the age of the establishment and other control variables such as average regional educational attainment and poverty rates. We also separate the analysis by two-digit North American Industry Classification System codes (NAICS) and find broadly similar results for the education, arts and entertainment, accommodations and food, wholesale and retail, information and finance, and the public administration industries. We find that the age of the business establishment has a positive effect on the survival of establishments over time but that each year has a diminishing positive effect on survival. This holds for all industries except for the Arts and Entertainment industries, for which the effect is linear.

This research will serve as the beginning of additional analyses that will focus more directly on the broader determinants of business survival and creation. There are several additional hypotheses that should be investigated which also follow directly from the Cornell and Kalt research. For instance, we will examine in future work whether there are important differences for existing reservation-based establishments based upon the specific mix of tribal government *institutions* on each reservation. In future analysis we will extend this research to show whether different levels of government accountability and/or access to capital affects long-run business duration as predicted by the work of Cornell and Kalt.

The next section provides a description of the data used and the geocoding for reservation location. Section 3 describes our empirical strategy and Section 4 provides the results. In Section 5 we discuss the results and conclude.

2   Data Description

We primarily use the U.S. Census Bureau Center for Economic Studies Longitudinal Business Database (LBD), which is available to researchers as a restricted-use data set. From 1975 on,

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[1]Our prior research using these datasets (Akee et al., 2017) identifies differences in the distribution of firms by industry and the total employment for establishments by location on or off of reservations in 2010. We find that reservations have a similar industry mix of establishments but fewer total establishments per capita. On the other hand, we find that establishments in the casino and government sectors give reservations an edge in total jobs.

the LBD contains annual employment, payroll, and industry classification data for all workplace establishments that file social security taxes or withhold federal payroll taxes for their employees (Jarmin and Miranda 2002; Fairman et al. 2008; 2016 personal communication from Kristin McCue of the U.S. Census Bureau). We link individual business establishments using their unique identification number across the years 2007-2012.

The LBD records are linked to establishment data in the SSEL maintained by the U.S. Census Bureau in order to obtain the establishment location information. We also use SAS procedures and geographic data files to conduct our own geocoding of the establishment addresses.[2]

Once we have the addresses for the business establishments, we are able to assign whether the business is located on or off a federally-recognized American Indian reservation. We use their geographic coordinates and TIGER/Line Shapefiles for reservation boundaries in order to identify these geographic units. Finally, we override a small percentage of these reservation codes in cases where the establishments 5-digit ZIP code is inconsistent with our geocoding results.

In this analysis we restrict our sample to only federally recognized reservations in the contiguous 48-states. The analysis is based on all employer firm establishments that were operating at some point between 2007 and 2012. We use establishment-level observations for all firms in existence at some point between 2007 and and 2012, and record firm failure and age at failure during the observable period. While we could only geocode establishments in existence between 2007 and 2012, the LBD, in each wave, provides information on when each establishment was first and last observed; these dates range between the first year of the LBD (1975) and the most recent wave available (2016 in this study). These data make it possible to compute age in 2007 (when we first observe location for all establishments in existence that year) and each subsequent year including the year of eventual failure (up to 2016). Establishments not in existance in 2007 are born during the observation period (thus age first observed is 0), while those that do not fail during the observation period are treated as top-censored in 2016.

We provide descriptive statistics in Table 1 below. Column 1 provides the means for all business establishments combined. Column 2 provides the means for the business establishments in non-reservation counties. Column 3 provides the means for establishments located on reservations.[3] For all observations in total, the average age at death (or censoring) is about 13 years and about 40% of all establishments die at some point in our observation period. The average initial age at which we observe an establishment is about 7 and a half years old. The poverty rate in the local community is on average 14% and about 30% of the local population has a BS degree or higher. About 15% of the observations are rural locations while 10% are

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[2]Multiple considerations led us to this decision. Although the SSEL contains some Census-provided geolocation data, this information was not ideal for our purposes. Many SSEL records have missing latitude-longitude or Census block data, so we attempt to expand the set of records with usable geocodes. In addition, we have only limited documentation explaining how the geographic coordinates and Census block codes in the SSEL were determined. We use SAS procedures to geocode the physical addresses where available and the mailing address otherwise (on the assumption that the mailing address is also the physical address for those records). For more information, see (Akee et al., 2017).

[3]Note that we show the table of means completely disaggregated for these same three groups by each industry in Appendix Tables A1, A2 and A3.

remote (which indicates the furthest from urban centers and sparsest locations among rural counties according to Economic Research Service, US Dept of Agriculture Rural-Urban Continuum Code Definitions). These two variables are not mutually exclusive; rural locations have a RUCC score of 4 or more while remote locations have a score of 7 or more.[4] Finally, less than 1 percent of the observations are located on reservations in this data. This is not surprising given the small population size of American Indians in general (which is also approximately 1 to 2 percent of the population).

In the next column we provide the means for establishments located off of reservations; we find that the characteristics are quite similar to those in column 1. For the observations located on reservation in column 3, however, we do notice some differences from the previous two columns. The age at death or censoring is almost half a year larger and there is a slightly lower probability of business death during the recession years. The average age of the establishment at the start of the panel is higher at 8 years and the average poverty rate in the local communities is higher at 18%. The population has a lower percentage of adults with a BS degree or more at only 20% and a larger proportion appear to be rural and remote as compared to the all other counties.

3   Empirical Strategy

Our analysis uses the longitudinal nature of the data set and examines the death of business establishments over the Great Recession located on American Indian reservations as compared to business establishments located in (non-reservation) county areas. As a result, we employ a proportional hazard model to identify the probability of survival of the business establishment in each subsequent year.

We include all establishments that are present in the data across the years 2007-2012, however are able to track survival up to year 2016. Our outcome variable measures whether the establishment operates in a given year and it is considered as censored in 2016 for all establishments that are still in existence.

$$\Delta \ln \frac{h(t)}{h(0)} = \beta_1 \times X_i + \beta_2 \times Reservation Location \tag{1}$$

In the equation above h(t) indicates that an establishment does not survive into time period t. We include a vector of covariates which is denoted by X. However, in our most basic specification the vector X is empty and we report only the differential establishment survival rates for being located on or off of the reservations. In additional specifications, we control for the age of the establishment and age squared on the first year observed in the vector X.[5] Finally, in a third specification we include the same age control variables as well as for poverty

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[4]These are based on Rural-Urban Continuum Codes or RUCC codes that exist for every county in the U.S.

[5]In additional analysis not reported here we only use the number of years present in the panel data which ranges from 1-5, instead of taking advantage of LBD reported years first and last observed, and find very similar results.

Table 1: Table of Means for All Industries

	All Obs	Off Reserve	On Reserve
Highest age	13.09	13.08	13.67
	(10.85)	(10.85)	(10.93)
Died in Panel	0.40	0.40	0.38
	(0.49)	(0.49)	(0.49)
Age	7.63	7.63	8.01
	(9.63)	(9.63)	(9.73)
Poverty Rate	13.92	13.91	18.16
	(5.04)	(5.02)	(7.95)
% BS or More	0.30	0.30	0.21
	(0.11)	(0.11)	(0.07)
Rural	0.15	0.15	0.63
	(0.36)	(0.36)	(0.48)
Remote	0.10	0.10	0.44
	(0.29)	(0.29)	(0.50)
On Reservation	0.00	0.00	1.00
	(0.05)		

Standard deviations in parentheses. Data have been appropriately rounded as required by U.S. Census Bureau rules for confidentiality. All analyses provided have been approved by the U.S. Census Bureau to ensure no confidential information has been disclosed.

levels, adult educational attainment measures, and rural or remote status indicator variables.

The Cox Proportional Hazard Model is a standard one for examining business and firm deaths over time. The model requires several assumptions, the most important being that there is an independence of individual establishments in the analysis and survival times. We attempt to control for potentially correlated economic shocks in a region by including population characteristics for the geographic units studied in the regression. This allows us to separate shocks across different regions that may result in above average firm closures.

4   Research Results

In Table 2 we provide the results from the Cox Proportional Hazard model as described above in Equation 1. The outcome is establishment death in a particular year between 2007 and 2012. In the table below, we pool all observations across all industries in the data; subsequent analysis will separate out the observations by two-digit North American Industry Classification System (NAICS) industries.

The first column provides the simplest model specification where we include a single

right hand-side covariate – a dummy variable for whether a firm is located on a reservation. The estimated coefficients are provided in odds-ratio form; the smaller the size of the coefficient (smaller than one), the lower the likelihood that the particular characteristic is associated with business death. Conversely, odds-ratios that are larger than one indicate that the covariate is associated with a higher likelihood of death. We find that the odds-ratio for a business establishment that is located on a reservation is less than one and statistically significant in all three specifications in the table; we provide Z-scores for the estimated coefficients in parentheses in this table. This indicates that residing on a reservation is associated with a lower probability of business death over the observation period than a similar business establishment anywhere outside of a reservation. Each column in the table below adds additional covariates to the model. In column two, we include the age of the business (measured in 2007) as an additional control. The odds-ratio is smaller than one and it is statistically significant indicating that older business establishments, on average, are less likely to die in any given year over the observed time period. The next row provides the age squared variable which has an odds-ratio of one in all cases. It is also statistically significant. We have rounded the odds-ratio to two significant decimal places as required by the U.S. Census Bureau. Jointly the two age parameter estimates imply a convex survival curve consistent with the literature. This means that age increases the chances that a business establishment will survive into the next period but at a decreasing rate.

We find that rural establishments are also less likely to die over this time period as compared to more urban establishments.[6] On the other hand, establishments in much more remote communities are slightly more likely to die over this time period. We also observe that the probability of establishment death increases slightly for communities with higher proportion of adults with a college degree or more. The relationship between the local community poverty rate is equal to one and statistically significant. We have rounded the odds-ratio to two significant decimal places as required by the U.S. Census Bureau; these results indicate that higher local levels of poverty are associated with higher probability of business deaths.

Table 3 provides the same analysis as previously except that we have disaggregated the data into two-digit NAICS categories. This table provides analysis for the Education, Construction, Manufacturing and Transportation industries. Location on a reservation is associated with a lower probability of business establishment deaths for the education industry. While location on reservation is also associated with lower probability of business deaths for manufacturing and transportation, the odds-ratios in those regressions are not statistically different from one. For the construction industry, the odds-ratios are greater than one and statistically significant in column 6; this indicates that business establishments located on reservations in the construction industry have a higher likelihood of going out of business than those located off of reservations.

We again see across all four industries that the older a firm in 2007, the lower its chances are of going out of business. Once again, the odds-ratio coefficient for age squared is greater than one but due to rounding requirements we are unable to show the actual ratio. Nevertheless, it is statistically significant in these regressions. In general the relationship between rural community,

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[6]Note that rural community identifier is based on the U.S. Department of Agriculture Rural Economic Research Service Rural-Urban Continuum Codes (RUCC) codes that exist for every county in the U.S.; larger values indicate a community is more remote. Any community with a score of 4 or higher is classified as "rural" while a score of 7 or higher is classified as "remote".

Table 2: Cox Proportional Hazard Models for Business Establishment Failure with Odds-Ratios for All Industries

	All Industries		
Panel A	(1)	(2)	(3)
On Reservation?	0.95	0.92	0.91
	(5.40)**	(7.65)**	(0.01)**
Age		0.77	0.77
		(982.1)**	(983.2)**
Age Squared		1.00	1.00
		(90.80)**	(91.18)**
Rural Community			0.93
			(35.39)**
Remote Community			1.01
			(4.45)**
% with BS +			1.03
			(6.48)**
Poverty Rate			1.00
			(28.08)**
Observations		11,400,000	

Note: The outcome variable is business establishment death in a given year. All coefficients are odds-ratios in the table. We provide Z-scores in parentheses. Data have been appropriately rounded as required by U.S. Census Bureau rules for confidentiality. All analyses provided have been approved by the U.S. Census Bureau to ensure no confidential information has been disclosed. * significant at 5%; ** significant at 1%

remote community, percent with a college degree or more and overall poverty rates appears to be very similar to that found in Table 2 for the pooled regressions across all industries.

Table 3: Cox Proportional Hazard Models for Business Establishment Failure with Odds-Ratios for Selected Industries

	Education			Construction			Manufacturing			Transportation		
Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
On Reservation?	0.82	0.80	0.50	1.02	1.01	1.10	0.94	0.92	1.05	0.95	0.95	1.02
	(0.08)*	(0.08)*	(0.05)**	(0.03)	(0.03)	(0.03)**	(0.05)	(0.05)	(0.06)	(0.04)	(0.04)	(0.04)
Age		0.79	0.79		0.77	0.77		0.76	0.76		0.77	0.77
		(0.00)**	(0.00)**		(0.00)**	(0.00)**		(0.00)**	(0.00)**		(0.00)**	(0.00)**
Age Squared		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
		(0.00)**	(0.00)**		(0.00)**	(0.00)**		(0.00)**	(0.00)**		(0.00)**	(0.00)**
Rural Community			0.93			0.93			0.92			0.94
			(0.02)**			(0.01)**			(0.01)**			(0.01)**
Remote Community			0.94			0.97			1.08			1.05
			(0.03)*			(0.01)**			(0.01)**			(0.01)**
% with BS +			0.74			0.78			1.87			1.01
			(0.04)**			(0.01)**			(0.06)**			(0.03)
Poverty Rate			1.00			1.01			1.01			1.01
			(0.00)			(0.00)**			(0.00)**			(0.00)**
Observations		146,000			1,110,000			420,000			348,000	

Note: The outcome variable is business establishment death in a given year. All coefficients are odds-ratios in the table. Standard errors in parentheses. Data have been appropriately rounded as required by U.S. Census Bureau rules for confidentiality. All analyses provided have been approved by the U.S. Census Bureau to ensure no confidential information has been disclosed. * significant at 5%; ** significant at 1%.

Table 4 provides a continuation of the Cox Proportional Hazard model for the Healthcare, Arts and Entertainment, Accommodations and Food, and the Food and Retail industries. Across all four industries and all specifications, the odds-ratio for location on a reservation is less than one and statistically significant. This indicates that reservation location is associated with a lower incidence of business death for these industries over these years. The other odds-ratios for the other covariates are quite similar to our prior findings. We note that in the regressions for the Arts and Entertainment industries that the odds-ratio for the age squared variable is not statistically significant; indicating that the age-survival profile is not convex for this particular industry which is in stark contrast to our results for all other industries.

Table 4: Cox Proportional Hazard Models for Business Establishment Failure with Odds-Ratios for Selected Industries

	Healthcare			Arts and Entertainment			Accommodation and Food			Wholesale and Retail		
Panel C	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
On Reservation?	0.91	0.96	0.95	0.80	0.80	0.76	0.91	0.95	0.91	0.89	0.87	0.86
	(0.04)*	(0.04)	(0.04)	(0.06)**	(0.06)**	(0.06)**	(0.03)**	(0.03)	(0.03)**	(0.02)**	(0.02)**	(0.02)**
Age		0.76	0.76		0.78	0.78		0.76	0.76		0.77	0.77
		(0.00)**	(0.00)**		(0.00)**	(0.00)**		(0.00)**	(0.00)**		(0.00)**	(0.00)**
Age Squared		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
		(0.00)**	(0.00)**		(0.00)	(0.00)		(0.00)**	(0.00)**		(0.00)**	(0.00)**
Rural Community			0.98			0.93			0.97			0.92
			(0.01)*			(0.02)**			(0.01)**			(0.00)**
Remote Community			1.01			1.01			1.10			1.05
			(0.01)			(0.02)			(0.01)**			(0.01)**
% with BS +			0.83			0.69			0.76			1.35
			(0.02)**			(0.03)**			(0.01)**			(0.02)**
Poverty Rate			1.01			1.00			1.00			1.00
			(0.00)**			(0.00)*			(0.00)**			(0.00)**
Observations	1,100,000			184,000			980,000			2,160,000		

Note: The outcome variable is business establishment death in a given year. All coefficients are odds-ratios in the table. Standard errors in parentheses. Data have been appropriately rounded as required by U.S. Census Bureau rules for confidentiality. All analyses provided have been approved by the U.S. Census Bureau to ensure no confidential information has been disclosed. * significant at 5%; ** significant at 1%.

Table 5 provides the Cox Proportional Hazard ratio regressions for the following broad industry categories: Information, Finance and Real Estate; and Professional, Management and Administrative services; and Public Administration and Other Services; and Agriculture, Mining and Utilities industries. The odds-ratio in the information and finance industry is less than one and statistically significant which indicates that reservation establishments in this industry are less likely to die than those located in adjacent counties over this time period. The same holds for public administration and other industries as well. For professional and other services as well as for agriculture, mining and utilities the odds-ratios are all close to one or larger than one, however, none are statistically significant. Again, the other covariates appear to be approximately the same size and statistical significance as found in previous tables.

Table 5: Cox Proportional Hazard Models for Business Establishment Failure with Odds-Ratios for Selected Industries

Panel D	Info, Finance, Real Estate			Prof, Manage, Admin Svs			Public Admin and Other			Agri/Mining/Utilities		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
On Reservation?	0.95	0.85	0.82	1.00	0.98	1.03	0.82	0.80	0.78	0.99	1.02	1.06
	(0.03)	(0.03)**	(0.03)**	(0.03)	(0.03)	(0.03)	(0.03)**	(0.03)**	(0.03)**	(0.03)	(0.03)	(0.03)
Age		0.78	0.78		0.76	0.76		0.76	0.76		0.75	0.75
		(0.00)**	(0.00)**		(0.00)**	(0.00)**		(0.00)**	(0.00)**		(0.00)**	(0.00)**
Age Squared		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00
		(0.00)**	(0.00)**		(0.00)**	(0.00)**		(0.00)**	(0.00)**		(0.00)**	(0.00)**
Rural Community			0.85			0.93			0.91			0.93
			(0.01)**			(0.01)**			(0.01)**			(0.01)**
Remote Community			0.96			1.01			0.96			1.01
			(0.01)**			(0.01)			(0.01)**			(0.01)
% with BS +			1.22			0.94			1.01			1.25
			(0.02)**			(0.01)**			(0.02)			(0.05)**
Poverty Rate			1.00			1.00			1.01			1.01
			(0.00)**			(0.00)			(0.00)**			(0.00)**
Observations	1,530,000			1,970,000			1,080,000			318,000		

Note: The outcome variable is business establishment death in a given year. All coefficients are odds-ratios in the table. Standard errors in parentheses. Data have been appropriately rounded as required by U.S. Census Bureau rules for confidentiality. All analyses provided have been approved by the U.S. Census Bureau to ensure no confidential information has been disclosed. * significant at 5%; ** significant at 1%.

Overall, while we find that firms in reservations are more likely to survive in any given year between 2007 and 2016, on average, the pooled result masks some heterogeneity across industries. In Figure 1 we provide the transformed values of the odds-ratios from the first columns of Tables 3 to 5. We took the natural log of these odds-ratios (and multiplied them by negative one) to provide the differential probability of business survival by industry for reservation establishments. The black columns are statistically significant while the gray columns are not. This provides a more succinct presentation of the differences in business survival by industry and location on or off of a reservation.

The figure shows that lodging and food establishments located on reservations have about a 4% higher probability of survival into the next year on average than an establishment located in an adjacent county. For the arts and entertainment industry it is as large as almost 10%. Clearly this is related to the casino and gaming industry. The educational and public administration industries have almost as high a probability of survival over time as well. Establishments in all other sectors appear to survive at about the same rate in reservations as they do elsewhere.

Figure 1: Differences in Business Survival Probability for Reservation-Based Establishments by Industry
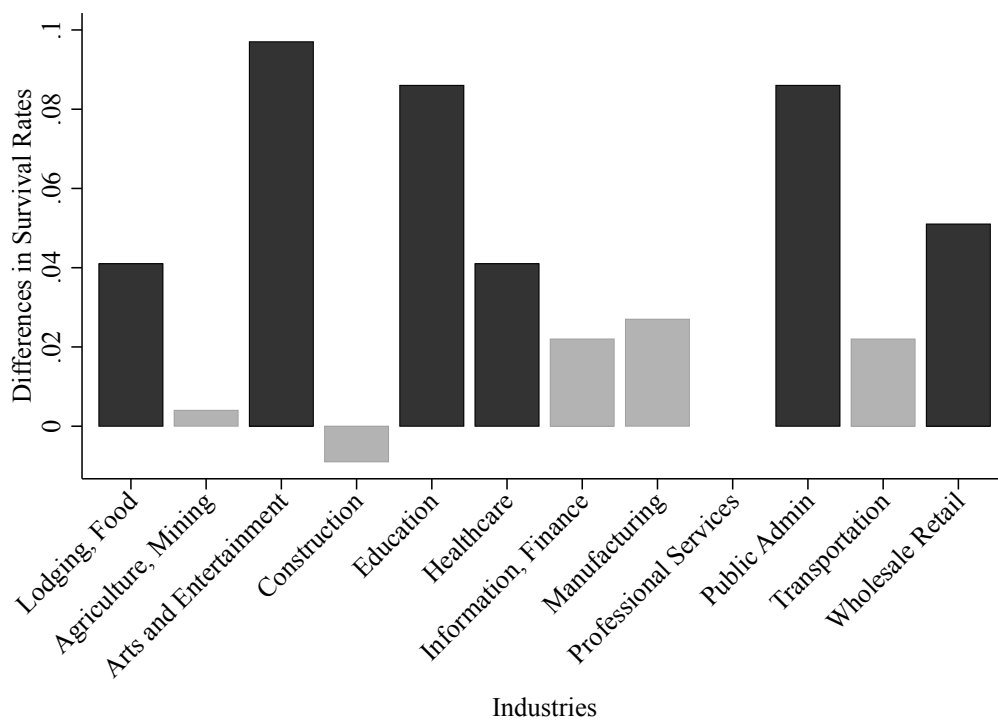
Note: This figure is based on the first column of Tables 3-5 for the odds-ratio on reservation location. We have transformed the odds-ratios using the log transformation and provide this as an additional method to visualize the differences. The gray bars are not statistically significant, while the black bars are statistically significant. We have also transformed the data so that we are now showing survival; the previous tables showed the probability of business death.

5   Discussion and Conclusion

Our work in this paper builds upon the Cornell and Kalt research agenda that identified differences across American Indian reservations in employment and incomes. Our contribution focuses on business establishment survival over the Great Recession and subsequent recovery (2007-2016) by location on reservations.

In this work we have created the first comprehensive data set that provides a dynamic analysis of business establishments located on and off of reservations. We follow business survival for reservations and compare it to non reservation establishments in the lower 48 U.S. States. Prior work has not been able to identify the location of business establishments by reservation location due to a lack of geographic identifier information for the reservation geographic areas. Our geocoding of the ILBD and LBD data allow for this analysis for the first time. This paper uses the LBD to focus on employers.

Inherent in our analysis is the idea that reservation-based establishments differ from non-reservation establishments due to the institutional climate in reservations. For instance, trust land tenure often makes it difficult for individuals to access capital through standard commercial mortgages as the land may not be used as collateral. In other areas, overlapping legal jurisdictions within Public Law 280 states may create ambiguities and additional difficulties for establishments located on reservations. Finally, many tribal governments may not have extensive commercial or business codes to govern the activities and operations for establishments located on the reservation.[7] For all of these reasons, there is good reason to expect that the business success and survival rates for reservation-based business establishments should differ from their off-reservation counterparts. The generally more difficult climate and access to capital might suggest that reservation firms would be less able to overcome negative shocks and might be expected to show lower survival rates. Alternatively, for those establishments that are able to get a strong foothold on a reservation, the lack of competitors and customer loyalty may, in fact, predict for some long-term business stability and success. In reservations, it might also be the case that a higher barrier to entry limits the number of business ideas that come to fruition and are able to become employers. This positive self-selection might predict higher survival rates conditional on being an employer at some point in time.

We, in fact, find some striking evidence for this hypothesis. Establishments located on reservations over the period of the Great Recession and subsequent start of the recovery are about 5% more likely to survive on average than their off-reservation counterparts. This striking difference persists even when we control for other characteristics such as age of the establishment and local community characteristics such as poverty and education levels. Additionally, we find even stronger differences across certain industries such as the education, arts and entertainment, wholesale and retail, and public administration industries.

While uncovering the reasons for these differences is not possible in this preliminary analysis, we do have a couple of hypotheses that merit further investigation. For instance, given that we know the business climate on reservations may already be quite difficult to navigate, then

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[7]Very few tribal governments, for instance, have adopted the Uniform Commercial Code that all 50 U.S. states have adopted to facilitate business transactions and other activities. These codes standardize business practices and the scope of legal actions between different parties.

any establishments that survive into our data are probably positively-selected to begin with. This may contrast with establishments located off of the reservation which may have lower start-up and entry costs than reservation-based establishments. As a result, these businesses located on reservation may be positively selected and more resilient than their non-reservation based counterparts; they may be better able to weather economic shocks – such as the Great Recession. This could have negative consequences for development as fewer ideas get a shot at becoming firms in reservations; this could come at the cost of significant limitations in the potential for innovation. While we have not devised a test of this in this preliminary work, the fact that the reservation survival differential does not change after inclusion of firm age suggest that the higher survival rates are not concentrated among newborn firms. More deliberate analysis can test this hypothesis directly and also examine churn more explicitly (accounting for births and replacement not just survival of existing stock). More explicit analysis can also focus on specific institutional features and their ability to explain the reservation survival gap, as well as implication for growth and development.

Alternatively, the establishments that have the highest differential probability of survival are also in industries related to casino operations and tourism. The relatively high rate of firm survival over the Great Recession may be attributable to the presence of the casino industry that was still a draw for many customers to the adjacent business establishments located on reservations. While casino revenues did decline over the Great Recession it may have still been less sensitive than entertainment and tourism expenditures in the rest of the nation, and revenues may have still been large enough to sustain the surrounding businesses. Future work should be focused on identifying whether this is an important causal pathway to explaining the observed results.

Overall, geocoding the SSEL for location in reservations opens the door for substantial improvements in our understanding of reservation economies. This is interesting because reservations are underdeveloped in general, but it is also interesting because they display a large variation in institutions that can be used for obtaining a greater understanding of relationships between institutions and development in general. Here we only present evidence of a survival gap between reservation and non-reservation employers, but the potential explanations for this, its relationship to the various institutional differences in reservations and implications for mechanisms of development are interesting future research areas that are now feasible.

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A Appendix Tables

Table A1: Table of Means for All Observations Inclusive of On and Off Reservation Business Establishments

Panel A: Total	All	Const	Manu	Transport	Edu	Health	Arts Rec	Hotel HFood	Whole Retail	Extract	Info Finan	Prof Svcs	Pub Admin
Highest age	13.09	12.12	17.66	10.89	15.07	14.22	13.08	10.88	13.98	14.61	11.77	11.38	16.45
	(10.85)	(10.12)	(12.65)	(9.63)	(13.01)	(10.88)	(11.41)	(9.41)	(11.06)	(10.04)	(10.26)	(9.43)	(12.90)
Died in Panel	0.40	0.48	0.36	0.46	0.33	0.31	0.40	0.42	0.38	0.35	0.44	0.42	0.34
	(0.49)	(0.50)	(0.48)	(0.50)	(0.47)	(0.46)	(0.49)	(0.49)	(0.49)	(0.48)	(0.50)	(0.49)	(0.47)
Age	7.63	7.00	11.80	5.86	9.30	8.29	7.65	5.68	8.39	8.74	6.56	6.08	10.60
	(9.63)	(8.89)	(11.51)	(8.39)	(11.66)	(9.88)	(10.09)	(8.17)	(9.96)	(8.91)	(9.02)	(8.23)	(11.57)
Poverty Rate	13.92	13.23	13.94	14.38	13.64	14.15	13.78	14.13	14.19	15.27	13.93	13.36	14.13
	(5.04)	(4.86)	(4.79)	(5.28)	(5.09)	(5.12)	(4.72)	(5.05)	(5.12)	(5.85)	(4.90)	(4.83)	(5.10)
% BS or More	0.30	0.29	0.28	0.27	0.32	0.30	0.31	0.30	0.29	0.21	0.31	0.32	0.29
	(0.11)	(0.10)	(0.10)	(0.10)	(0.11)	(0.10)	(0.11)	(0.11)	(0.10)	(0.09)	(0.11)	(0.11)	(0.11)
Rural	0.15	0.16	0.17	0.21	0.12	0.14	0.15	0.16	0.15	0.51	0.12	0.09	0.18
	(0.36)	(0.37)	(0.38)	(0.40)	(0.33)	(0.34)	(0.36)	(0.36)	(0.36)	(0.50)	(0.33)	(0.29)	(0.38)
Remote	0.10	0.10	0.10	0.14	0.07	0.08	0.09	0.09	0.09	0.40	0.07	0.05	0.11
	(0.29)	(0.30)	(0.31)	(0.34)	(0.26)	(0.27)	(0.29)	(0.29)	(0.29)	(0.49)	(0.26)	(0.22)	(0.31)
On Reservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
	(0.05)	(0.05)	(0.04)	(0.06)	(0.06)	(0.04)	(0.05)	(0.05)	(0.04)	(0.09)	(0.04)	(0.04)	(0.05)

Table A2: Table of Means for Business Establishments Located Off of Reservations

Panel B: Off Reservation	All	Const	Manu	Transport	Edu	Health	Arts Rec	Hotel HFood	Whole Retail	Extract	Info Finan	Prof Svcs	Pub Admin
Highest age	13.08	12.12	17.66	10.89	15.05	14.22	13.08	10.88	13.98	14.61	11.77	11.38	16.45
	(10.85)	(10.12)	(12.65)	(9.63)	(12.99)	(10.88)	(11.41)	(9.41)	(11.06)	(10.04)	(10.26)	(9.43)	(12.90)
Died in Panel	0.40	0.48	0.36	0.46	0.33	0.31	0.40	0.42	0.38	0.35	0.44	0.42	0.34
	(0.49)	(0.50)	(0.48)	(0.50)	(0.47)	(0.46)	(0.49)	(0.49)	(0.49)	(0.48)	(0.50)	(0.49)	(0.47)
Age	7.63	7.00	11.80	5.87	9.27	8.29	7.65	5.68	8.39	8.74	6.55	6.08	10.60
	(9.63)	(8.90)	(11.51)	(8.39)	(11.65)	(9.88)	(10.10)	(8.16)	(9.96)	(8.91)	(9.02)	(8.23)	(11.57)
Poverty Rate	13.91	13.22	13.94	14.38	13.61	14.14	13.77	14.12	14.18	15.23	13.92	13.36	14.12
	(5.02)	(4.85)	(4.78)	(5.27)	(5.05)	(5.11)	(4.71)	(5.04)	(5.11)	(5.81)	(4.89)	(4.82)	(5.08)
% BS or More	0.30	0.29	0.28	0.27	0.32	0.30	0.31	0.30	0.29	0.21	0.31	0.32	0.29
	(0.11)	(0.10)	(0.10)	(0.10)	(0.11)	(0.10)	(0.11)	(0.11)	(0.10)	(0.09)	(0.11)	(0.11)	(0.11)
Rural	0.15	0.16	0.17	0.20	0.12	0.14	0.15	0.15	0.15	0.51	0.12	0.09	0.18
	(0.36)	(0.37)	(0.38)	(0.40)	(0.33)	(0.34)	(0.36)	(0.36)	(0.36)	(0.50)	(0.32)	(0.29)	(0.38)
Remote	0.10	0.10	0.10	0.14	0.07	0.08	0.09	0.09	0.09	0.40	0.07	0.05	0.11
	(0.29)	(0.30)	(0.31)	(0.34)	(0.26)	(0.27)	(0.29)	(0.29)	(0.29)	(0.49)	(0.26)	(0.22)	(0.31)

Table A3: Table of Means for Business Establishments Located On of Reservations

Panel C: On Reservation	All	Const	Manu	Transport	Edu	Health	Arts Rec	Hotel HFood	Whole Retail	Extract	Info Finan	Prof Svcs	Pub Admin
Highest age	13.67	11.06	16.47	10.24	22.66	14.54	14.44	11.66	14.86	14.18	12.96	11.02	17.48
	(10.93)	(9.42)	(12.15)	(9.35)	(14.63)	(10.94)	(10.56)	(9.53)	(11.16)	(9.76)	(10.78)	(9.11)	(12.87)
Died in Panel	0.38	0.50	0.36	0.45	0.21	0.30	0.33	0.40	0.35	0.36	0.39	0.43	0.28
	(0.49)	(0.50)	(0.48)	(0.50)	(0.41)	(0.46)	(0.47)	(0.49)	(0.48)	(0.48)	(0.49)	(0.49)	(0.45)
Age	8.01	6.02	10.53	5.19	16.08	8.50	8.57	6.31	8.97	8.35	7.36	5.64	11.24
	(9.73)	(8.17)	(11.11)	(8.04)	(13.33)	(9.95)	(9.47)	(8.42)	(10.15)	(8.64)	(9.54)	(7.91)	(11.60)
Poverty Rate	18.16	16.61	16.65	16.08	21.27	19.63	17.68	18.29	18.30	19.17	17.95	17.18	18.77
	(7.95)	(7.19)	(7.15)	(7.36)	(9.87)	(8.38)	(6.90)	(7.46)	(8.00)	(8.07)	(7.65)	(7.50)	(8.26)
% BS or More	0.21	0.23	0.22	0.21	0.20	0.21	0.22	0.21	0.22	0.19	0.22	0.23	0.21
	(0.07)	(0.07)	(0.06)	(0.06)	(0.07)	(0.06)	(0.07)	(0.06)	(0.07)	(0.05)	(0.07)	(0.07)	(0.07)
Rural	0.63	0.64	0.56	0.64	0.70	0.66	0.61	0.66	0.60	0.76	0.59	0.53	0.64
	(0.48)	(0.48)	(0.50)	(0.48)	(0.46)	(0.48)	(0.49)	(0.47)	(0.49)	(0.43)	(0.49)	(0.50)	(0.48)
Remote	0.44	0.45	0.37	0.53	0.47	0.41	0.42	0.46	0.39	0.63	0.37	0.32	0.43
	(0.50)	(0.50)	(0.48)	(0.50)	(0.50)	(0.49)	(0.49)	(0.50)	(0.49)	(0.48)	(0.48)	(0.47)	(0.49)