Economic Consequences of Judicial Institutions: Evidence from a Natural Experiment*

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Abstract

This paper studies the effects of judicial institutions on investment and employment using an industry-by-industry approach, combined with the legal context of American Indian reservations. Using variation in legal institutions from a quasi natural experiment, better-understood courts lead to greater employment and more establishments among high-sunk-cost industries while having minimal effects on low-sunk-cost industries. The heterogeneity in effects across industries is consistent with the hypothesis that better-understood courts overcome a potential hold-up problem in contract negotiations. Beyond American Indian reservations, these findings suggest broad and wide-reaching effects of the nature of court systems on economic activity.

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Scholars have long hypothesized that political and legal institutions that enforce contracts promote robust capital markets, facilitate market transactions, and set the stage for economic growth (North and Weingast, 1989; North, 1990; Henisz, 2000). The empirical literature on the effects of institutions has scoured cross-national data sets to gain insight into the nature and effect of institutions (Sala-I-Martin, 1997; La Porta et al., 1997; Acemoglu et al., 2001; Rajan and Zingales, 2003). Although this work has made considerable progress, it has proven difficult to distinguish among the many competing hypotheses linking institutions and economic activity because much of what determines economic activity across countries is unobservable (Knack and Keefer, 1997; Sachs and Warner, 1999; Sala-i Martin et al., 2004).

This paper takes an alternative approach, relying on within-country variation to study the effects of institutions on economic outcomes (as in Barro and Sala-i Martin, 1992). This within-country approach is promising because much of the institutional variability within countries is observable, allowing the researcher to obtain precise insight into how institutions matter. Specifically, this paper uses a quasi natural experiment in legal institutions on American Indian reservations to study how legal institutions affect investment. Unlike sub-national units in other countries, reservations are generally not subject to regulations and laws enforced at the state level. For example, Native American tribes historically have operated tribal courts that enforce tribal law, which may differ substantively from state law. Congress changed this status quo in 1953 by assigning a subset of reservations to jurisdiction by state courts with the passage of Public Law 280 (PL280). Moreover, PL280 was imposed without tribal consent, and in a manner that recent work has argued to be exogenous to later economic outcomes (Anderson and Parker, 2008; Parker, 2012).

The Congress-induced application of state courts to only a subset of tribes provides useful variation to study the effects of judicial institutions more generally. State courts tend to be better understood by individuals than tribal courts, and thus, provide a more consistent basis for adjudication (Anderson and Parker, 2008). To exploit this variation in court adjudication, my specifications focus on industry-level outcomes in which the relationship between courts and economic activity is more likely to be causal, and control for a rich set of persistent characteristics that may have influenced original assignment of PL280 to tribes.[1] Beyond enhancing the credibility of the estimates, my industry-by-industry approach facilitates comparisons of the effect of judicial institutions across industries where courts should have different effects on investment, *ex ante*. Specifically, sunk cost invest-

[1] Section 1.2 describes in detail the nature of identification in this paper, and how it improves upon previous uses of PL280 to understand the nature and effect of judicial institutions.

ment is sensitive to hold up in contract negotiations (Williamson, 1979; Hart and Moore, 1999; Baker and Hubbard, 2003), which is influenced by the nature of judicial institutions. Rooted in this theory, my main specifications investigate the impact of state court adjudication on establishment counts and employment in high sunk cost industries, and contrast these results with those from low sunk cost industries. This approach not only allows me to document significant effects of judicial institutions, but it also provides a rationale for why judicial institutions have significant effects.

Moreover, the comparison of economic outcomes under tribal and state courts provides a uniquely powerful lens through which to investigate institutional underpinnings of investment. For context on this point, a growing literature uses cross-state variation in the independence of judges and regulators to understand how legal and political institutions lead to economic outcomes (e.g., Besley and Coate 2003, Hanssen 2004 and Lim 2013). This work has documented effects of state-level legal institutions on litigation, employment in regulatory agencies, the volume of employment discrimination cases, and the size of torts awards (Hanssen, 1999, 2000; Besley and Payne, 2003; Tabarrok and Helland, 1999). Related work on regulation has linked regulatory independence to greater investment in telecommunications infrastructure (see Falaschetti, 2003) and less pro-consumer policy (Besley and Coate, 2003). In this context, my approach is particularly attractive for identifying the importance of legal institutions because tribal and state courts differ so markedly. Indeed, my empirical results reveal much larger economic effects than studies based on differences in institutions across U.S. states (which tend to be relatively modest).

Although my results analyze other high sunk cost industries as well, my empirical specifications focus on golf course establishments to take advantage of several econometric advantages. Relating to sunk costs, golf courses require managerial expertise, large upfront investment costs and financing, and continual maintenance, which raises the possibility of hold up in contract negotiations.[2] In addition, given that my data are in the form of establishment counts (NAICS data), golf course establishments - with close to fixed scale[3] - are a better measure of economic activity because the investment essentially takes place on

[2]Many golf courses are managed by national companies, which makes the contracting issue more important. For example, see Golf Inc. Magazine's website, which contains a separate tab for management companies (http://www.golfincmagazine.com/management-companies). Tribes often own golf courses, but frequently relinquish management, hiring and maintenance decisions to these outside companies. These companies find golf course management opportunities more valuable if state jurisdiction (rather than tribal jurisdiction) governs contracts for hiring and employing local workers (as well as vendor contracts).

[3]Most golf courses are 18 holes while some smaller golf courses can be 9 holes. In general, greater economic activity could be reflected by more establishments or larger establishments. Larger establishments could reflect expanded economic activity even if the absolute number of establishments declines.

the extensive margin. Finally, according to the United States Golf Association, there has been approximately a ten-fold increase in the number of golf courses in the United States from 1947 (six years prior to PL280) to the present day number of 10,600. That is, the majority of the golf course establishment investments occurred after PL280 was passed, which mitigates the concern that PL280 was systematically targeted to regions with many golf courses.

As Table 1 illustrates using raw data on establishment counts, reservations subject to state court jurisdiction through PL280 have more golf courses, hotels, and real estate establishments, and these differences are economically large, amounting to 0.26 to 0.40 of a standard deviation difference depending on the industry and time period. As the covariate balance table in Panel C indicates, it is important to control for relevant confounding characteristics (namely, preexisting income), but the differences in the raw data are stark, and when I control for these and other important characteristics, these patterns persist as an important feature of the data.

In a series of Zero-Inflated Poisson regressions, I find that that the primary county of a PL280 reservation has 1.22 to 1.79 times the number of golf courses of a non-PL280 reservation after controlling for a rich set of county and reservation-level characteristics. Apart from being robust to a rich set of regional controls, the effects that I document are robust to measuring economic activity using employment rather than number of establishments, and I find similar effects for other high sunk cost industries – hotel, traveler accommodation, and real estate employment and establishment counts – which is evidence for the pervasiveness of these effects across reservation industries where sunk investment is important.

Beyond examining the main effect of state jurisdiction, I also exploit heterogeneity in the natural profitability of an area to have a golf course – as measured by the quality of natural amenities – to provide a cleaner, additional test for the effect of state jurisdiction on sunk cost investment. Because regions with greater natural amenities are more conducive to golf course establishments, high-amenity reservations should exhibit a greater effect of state jurisdiction than low-amenity reservations. Consistent with this motivating intuition, I find stronger effects of state jurisdiction on the number of golf course establishments in areas with greater natural amenities. For a reservation one standard deviation above the mean of natural amenities, I find a multiplicative effect of 1.52 to 2.21 times the number of golf courses. Identifying the effect of jurisdiction using the interaction with amenities facilitates the use of state and regional fixed effects because there is significant variation in natural amenities on reservations within states. In specifications using state and regional fixed effects, the interaction effect remains significant and of a similar magnitude to the

baseline specifications without fixed effects, a finding that highlights the pervasiveness of the effect of state jurisdiction.

When I examine the effect on other industries, my estimates are largest for industries where specific investment is unavoidable, external finance is important, and relocation costs are high. My findings do not merely reflect broad trends in reservation economies or heterogeneity across reservations that is correlated with PL280. As evidence of these industry-specific effects, I contrast my main results on high sunk cost industries with results from three narrowly-defined industries where relocation is relatively low cost, and specific investment on the reservation is avoidable: barbers, beauty salons, and musical groups/artists. PL280 has no predictive power for the amount of economic activity in these industries. Taken together with my main specifications, my estimates suggest PL280 affects economic outcomes through better contract enforcement.

More generally, this paper contributes to the literature on relationship of legal institutions to economic development, finance and investments. As La Porta et al. (1998; 2000) linked the structure of the legal system to protection of shareholders (La Porta et al., 1998) and quality of corporate governance (La Porta et al., 2000) in the cross-national context, this paper links more consistent court adjudication to greater investment in establishments and greater employment in industries that rely heavily on sunk costs. My estimates imply that judicial institutions can have significant economic effects, and this finding contributes broadly to the general literature on the effects of institutions in a cross-national context (Acemoglu et al., 2001; La Porta et al., 1997; North, 1990; North and Weingast, 1989). As in similar-minded studies of U.S. states, there are considerable lessons to be learned from using sub-national variation in institutions (Anderson and Leuck, 1992; Anderson and Parker, 2008; Barro and Sala-i Martin, 1992).[4]

The remainder of this paper is structured as follows. Section 1 provides a motivation for the empirical exercise, including a history of PL280 in the context of tribal legal institutions and the status of Native American data. Section 2 presents a simple conceptual framework and discusses the identification strategy. Section 3 presents the main specifications on the effect of judicial institutions on high sunk cost industries. Section 4 presents a battery

[4]Relative to the literature on American Indian reservation economies, my industry-by-industry approach allows me to provide more credible evidence for the effects of judicial institutions on investment and employment outcomes on American Indian reservations (Anderson and Parker, 2008; Dippel, 2013; Anderson and Leuck, 1992). By looking at variation within industry and the differences in effects across industries, my specifications build on previous Public Law 280 research to clarify our understanding of the effects of American Indian judicial institutions. Moreover, the pattern of results in this paper suggests that the underlying mechanism driving differences in investment and employment on reservations is a clear and consistent judiciary. My results indicate significant economic benefits to improving the clarity of tribal court systems.

of robustness tests, extensions and placebo tests based on low-sunk-cost industries and adjacent counties. Section 5 concludes and offers directions for future research.

1. Motivation for Empirical Exercise

Throughout the history of the United States, the policy of the U.S. Federal Government regarding Indian tribes has swayed between assimilation and self-government several times. The existing legal structure of American Indian reservations reflects each swing in attitudes because each shift in policy was accompanied by far-reaching legislation.[5] Because the laws are persistent but the attitudes that generated the laws are not, studying the effects of these laws can be a fruitful way to learn about the effects of institutional variation on economic activity.[6]

1.1. History of Public Law 280 Jurisdiction

In an era when the federal government favored assimilation of tribes, Congress passed Public Law 280 in 1953, which transferred criminal and civil jurisdiction to state courts without tribal consent. These assertions of jurisdiction were applied on a mandatory basis to Indian reservations in California, Minnesota, Nebraska, Oregon, Wisconsin, and upon statehood, Alaska. After 1953, other states could unilaterally assert court jurisdiction over American Indian reservations by passing a law, and several states opted into PL280 jurisdiction over reservations within their borders. Specifically, Florida, Iowa, and Washington opted into full civil jurisdiction over contracts.[7]

Congress required tribal consent for new impositions of PL280 jurisdiction when it passed the Indian Civil Rights Act in 1968, which effectively halted additional assertions

[5] In an early series of Supreme Court cases called the Marshall Trilogy (1823-1832), American Indian tribes were recognized to have a limited form of sovereignty whereby tribes were subject to federal law, but not state law. More than just subjecting tribes to federal law, these court cases painted tribes as wards of the United States Federal Government, designating a responsibility to the government to protect the tribes. Some examples of far-reaching legislation that affects American Indian reservations to this day are the Dawes Act (land allotment, 1887), the Indian Reorganization Act (self governance and constitutions, 1934), Public Law 280 (state court jurisdiction, 1953), the Indian Civil Rights Act (self determination, 1968), and the Indian Gaming Regulatory Act (Indian casinos, 1988). Although each of these laws reflected the attitude of the times in which they were passed, parts of all of these laws remain in effect today.

[6] A growing literature exists to study these effects in order to make more general inferences (Anderson and Leuck, 1992; Cornell and Kalt, 2000; Anderson and Parker, 2008; Cookson, 2010)

[7] Public Law 280 was mostly imposed on a state-by-state basis, but select American Indian reservations were exempted from the law, and several reservations had jurisdiction returned to them after the Indian Civil Rights Act. In a series of robustness tests, Cookson (2010) showed that there was little sensitivity in his results on Indian casinos to whether these tribes are excluded or included as PL280 tribes.

of PL280. Although it required tribal consent for further impositions of PL280, the Indian Civil Rights Act did not require tribal consent for previous assertions of the law. In effect, this locked into place a jurisdictional arrangement where some reservations, but not all, had state jurisdiction imposed on them.

1.2. Exogeneity of State Jurisdiction

Given this history of the legal imposition of state courts on American Indian reservations, Anderson and Parker (2008) argued that PL280 state jurisdiction is exogenous to subsequent per capita income growth. Their exogeneity argument is two-fold. First, PL280 reservations were selected on the basis of exhibiting lawlessness, and second, citing Goldberg-Ambrose (1997), civil jurisdiction was added as an "afterthought" when its primary purpose was to extend criminal jurisdiction over some reservations that were perceived to be lawless.

A potential threat to exogeneity is that PL280 may have been passed with broader economic conditions in mind, and that these broader economic conditions lead to more economic activity.[8] Previous work in the law and economics literature has addressed this issue. In particular, Parker (2012) presents evidence on the context of per capita credit provision that PL280 jurisdiction was not systematically targeted toward or away from economically-advantaged tribes.

Nevertheless, given that PL280 reservations were selected on account of lawlessness in the 1950s, an argument for exogeneity of PL280 to present day outcomes must either control for pre-existing lawlessness or use an outcome variable that is uncorrelated with lawlessness. My empirical exercise of establishment counts and employment on American Indian reservations does both.

Regarding the choice of outcome variable, PL280 state jurisdiction is more likely exogenous to the establishment of golf courses than overall economic activity. In this way, my choice of focusing on a specific industry enhances the claim to PL280's exogeneity. Beyond focusing on one industry, my finding of heterogeneous effects across high-sunk-cost industries and low-sunk-cost industries enhances the credibility of the exogeneity argument by pointing to a causal channel.

To alleviate lingering concerns about endogeneity of the law, the empirical analysis controls for the number of criminal cases per American Indian resident as of 1985. Con-

[8]For example, the legal literature contends that PL280 was (in part) a targeted assimilation program, and hence, the law did little to improve levels of crime on these American Indian reservations, which has recently been studied empirically by Dimitrova-Grajzl et al. (2012).

ditional on pre-existing levels of crime, PL280 state jurisdiction provides variation that is plausibly-exogenous to golf course establishment counts. In addition, my main specifications control for a rich set of reservation-level and regional economic variables that include population density in the region, per capita income of the tribe, and per capita income in the adjacent country region. Because my regressions condition on this rich set of economic and demographic variables, my findings are robust to an argument that economically advantaged tribes were targeted by PL280.

1.3. Data and Data Limitations

Because Public Law 280 provides useful variation in institutions, a growing literature has studied how institutions lead to various economic outcomes on American Indian reservations. This line of research has progressed despite the difficulty in collecting detailed information on the status and investments made on American Indian reservations. Empirical work has used Census measures of reservation-level well being, such as per capita income, educational attainment, population, and population density in conjunction with hand collected measures of institutional features Anderson and Leuck (1992); Anderson and Parker (2006, 2008); Cookson (2010); Dippel (2013). With the exception of Parker (2012) who studied the effect of institutions on the provision of credit, the economic outcomes investigated by previous PL280 papers – notably per capita income – are several steps removed from the investment decision. These broader measures of economic activity were chosen, in part, because there is a dearth of data on investments and establishments on American Indian reservations. As Todd (2012) discussed in his survey of data and data gaps in Native American research, there is a distinct lack of reservation-level information on industry activity on American Indian reservations.

My paper fills that gap by matching existing county-level data from the Census Business Patterns database to the standard reservation-level data set. To map reservations to counties, I select the county in which the reservation's headquarters is located. As many reservations have territory that spans into multiple U.S. counties, the headquarters country is likely to be more central to the reservation than a randomly selected county in which there is reservation land. This implies that the golf courses, which are tallied in the Census Business Patterns data are likely affected by reservation institutions, and hence, subject to the PL280/non-PL280 distinction.[9]

[9] As this mapping is not perfect, in Section 4.5, I conduct a placebo test where instead of mapping to the headquarters county, I map neighboring counties to the reservation. In the placebo test, state jurisdiction has no significant relationship to golf course establishment counts, which suggests that the mapping the

Using the reservation's county identifier, the data are matched with the yearly Census Business Patterns (CBP) database on establishment counts by industry and county. Industry-by-county establishment counts are available from 1986 until 1997 for the Standard Industrial Classification (SIC) and from 1998 until 2009 for the North American Industry Classification System (NAICS). Although establishment counts are comparable across years within classification system (SIC or NAICS), the transition from SIC to NAICS in 1997-1998 changed the definition of a golf course so that NAICS counts are not directly comparable to SIC counts.[10] Thus, my specifications use data within each classification scheme to independently examine the effects of judicial institutions.

The sample consists of 109 American Indian reservations with American Indian population of 250 residents or greater. The resulting sample covers reservations in 24 states, and there is substantial across-region and within-region variability in the main variables of interest. Table 2 presents summary information by region for the primary variables. These are *statejur*, a dummy variable equal to one if the reservation is under state jurisdiction (Anderson and Parker, 2008; Cookson, 2010), *amenities*, a measure of the quality of natural amenities from the USDA (McGranahan, 1999), and establishment counts for golf courses and for barbers from the Census Business Patterns database. As is illustrated in Table 2, each of these variables varies significantly by region, but there is also plenty of within-region variability (measured by the standard deviation) available for identification. My empirical approach uses both sources of variability, with more stringent tests relying upon within-region (and within-state) variability.

In addition, the final data set is rich with reservation-level controls – tribal population, per capita income, population density and acreage – as well as information about distance to metropolitan areas, ZIP and county identifiers, adjacent counties, states and the nearest metropolitan areas.[11] To control for other influences of golf course establishments, all specifications include weather control variables – average temperature, number of months

reservation to its headquarters county is a good choice.

[10] In particular, the SIC classification includes only public golf courses while the NAICS classification includes both public and private golf courses. Establishments classified as a golf course under NAICS fall into two different classifications under SIC (golf courses and membership clubs). SIC membership clubs include private golf courses, but they also include other types of establishments, such as tennis clubs. For this reason, the empirical tests using SIC data use establishment counts of public golf courses, which are a subset of the types of establishments that are classified as a golf course under NAICS. The fact that the SIC and NAICS results are similar further enhances the credibility of the empirical analysis.

[11] These income variables are observed separately for American Indian residents of the reservation, state residents, residents of the nearest metropolitan area of one million people, and residents of adjacent counties. All of these income measures are Census data available through the American FactFinder tool online (U.S. Census Bureau, 1990). The adjacent county population density, size of the reservation and population measures are also Census data.

below which the average low temperature falls below freezing, and average rainfall – as well as the fraction of land held in fee simple on the reservation (Anderson and Leuck, 1992). Finally, to help control for preexisting lawlessness, the data set has information on tribal court resources and caseload activity provided by the National American Indian Court Judges Association (NAICJA) publication *Native American Tribal Court Profiles* (NAICJA, 1985).

2. Conceptual Framework

To provide context for the empirical analysis, this section develops a simple model of institutions and investment, and explicitly links the comparative statics of the model to the paper's identification strategy.

2.1. Model of Investment and Hold up

At $t = 1$, an entrepreneur can make an investment that costs C after drawing a project that (if completed) yields revenue $R \sim f(R;a)$, where a is a parameter that shifts the revenue distribution. Because of the nature of the product, a fraction $\rho \in (0,1)$ of the investment costs must be sunk before receiving revenue from the investment. At $t = 2$, a counterparty shock occurs that determines whether the investment goes through. At $t = 3$, the entrepreneur receives revenue of R if the investment goes through. Assume that $f(R;a)$ has continuous support on $[C,\infty]$ to focus on profitable projects.

An entrepreneur who successfully invests in the project, thus, receives profit equal to:

$$\pi = R - C$$

An entrepreneur whose investment does not go through experiences a loss of ρC. In the model, the counterparty shock represents the possibility that an investment will be expropriated due to incomplete contracting. We represent this probability by the function $\omega(x)$, which equals the probability of losing the investment for a given strength of contract enforcement x. To capture the notion that greater contract enforcement reduces the risk of expropriation, let $\omega'(x) < 0$.

Given this setup, the entrepreneur's expected profit is given by

$$\begin{aligned} E[\pi] &= (1-\omega(x))(R-C) - \omega(x)\rho C \\ &= \pi - \omega(x)(R - C + \rho C) \end{aligned}$$

The entrepreneur will make the initial investment if expected profit from the project is positive $E[\pi] \geq 0$, which occurs if and only if

$$R \geq C + \frac{\omega(x)\rho C}{(1-\omega(x))}$$

We denote the revenue cutoff at which $E[\pi] = 0$ to be

$$R^* = C + \frac{\omega(x)}{1-\omega(x)}\rho C$$

If revenue exceeds R^*, the entrepreneur finds it optimal to invest. Thus, the mass of entrepreneurs that find it optimal to invest is given by:

$$Y = \int_{R^*}^{\infty} f(R;a)\,dR = 1 - F(R^*;a) \tag{1}$$

where F is the CDF of the revenue distribution.

Given this setup, compute comparative statics of Y and R^* by taking derivatives with respect to x and ρ.

$$\begin{aligned}
\frac{\partial R^*}{\partial \rho} &= \frac{\omega(x)}{1-\omega(x)}C > 0 \\
\frac{\partial R^*}{\partial x} &= \frac{\omega'(x)}{(1-\omega(x))^2}\rho C < 0 \\
\frac{\partial R^*}{\partial x \partial \rho} &= \frac{\omega'(x)}{(1-\omega(x))^2}C < 0
\end{aligned}$$

Thus, the revenue cutoff increases in the sunk cost intensity ρ, decreases in the strength of contract enforcement x, and this effect of contract enforcement is larger in magnitude if sunk cost intensity is greater.

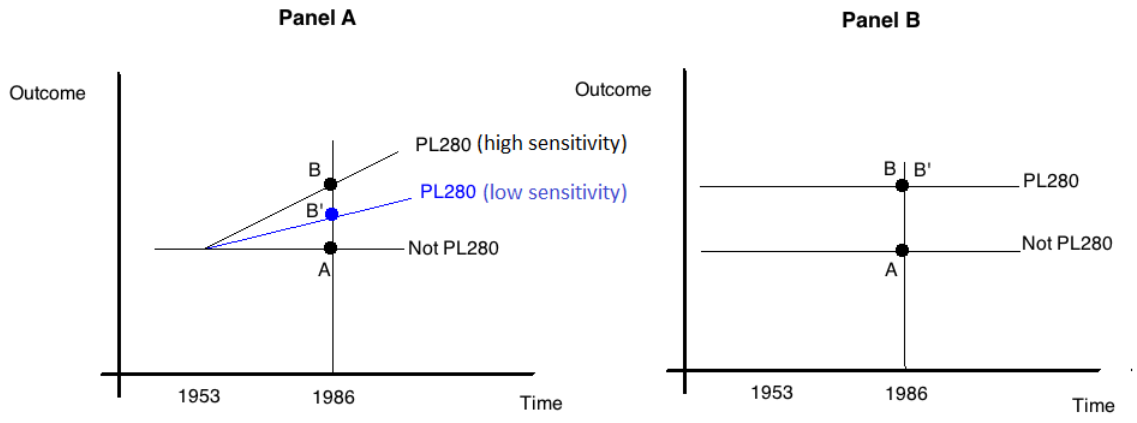
Note that R^* is inversely related to Y through equation (1). Thus, the comparative statics for R^* translate directly into comparative statics for the amount of investment Y. Investment is decreasing in the sunk cost intensity $\left(\frac{\partial Y}{\partial \rho} < 0\right)$, increasing in the strength of contract enforcement $\left(\frac{\partial Y}{\partial x} > 0\right)$, and the effect of contract enforcement is increasing in sunk cost intensity $\left(\frac{\partial Y}{\partial x \partial \rho} > 0\right)$.

2.2. Identification Strategy

In the context of legal institutions on American Indian reservations, state jurisdiction under Public Law 280 represents an increase in the strength of contract enforcement. According to the comparative statics with respect to x, we should expect greater investment in Public Law 280 jurisdictions $\left(\frac{\partial Y}{\partial x} > 0\right)$, and the estimated effect of PL280 on investment should be greater in high sunk cost industries $\left(\frac{\partial Y}{\partial x \partial \rho} > 0\right)$. Thus, the model provides two alternative tests for the effect of PL280 on investment: a direct effect by comparison of PL280 to non-PL280 jurisdictions, as well as a cross-industry effect where the effect of legal institutions is greater for industries where sunk cost intensity is greater.

In the context of data on American Indian reservations, the fact that variation across industries with different sunk cost intensities identifies the effect of judicial institutions is useful because Public Law 280 was passed in 1953 while data on establishment counts and employment become available in 1986. For this reason, my empirical strategy relies on whether PL280 status is related to greater investment in industries or economic circumstances where judicial institutions should have strong effects, *ex ante*. Figure 1 depicts conceptually my identification strategy. The goal of the empirical exercise is to distinguish Panel A where PL280 has significant economic effects from Panel B where PL280 was merely adopted in jurisdiction with higher economic outcomes.

Figure 1: Diagram of Identification Strategy



Rather than merely looking at differences in establishment counts and employment be-

tween PL280 and non-PL280 jurisdictions, my empirical strategy focuses on the difference between B and B' in Panel A. On an intuitive basis, if the effect of PL280 is stronger where the *ex ante* incentive for investment and employment is stronger, this pattern of results is a robust signal that adjudication by state courts rather than unobserved characteristics is driving the differences in investment and employment. This empirical strategy motivates looking at how PL280 differentially affects high sunk cost industries (i.e., golf courses) versus low sunk cost industries (i.e., barbers and music troupes).[12] If state jurisdiction has significant economic effects, it is through more consistent court adjudication and the rule of law, which is not equally important across industries. Finding large effects for high-sunk-cost industries and small/no effects for low-sunk-cost industries is conceptually identical to finding a significant difference between B and B' in Panel A.

In the context of Figure 1, other scholars' arguments for exogeneity of PL280 to contemporary economic outcomes are equivalent to arguing that Panel B is not accurate. In fact, for the case of per capita credit, Parker (2012) explicitly collected data in PL280 and non-PL280 jurisdictions from prior to the passage of PL280, and found that there were no significant differences prior to the passage of the law. This is a compelling argument for exogeneity to per capita credit, which lends credibility to my main effects as well. Alternatively, if a case can be made that PL280 is exogenous conditional on covariates, the diagram in Figure 1 is properly interpreted as comparing the differences between PL280 and non-PL280 jurisdictions after projecting out the effects of other covariates. By controlling for the level of crime prior to the sample period and other indicators of economic development in the region, I am also taking this approach. From this perspective, the main effects of PL280 in my specifications are also informative about the effect of state court jurisdiction. Nevertheless, my results on differences in the magnitude of effects (i.e., the natural amenity interactions and cross-sectional difference-in-differences) and industry-by-industry placebo tests lend additional credibility to hypothesis that state court jurisdiction is responsible for more investment and greater employment.

3. Empirical Analysis of Establishment Counts

This section motivates the primary specification using Zero-Inflated Poisson regression, and presents the central results on the effect of court jurisdiction on establishments of golf

[12] On an intuitive basis, this empirical strategy also motivates looking at how PL280 affects the number of golf courses in areas with high natural amenities (good for golf courses) versus areas with low natural amenities (not as good for golf courses).

courses. In these specifications, not only do I find a large main effect of state jurisdiction on the number of golf courses, but the results presented here document a larger effect of state jurisdiction on the mean number of golf courses in *a priori* desirable locations. This section also presents specifications that contrast the reservation-specific judicial variation to a measure of judicial uncertainty taken from the literature on state-level judicial institutions. The estimates in this section provide broad support that state jurisdiction is robustly related to golf course establishment counts in an internally-consistent manner.

3.1. Main Specification for Establishment Counts

As the data on golf course establishments are count data that contain more zeros than a Poisson random variable would predict, I estimate a Zero-Inflated Poisson (ZIP) model using maximum likelihood (Lambert, 1992). This technique treats the dependent variable G as coming from a process where $G = 0$ with probability $P(W'\gamma)$, but with probability $1 - P(W'\gamma)$, G is distributed $Poisson(\exp(X'\beta))$. Given this notation, the likelihood for this estimation routine is:

$$\begin{aligned}\mathscr{L}(\beta,\gamma;\mathbf{W},\mathbf{X},\mathbf{G}) &= \prod_{i=1}^{n}\Lambda(W_i'\gamma)^{I_{\{G_i=0\}}}\left((1-\Lambda(W_i'\gamma))\left(\frac{1}{G_i!}\exp\left(G_iX_i'\beta-\exp(X_i'\beta)\right)\right)\right)^{1-I_{\{G_i=0\}}} \\ &= \mathscr{L}_{zinf}(\gamma;\mathbf{W},\mathbf{G})\left(\mathscr{L}_{pois}(\beta;\mathbf{X},\mathbf{G})\right)^{1-I_{\{G_i=0\}}}\end{aligned}$$

where $\Lambda(\cdot)$ is the CDF of a logistic random variable. My main specification treats the $\mathscr{L}_{zinf}$ component of the likelihood as in binary logistic regression. For the Poisson regression component of the likelihood, the base specification uses the log-link function to model the Poisson mean:

$$\log\mu(G_{it}) = X_{it}'\beta = \beta_0^t + \beta_1 stjur_i + \beta_2 amenities_i + \beta_3 stjur_i \times amenities_i + \gamma' C_i \quad (2)$$

where G_{it} is the count of the number of public golf courses in the county of reservation i's headquarters for year $t \in \{1986,...,1997\}$, $stjur_i$ is a dummy variable that is 1 if reservation i is subject to state jurisdiction, and C_i is a vector of important reservation-level controls for economic activity and desirability of golf courses in the region.[13] The $amenities_i$

[13] In all specifications, I control for adjacent county income, population, state income, population density in the region, percentage of reservation land held in fee simple land tenture (Anderson and Leuck, 1992), reservation acreage, the straight-line distance from the reservation headquarters to the nearest metropolitan area of one million residents in 1989 (DaftLogic, 2009), typical weather conditions (rainfall, typical number

variable is an amenity scale compiled in a technical report by the United States Department of Agriculture (McGranahan, 1999), which aggregates information about a county's natural desirability (rainfall, temperature, sunlight, and topological variation).[14] The interaction effect with amenities relies on an intuition that an area with low natural amenities is typically a less profitable location for a golf course. On this basis, state jurisdiction should have a greater effect in high amenity jurisdictions than in low-amenity jurisdictions.[15]

Table 3 reports results from estimating the log-linear model for the Poisson mean in equation (2) using ZIP regression.[16] Columns (2) and (4) report related interactive specifications where the effect of state jurisdiction is allowed to differ by the level of natural amenities in the region. In the basic specification, both state jurisdiction and amenities have positive estimated effects that are statistically significant at the one percent level. The estimates on state jurisdiction imply that a typical PL280 reservation has between 1.22 and 1.79 times the number of golf courses of a similar non-PL280 reservation. These specifications control flexibly for income, include year fixed effects, as well as other reservation and weather control variables.

In the interactive specifications, the coefficient on the interaction between state jurisdiction and amenities is statistically and economically significant. At a natural amenities score of one standard deviation above the mean, these specifications imply that the typical PL280 reservation county has between 1.52 and 2.21 times the number of golf course establishments of the typical non-PL280 reservation county.[17] These estimated effects are

of months when the temperature drops below 32 degrees Fairenheit, and average temperature), and to control for persistent legal characteristics of American Indian reservations that could be related to the passage of PL280, the vector C_i also includes the 1985 per capita number of criminal cases and civil cases from the National American Indian Court Judges Association (NAICJA) publication *Native American Tribal Court Profiles* (NAICJA, 1985).

[14]Higher values of the index mean warmer winters and more water area among other desirable features governing whether the area is a pleasant place to live. The original data were compiled for a USDA Agricultural Report and are county data (McGranahan, 1999), which I converted to the reservation level by averaging the scale for all reservation counties.

[15]One might worry about a non-linear relationship for this interaction effect in the level of amenities. With sufficiently low amenities, better contract enforcement will have no effect (because golf courses would never be profitable), while a location with sufficiently high amenities may be a profitable location to establish the golf course, even if there are contracting issues. Although theoretically possible, these possibilities do not appear to be an important feature of the data. In a series of tests available in the Appendix, I estimated the interaction effect using a cross-sectional difference-in-difference approach ($st\,jur \times high.amenities$) that facilitates estimating an interaction effect of being above a pre-specified cutoff in the amenity distribution. The positive sign and significance of the difference-in-difference effect is robust to my choice of cutoff between the 20th percentile and the 80th percentile of the amenity distribution.

[16]In Table 3, the estimates for control variables are suppressed so as to focus on the primary variables of interest. In the Appendix, Table 14 presents the full set of results for the main specifications. The signs and significance are generally as expected. For other specifications, full results are available from the author.

[17]Compute this multiplicative effect by adding the main effect of state jurisdiction to the effect on

highly statistically significant and robust to the inclusion of flexible controls for income, year fixed effects, alternative specifications for the zero-inflation model, SIC versus NAICS establishments counts, and different time frames.

Most of the variation in *statejur* is state by state, and has a strong regional component evidenced in Table 2. To ensure that there is enough variability for identification for the main effect of *st jur*, the specifications in Table 3 do not include state fixed effects, but use reservation, regional, and state-level controls instead. Unlike the main effect on *statejur*, the interaction effect between state jurisdiction and natural amenities is well identified in the presence of state fixed effects (as long as there is suitable within-state variation in amenities; see Table 2). Based on this motivation, Table 4 presents ZIP regression estimates of the interaction effect $statejur \times amenities$. As the results indicate, the interactive effect of state jurisdiction in areas with high natural amenities is strongly and robustly positive, even in specifications that employ state and region fixed effects. This finding enhances the credibility of the main results by using within-state variation to identify the effect of jurisdiction.

3.2. Relationship to State-Level Judicial Institutions

As I discussed in the introduction, there is a growing literature that uses variation in state-level judicial institutions to speak to the effects of judicial institutions on economic outcomes (Hanssen, 2004; Lim, 2013). This literature has empirically documented that judges that are elected rather than appointed tend to make politically-motivated decisions, and judiciaries in these states are less independent from other branches of government than in states that have appointed judges.[18]. These effects of state-level judicial institutions present an alternative reason for PL280 to be correlated with economic activity on American Indian reservations. Namely, more politically-motivated courts in a state may be associated with more political attention paid to reservations in that state, which may affect investment in sunk cost industries. To account for this in my estimate of the effect of PL280, I control for whether the reservation is in a state where judges are elected.

the interaction with amenities, and applying the exponential function. Column (2) is smallest $1.516 = \exp(0.624 - 0.208)$ while Column (4) is largest $2.212 = \exp(0.460 + 0.334)$.

[18]For example, Tabarrok and Helland (1999) find that states in which judges are elected tend to provide larger torts awards, which are politically popular in an environment with out-of-state defendants and in-state plaintiffs (common in torts cases). Hanssen (2000) finds that states where judges are appointed rather than elected tend to have greater regulatory agency employment, a consequence of guarding against judicial review (more likely when judges are appointed). In another vein, Besley and Payne (2003) find that states where judges are elected tend to have more employment discrimination charges than states where judges are appointed, and that these additional cases likely come from a re-election incentive.

Beyond using this variation in state-level judicial institutions as a robustness test, the relationship between establishment counts and whether a state retains its judges by election is interesting unto itself.[19] Table 5 presents Zero-Inflated Poisson specifications for the number of golf establishments that also control for whether judges in the reservation's state are retained through election as of 1990. I take this measure from Table 1 of Hanssen (2004).

As the specifications in Table 5 indicate, the coefficient estimates for state jurisdiction and state jurisdiction's interaction with natural amenities are both qualitatively and quantitatively similar to the estimates from my main specifications (see Tables 3 and 4). From these estimates, we can conclude that state jurisdiction is strongly and positively related to the number of golf course establishments even after holding constant the independence of the state judiciary (as proxied through whether judges are elected). That is, the result on the difference between state and tribal jurisdiction is robust to different state judicial arrangements.

Specific to the effect of retaining judges by competitive election, there are significantly fewer golf course establishments on reservations in states where judges are retained through election rather than appointment, as is indicated in column (2) of Table 5.[20] Moreover, using the interaction of retention by election with natural amenities as a similar difference-in-difference test to the ones motivated for state jurisdiction, the effect of additional state-level judicial uncertainty (as proxied for using whether the state retains judges by election) is greater in areas a high natural amenities. Consistent with my main results and the broad findings in the state-level judicial institutions literature, this finding implies that less independent courts – those with elected rather than appointed judges – are associated with less investment in sunk cost industries. Nevertheless, when I control for state jurisdiction status of the tribe in the same specification, the coefficient estimates for state jurisdiction remain

[19] *Ex ante*, the prediction about the sign of the relationship of elected judges to investment on and around American Indian reservations is ambiguous. Politically-motivated court decisions like those that tend to be issued when judges are elected will tend to discourage investment on American Indian reservations if popular opinion opposes these investments, and will tend to encourage investment if popular opinion supports these investments. In the context of Indian casinos, Cookson (2010) provided evidence of a state political channel using reservations with land in multiple states. Work on state-level judicial institutions has shown that appointed judges tend to increase decision uncertainty while maintaining greater independence from other branches of government (Hanssen, 1999, 2000). These three channels – direct political intervention, decision uncertainty, and judicial independence – are either ambiguous or point in opposite directions. Nevertheless, if elected judges are associated with less investment, the positive effects of judicial independence and favorable court politics outweighs the negative effects of decision uncertainty and unfavorable court politics.

[20] My coding of retention by election equals 1 if a judge runs in a partisan or non-partisan election, and zero otherwise. Notably, it is zero under the merit system where judges are retained in a retention election, and no other candidate opposes the sitting judge on the ballot.

significant while the effect of competitive elections goes away.[21]

4. Robustness to Alternative Specifications

This section provides various alternative empirical assessments of the state jurisdiction hypothesis and economic activity on American Indian reservations. This section's results demonstrate that the main findings (i) do not depend on outliers or influential observations/regions, (ii) are robust to alternative modeling assumptions, (iii) affect other industries that depend on sunk costs similarly to golf courses, and (iv) affect employment in a similar fashion to the effects on establishment counts. I also present two placebo test using estimates from industries and locations that, *ex ante*, do not depend critically on the nature of PL280 contract enforcement.[22]

4.1. Estimation of the Extensive Margin

A possible concern regarding the zero-inflated Poisson regression estimates is that observations in areas with particularly many golf course establishments may be influential, and hence drive coefficient estimates to be statistically significant. One way to eliminate the influence of outliers is to estimate a binary outcome variable for whether there is a golf course in the reservation's primary county. To this end, I estimate a logistic regression to explain the presence (or absence) of golf courses in a reservation's county.

$$log\left(\frac{P(G_{it}>0)}{P(G_{it}=0)}\right) = \beta_0+\beta_1 st\,jur_i+\gamma_t+\gamma'_A\mathbf{X}_i+\varepsilon_i \tag{3}$$

where G_{it} is the count of the golf courses in reservation county i on date t, $st\,jur_i$ is an indicator for whether state courts have civil jurisdiction on reservation i, and $\mathbf{X}_i$ is a vector of covariates. As Figure 2 illustrates, the fraction of reservations for which there were no golf course establishments in their primary county was declining significantly over the time frame. For this reason, it is important include year effects γ_t in the specification.

[21] This relative robustness of the state jurisdiction coefficient may reflect that the nature of judicial institutions (tribal versus state) provides greater variation in judicial institutions than does state-by-state variation in appointment of judges.

[22] In specifications available from the author, I conduct two additional robustness checks: (i) I estimate the effect of PL280 on golf course establishment counts by ZIP code rather than county, (ii) I estimate the model using a hurdle model instead of a zero-inflated Poisson. The results for the main specifications are qualitatively similar, but are omitted from the main discussion for brevity. The hurdle results are discussed in the appendix. The ZIP code results are available from the author.

Figure 2: Fraction of Reservations with Zero Golf Establishments by Year

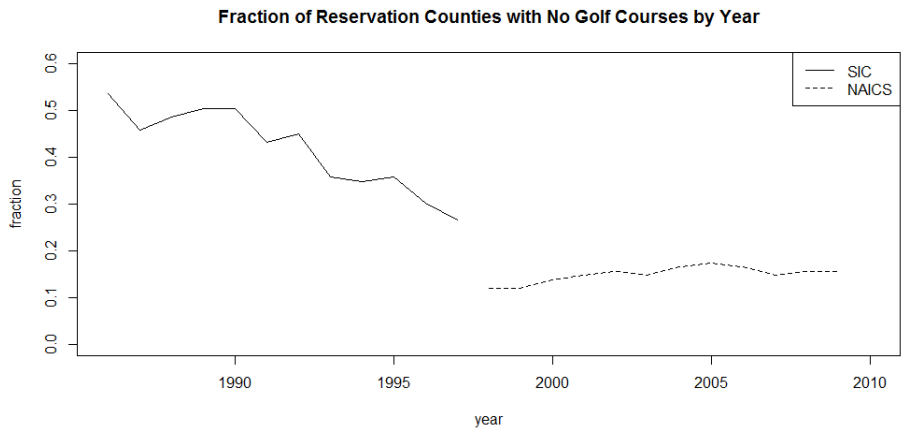


Table 6 reports estimates from logistic regressions explaining the presence of golf courses in the reservation's primary county. For the earlier years in the sample, the estimated odds ratio on state jurisdiction implies that a PL280 reservation's primary county has 6.92 times the odds of having a golf course of a comparable non-PL280 reservation's primary county, and this effect is statistically significant at the one percent level. For the later years in the sample, the magnitude of the estimate for state jurisdiction increases, but the effect is estimated imprecisely.[23] Nevertheless, these specifications lend additional support that state jurisdiction is important for the number of golf establishments, not just because of a few influential observations.

4.2. OLS Estimation of Golf Course Establishment Counts

OLS estimation of these relationships helps evaluate the robustness of the results to particular distributional assumptions. The OLS specifications in this section are an extension of the the difference-in-difference estimates in Section 3.1, which can be estimated using a straightforward OLS regression using main effects for *st jur* and *amenities* and their interaction.

Relative to the difference-in-difference estimates, the specifications in this section condition on additional covariates and introduce year and state fixed effects. Specifically, I

[23]Together with the estimates from the previous section, the negative estimates on amenities suggest that natural amenities influence the number of golf establishments rather than whether there are golf establishments in a region. An alternative interpretation is that the positive effect of amenities on golf courses from the previous section may be due to the fact that high amenity areas are many likely to have many golf courses rather than just a few.

estimate several variants on the regression specification

$$G_{it} = X_{it}'\beta + U_{it} \quad (4)$$

where X_{it} is a vector that includes available control variables, as well as indicator variables to implement state and year fixed effects.

Table 7 presents the results from estimating equation 4. These results are broadly consistent with the ZIP estimates of the relationship of state jurisdiction to golf course investment. The estimates using the NAICS-based counts are stronger in magnitude and statistical significance than the estimates using SIC-based counts. These estimates imply that at one standard deviation above the mean of natural amenities, the effect of state jurisdiction is 7.5 to 20.7 golf courses (1.3 to 4.9 for SIC-based) greater than a reservation with average natural amenities. These estimated effects are robust to the inclusion of other covariates, year fixed effects, and state fixed effects.

The difference between the NAICS and SIC classification of golf courses may explain why the results are stronger for later years. The NAICS classification of golf courses includes country clubs and membership-based golf courses while the SIC classification does not. The additional significance from the SIC-based counts suggests that more extensive golf course operations that also involve membership contracts are more sensitive to state jurisdiction. This difference matches well with the hypothesis that state jurisdiction more strongly affects businesses that rely on sunk specific investment.

4.3. Using Employment Instead of Establishment Counts

One potential concern regarding the analysis of establishment counts to capture economic activity is that establishment counts only measure the extensive margin, but there is a potentially important intensive margin as well. To address this concern, Table 8 presents the analog of Table 7, but using the Census Business Patterns data on employment in the golf course industry instead of golf course establishment counts.

As the results in Table 8 indicate, at one standard deviation above the mean of natural amenities, the effect of state jurisdiction is 599 to 1282 employees of golf courses greater than a reservation with average natural amenities (86 to 222 for SIC-based). These estimated effects are statistically significant at the five percent level or better, and robust to the inclusion of other covariates, year fixed effects, and state fixed effects. Relative to Table 7, the SIC-based estimates are stronger. This difference in significance suggests that there is an important intensive margin for PL280-related economic activity of golf course estab-

lishments. One possible conclusion from this evidence is that PL280 state court jurisdiction not only makes some types of golf course establishments profitable enough to exist, but it also increases the scope of existing establishments.

4.4. State Jurisdiction and Other Related Industries

Judicial institutions have effects on other industries on reservations as well. As a robustness check, I consider three related industries that also rely on upfront sunk investment: hotels, accommodation, and real estate establishments.[24] Like golf courses, these industries depend critically on the nature of contract enforcement. For example, any real estate negotiation involves complicated contract negotiation and financing, both of which are promoted by a predictable judiciary. Hotels and the accommodation industry involve a significant physical investment in the building. In addition to the physical structure of a hotel, successful hotels also rely critically on enforceable employee contracts, vendor contracts, and for hotels that have conference facilities, contracts with caterers and other food providers.

Table 9 presents OLS regression evidence on all three types of establishments. For both SIC-based and NAICS-based classification, each type of establishment count bears a significant relationship with state jurisdiction that is positive and stronger for areas with high amenities.

4.5. Low-Sunk-Cost Industries and Adjacent Counties

To address the concern that an unobserved factor related to success of industry in general drives the results, I run two types of placebo tests. First, I estimate the effect of PL280 state jurisdiction on establishment counts where doing business is not, *ex ante,* affected by the nature of the rule of law. Second, I estimate the effect of PL280 state jurisdiction on golf courses in counties *adjacent* to the reservation's primary county. Many of these counties will be outside of the reservation's borders, and hence, should experience no effect of PL280 state jurisdiction.[25]

[24] In this table, the SIC-based accommodation establishment counts include hotels and related temporary housing establishments like RV parks. The NAICS-based accommodation counts include these types of establishments, but also include counts for caterers and food vendors. This difference partially explains why the scale of hotels and accommodation establishments differ across the classification systems.

[25] In theory, if the decision to locate a business is deciding between a location just off of a reservation versus just on the reservation, this effect could be negative because the additional business activity on the reservation could come from businesses that would locate in the region anyway, but now choose to locate on the reservation.

Under the hypothesis that state jurisdiction drives economic activity through more credible court adjudication, judicial institutions will have little effect in industries where there are little start-up costs and minimal contractual complexity. To test for this, I use Census Business Patterns data on establishment counts for barber shops, beauty salons, and musical groups/artists, which depend little on sunk investment, and face much lower costs of relocating than golf courses do.[26] As the results in Table 10 indicate, there is little relationship between PL280 and these types of establishments.

In a second placebo test, I examine the effect of PL280 on counties adjacent to the reservation headquarters country.[27] Adjacent counties are similar to the headquarters counties, but for most reservations, the adjacent county is outside of the reservation boundary. For this reason, civil disputes in nearby counties will be heard by state courts (whether the reservation is PL280 or not) because reservation law does not apply, and state jurisdiction should exhibit no effect on these nearby counties. Table 11 presents results of this placebo test. For ease of comparison, column (1) uses reservation headquarters counties while column (2) reports the estimates using adjacent counties.[28]

These placebo tests lend additional credibility to hypothesis that PL280 state court jurisdiction affects economic outcomes through the rule of law, rather than through some unobserved channel.

5. Discussion and Conclusions

Researchers have long considered institutions to be of fundamental importance to economic and financial development. To better understand the nature and effects of institutions, researchers have devoted considerable attention to this question using cross-national data sets, theoretical modeling, or a combination of both (e.g., Acemoglu and Robinson, 2001;

[26]These industries were chosen because they reflect the absence of sunk costs particularly well. More broadly, Table 15 presents results on differences in personal income by broad industry classification: manufacturing, transportation, wholesale, retail, and services. In finding significant differences between on-reservation counties and off-reservation counties for income derived from manufacturing, transportation, and wholesale, but not for retail and services, the results in Table 15 suggest that splitting industries and sectors by the degree to which their business depends on sunk cost investments is a useful insight more generally.

[27]Using Allan Collard-Wexler's county link table, I identify counties that are adjacent to the reservation's primary county. From this set of counties, I remove the duplicates and I remove the counties that are also reservation counties in the initial sample.

[28]In Table 15 in the Appendix, I present a number of specifications that highlight the differences between reservation-headquarters counties and those counties adjacent to the reservation-headquarters county. In particular, reservations tend to have significantly less income derived from manufacturing, wholesale, and transportation industries, while having similar income in retail and services industries. This is to say that the results in Table 11 do not appear to be driven by worse economic activity in adjacent counties.

Besley and Persson, 2009). This research agenda has yielded important insights into the nature of institutions and how they matter for economic development, but the analysis of cross-national data sets must deal with considerable unobserved variation in institutions, and as a result, it remains difficult to distinguish among competing hypotheses using cross-national data (Sala-i Martin et al., 2004).

This paper takes an alternative approach, using within-country variation in the nature of court adjudication on American Indian reservations to provide compelling new evidence on the effects of judicial institutions. My innovation is to use within-country differences in court adjudication to predict industry-level establishment counts and employment. My industry-by-industry approach also casts light on an important mechanism through which judicial institutions affect economic activity: sunk cost investments. The largest effects of state court adjudication are in industries that rely heavily on sunk cost investment, which is facilitated by clear and consistent court adjudication. In this way, my findings provide credible evidence for the large and wide-ranging effects of judicial institutions *and* give a rationale for why judicial institutions can have wide-ranging effects.

In addition to my analysis of directly-affected industries, I am able to attribute a significant proportion of the effect of state jurisdiction on Indian casino investment to the relationship of casinos to investments in complementary industries. In finding evidence for a significant indirect effect of judicial institutions, this paper lends support to the hypothesis that contract enforcement and adjudication are critically important determinants of economic well being.

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6. Tables

Table 1: Establishment Counts by Legal Jurisdiction and Industry

Panel A: SIC Data (1986-1997)

	State Jurisdiction	Tribal Jurisdiction	Diff.	Std. Diff.
Golf Courses	5.75	2.79	2.96	0.3720
Hotels	3200.53	1723.79	1476.74	0.2984
Real Estate Establishments	420.24	200.99	219.24	0.3337

Panel B: NAICS Data (1998-2009)

	State Jurisdiction	Tribal Jurisdiction	Diff.	Std. Diff.
Golf Courses	19.39	8.99	10.40	0.3960
Hotels	78.21	42.73	35.48	0.3836
Real Estate Establishments	647.06	358.94	288.12	0.2610

Panel C: Covariate Balance for Other Characteristics

	State Jurisdiction	Tribal Jurisdiction	Diff.	Std. Diff.
Avg. Temp.	50.02	49.94	0.08	0.0098
Natural Amenities	1.76	2.59	-0.83	-0.2621
Percentage Fee Simple	25.27	25.53	-0.25	-0.0082
1989 AI Per Capita Income	5807.89	5234.66	573.22	0.4044

This table presents simple differences across jurisdiction type for establishment counts in high-sunk cost intensity industries on American Indian reservations. Panel A uses the SIC industry classifications while Panel B uses the NAICS industry classifications. The standardized difference is difference measured in the number of standard deviations.

Table 2: Characteristics of Main Variables by Region

Region	Fraction PL280	Amenities	# Golf Courses	# Barbers	# Reservations
East	0.4545	0.5392	6.4318	1.1515	11
FL, ME, MS, NC, NY	(0.4998)	(1.797)	(9.3516)	(3.3962)	
Great Plains	0.0769	-1.313	0.9102	0.0000	13
KS, ND, NE, SD	(0.2673)	(0.8187)	(0.9796)	(0.0000)	
Midwest	0.7857	-1.922	5.2321	0.3095	14
MI, MN, WI	(0.4116)	(0.8933)	(3.6427)	(0.8038)	
Northwest	0.0000	3.642	8.5000	3.7500	18
ID, OR, WA	(0.0000)	(1.4470)	(9.6217)	(6.9129)	
Southwest	0.3333	5.663	33.2346	8.8611	27
AZ, CA, NV	(0.4721)	(1.9488)	(45.0236)	(13.9464)	
West	0.0000	3.031	1.6987	0.7435	26
CO, MT, NM, UT, WY	(0.0000)	(1.8134)	(1.6587)	(2.0283)	

This table presents raw summary statistics by region using the data from the NAICS (1998-2009) sample. Numbers in parentheses are standard deviations, which show the degree of within region variability.

Table 3: Zero-Inflated Poisson Regression Estimates Golf Course Establishment Counts (1986 – 2009)

	(1)	(2)	(3)	(4)
stjur	0.212^{**}	-0.182^{**}	0.516^{**}	0.357^{**}
	(0.057)	(0.065)	(0.033)	(0.037)
amenities	0.317^{**}	-0.334^{**}	0.229^{**}	0.008
	(0.028)	(0.058)	(0.015)	(0.025)
stjur $\times$ amenities		0.767^{**}		0.263^{**}
		(0.063)		(0.026)
Income Controls	Yes	Yes	Yes	Yes
Reservation Controls	Yes	Yes	Yes	Yes
Weather Controls	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes
Data Type	SIC	SIC	NAICS	NAICS

† , *, and ** indicate significance at the ten, five and one percent level respectively. Income controls include 1989 values for American Indian per capita income, adjacent county per capita income, state per capita income, and nearest metropolitan area per capita income. Reservation controls include adjacent county population density, distance to nearest metropolitan area, fraction of county population that is American Indian, acres of reservation land, the percent of reservation land held in fee simple, and the number of civil and criminal court cases filed on the reservation in 1985. Weather controls include average historical temperature and a count of the number of months for which the low temperature lies below 32 degree Fahrenheit.

Table 4: Zero-Inflated Poisson Estimates with Region and State Fixed Effects

	(1)	(2)	(3)	(4)	(5)	(6)
stjur $\times$ amenities	0.732^{**}	0.301^{*}	0.517^{**}	0.630^{**}	0.617^{**}	0.752^{**}
	(0.068)	(0.121)	(0.120)	(0.036)	(0.073)	(0.073)
stjur $\times$ acres			1.925^{**}			1.783^{**}
			(0.326)			(0.181)
Fixed Effects	Region	State	State	Region	State	State
Data Type	SIC	SIC	SIC	NAICS	NAICS	NAICS

† , *, and ** indicate significance at the ten, five and one percent level respectively. Each specification also includes the full set of income controls, reservation controls, and weather controls. For this table, I suppress the main effect on stjur because PL280 was applied state by state, with rare exceptions, and thus, is clustered regionally. For this reason, stjur's main effect is tenuously identified, and the observations for which it is identified are exceptional cases.

Table 5: Zero-Inflated Poisson Estimates Using State-by-State Variation in Enforcement Uncertainty (SIC sample)

	(1)	(2)	(3)
stjur	1.158^{**}		0.674^{**}
	(0.139)		(0.188)
stjur × amenities	0.864^{**}		0.593^{**}
	(0.064)		(0.081)
stjur × acres	2.548^{**}		1.63^{**}
	(0.238)		(0.266)
competitive election		-0.278^{**}	-0.117
		(0.087)	(0.094)
competitive election × amenities		-0.236^{**}	-0.078
		(0.044)	(0.081)
competitive election × acres		1.170^{**}	0.944^{**}
		(0.087)	(0.094)
Income Controls	Yes	Yes	Yes
Reservation Controls	Yes	Yes	Yes
Weather Controls	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes

† , *, and ** indicate significance at the ten, five and one percent level respectively. Income controls include 1989 values for American Indian per capita income, adjacent county per capita income, state per capita income, and nearest metropolitan area per capita income. Reservation controls include adjacent county population density, distance to nearest metropolitan area, fraction of county population that is American Indian, acres of reservation land, the number of civil and criminal court cases filed on the reservation in 1985. Weather controls include average historical temperature and a count of the number of months for which the low temperature lies below 32 degree Fahrenheit.

Table 6: Logistic Odds Ratio Estimates of the Presence of Golf Courses in the Primary County of American Indian Reservations

	(1)		(2)	
	Estimate	Z-stat	Estimate	Z-stat
stjur	6.922**	(3.187)	7.847	(1.13)
amenities	0.795	(-0.8)	0.381**	(-2.943)
Year Effects	Yes		Yes	
Data Type	SIC		NAICS	
N	1304		1296	
Deviance	1129.657		748.124	
$-2LLR(Model\chi^2)$	642.792**		349.617**	
AIC	1177.657		796.124	

$\dagger p \leq 0.10$, * $p \leq 0.05$, ** $p \leq 0.01$

Standard errors are clustered by state. These regressions also include controls for 1989 values for adjacent county population density, American Indian per capita income, adjacent county per capita income, state per capita income, nearest metropolitan area per capita income, distance to nearest metropolitan area, fraction of county population that is American Indian, acres of reservation land, average historical temperature, the number of civil and criminal court cases filed on the reservation in 1985 and a count of the number of months for which the low temperature lies below 32 degree Fahrenheit.

Table 7: OLS Estimation of Golf Course Establishment Counts

SIC Establishment Counts (Years 1986 - 1997)

	(1)	(2)	(3)
stjur	1.108	1.088	6.968
	(0.949)	(0.956)	(3.871)
amenities	-1.922^{*}	-1.886^{*}	-2.684
	(0.841)	(0.829)	(1.807)
stjur $\times$ amenities	$1.271^{\dagger}$	$1.257^{\dagger}$	$4.887^{\dagger}$
	(0.665)	(0.661)	(2.567)
Year Fixed Effects	*No*	*Yes*	*Yes*
State Fixed Effects	*No*	*No*	*Yes*
R-squared	0.587	0.599	0.655
N	1304	1304	1304

NAICS Establishment Counts (Years 1998 - 2009)

	(1')	(2')	(3')
stjur	6.950^{*}	6.949^{*}	26.592
	(3.517)	(3.533)	(14.877)
amenities	-8.742^{**}	-8.740^{**}	-12.189
	(3.023)	(3.033)	(7.460)
stjur $\times$ amenities	7.476^{**}	7.475^{**}	20.655^{*}
	(2.434)	(2.444)	(9.902)
Year Fixed Effects	*No*	*Yes*	*Yes*
State Fixed Effects	*No*	*No*	*Yes*
R-squared	0.635	0.635	0.704
N	1308	1308	1308

† , *, and ** indicate significance at the ten, five and one percent level respectively. Standard errors are clustered by state. These regressions also include controls for logged county population, and 1989 values for adjacent county population density, American Indian per capita income, adjacent county per capita income, state per capita income, nearest metropolitan area per capita income, distance to nearest metropolitan area, fraction of county population that is American Indian, acres of reservation land, average historical temperature, and a count of the number of months for which the low temperature lies below 32 degree Fairenheit

Table 8: OLS Estimation of Golf Course Employment

Employment in SIC Establishments (Years 1986 - 1997)

	(1)	(2)	(3)
stjur	78.212	77.503	299.040
	(39.965)	(40.199)	(159.479)
amenities	−92.291*	−91.078*	−150.840
	(37.429)	(36.930)	(85.803)
stjur × amenities	86.242**	85.813**	222.489*
	(30.457)	(30.230)	(107.700)
Year Fixed Effects	*No*	*Yes*	*Yes*
State Fixed Effects	*No*	*No*	*Yes*
R-squared	0.493	0.502	0.570
N	1304	1304	1304

Employment in NAICS Establishments (Years 1998 - 2009)

	(1')	(2')	(3')
stjur	575.864*	575.692*	1719.975
	(227.564)	(228.723)	(923.601)
amenities	−530.919*	−530.149*	−845.952
	(212.404)	(212.692)	(493.107)
stjur × amenities	599.073***	598.644***	1282.132*
	(167.147)	(167.649)	(612.712)
Year Fixed Effects	*No*	*Yes*	*Yes*
State Fixed Effects	*No*	*No*	*Yes*
R-squared	0.592	0.593	0.664
N	1308	1308	1308

† , *, and ** indicate significance at the ten, five and one percent level respectively. Standard errors are clustered by state. These regressions also include controls for logged county population, and 1989 values for adjacent county population density, American Indian per capita income, adjacent county per capita income, state per capita income, nearest metropolitan area per capita income, distance to nearest metropolitan area, fraction of county population that is American Indian, acres of reservation land, average historical temperature, and a count of the number of months for which the low temperature lies below 32 degree Fairenheit

Table 9: OLS Estimation of Establishment Counts in Other Industries with High Specific Investment

SIC Establishment Counts (Years 1986 - 1997)

	Hotels	Accomodation	Real Estate Est.
stjur	7237.681**	7246.368**	1099.007***
	(2418.710)	(2421.388)	(322.304)
amenities	−619.188	−619.193	−45.640
	(1167.651)	(1169.220)	(156.875)
stjur × amenities	5236.119**	5244.668**	775.359***
	(1700.397)	(1702.620)	(225.314)
R-squared	0.767	0.767	0.756
N	1304	1304	1304

NAICS Establishment Counts (Years 1998 - 2009)

	Hotels	Accomodation	Real Estate Est.
stjur	145.311***	2016.345**	1826.226**
	(40.592)	(683.553)	(584.685)
amenities	−15.829	−268.504	−217.128
	(19.020)	(332.176)	(280.769)
stjur × amenities	111.159***	1505.396**	1349.291**
	(29.265)	(492.767)	(426.814)
R-squared	0.806	0.780	0.730
N	1308	1308	1308

† , *, and ** indicate significance at the ten, five and one percent level respectively. Standard errors are clustered by state. These regressions also include controls for logged county population, and 1989 values for adjacent county population density, American Indian per capita income, adjacent county per capita income, state per capita income, nearest metropolitan area per capita income, distance to nearest metropolitan area, fraction of county population that is American Indian, acres of reservation land, average historical temperature, and a count of the number of months for which the low temperature lies below 32 degree Fairenheit

Table 10: OLS Estimation of Establishment Counts in Industries with Low Specific Investment (Placebo Test using NAICS Data)

	Barber Shops		Beauty Salons		Musical Groups/Artists	
	(1)	(2)	(3)	(4)	(5)	(6)
stjur	−1.025	−1.024	16.592	16.579	0.447	0.446
	(0.640)	(0.643)	(12.858)	(12.907)	(0.684)	(0.687)
amenities	0.599	0.599	20.299**	20.311**	1.960***	1.960***
Year Effects	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*
R-squared	0.314	0.314	0.323	0.324	0.278	0.279
N	1308	1308	1308	1308	1308	1308

† , *, and ** indicate significance at the ten, five and one percent level respectively. Standard errors are clustered by state. These regressions also include controls for logged county population, and 1989 values for adjacent county population density, American Indian per capita income, adjacent county per capita income, state per capita income, nearest metropolitan area per capita income, distance to nearest metropolitan area, fraction of county population that is American Indian, acres of reservation land, average historical temperature, and a count of the number of months for which the low temperature lies below 32 degree Fairenheit

Table 11: OLS Estimation of Golf Course Establishment Counts in Counties Adjacent to the Reservation (Placebo Test using NAICS data)

	Reservation-HQ	Adjacent County
stjur	6.940*	2.981
	(3.517)	(1.814)
amenities	−8.742**	−1.802
	(3.023)	(1.168)
stjur × amenities	7.476**	0.792
	(2.434)	(0.977)
R-squared	0.635	0.185
N	1308	3708

† , *, and ** indicate significance at the ten, five and one percent level respectively. Standard errors are clustered by state. These regressions also include controls for logged county population, and 1989 values for adjacent county population density, American Indian per capita income, adjacent county per capita income, state per capita income, nearest metropolitan area per capita income, distance to nearest metropolitan area, fraction of county population that is American Indian, acres of reservation land, average historical temperature, and a count of the number of months for which the low temperature lies below 32 degree Fairenheit.

A.1. Estimating a Hurdle Model[29]

This section presents another assessment of the robustness of ZIP regression results. I estimate the main specifications using a hurdle model for golf course establishment counts where the zeros are modeled using binomial logistic regression and the positive counts are modeled using a truncated Poisson distribution (Mullahy, 1986). A hurdle model combines the estimation of zeros by binary logit with a truncated Poisson model for strictly positive counts. Because the specification uses a truncated Poisson, there is only one source of zeros in a hurdle model, which is in contrast to the ZIP model where a zero in the data could come from the Poisson-distributed component as well as the zero-inflation model.

Table 12 presents the results from estimating the hurdle model that use a truncated Poisson distribution for the strictly positive counts. Compared with the ZIP estimates in Tables 3 through 5, the hurdle estimates are qualitatively similar in magnitude and statistical significance. For the SIC-based establishment counts, the magnitudes are almost identical, but for the NAICS counts, the estimates are slightly larger.

Table 12: Truncated Poisson Regression Estimates in a Hurdle Model for Golf Course Establishment Counts (1986 – 2009)

	(1)	(2)	(3)	(4)
stjur	0.059	-0.040	0.568**	0.512**
	(0.080)	(0.079)	(0.070)	(0.037)
amenities	−0.101**	−0.266**	0.099** -0.020	0.016
	(0.077)	(0.077)	(0.027)	(0.026)
stjur × amenities	0.613**	0.756**	0.290**	0.333**
	(0.082)	(0.082)	(0.028)	(0.027)
Income Controls	Yes	Yes	Yes	Yes
Year Effects	No	Yes	No	Yes
Data Type	SIC	SIC	NAICS	NAICS

Standard Errors in Parentheses. * and ** signify statistical significance at the five and one percent level. Columns (1) and (2) are estimated using 1986-1997 SIC establishment counts while (3) and (4) are estimated using 1998-2009 NAICS establishment counts. The amenities variable is standardized for ease of interpretation. Each specification also includes covariates for the per capita civil case load in 1985, per capita criminal case load in 1985, distance to nearest metropolitan area of 1 million residents, and acreage of the reservation. Income controls include 1989 per capita income figures for the American Indian reservation, 1989 average per capita income of the adjacent country region, 1989 state per capita income and the 1989 per capita income of the nearest metropolitan area of one million residents

[29]This appendix may be made available online.

A.2. Cross-sectional Difference-in-Difference Tests

This section presents a series of simple difference-in-difference tests for the effect of state jurisdiction on the number of golf course establishment counts. The tests rely on the intuition that an area with low natural amenities is typically a less profitable location for a golf course. For natural amenity data, I use an amenity scale compiled in a technical report by the United States Department of Agriculture (McGranahan, 1999). These data aggregate information about a county's weather (rainfall, temperature, sunlight, and topological variation) into a single index that describes the desirability of an area for outdoor recreation. Higher values of the index mean warmer winters and more water area among other desirable features governing whether the area is a pleasant place to live. The original data were compiled for a USDA Agricultural Report and are county data (McGranahan, 1999), which I converted to the reservation level by averaging the scale for all reservation counties.

Conditional on a golf course being a profitable investment in the ideal contracting environment, the nature of court adjudication of contracts can affect whether the potentially profitable golf course is built. Sufficiently low amenity locations will exhibit less of an effect of state jurisdiction on golf courses because some locations are not conducive to golf. On the other hand, sufficiently high amenity locations will exhibit a larger effect of state jurisdiction on the number of golf course establishments. Moreover, golf course establishments are an ideal setting in which to examine the effect of court adjudication because they involve large sunk investments and significant vendor contracts, which makes underinvestment more likely under imperfect contracting.

That the effect of state jurisdiction should differ by level of natural amenities suggests a straightforward difference-in-difference estimator for the effect of state jurisdiction:

$$\begin{aligned}\hat{\theta} &= diff_{high.amenity} - diff_{low.amenity} \\ &= \left(\bar{G}^{st\,jur=1}_{high.amenity} - \bar{G}^{st\,jur=0}_{high.amenity}\right) - \left(\bar{G}^{st\,jur=1}_{low.amenity} - \bar{G}^{st\,jur=0}_{low.amenity}\right)\end{aligned}$$

where G is a variable that contains golf course establishment counts.[30] As the amenity scale is continuous (i.e., it does not have a natural cutoff between desirable and undesirable), I consider two cutoffs between high and low amenity areas: 40th and 60th percentiles of the natural amenity distribution. If state jurisdiction has a positive effect on golf course establishment counts in both low and high amenity regions, the estimates from the difference-in-difference estimator do not capture the full effect of state jurisdiction because the difference-in-difference estimator estimates the difference in effects. Later, I also present estimates of the main effect of state jurisdiction.

The first panel in Table 13 summarizes difference-in-difference estimates of the effect of state jurisdiction using of golf court establishment count data pooled across SIC years (1986 – 1997), and separately pooled across NAICS years (1998 – 2009). Depending on the

[30] For 1986 – 1997, these data are matched to SIC industries. For 1998 – 2009, the establishment counts are matched to NAICS industries. There is an imperfect match between SIC golf courses and NAICS golf courses because the code for NAICS includes membership-based country clubs while SIC does not and mixes membership-based country clubs with other membership clubs like tennis clubs.

cutoff for high natural amenities, the estimate of the effect of state jurisdiction ranges from 4.5 to 4.8 for SIC counts and 20.95 to 22.34 for NAICS counts, which is an effect size of approximately the mean number of golf establishments for both establishment types. Three of these estimates are statistically significant at the 10 percent level using robust standard errors clustered by state.[31]

To mitigate the concern that several years of data are driving the results, the second panel in Table 13 presents within-year difference-in-difference estimates. Regardless of whether SIC or NAICS classifications are used, these estimates are positive for all years. Within each establishment count classification, the estimates are tightly clustered around the pooled estimates, suggesting that this relationship between state jurisdiction and golf course establishments is robust and consistent over time.

Table 13: Difference-in-Difference Estimates for the Effect of State Jurisdiction on Golf Course Establishment Counts

Pooled Estimates

Cutoff	SIC Estimate (Std. Err.)	NAICS Estimate (Std. Err.)
40th Percentile	4.847† (2.536)	22.344* (9.085)
60th Percentile	4.557 (3.135)	20.953† (11.417)

Year-by-year Estimates

SIC	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
40th	4.263	4.461	4.316	4.024	3.534	3.741	3.969	6.018	5.654	5.411	5.541	7.267
60th	4.276	4.328	4.115	3.651	3.250	3.445	3.596	6.130	5.331	5.030	5.032	6.588

NAICS	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
40th	20.822	23.229	20.690	21.493	20.895	19.331	20.011	22.387	23.594	23.861	26.766	25.050
60th	19.921	22.440	19.299	20.170	19.774	17.404	18.221	20.984	22.152	22.336	25.268	23.466

* and † denote statistical significance at the five and ten percent level. Standard errors are clustered by state. This table presents unconditional difference-in-difference estimates for the effect of state jurisdiction on the number of golf courses in high amenity areas versus low amenity areas. Each row considers a different cutoff in the natural amenity distribution for high versus low amenities. The Census Business Patterns data report establishment counts by SIC industry for 1986 – 1997, but switched to NAICS industry establishment counts for 1998 – 2009

[31] Using the 80th percentile of the amenity distribution as the cutoff, tests using both SIC and NAICS are statistically significant at the five percent level. Cutting the data this way provides qualitatively similar results, but I omitted these from the table for clarity of presentation. These results are available from the author.

A.3. Other Appendix Tables

Table 14: Zero-Inflated Poisson Regression Estimates Golf Course Establishment Counts (1986 – 2009): Full Results

	(1)	(2)	(3)	(4)
stjur	0.212^{**}	-0.182^{**}	0.516^{**}	0.357^{**}
	(0.057)	(0.065)	(0.033)	(0.037)
amenities (Z)	0.317^{**}	-0.334^{**}	0.229^{**}	0.008
	(0.028)	(0.058)	(0.015)	(0.025)
stjur $\times$ amenities (Z)		0.767^{**}		0.263^{**}
		(0.063)		(0.026)
Reservation Controls				
acres (Z)	0.249^{***}	0.175^{***}	0.033	0.036
	(0.051)	(0.051)	(0.023)	(0.023)
fee simple (Z)	0.056^{**}	0.069^{***}	-0.071^{***}	-0.106^{***}
	(0.026)	(0.007)	(0.015)	(0.015)
civil cases per capita 1985	-2.149^{***}	-2.342^{***}	-1.165^{***}	-1.450^{***}
	(0.680)	(0.673)	(0.381)	(0.381)
criminal cases per capita 1985	-0.646^{***}	-0.561^{***}	0.060	0.144^{**}
	(0.140)	(0.125)	(0.072)	(0.070)
distance (100s of miles)	-0.914^{***}	-1.014^{***}	-0.810^{***}	-0.837^{***}
	(0.030)	(0.032)	(0.016)	(0.016)
AI / County population	-0.088^{***}	-0.085^{***}	-0.482^{***}	-0.058^{***}
	(0.008)	(0.008)	(0.003)	(0.004)
Income Controls ($1000s)				
AI Income 1989	-0.015	-0.028^{**}	0.026^{***}	0.020^{**}
	(0.011)	(0.011)	(0.006)	(0.006)
Adj. County Income 1989	-0.037^{***}	-0.046^{***}	0.018^{**}	0.017^{**}
	(0.013)	(0.014)	(0.008)	(0.008)
State Income 1989	-0.233^{***}	-0.266^{***}	-0.236^{***}	-0.239^{***}
	(0.025)	(0.026)	(0.013)	(0.013)
Metro Income 1989	-0.046^{**}	-0.092^{***}	0.024^{**}	0.024^{**}
	(0.023)	(0.023)	(0.012)	(0.012)
Weather Controls				
Frost Months (Z)	0.110^{***}	0.246^{***}	0.051^{***}	0.104^{***}
	(0.031)	(0.035)	(0.017)	(0.017)
Avg. Temp. (Z)	0.299^{***}	0.375^{***}	0.460^{***}	0.473^{***}
	(0.030)	(0.031)	(0.016)	(0.016)
Year Effects	Yes	Yes	Yes	Yes
Data Type	SIC	SIC	NAICS	NAICS

† , *, and ** indicate significance at the ten, five and one percent level respectively. Income controls include 1989 values for American Indian per capita income, adjacent county per capita income, state per capita income, and nearest metropolitan area per capita income. Reservation controls include adjacent county population density, distance to nearest metropolitan area, fraction of county population that is American Indian, acres of reservation land, the percent of reservation land held in fee simple, and the number of civil and criminal court cases filed on the reservation in 1985. Weather controls include average historical temperature and a count of the number of months for which the low temperature lies below 32 degree Fahrenheit.

Table 15: Comparison of Reservation Counties and Adjacent Counties: 1969-1985

	Manufacturing	Retail	Wholesale	Transport	Services
reservation dummy	-0.246^{*}	-0.033	-0.154^{*}	-0.142^{**}	0.004
	(0.126)	(0.037)	(0.085)	(0.072)	(0.051)
$log(population)$	1.515^{***}	1.080^{***}	1.170^{***}	1.129^{***}	1.179^{***}
	(0.047)	(0.011)	(0.027)	(0.021)	(0.016)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
R-squared	0.756	0.954	0.813	0.870	0.933
N	5603	5603	5603	5603	5603

* , **, and *** indicate significance at the ten, five and one percent level respectively. Standard errors are clustered by county. The purpose of this table is to compare economic activity in reservation counties and adjacent counties, across broad sectors. Each observation in these specifications is a year-county observation from 1969 through 1985 for reservation headquarter counties and counties adjacent to them according to Allan Collard-Wexler's county link table. The data on sector-specific personal income come from the Bureau of Economic Analysis Regional Data Files - Table CA05. Each dependent variable is the log of total personal income in that sector, which normalized by including $log(population)$ in each specification.