

Three Essays on Native American Economic Development

by

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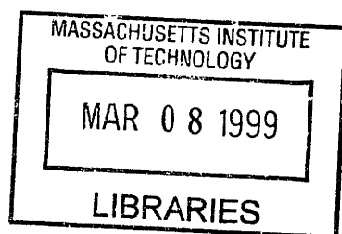
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Abstract

I explore the recent attempts of Alaska Natives and American Indians to achieve self-determined economic progress by exploiting one-time, group-based wealth transfers. The results suggest caution when using such transfers as development tools.

In Essays one and two, I analyze the Alaska Native Claims Settlement Act of 1971 (ANCSA), which transferred 44 million acres of land and 1 billion dollars to Alaska Native business corporations. After adjustment for windfall tax preferences and natural resource asset sales the 12 regional corporations lost 80 percent of their cash endowment -- about \$380 million -- in business operations between 1973 and 1993. The corporations channeled resources toward investment, but the investment was not productive.

Behind the poor average performance lies much cross-sectional variation which I explore using models from development theory and political economy. In a multi-sector framework, local business ventures based on the traditional economy earned positive returns, but were limited by small markets. Statewide enterprises made persistent losses of more than 20% per year. Oil investments produced mixed results. Joint ventures with non-Native firms performed better than wholly owned operations. Quasirents from Native employment were important to three firms -- the rest lost money without any countervailing employment. Case history evidence suggests that internal sharing networks and common preferences helped the high-employment firms to deliver both jobs and dividends. Overall, most variation in performance remains unexplained.

In Essay three I estimate the welfare effects of reservation-based high-stakes bingo on individual American Indians, using differences-in-differences techniques applied to U.S. census microdata from 1980 and 1990. The economic decline of one large non-gaming tribe generates spurious average treatment effects. When this tribe is removed from the data the average gains to bingo-area Indians in hours worked, income, and poverty status are plausible but insignificant. Using bingo revenue as a measure of treatment intensity I find modest and significant positive effects of bingo revenue on hours worked and income. Using white people as additional controls corroborates these results and highlights the economic decline of Indians relative to whites. Against this decline any gains from bingo are small.

Thesis Supervisor: Professor Peter Temin

Contents

I. Group-based Asset Transfers and Economic Development:	
Some Results from Alaska's Native corporations	7
II. Exploring Variation among	
Alaska's Native Regional Corporations	65
III. Indian Gaming and Indian Welfare	123

I. Group-based Asset Transfers and Economic Development: Some Results from Alaska's Native corporations¹

Abstract

The Alaska Native Claims Settlement Act of 1971 (ANCSA) departed from previous U.S. Indian policy by transferring 44 million acres of land and \$1 billion to Alaska Native business corporations. Standard accounting data are poor indicators of their actual performance. After adjustment for windfall tax preferences and natural resource asset sales the 12 regional corporations lost 80 percent of their original cash endowment -- about \$380 million -- in direct business operations between 1973 and 1993. The village corporations appear to have lost similar amounts. The ANCSA corporations channeled resources toward investment, but the investment was not productive. These results suggest caution in the use of group-based lump-sum transfers as development tools.

1. Introduction

Economists espouse lump-sum transfers as policy tools for efficiently redistributing wealth. In this paper I analyze the economic consequences of the Alaska Native Claims Settlement Act of 1971: a one-time, large-scale conveyance of land and money to a poor minority group. The analysis shows that this particular *group-based* transfer was far from efficient. Although it clarified property rights and provided a secure contracting environment, this stability did not lead to sustained growth. Although the rights were vested with putative business corporations, these corporations were constrained to behave much like governments. Although the corporations may have promoted saving, the resulting investment was dissipated in ongoing business failures.

The Alaska Native Claims Settlement Act (ANCSA) was widely hailed as a radical departure from previous United States Indian policy and perhaps the most generous settlement of indigenous land claims ever offered by a major colonial power. Alaska's 70,000 living Natives acquired clear title to 44 million acres of land -- an area larger than New England. They also received almost one billion dollars in cash, as compensation for lands not conveyed. These

¹ I thank Peter Temin, Joe Kalt, Michael Kremer, Matthew Berman, Don Mitchell, and participants at the University of Alaska ISER Faculty Seminar series for helpful comments and guidance. Numerous managers, staff, and shareholders of Alaska's Native corporations provided critical data and insights.

property rights were assigned to twelve regional and 200 village-level business corporations to be created and operated under Alaska corporate law. Every Native alive on December 17, 1971 became a voting shareholder in these corporations.² However, no one was allowed to sell his or her shares until 1991 at the earliest.

While some Alaska Natives saw ANCSA as “simply a real-estate deal,”³ it is clear that others regarded it as an economic development tool.⁴ Regardless of intentions, the experience of these corporations provides a natural experiment, of sorts, in the economic development of the Arctic -- a peripheral region beset by persistent poverty and facing rapid social change.⁵ Specifically, the economic progress of the Native corporations provides a large-scale, if crude, test of the hypothesis that property rights matter and that a lump-sum transfer of endowments to an indigenous minority group can be an effective catalyst of growth with self-determination.

Historians, political scientists and anthropologists have dissected the origins and qualitative consequences of the claims act at length.⁶ In this paper I develop and analyze 21 years of consistent data on the regional corporations’ economic performance. The results provide a quantitative basis for evaluating ANCSA as policy, and may be of interest to others engaged in the settlement of indigenous land claims.⁷ The corporations reported \$596 million in net income between 1974 and 1993. But these accounting profits are a confusing mixture of asset sales, windfall gains from tax preferences, and other direct transfers, as well as productive economic activity. By isolating active business operations from windfalls and passive investments, I show that the twelve regional corporations lost more than \$380 million -- more than 80% of their initial cash endowment -- in direct business. A sample of 18 village corporations shows a similar

²Section 3 of this paper provides additional background. Arnold (1976) provides a step-by-step account of the claims settlement process, the legislation, and its early implementation. Berry (1975) focuses on the political maneuvering leading to the act.

³Willie Hensley, personal communication, October 1991. Hensley was one of the leading architects of the settlement on the Native side.

⁴“The bill before you is not just a question of land,’ said John Sackett, an Athabascan Indian, as the U.S. Senate considered the initial settlement. ‘It is a grasp, a handhold for the development of our future.’” quoted in Bernton, Hal, 1992. “Alaska’s Native corporations at 20: Mixed results amid sharp divisions.” *Washington Post*, 1/2/92 p. A3

⁵Although there were no untreated Alaska Natives, numerous indigenous “controls” in Canada and Siberia faced similarly rapid social and economic change during the study period.

⁶See: Anders (1989, 1987), Flanders (1989), Pretes, Robinson, and Wuttunee (1989). All of these authors are highly critical of ANCSA as an aid to development, but for reasons other than its communal institutions.

⁷Claims processes are underway at least in Australia (Case 1995), Canada (Nickerson 1998), New Zealand (Kalt, Joseph, Harvard University, personal communication, May 15, 1997), and Russia (Fischer, Victor, University of Alaska, personal communication, February 7, 1995). Other examples undoubtedly abound.

pattern of losses. And while jobs were more important than dividends to most Alaska Natives, only two corporations generated significant employment for their shareholders.

These results provide a clear counterexample to some current hypotheses about the determinants of growth and development, both in isolated pockets of poverty such as Indian reservations, and in larger entities such as developing countries. The Native corporations were effective at channeling resources toward investment, but the investments were grossly unproductive, thus refuting the maintained hypothesis of much growth theory that a lump-sum transfer of resources will not reduce aggregate production. Since this inefficiency persists over time it cannot easily be explained as a learning process. Thus, while a hardening of property rights and increased exposure to external markets may be necessary to halt or reverse economic stagnation, these things were far from sufficient in this case.

Finally, some authors have argued that shareholders' inability to sell their stock was the specific cause of poor performance (Karpoff & Rice 1989). However, not one of the 212 corporations has exercised its option to make its shares tradable, even though shareholders have repeatedly overcome free-rider problems to effect other corporate regime changes. While this evidence does not prove that nontradable shares are efficient, it does suggest the existence of a countervailing preference for group control of Native assets.

The paper proceeds as follows. Section 2 frames several broad hypotheses to be tested, drawing connections between growth theory, property rights, and the ANCSA corporations. Section 3 provides historical context. Section 4 discusses methodology and data development, and Section 5 presents the analysis of aggregate economic performance. Section 6 draws conclusions and suggests further lines of inquiry.

2. Theory and Hypotheses

In this section I develop several hypotheses about the aggregate economic performance of the ANCSA corporations as a group. I first consider the question of whether lump-sum asset transfers promote growth. Next, I consider changes in the structure of property rights. Finally, I look at theories of the firm and the inability of the Native shareholders to sell their shares.

2.1. Asset Transfers and Economic Efficiency

It is a staple of microeconomic theory that the lump-sum redistribution of endowments is an economically efficient way to promote equity or other social goals. The second fundamental theorem of welfare economics formalizes this notion with appropriate requirements for convex production sets and preferences, complete markets, and price-taking behavior (Mas-Colell, Whinston, and Green 1995). Lump-sum transfers are presumed efficient because they do not distort agents' economic behavior at their various margins. That is, marginal rates of substitution are still equal to each other and to marginal rates of transformation throughout the economy.

Asset Transfers in Practice. While optimal lump-sum taxes and transfers have long been used in analytical exercises, they are rarely pursued as intentional public policies.⁸ Distortionary taxes and in-kind or project-specific transfers to the poor continue to predominate in the real world, and the associated efficiency losses are a continuing topic for empirical research, as well as a cause for concern in policy formulation.

A recent paper by Bourguignon (1991) is a good example of this pragmatic approach to the twin challenges of poverty and growth. Bourguignon identifies three main tradeoffs between poverty alleviation and efficiency. First, there are static losses from “the distortionary efficiency costs of non-lump-sum transfers and the leakage resulting from necessarily imperfect targeting of the poor” (p. 316). Second, there is an intertemporal tradeoff that results from the assumed lower savings rate of the poor: “Redistribution that achieves less poverty and lower savings in the present therefore implies less income, and thus more poverty, in the future” (p.317). Finally, there is “a strategy choice: whether poverty should be reduced through current income transfers or through investment in the poor” (p. 317). This final dilemma has two parts. The first part is the simple fact that the returns from investment in the poor take time to show up. The second part is that investment in the poor may be less productive than investment elsewhere in the economy.

ANCSA as a Lump-Sum Transfer. The Alaska Native Claims Settlement Act was a large one-time transfer with substantial lump-sum properties.⁹ The recipients were free to use the 44 million acres of land for subsistence, tourism, or extractive industry. In fact, they were free to

⁸The use of such transfers as *potential* policy tools continues. See, for example, Howarth and Norgaard (1995) for a recent use of these tools in a model of global environmental externalities.

sell the land. They were similarly free to use the \$1 billion dollar cash payment for consumption or investment of any kind. Openly labeled a social experiment, ANCSA stood in marked contrast to decades of United States Indian policy based on in-kind transfers of education, health care, and infrastructure.

A major institutional constraint was nonetheless imposed by the use of the corporation as the settlement vehicle. Fundamentally, ANCSA was a lump-sum transfer to collective institutions, not to individuals. Furthermore, the Native corporations were uniquely communal because no one could sell their shares. The fixed, diffuse structure of control rights introduced numerous weak links between shareholder-principals and manager-agents, leaving a wide scope for inefficient rent seeking, ineptitude, and other forms of dissipation.

ANCSA Corporations and Efficient Production. A for-profit corporation is supposed to be a producing and investing entity. Thus, while authors like Bourguignon take it as a given that transfers to the poor come at the expense of investment (by the rich), one can view ANCSA as an attempt to get around this tradeoff by using the corporation as an institution for forced savings and investment by the impatient poor. Yet the allocation of resources to investment does not guarantee high returns. Bourguignon alludes to this problem in considering the tradeoff between investment in the poor and investment elsewhere in the economy, but he does not give the problem further attention. This approach is typical of standard neoclassical growth theory, which maintains the hypothesis that there is essentially one production function through which capital is equally productive at the margin, no matter who invests it or where. For example, Solow's classic model (1956) is still in widespread use, with only minor modifications. Young (1995) shows that factor accumulation can explain recent high rates of growth in East Asia. Mankiw, Romer, and Weil (1992) argue that "an augmented Solow model that includes accumulation of human as well as physical capital provides an excellent description" of cross-country differences in growth rates (p. 407).¹⁰

Institutions have also been recognized as factors within the aggregate production function framework, with the pace of empirical work accelerating since North's emphatic assertions

⁹Of course, the tax dollars used to finance the cash settlement were raised through distortionary taxes. I ignore this efficiency cost to the larger U.S. economy.

¹⁰ Knight, Loayza, and Villanueva (1993) use the MRW approach with European panel data to affirm the importance of outward trade policies and public infrastructure as additional factors. Coe and Moghadam (1993) use French data to include residential and R&D capital as well.

(1990) that a secure contracting environment is decisive for economic performance.¹¹ Recent work, such as Knack and Keefer (1995), attempts to sharpen the definitions of institutional attributes and to include them in empirical tests. However, Levine and Renelt (1992) caution that many of the associations between measured institutional factors and growth are sensitive to small changes in the other right-hand side variables.

Lying behind the use of an aggregate production function is a maintained hypothesis that competitive pressure acts over time to eliminate inefficient producers. This assumption works well for entire countries or industries, but is inappropriate for individual firms. Firms take risks, make blunders, and go bankrupt. Only the long-run survivors can be presumed efficient.

At the firm level, recent theory (Dixit and Pindyck 1994) stresses that much of a firm's value stems from its menu of future project options rather than its currently invested capital. Alaska Native corporations had no such menu of opportunities when they formed, and little expertise in particular products or services. On the other hand, they all enjoyed the macroeconomic and political stability of the U.S. economy, excellent political connections, and the ability to import scarce management. They could also invest world capital markets; this option provided a theoretical floor on investment returns. Finally, their contracting environment was quite secure, maintained by state law and enforced by state and federal courts. By North's criteria, then, the ANCSA corporations had every reason to be efficient.

It is ultimately an empirical question whether the Native corporations achieved efficient production or not. Standard neoclassical theory predicts that they would make active investments up to the point where the ex-ante, risk-adjusted return has declined to the world market rate, and invest their remaining cash in stocks and bonds. While realized returns may have differed greatly from expected (especially during early periods), on average risky projects should have earned more than world market safe returns. As a broad initial proposition, then, the average return on Native corporation equity should be roughly bounded below by world market returns if production is efficient and the corporation is maximizing profits.

Hypothesis 1: The ANCSA corporations achieved a rate of return on investment that was perhaps above but not persistently below the risk-free world market rate.

¹¹North argues: "The inability of societies to develop effective, low-cost enforcement of contracts is the most important source of both historical stagnation and contemporary underdevelopment in the Third World." (1990, p. 54).

Employment and multiple objectives. Unemployment among Alaska Natives remained a severe problem throughout the study period. The opportunity cost of labor in rural villages was often very low. In this environment jobs at urban market wages contained significant quasi-rents. At least one corporation openly tried to provide such jobs at the expense of accounting profits. The possibility of an efficient tradeoff of profits for wages suggests a modified form of the efficiency test:

Hypothesis 2: Those Native corporations with substandard accounting returns generated significant shareholder employment.

Learning Effects. It is also possible that transferred assets are used with initially low but steadily increasing efficiency as learning takes place. The idea of learning by doing has been proposed by Lucas (1988) as one of three possible mechanisms that could serve as an engine of growth capable of generating observed differences in output between rich and poor nations. In these models (e.g., Stokey 1987) learning is embodied in new goods; in the present context it could plausibly be embodied in new investment projects:

Hypothesis 3: As bad projects are discarded and better ones adopted, and as management of ongoing projects improves, the average return on the Native corporations' invested capital rises over time.

2.2. Property Rights, Open Markets, and Growth

Property Rights and National Growth. The experience of the ANCSA corporations may also be relevant to larger questions about institutions, policies, and economic convergence. Sachs and Warner (1995) argue that “reversible policy failures” and inefficient institutions such as insecure property rights, autarchy, and inconvertible currencies are to blame for poor economic performance, rather than endowments. Thus, while there is an empirically-established “convergence club” (Baumol 1994), Sachs and Warner argue that membership in the club is open to all:

the ‘convergence club’ is better defined according to policy choices rather than initial levels of human capital. (p. 5) [emphasis in original]

In much the same vein and largely echoing North, Olson argues in a recent lecture (1996) that the full measure of the output gains from specialization and trade requires, at a minimum, secure property rights, impartial third-party enforcement of contracts, and effective protection against predatory rent seeking. Olson stresses the existence of a large gap between individual

rationality and aggregate performance; a gap which can only be filled by sophisticated, efficient institutions. Like Sachs, Olson is optimistic that once the policies and institutions are right, growth will follow:

any poorer countries that adopt relatively good economic policies and institutions enjoy rapid catch-up growth...not only because of the technological and other advances that simultaneously bring growth to the richest countries, but also by narrowing the huge gap between their actual and potential income. (p.20)

Property Rights and American Indians. The hardening of property rights and exposure to market discipline has also been promoted as a critical element of good policy towards Indian tribes on reservations in the continental United States.¹² Based on extensive fieldwork, Kalt (1987) argues strongly that returning economic property rights to American Indian tribes is one promising avenue for sustained economic growth, and that without such property rights the political sovereignty of Indian tribal nations is almost useless:

The gradual transfer and solidification of tribes' rights in their own reservations over the last decade is correlated with inklings of real economic development. (Kalt 1987: p. 57)

The ANCSA experience is relevant to the development problems of reservation Indians for several reasons. First, both Alaska Natives and American Indians have faced rapid modernization, attempts at forced assimilation, and a history of oppression and poverty. Second, ANCSA was a formal, instantaneous shock that effected the same types of changes that have been gradually evolving on some reservations. It hardened property rights, internalized the costs and benefits of investment and land use decisions, specified contract enforcement through existing commercial law, and mandated formal mechanisms for financial reporting, auditing, and shareholder governance that are all designed to limit opportunism. Third, the property rights in both cases are vested in collective institutions (corporations and tribes) rather than individuals. Fourth, from an empirical research perspective, the reporting requirements faced by all ANCSA corporations provide a richer, more consistent set of data than can be obtained from most tribes.

In summary, the Alaska Native corporations provide a direct test of the idea that secure property rights and efficient institutions matter a lot -- for Indian tribes, economically marginalized Alaska Natives, and poor countries in general.

¹² There are only two formal reservations in Alaska. Both were established decades before ANCSA.

Hypothesis 4: By solidifying property rights, providing accountability and a corporate governance structure, and exposing Alaska Natives to the full opportunity costs of their actions, ANCSA effectively promoted economic growth.

2.3. ANCSA Corporations and the Theory of the Firm

The Importance of Nontradable Shares. In Kalt's conception, the tribal group can be the efficient level at which to vest property rights. Others, however, have argued that the quasi-communal nature of the ANCSA corporation is its fatal flaw. Karpoff and Rice (1989) blame the generally poor financial performance of ANCSA firms during the 1980s on one and only one factor: the inability of individuals to sell their shares. They consider several reasons why restricted stock sales might be appropriate to the unique circumstances of Native corporations, such as conflicting multiple objectives and the public good problem of their communal land ownership. But they argue that these unique structural features are either unimportant or just another part of the corporations' problem. In this view, the standard corporate form is the efficient way to organize production no matter what the objectives or who the owners. Any deviations from this form spell inefficiency and trouble. In particular, a prohibition on stock sales eliminates the takeover mechanism as a source of discipline or corrective action, and forces the "firm" to behave more like a government.

Karpoff and Rice (1989) make this analogy nicely:

One way of viewing the effect of share transferability restrictions is that they create incentives similar to those found in politics and government. Like citizens of a state, stockholders can "bail out" only at high cost. Like an arm of government, the corporation has a less well-defined mission. And like disgruntled citizens or individuals competing for the political rents that accrue to officeholders, stockholders can displace current managers only by waging a (proxy) vote campaign to gain the support of a large enough block of other shareholders without buying votes directly (p. 5)

Having made the analogy, they go on to make the obvious point that the resulting attenuation of property rights has efficiency costs:

As with other cases of attenuated property rights, we would expect this to lead to dissipative behavior through increased transactions costs, competition for the assignment of rights, or misallocation of resources. (p. 6).

All of these arguments are undoubtedly correct. Political rather than market organization clearly has a cost. Yet nation-states do exist. They offer real benefits and address real sources of

market failure. In the Alaska Natives' case these possible market failures are myriad: highly imperfect information, uninformed shareholders, intergenerational equity problems, and the public good nature of the communal land base.

Can current theories of the firm shed light on this debate? Mainstream theories of organizational form and corporate governance (Hart 1995; Fama and Jensen 1985, 1983a,b; Jensen and Meckling 1976) invoke the forces of competition and the resulting survivor test to conclude that the range of observed organizational forms is an efficient response to the combination of production and agency costs faced by each. From this assumption of revealed efficiency these authors and others seek to explain and describe the differing behaviors of the different observed forms.

Clearly one cannot apply similar reasoning to ANCSA corporations because their form was imposed from without and has been subject only to the weak pressures of potential bankruptcy. This constraint allows them to self-liquidate at the rate of inflation while still declaring accounting profits. While product market competition restricts the *ex post* ability of a Native corporation to make sales there is no *ex ante* competition for the shareholders' capital during the investment process. With no takeovers and no information feedback from a market in shares, the only potentially effective constraint on inefficient investment behavior is political action, or "voice" (Hirschmann 1972), and this is subject to serious transaction costs and free-rider problems.

Voice vs. Exit in ANCSA Firms. The Native corporations' experience provides an interesting example of the substitution of voice for exit. Karpoff and Rice suggest that the substitution caused excessive communication with shareholders and excessive board and management turnover. Hirschmann, however, argued that economists are perhaps too quick to extol exit and dismiss voice. One would expect to see more use of voice when exit is foreclosed. Although a detailed analysis of board turnover, elections, and dissident behavior is well beyond the scope of this paper, the tests of hypotheses one through four above shed some light on whether this substitution was efficient or not.

Clearly the ANCSA corporations cannot be assumed to be a "revealed-efficient" organizational form. Like countries, they could muddle along earning below-market returns, provided that the decision-making elite is earning at least a market return on its own human capital and the gains from reorganization are not sufficient to overcome the free-rider problems

involved. However, it is a mistake to assume that these corporations are simply business firms gone awry, as Karpoff and Rice seem to do. The difficult task for any serious evaluation of ANCSA as public policy is to consider both the costs *and the benefits* of the inherently political nature of these groups. To that end, it is possible to consider the evidence on internal political pressure to lift stock sales restrictions after 1991, when they were originally scheduled to automatically expire. If these restrictions carried large costs with few benefits, one would expect to see some efforts made to lift them:

Hypothesis 5: To the extent stock sale restrictions were inefficient with no countervailing benefits, they generated some internal pressure to remove them.

Of course these efforts may have been wholly unsuccessful due to free-rider problems.

2.4. Summary: Theory and Hypotheses

In this section I have proposed five broad hypotheses about the behavior of the Alaska Native corporations and the resulting outcomes. The common thread running through all five hypotheses is the question of whether a one-time transfer of secure property rights in land and money to a group can promote efficient investment and growth.

Economic theory suggests that the lump-sum nature of the asset transfers and the relatively clear specification of each corporation's property rights to land and money should promote growth more successfully than the in-kind transfers and ambiguous rights that characterized United States Indian policy during much of this century (**H4**). Since they always have the option of investing in the world market, the corporations should on average earn at least the market rate on their capital (**H1**), unless they were trading off profits for employment (**H2**). The Natives' low initial human capital may have caused initially poor performance while learning took place, in which case performance should improve over time and long-term efficiency should be judged by later outcomes (**H3**). Considered strictly as business firms rather than collective entities, the corporations should have suffered from the inability of shareholders to sell shares. If these restrictions brought no offsetting benefits, they would generate internal pressures for removal after 1991 (**H5**).

3. A Brief History of Alaska Native Land Claims

The legislative settlement of Native land claims was one of four major milestones in the evolution of property rights, resource scarcity, and political power in the territory that forms Alaska.¹³ To appreciate this evolution and to understand the initial conditions facing the Alaska Native people, it is useful to briefly review the history of the occupation and settlement of Alaska and the land claims process.

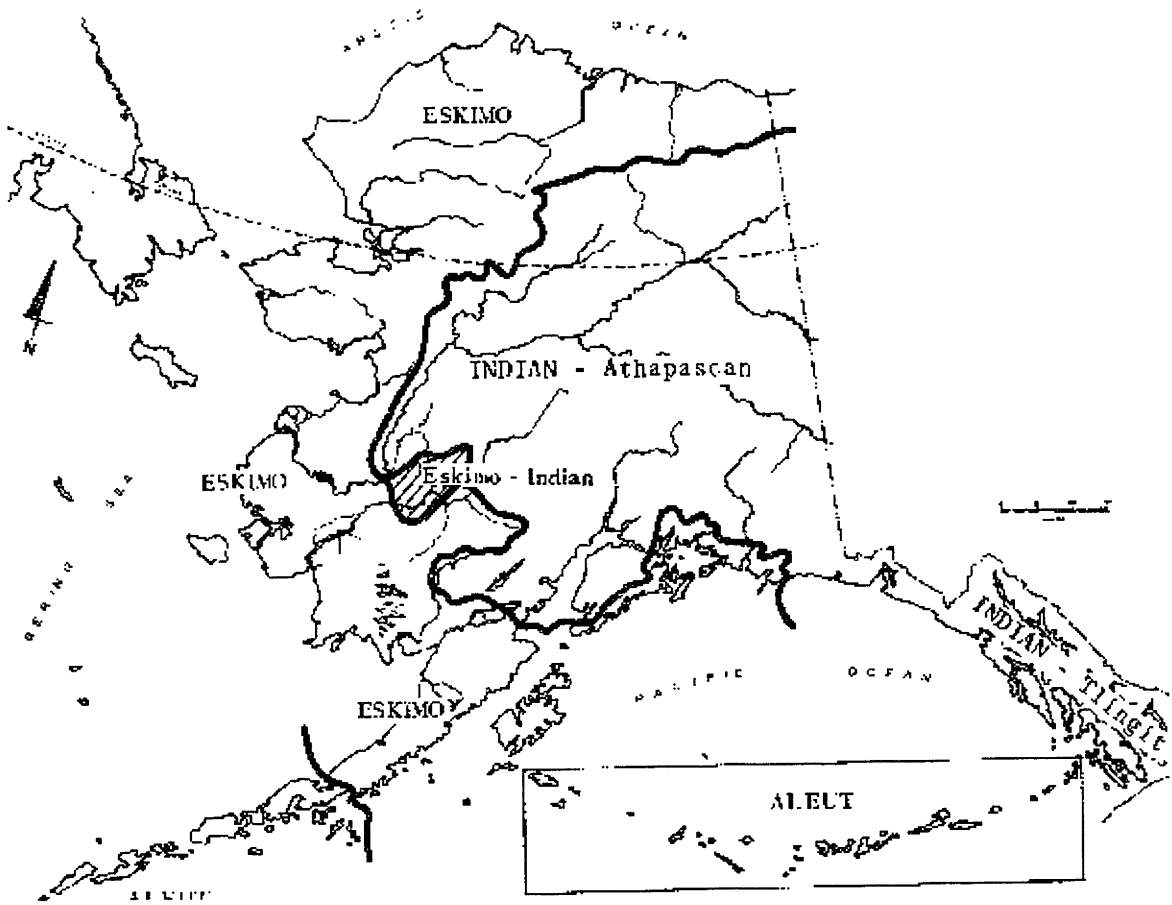
3.1. Alaska's Native Peoples

Alaska's indigenous peoples -- the Aleuts, Eskimos, and Indians-- have continuously occupied and used the entire territory for about 8 to 10 thousand years. According to Chance (1990), the Aleuts and Eskimos are closely related linguistically and appear to be the most recent aboriginal arrivals from Asia, while the Indians moved up the Pacific coast of North America and share linguistic ties with continental North American groups ranging from Canadian Athapaskans to the Apache and Navajo of the U.S. Southwest. At the time of European contact, there were about 70,000 Natives living in the territory (Arnold 1976, p. 8). Figure 1 shows the approximate distribution of these peoples.

Between 15,000 and 20,000 Aleuts lived in coastal villages on the lower Alaska Peninsula and Aleutian Island chain. They hunted marine mammals and gathered eggs, roots, and berries. In the 1700s Russian fur traders enslaved the Aleuts and exploited their labor in the harvesting of the rich populations of fur seals. This contact decimated the Aleut population. Through direct execution and the spread of infectious disease, their population had by the time of Russian departure in 1867 shrunk to only 2,000 people (Federal Field Committee 1968, pp.236-238).

¹³The purchase of Alaska from Russia in 1867, the Statehood Act of 1959, and the Alaska National Interest Lands Conservation Act (ANILCA) of 1980 are the other major milestones in this evolution.

Figure 1: General Distribution of Alaska Native Peoples



The Eskimos numbered about 40,000 and occupied the western and northern coastal mainland. The Inupiat occupied the north and were highly dependent on hunting marine mammals, especially whales. The Yup'iks lived in the coastal and upriver lowlands and based their subsistence economy on Salmon.

In the middle 1800s the New Bedford Whaling fleet ranged into the Arctic Ocean in search of dwindling whale stocks and established a physical and cultural presence among the Inupiat (northern) Eskimo. At Barrow and other northern villages, relations with whites were cordial, with substantial intermarriage between whalers and Inupiat women that is reflected in today's family names. Apparently there were enough whales to go around for all, even though the Inupiat were highly dependent on the Bowhead for food, fuel, and ritual.

Finally, there were the Indians. Several thousand Athapaskans occupied the vast Alaska interior with a hunting and fishing society that included limited copper smelting technology. Their contact with Europeans was highly limited until the gold rush of the 1890s. In marked contrast, white traders had contacted the 12,000 Tlingit and Haida Indians along the coast of Southeast Alaska as early as 1780. These wealthy clans lived in an exceptionally resource-rich, temperate environment, and their trading savvy was widely known. Because they had traded with earlier Europeans for guns, they were able to fend off enslavement by the Russian-American Company when it established its monopoly trading position (and government) at Sitka in 1800.

3.2. Emerging Land Use Conflicts: 1867-1960

The Natives made heavy use of marine and fish resources as their staple foods, supplemented by roots and berries. Arriving Caucasians exploited fur seals, whales, and gold by 1900. Notably absent from the list of economic opportunities in the Alaska territories were agriculture and manufacturing. Settlement was not a desired goal; there were only 550 Russians living in the territory when it was sold in 1867. Because the resources were either marine or (in the case of placer gold) widely scattered, and their extraction was extensive rather than intensive in land, there were few major conflicts between whalers or miners and Natives. With Southeast coastal salmon things were different as the Tlingits sought to defend some of their valuable salmon runs, with limited success. Other Salmon runs were not exploited by the Seattle-based commercial salmon industry until the early 20th century.

In short, throughout the 19th and early 20th centuries, there seemed to be plenty of land and (with some exceptions) resources for all. This lack of perceived scarcity was reflected several times in the federal laws governing the territory of Alaska. At the time of purchase from Russia (1867), the Treaty of Cession simply lumped Alaska Natives in with the rest of the Indigenous U.S. Population.¹⁴ The Organic act of 1884¹⁵ (setting out the governance structure for the territory) contained much stronger language protecting Native rights:

The indians or other persons in said district shall not be disturbed in the possession of any lands actually in their use or occupation or now claimed by them but the terms under which such persons may acquire title to such lands is reserved for future legislation by Congress.

Almost immediately, this language began to acquire economic and legal meaning, as the gold rush and then the commercial “salmon rush” led to serious encroachment on Native lands and food supplies. The Tlingit Indians bore the brunt of this new exploitation and organized legal protests and political action that culminated in the Tlingit and Haida lawsuit of 1936. This suit sought compensation for millions of acres of lands withdrawn by the federal government for the Tongass National Forest.

While the Tlingit-Haida claim was being adjudicated, the Alaska Statehood Act of 1958 further renewed a bland claim of continuing respect for Native rights established by use and occupancy¹⁶. But far more important was the Act’s direct assignment of more than 100 million acres in property rights to the new state. The Statehood Act required the State of Alaska to select, survey, and patent fully one third of the land base, and to select the most valuable lands it could discern for mineral leasing, agriculture, tourism, and other export industries. The theory was that devolving a secure resource base to the struggling State of Alaska would lead to its fiscal and economic autonomy and growth.¹⁷ This imminent hardening of property rights in an area with essentially zero existing private property signaled a major and rapid foreclosure of possible Native rights to these lands.

Shortly after statehood the Court of Claims finally decided the Tlingit-Haida case. The court held that the land withdrawal did in fact constitute a taking of formerly occupied lands and

¹⁴The Treaty of Cession stated: “The uncivilized tribes will be subject to such laws and regulations as the United States may, from time to time, adopt in regard to aboriginal tribes in that country.” (quoted in Arnold 1976, p. 26)

¹⁵ Act of May 17, 1884, 23 Stat. 24, section 8, quoted in Arnold 1976, p. 68.

¹⁶The Act disclaimed the State’s rights to lands “the right or title to which may be held by Eskimos, Indians, or Aleuts.” (Arnold 1976 p. 91)

¹⁷At the time, some scholars questioned this theory of economic determinism (Rogers 1962).

required compensation. But the compensation was finally established (8 years later) at only 50 cents per acre based on nominal values as of the purchase from Russia in 1867. The decision shocked many Natives into the realization that established judicial channels would not bring meaningful amounts of land or even cash assets into Native hands. Yet it also provided an important legal precedent by accepting the link between traditional subsistence use and occupancy of vast land areas -- as opposed to fixed agricultural settlement -- and the lawful claim to that land. By this standard, the Natives had a valid claim to all of Alaska.

3.3. The Land Claims Struggle: 1960-1970

During the early 1960s the encroachments on traditional Native lands accelerated. World War II had brought a large influx of white people into the territory and established white settlement -- and hunting and fishing pressure -- at many heretofore-unoccupied places. However, it was the grand development schemes and increased enforcement of federal hunting restrictions that really alarmed the Natives. In 1961 the Atomic Energy Commission proposed using atomic weapons to blast a harbor out of the bluffs at Cape Krusenstern on the Northwest coast. Shortly thereafter, the Bureau of Reclamation and Army Corps of Engineers developed plans to build a huge dam on the Yukon river that would have flooded out many villages and subsistence habitats.

Three Important Shocks. These regional conflicts might have remained isolated pockets of ineffective Native complaints in a vast territory but for three events that qualify as exogenous shocks to the Alaska economy. Two were technological, while the third was legal.

The first innovation was a dramatic increase in the human capital and communications technology available to the Natives. During the mid-1960s a new generation of college-educated leaders was just emerging from school. They had shared the high school experience together at the Bureau of Indian Affairs' Mt. Edgcombe Boarding School in Sitka -- a sort of educational boot camp that took the best and the brightest and instilled in them both self-confidence and a sober realization of the Alaska Natives' lot in life. This experience created an instant and unprecedented leadership class and a statewide network of personal relationships among these leaders.

Equally important, these leaders found a sympathetic source of private funding¹⁸ to support a statewide, Native-controlled newspaper, the *Tundra Times*. This newspaper was the first means of mass communication available to Alaska Natives, since at the time there was essentially no television reception, radio was dominated by localized commercial am broadcasters, and telephone connections were tenuous or nonexistent. Even this innovation would have been pointless were it not for the increasing literacy among the Native population generally. It is hard to underestimate the importance of this innovation in galvanizing the awareness and subsequent statewide political organization of the Native population in a land of scattered roadless villages.

The second shock to the system was an administrative legal action taken in 1966 by Interior Secretary Stuart Udall. Concerned that the 1884 Organic act had sidestepped the legitimate rights of the Natives, Udall placed a freeze on all transfers of disputed land. This action effectively halted *all* transfers to the State of Alaska and created immediate pressure for Congress to resolve the Native land claims issue. Although an administrative action, the freeze was extended past 1968 when Senator Henry Jackson agreed to give the Alaska Federation of Natives (AFN) veto power over President Nixon's appointment of Walter Hickel as the new Interior Secretary. Hickel extended the land freeze as the price of his approval by AFN.

By 1968, then, the bargaining over Native land claims was finally shifted to Congress, the only body that could dispose of the issue at relatively low cost. Still, the terms would have been poorer and the resolution far slower had it not been for the third, decisive shock to the system. This was the discovery of the supergiant oil field at Prudhoe Bay. Located on land owned by the State of Alaska, the field was immediately estimated to contain more than 10 billion barrels of recoverable reserves, producible at a rate equal to about 20% of existing U.S. oil production.

The Importance of Prudhoe Bay. The petroleum shock dramatically raised the stakes of the bargaining game for all parties. Although the Natives never asserted title to the oilfield itself, the oil required transportation across 700 miles of contested federal lands to reach the ice-free port of Valdez.¹⁹ With daily production of 2 million barrels at stake, the discovery created an

¹⁸ Dr. Henry Forbes of Cambridge, Massachusetts (Arnold p. 99).

¹⁹ Other pipeline routes were considered. The leading candidate was an overland route through Canada to the Midwest. However, this option was ultimately judged too expensive and politically difficult. The consideration of

effective opportunity cost in lost rents of about \$6 million per day. Because the field was located on state land, it promised billions of dollars in royalties as well as oil company profits.

Equally important, the Prudhoe discovery changed the perceptions of what a claims settlement could accomplish. Alaska, which had been poor, would now be rich. If there were additional sources of such huge rents lurking in everyone's backyard, then the economic development problem was reduced to distributing endowments. The Natives could get rich too. Seeing the coming speculative boom fueled by such a huge discovery, many prescient businesspeople realized that putting land into Native hands was a far faster route to exploitation than leaving it in federal public domain or even passing it to the State. Business opposition to a settlement began to soften.

Most important, it was the oil shock that allowed the Native *land claims* movement to be merged, in the eyes of Congress, with the Native *economic development* problem. Alaska Native underdevelopment in 1968 was severe by any standard. Native unemployment ranged between 50 and 60 percent in the fall and winter (Federal Field Committee 1968). The 1960 Census reported median per capita income for rural Natives at about \$1,200, or only 25 percent of urban white income. Half of all Native children had not completed more than 6th grade, and only 8 percent had completed high school (U.S. Census 1960). In 1960 Native life expectancy at birth averaged 60 years, ten years less than the U.S. average of 70 years (U.S. Public Health Service 1967). In the socially tumultuous climate of the late 1960s, the Alaska Native land claims issue presented Congress and the nation with a chance to make more enlightened, or at least more compassionate, Indian policy than had been imposed on the tribes of the lower 48 states.

These three shocks-- new political technology, the land freeze, and huge but sterilized resource rents -- served to make Coasian bargaining over Native land claims possible. The legislative story has been well told by several authors.²⁰ Most of the bargaining revolved around two questions: how much land, and how much money? Both quantities were decided through simple political assessments, proposals, and compromise. Of greater interest to economists, the *structure* of the settlement was hardly debated at all, although there were many major changes made to this structure throughout the process. In fact, major structural changes were introduced

this option, which would have avoided dealing with Native land claims, probably explains why oil company support for settling the issue was lukewarm at best until 1971.

²⁰Arnold (1976), Berry (1975), and Groh (1981) provide good accounts from different perspectives.

at the last minute to appease various interests and create compromise on what were perceived to be the larger issues.

3.4. *The Settlement Act*

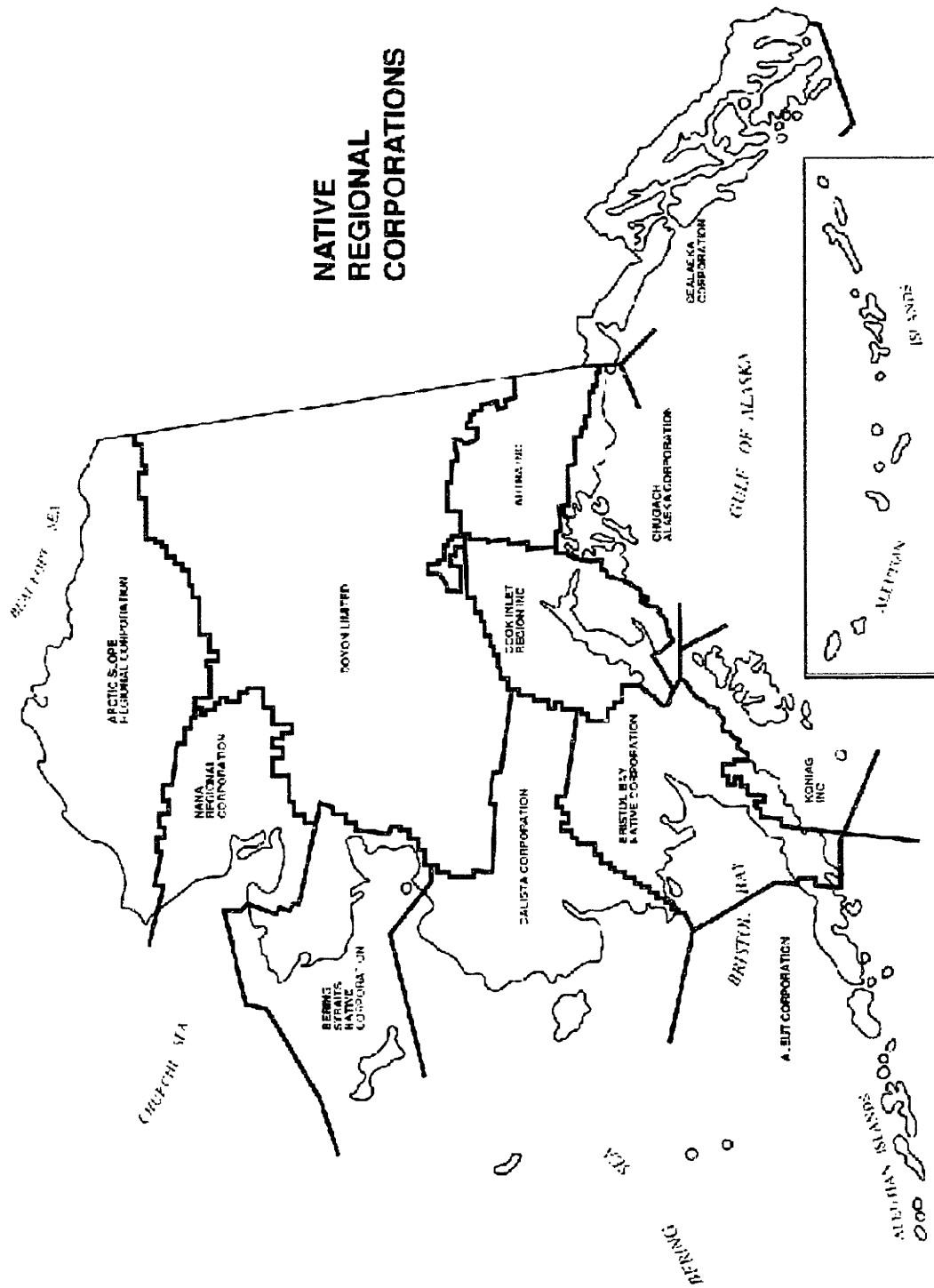
ANCSA transferred 44 million acres of land and \$962.5 million in cash to business corporations owned exclusively by Alaska Natives. The act established 12 regional corporations and approximately 200 village corporations. Each Alaska Native alive at the time of the act (December 17, 1971) was allowed to enroll in a village corporation, which choice automatically enrolled them in the corresponding regional corporation. Table 1 shows the wide variation in land areas and number of shareholders across regions.

Table 1: Alaska Native Regional Corporations

Name	number of shareholders	regional and village land area (million acres)	Initial ANCSA cash (\$ million)	major natural resource endowments
Ahtna	1,100	1.7	6.4	
Aleut	3,249	1.6	19.5	
Arctic Slope	3,738	5.1	22.5	potential oil and gas
Bristol Bay	5,200	3.0	32.5	
Bering Straits	6,200	2.2	38.1	
Calista	13,306	7.0	80.1	
Chugach Natives	2,109	1.0	11.5	timber
Cook Inlet	6,553	2.5	34.4	known oil and gas
Doyon	9,061	12.5	53.4	potential minerals
Koniag	3,731	1.7	20.0	
NANA	5,000	2.2	28.9	zinc-lead deposits
Sealaska	15,700	0.3	92.5	old-growth timber
Total	74,947	40.8	439.9	

The corporations were given substantial freedom in choosing and using their new endowments, consistent with Alaska corporation law. However, the Native shareholders could not sell their shares and the regional corporations had to share a portion of their natural resource rents with all other Native corporations on an equal per capita basis.

Figure 2: Alaska Regional Corporations



The land transfer was straightforward. Village corporations received selection rights to 26 million acres of proximate lands. The intent was to formally convey ancestral heritage and subsistence lands. It was widely recognized that 26 million acres was not enough land to provide for subsistence needs and that no fishing rights were included in the deal.²¹ Regional corporations received all of the subsurface under village lands plus an additional 16 million acres in fee simple (surface and subsurface).

The Tlingit-Haida decision had established the principle of money compensation for lands taken. Secretary Udall came up with the idea of tying the money settlement to future federal petroleum leasing revenues from outer continental shelf (OCS) lands off the Alaska coast as a way of making the compensation politically palatable. The Prudhoe Bay discovery probably made this tapping of prospective new revenues seem like a painless proposition. The final figure of \$962.5 million was a last-minute compromise; the basic amount of \$1 billion appears to have been pulled out of thin air as a "nice round number"²² Everyone recognized that working capital would be needed for functioning business corporations.²³

The regional corporations were required to incorporate as for-profits, while the village corporations had the option of incorporating as nonprofits. Almost none did.²⁴The regional and village corporations each received 45 percent of the money settlement. The remaining 10 percent went to each individual enrolled Native. (Among other things, this immediate payment to individuals can be interpreted as a "sign-up bonus" to encourage people to enroll in a corporation.)

3.5. The Corporation as the Settlement Institution

One Inupiat Eskimo called them the "new Harpoon."²⁵ Why was the alien institution of the profit-making business corporation chosen as the principal repository for the Natives' new

²¹ Subsistence rights were the subject of continuing bargaining culminating in additional rights in 1980. The Alaska National Interest Lands Conservation Act of 1980 granted subsistence rights to *rural* (not Native) residents. The allocation of subsistence rights remains bitterly contested and unresolved. (Morehouse & Holleman 1994)

²² Weinberg, Ed, Interview with Victor Fischer, 7/13/77, recorded in Fischer's unpublished mimeo "Legislative History: Structuring the Settlement." (page "r," available from the author). Weinberg was a lead attorney for the Natives.

²³The \$1 billion dollar amount was first broached in the Federal Field Committee's (1968) report to Senator Jackson, *Alaska Natives and the Land*. The corporation concept was already well-established at the time.

²⁴Flanders (1996, personal communication, May 13) cites his own interviews in which Native leaders said that the for-profit structure offered more flexibility even if a nonprofit mission was to be embraced.

²⁵Charlie Edwardsen, in Edwardsen (1974).

property rights? The use of the corporation as the settlement vehicle was a direct recommendation of the State of Alaska's Land Claims Task Force. One legal scholar noted in a subsequent review that

The legislative history of ANCSA does not contain any significant discussion of the use of corporations to implement the settlement. The 1968 report of the Federal Field Commission recommended use of corporations, and all subsequent legislative proposals followed that model. (Bass, 1984, p. 4)

Recent research by Mitchell (forthcoming), based on extensive interviews with primary actors, traces the corporation concept to Barry Jackson, a staff attorney for the AFN who drafted the Natives' proposed bill for the Task Force. Jackson claims he adopted the concept based on a widespread distaste for other alternatives -- especially IRA²⁶ corporations and other entities controlled by the BIA -- and for the formally egalitarian structure of shareholders' rights. But the deliberate vagueness that the corporate form offered was clearly a reason why it was embraced by all sides.

Assimilationists saw in corporations business dealings and modern capitalism. Tribalists saw more real autonomy and, in any event, an improvement over the reservation system. New Native political leaders saw the opportunity for economic and political self-determination, not to mention the promise of management positions for themselves. The corporation offered a beguilingly simple vehicle for settling the thorny land claims issue. It allowed all parties to feel comfortable with their vision of the legislation.

Although the overall corporation concept was adopted early in the game, there was significant debate about how the corporations would be structured. Many early versions of the claims bill called for a statewide investment corporation to own the subsurface and control much of the working capital. The Alaska Federation of Natives early on opposed this concept and fought vigorously for regional corporations. They had learned from bitter experience how hard it was to hold together a statewide political coalition among disparate Native groups. Native leaders had invested heavily in region-specific political capital.

²⁶ Indian Reorganization Act (of 1934)

3.6. Special Features of the ANCSA Corporations

In many ways the ANCSA bundle of property rights was quite straightforward. However, three special features of ANCSA were highly unconventional, with potentially serious implications for economic efficiency.

First, shareholders could not sell their stock for at least 20 years. This prohibition removed the threat of takeover as a powerful discipline mechanism and eliminated the actual takeover as a corrective mechanism. With no takeover threat and no information feedback from a market in shares, finance theory suggests that shareholders would be forced to substitute a host of higher-cost and less effective monitoring activities. Inalienability also blocks individuals' attempts to diversify which creates artificial demand for corporate diversification (Karpoff and Rice 1989) and stifles productive but risky investment (Fama & Jensen 1985). It creates problems for shareholders facing liquidity constraints, a condition that certainly applied to many poor Alaska Natives.

The second potentially serious feature of ANCSA was the requirement of section 7(i) that regional corporations share 70 percent of the "net revenue" from subsurface and timber resource sales with all other corporations, both regional and village. This provision created standard incentives to shelter resource rent income. It was also poorly drafted and invited costly litigation during implementation.²⁷

Third, corporate management was given complete control over an essentially public good -- the land -- that was highly valued by individual shareholders. This tied the security of the land base to the control of the Board of Directors and ultimately to the voting power of the stock. Under this structure, allowing stock sales would invite free riding on the communally owned land and increase the incentives for individual Natives to sell out. Fearing this outcome, few would vote to allow stock sales.

3.7. Other Initial Conditions Faced by the Natives

Section 2 of ANCSA specified that the settlement was to address the "real social and economic needs" of Alaska Natives. Those needs in 1971 were compelling. The Natives at the time were poor and illiquid. This created pressure for early dividends. They had little formal education. This lack of human capital meant that internal management talent was scarce and the

Board's monitoring ability low. The Native people lived on the economic periphery of a peripheral region.

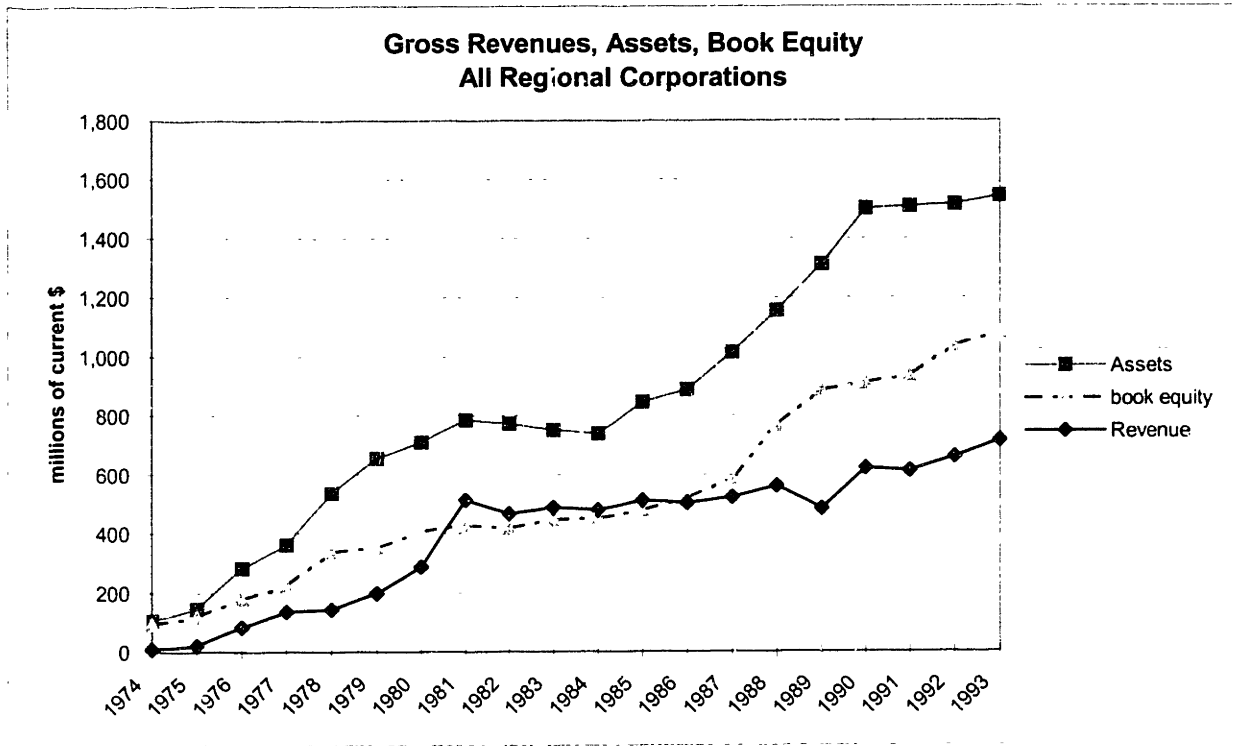
Countering these pessimistic conditions as the corporations were formed in 1972 was Alaska's new-found oil wealth. The Transalaska Pipeline System (TAPS) was finally approved in 1973 after the first OPEC oil shock. The resulting increase in oil prices fueled a speculative resource exploration boom throughout the State just as the Native corporations began to select their lands. Also of great importance was the continuing flow of federal money from the rest of the United States. Alaska Natives retained their specific eligibility for federal Indian programs and their status as U.S. citizens gave them access to all the social programs and infrastructure subsidies of the world's richest nation. This favorable economic climate allowed the ANCSA corporations substantial freedom to concentrate on profitable investments without facing overwhelming pressure for immediate distribution of wealth.

4. Methodology and Data

By the crude measures of gross revenue or assets, the Native regional corporations have become a significant economic force within the Alaska economy. Figure 3 tells this story for the 12 regional corporations as a group. Total revenue increased steadily to \$714 million in 1993 and total assets topped \$1.5 billion.

²⁷ The definition of "net revenue" was litigated for 10 years before being settled out of court.

Figure 3



Overall return on book equity as reported on financial statements was less spectacular-- averaging only 3.9% over the 1976-1993 period.²⁸ This average conceals huge disparities among corporations that I address in a subsequent paper. Of greater importance for an assessment of overall economic efficiency are the important differences between accounting net income and economic production. This section discusses these problems and lays out a method for estimating meaningful measures of production using the available accounting data.

4.1. *Basic Problems with the Accounting Data*

The data I will use to measure economic performance come from the audited financial statements in the corporations' annual reports. The statements follow generally accepted accounting principles and are accurate presentations of the corporate books. However, beyond the familiar problems with using financial statement quantities for economic analysis (Fisher and

²⁸This is an arithmetic average of overall annual returns, with each overall annual return computed as total net income for the group of twelve divided by the total of their book equity.

McGowan 1983), there are several serious measurement problems specific to the ANCSA corporations. The most important of these problems are the following.

First, natural resources and land conveyed by the settlement are not carried as assets on the corporate books. Thus reported book equity tends to understate shareholder wealth in resource-rich regions. This omission reduces the denominator in a rate of return calculation, thus overstating the true value of the ratio. Second, with no natural resources listed as assets, depletion is not charged against revenue when a natural resource is extracted and sold. This overstates income by confusing asset sales with true production. The overstatement of income inflates the numerator of the rate of return calculation.

These two accounting problems have two separate effects on the rate of return calculation. Suppose reported net income is NI and reported book equity is B . Then the reported rate of return is:

$$\text{[reported] } ROE = NI / B$$

Now suppose that reported net income NI consists partly of natural resource asset sales, r_n , made from an asset base with a market value of A_n that is owned outright by the shareholders. (If the corporation itself processes the raw resource, the asset sale r_n is the imputed amount normally taken as a depletion charge). Then the correct calculation of the return on shareholder equity is:

$$\text{[correct] } ROE = (NI - r_n) / (B + A_n).$$

In considering these resource-related accounting problems it is important to note that they are certainly not unique to Alaska Native corporations. Indeed, the problems that resource rents pose for national income accounts are well known. Scholars of growth have a healthy respect for their importance when a country is a heavy resource exporter. For example, Mankiw, Romer and Weil (1992) completely exclude all oil-exporting countries from their sample when doing cross-country comparisons.

Reliance on resource exports is an economic fact of life for the entire Alaska economy. The State government has recorded more than \$40 billion from oil royalties and severance taxes as “petroleum revenue” even though the cash flows stem from the one-time sale of petroleum

wealth and are clearly not sustainable. Historically, the economy has been built on successive resource extraction booms based on furs, gold, copper, fish, proximity to the Soviet Union,²⁹ and only quite recently petroleum. In each case the resource was essentially nonrenewable and the economic stock depleted rather quickly. These facts do not mean that resource rents should be treated as income when evaluating Native corporation performance. They simply suggest a proper context for interpreting the data on resource rents as compared with other business activities.

The third accounting problem is that ANCSA firms have no market values because the stock is not traded. Observable market values for residual claims would include capitalized future natural resource rents and partly solve the accounting problems just mentioned. It is impossible to say *a priori* how the use of a market value for equity in the denominator would affect the ROE calculation. Many ANCSA firms carried assets at inflated values, which artificially increased the denominator.

Fourth, a great deal of revenue and expense is treated as “extraordinary,” due to the many business startups and shutdowns during the study period. In particular, the losses from many failed businesses are often listed as “extraordinary losses,” rather than operating costs. On the revenue side, the corporations generated huge amounts of windfall cash by selling paper tax net operating losses to other companies. Proper economic analysis should attribute the extraordinary losses to their respective business operations and exclude the extraordinary windfall gains.

4.2. An Accounting Model of Net Income Components

Because of these accounting problems, reported net income is a tangled mixture of windfalls from tax preferences, natural resource asset sales, and other transfers, as well as productive economic activity. To extract the signal -- net income from actual business operations -- from the noise, I divide each corporation’s reported net income into four key components. The data are sufficient to make a direct assessment of *three* of these components: windfall tax loss sales, resource rents, and returns on passive investment. The fourth and the desired component, net income from active business, can then be computed as a residual.

I begin by writing reported accounting net income for a single regional corporation as:

²⁹In 1960 military spending accounted for more than half of Alaska’s total employment (Goldsmith 1994).

$$NI \equiv R - C - t - Tr \quad (1)$$

where

NI = total reported net income

R = total revenue from corporate activities

C = total reported cost of corporate operations

t = reported taxes

Tr = net resource revenue-sharing transfers *to* villages and other regions

All observations are annual from 1973 to 1993; time subscripts are suppressed.

Of these terms, only NI and t are reported in annual reports. R , C , and Tr are not reported directly; instead some combination of R and some [unknown] part of Tr is reported as revenue while some combination of C and some [unknown] part of Tr is reported as expense. However, net resource revenue-sharing transfers out, Tr , can be computed separately (see below). Thus t and Tr can be added back to (1) to get pretax, pre-sharing net cash generated within each region:

$$NIGEN = NI + t + Tr \quad (2)$$

or, using (1),

$$NIGEN = R - C \quad (2')$$

It is easy to compute $NIGEN$ from (2). The problem is to give empirical content to (2') by attributing the generated net cash to the four key activities:

Windfall sales of paper tax net operating losses (nol)

Natural resource asset sales (nr)

Passive financial investment (p)

Active business operations (bus)

Each type of activity contributes revenue and causes incremental costs. In addition I assume there is some fixed social overhead cost F that must be incurred to manage the millions of acres of settlement lands and to conduct corporate governance somewhat more intensively than would a standard corporation. This cost can be thought of as an implicit tax imposed by the multiple aims of ANCSA and cannot be charged against any of the four particular cash sources. Thus the right side of (2') can be expanded as:

$$R - C = (R_{nol} + R_{nr} + R_p + R_{bus}) - (C_{nol} + C_{nr} + C_p + C_{bus} + F) \quad (3)$$

Substituting (3) into (2') and rearranging into sources of net cash flow,

$$\begin{aligned}
NIGEN = & (R_{nol} - C_{nol}) \\
& + (R_{nr} - C_{nr}) \\
& + (R_p - C_p) \\
& + (R_{bus} - C_{bus}) \\
& - F
\end{aligned}
\tag{3'}$$

Again, the components of (3') cannot all be computed directly because the revenues R_{bus} and costs C_{bus} of active business operations are not reported in an economically meaningful way.³⁰ However, it is possible to compute good estimates of all of the *other* terms in (3').

Specifically,

R_{nol}	Gross proceeds from tax loss sales are reported directly.
C_{nol}	I allocate 2% of gross proceeds from tax loss sales for attorney's fees and other transactions costs
$(R_{nr} - C_{nr})$	This rental or "net resource revenue" amount is exactly what must be shared -- and hence reported -- according to ANCSA section 7(i).
R_p	Passive investment revenue is reported directly.
C_p	I allocate 2% of gross passive revenue for management fees.

The resulting residual measures the combined effect of net cash flow from business operations *and* fixed social overhead:

$$(R_{bus} - C_{bus}) - F = NIGEN - (R_{nol} - C_{nol}) - (R_{nr} - C_{nr}) - (R_p - C_p) \tag{4}$$

All the terms on the right side of (4) are measurable. As a final step I estimate the social overhead cost F and add it back to both sides (the details are discussed in section 5 below). This isolates the net cash flow attributable to actual business operations:

$$(R_{bus} - C_{bus}) = NIGEN - (R_{nol} - C_{nol}) - (R_{nr} - C_{nr}) - (R_p - C_p) + F \tag{5}$$

³⁰A few annual reports do contain modified income statements by business segment. However even these generally lump all depreciation, interest and administrative costs together. In addition much business activity for ANCSA corporations has been reported as "extraordinary income" or "discontinued operations," which are not properly allocated in the data. The vast majority of the reports do not contain any meaningful allocation of cash flows by line of business.

In summary, the approach I take makes use of all reasonably available accounting data to break down reported accounting net income, NI, into economically meaningful components:

$$\begin{aligned}
 NI &\equiv && \text{[reported net income]} \\
 (R_{bus} - C_{bus}) &&& \text{[net income from business operations]} \\
 + (R_p - C_p) &&& \text{[net income from passive investment]} \\
 + (R_{nr} - C_{nr}) &&& \text{[natural resource rents]} \\
 + (R_{not} - C_{not}) &&& \text{[net cash from windfall tax loss sales]} \\
 - Tr &&& \text{[net transfers of resource rents to others]} \\
 - t &&& \text{[corporate taxes]} \\
 - F &&& \text{[implicit social overhead tax]} \qquad (6)
 \end{aligned}$$

4.3. The Data Sets

I constructed two sets of consistent annual data from the ANCSA corporations' annual reports and other primary material. The first covers all twelve regional corporations from their inception in 1973 through 1993. This panel is complete and is, in effect, a census rather than a sample. The second data set consists of more condensed financial results from 18 village corporations for sporadic years between 1980 and 1994. This panel is an opportunity sample and is quite incomplete. The village sample is used mainly to conduct an additional broad test of the validity of the regional corporation results.

Coding of the Regional Corporation Accounting Data. In addition to measuring the components of net income just described, I also coded all balance sheet data into a consistent set of aggregates. This coding allows me to properly track the evolution of corporate assets and liabilities, which is important when calculating the various return on equity measures.

Assets. I used the balance sheet and associated notes to classify assets into the following four categories, which are intended to reflect the basic asset allocation problem facing management. In increasing order of risk and asset specificity, these are:

- Financial capital
- Joint ventures (minority interests)
- Natural resource investments (over and above ANCSA land conveyances)
- Physical (fixed) capital

Receivables. Receivables often form a significant part of the booked asset base. Accounting practice lumps together trade receivables and financial receivables, which are

economically quite different. Short-term trade receivables are non-productive claims on wealth, and are sometimes matched on the liabilities side by trade payables. Generally, however, they must be financed with working capital and thus constitute part of the firm's asset allocation problem. These items can be quite large, sometimes accounting for more than 20% of the total listed asset base. Other receivables, such as notes receivable, earn interest. I removed these financial receivables and classified them as financial capital.

Contributed Capital. ANCSA corporations received the bulk of their contributed capital as the cash portion of the original settlement. These settlement monies were distributed on an equal per-capita basis. However, in several cases individual corporations received significant additional contributed capital. Tracking these infusions is important since they represent one-time jumps in book equity not due to earnings. The infusions most difficult to handle are those arising from three regions where the regional corporation merged with its constituent villages during the early 1980s.

Natural Resource Rents. Accounting practice allows great flexibility (hence inconsistency among corporations) in reporting revenues and costs associated with natural resource sales, making the determination of rents from the income statement impossible. To get around this problem, I exploit the fact that since ANCSA requires net revenue to be shared, these *net* amounts are computed by all corporations according to uniform rules.³¹ Furthermore, as I now show, the structure of the sharing mechanism ensures that shareable revenue receipts data from one corporation are sufficient to identify the entire pattern of rent generation and transfers among all.

Each corporation generating net resource revenues must transfer 70% of these revenues to a pool that is then divided up on a per capita basis among all the ANCSA regional *and village* corporations. The pool is split 50/50, so that 35% of total revenue is shared among all regional corporations and 35% is shared among all village corporations. Thus, each regional corporation i receives a constant fraction α_i of the resource rents R_{jt} generated by regional corporation j in year t . The α_i are just the relative shares of the total shareholder population, normalized to sum to .35. This allocation leaves the other half of the 70% pool to be shared with the village

³¹The so-called "7(i) agreement" is a 120-page set of accounting rules that goes into great detail, especially with regard to the allocation of joint costs and the offset of profits on project A with losses from project B. It is clear that

corporations. Thus, a single set of observations from corporation i on its receipts r_{ijt} from each of the others j suffices to establish the complete pattern of rent generation R_{jt} for that year.³²

$$R_{jt} = r_{ijt} / \alpha_i \tag{7}$$

Since the timing of fiscal years differs among corporations, there is some minor measurement error noise resulting from imputing generated revenues based on the year of receipt by others.

Expenses. Standard accounting practice does not group expenses by line of business. In particular, business operating expenses are found partly in “cost of sales” items and partly in “general and administrative.” Therefore classification of expenses data is not used directly in the analysis.

Village Corporation Data. The village corporation sample consists of 19 corporations for which financial statements for at least some years are on file with the State of Alaska. State regulations require that only village corporations with assets over \$1 million and more than 500 shareholders must make such filings. However, several smaller corporations have provided data, perhaps out of ignorance of the rules. Thus 5 of the 19 have fewer than 500 shareholders, as shown in Table 2. The sample is still heavily weighted toward the larger villages, and as a result covers 29 percent of the total shareholder population.

the parties were acutely aware of the asymmetric incentives that could result if all profits from successful projects were shared while all losses from dry holes were absorbed.

³² My data on net resource revenue receipts was kindly provided by Cook Inlet, Inc. and Bristol Bay Native Corporation

Table 2: The Village Corporation Sample

(shaded boxes denote cells with data.)

ID#	Name	size	#obs	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79
31	Afognak	513	15																	
32	Bean Ridge	42	2																	
33	Bethel Native Corp	1,759	15														1			
34	Choggiung	1,049	2																	
35	GanaAYoo	1,155	11																	
36	GwitchyaaZhee	744	11																	
37	Kenai Natives	485	12																	
38	KIC	2,021	7																	
39	Kodiak (Natives of)	5,420	13																	
40	Koyitlotsina	492	5																	
41	Kuskokwim	1,215	10				1								1					
42	Old Harbor	329	6																	
43	Pilot Point	147	2																	
44	Sealion	621	11								1			1						
45	Sitnasuak	2,054	12				1													
46	TDX	542	5							1			1							
47	Tozitna	579	9											1	1				1	
48	UIC	2,042	8							1										
49	Unalakleet	828	11								1	1		1	1	1	1	1	1	1
	Total Sample	22,037	167	1	7	11	10	13	15	16	14	13	12	12	11	10	7	6	6	3

Missing Observations in the Village Sample. Although the regional corporation data set is a complete panel, the village corporation data is quite incomplete. This causes obvious problems with interpreting “combined” results for all villages taken together. The first problem is that a spurious time trend for the combined group could result simply from the changing composition of the sample. If we regard the subsample of available data in year t as a set of random draws (without replacement) from the sample, then the combined return on equity or the combined net income expressed on a per capita basis are unbiased estimates of the corresponding measures from the complete sample. I proceed on this assumption, using rates of return and real \$ per capita figures to at least control for inflation, growth in assets, and the changing *size* of the subsample.

Coding of the Village Corporation Data. Village corporations do not have to share (or report) the natural resource rents that they generate. Therefore there is no independent source of data on their natural resource asset sales beyond their own annual reports. However, since village corporations own only the surface estate, their major source of resource rents is timber sales, and these are usually reported directly. In addition, village corporations almost always report directly

the shared resource rents transferred to them from the regional corporations. Therefore the following variables (in addition to the standard accounting aggregates) can be directly coded from the village data:

R_p	passive investment proceeds
R_{nr}	natural resource rents (transferred in or generated)
R_{not}	proceeds from tax loss sales

With these variables the analysis of net cash flow components summarized in equations (4) and (5) above can also be carried out on the village sample.

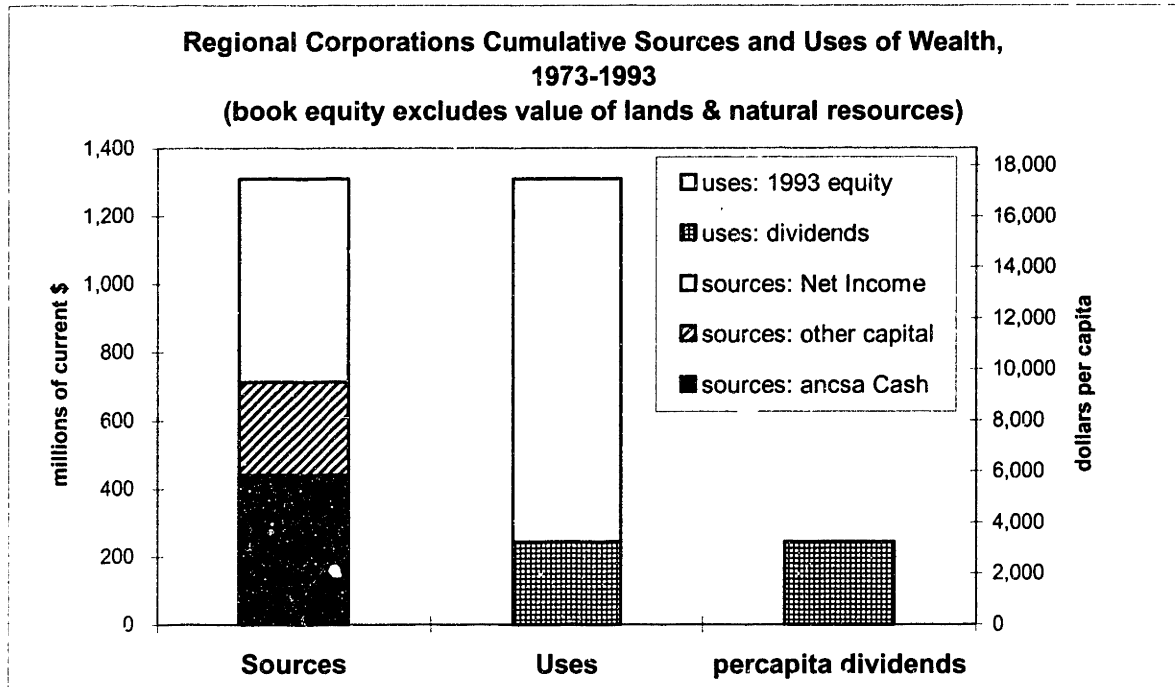
5. Analysis and Hypothesis Testing

In this section I carry out the analysis of net income described above. I focus on the twelve regional corporations. Some results for the village corporation sample follow.

5.1. Regional Corporation Reported Financial Results

Figure 4 shows a condensed balance sheet for the twelve regional corporations. This provides a useful perspective on the analysis that follows. It is worth noting the large amount of other contributed capital (the diagonally hatched part of the left-hand bar) in addition to ANCSA cash. Almost all of this represents surplus federal properties and bidding rights on other real estate seized by the FDIC during the savings and loan crisis. These properties went to Cook Inlet Region, Inc., in exchange for a reduction in the corporation's entitlement to ANCSA lands in Alaska. For Cook Inlet, the "additional capital" was about 6 times as much as it got in ANCSA cash, and helps explain the large amounts of absolute income generated by this one corporation. Although Cook Inlet has also posted one of the higher returns on equity, its popular status as the top performer among the regional corporations is largely due to this extra infusion of capital rather than to superior economic performance.

Figure 4: Sources and Uses of Regional Corporation Wealth



Sources and Uses of Wealth: 1973-93

		millions of current \$	\$ per capita
	ANCSA Cash	440	5,870
plus:	Other Capital	273	3,641
plus:	Net Income	596	7,956
equals:	Total Sources	1,309	17,467
less:	Dividends Paid	(243)	(3,249)
equals:	1993 Equity	1,066	14,219

The overall regional corporation return on book equity (ROE) averaged only 3.9% over the 1976-1993 period. (1974 and 1975 are excluded from ROE calculations because equity was very low and net income very erratic during these start-up years). The overall figure conceals significant variation among the twelve corporations, as shown in Table 3.

Table 3: Average Reported Returns on Book Equity

	per capita book equity on 12/31/93	average annual return on book equity 1976-93
Ahtna	21,965	4.5%
Aleut	4,282	-9.3%
Arctic Slope	25,170	13.1%
Bristol Bay	9,788	5.0%
Bering Straits	4,693	-40.7%
Calista	668	-7.5%
Chugach Natives	(1,180)	5.3%
Cook Inlet	66,453	12.0%
Doyon	15,573	12.8%
Koniag	6,215	10.7%
NANA	10,017	2.7%
Sealaska	13,489	7.7%
Overall	14,412	3.9%
excluding Bering Straits	14,024	4.8%

Since the Bering Straits Regional Corporation is a clear outlier (it went through chapter 11 bankruptcy in 1986), Table 3 also shows the overall return excluding this corporation. The overall return rises from 3.9% to 4.8%, hardly enough to change the basic initial result.³³

5.2. Analysis of Cash Flow Components

I now compute the adjustments to accounting net income laid out in section 4, above, and show the impact of each. The end result of the 5 adjustments will be a solid estimate of net income from business operations. The starting point is reported net income, *NI*, which is measured after taxes and after net transfers of resource rents. Adding taxes back in to net income is trivial and will not be discussed further. ANCSA corporations have paid very little in taxes due to their persistent accounting losses.

Adjustment 1: add back shared resource rents. Given that ANCSA was perceived by some as an attempt to promote economic welfare through land development, the data on natural resource rents are of some interest in their own right. Between 1973 and 1993, about \$455 million in shareable rents were generated. Table 4 shows that three corporations generated

³³The increase is small because Bering Straits contributes a small amount of equity to the calculation.

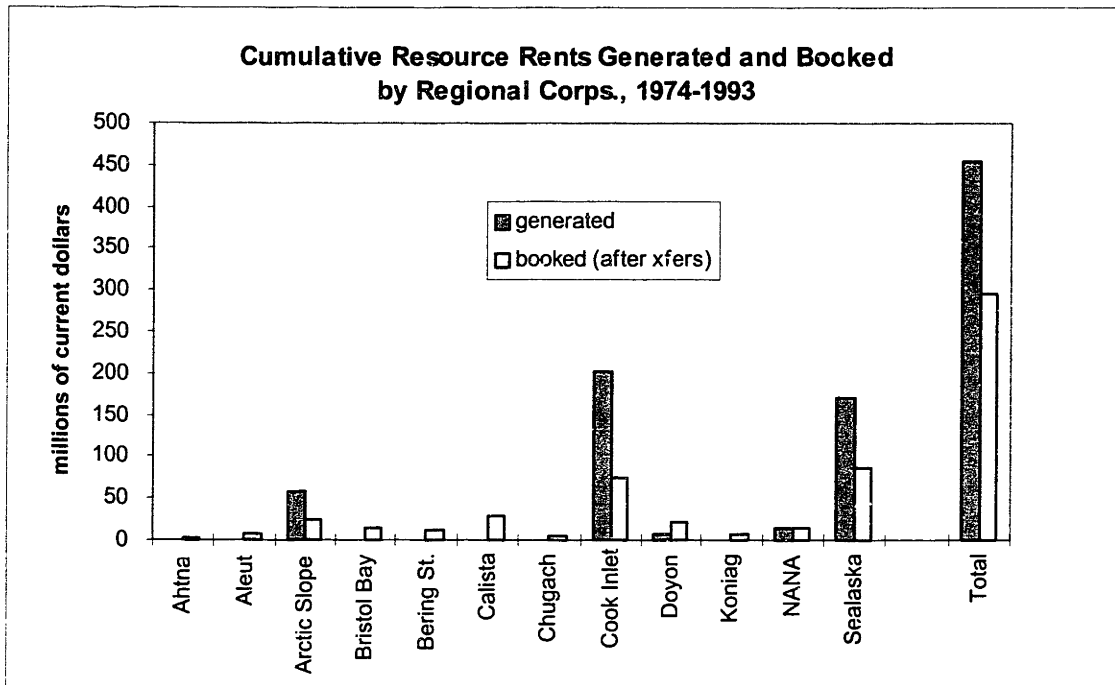
almost all the rents: Arctic Slope sold oil and gas leases, Cook Inlet sold oil and gas reserves and leases, and Sealaska sold timber. Of the total generated, \$159 million was shared among all regional corporations, and another \$159 million was shared among all village corporations. For many small village corporations this shared resource wealth constitutes their only relatively steady cash flow. Figure 5 highlights the great disparity in natural resource endowments.

Table 4: Natural Resource Rents Generated and Transferred

(thousands of current dollars)

	(1) Shareable net revenues generated	(2) gross Transfers TO other regions	(3) gross Transfers TO villages	(4) gross Transfers FROM other regions	(5)=(2)+(3)+(4) Net transfers out or (in)	(6)=(1)-(5) Revenues ultimately booked as income
Ahtna	0.6	0.2	0.2	(2.2)	(1.8)	2.4
Aleut	0.1	0.0	0.0	(7.0)	(7.0)	7.0
Arctic Slope	57.2	20.0	20.0	(8.0)	32.1	25.1
Bristol Bay	0.3	0.1	0.1	(13.5)	(13.3)	13.7
Bering St.	0.0	0.0	0.0	(11.6)	(11.6)	11.6
Calista	0.0	0.0	0.0	(28.5)	(28.5)	28.5
Chugach	0.3	0.1	0.1	(4.1)	(4.0)	4.2
Cook Inlet	202.6	70.9	70.9	(13.4)	128.4	74.2
Doyon	7.3	2.6	2.6	(19.4)	(14.3)	21.6
Koniag	0.3	0.1	0.1	(7.2)	(7.0)	7.2
NANA	15.1	5.3	5.3	(10.4)	0.2	14.9
Sealaska	171.5	60.0	60.0	(33.9)	86.1	85.4
Total	455.3	159.4	159.4	(159.4)	159.4	296.0

Figure 5: Natural Resource Rents Generated and Retained



The dark bars show rents generated. The light bars show rents ultimately booked as income. The difference between the two is the net transfer to other regions and villages. For all regions together (“Total”) the difference between \$455 million generated and \$296 million booked is the net transfer of \$159 million to all the village corporations.

The purpose of adjustment 1 is to add taxes and resource revenue transfers back to reported net income to get pretax, pre-sharing net cash flow. The impact of this adjustment is to increase cumulative income generated by 25 percent and to raise the average return on equity from 3.9 to 5.4 percent, as shown in shown in Table 5.

Table 5: Adjusting for taxes and sharing of resource rents

	symbol	cumulative current \$ million	adjusted average ROE
reported net income	<i>NI</i>	596	3.9%
plus: taxes	<i>t</i>	5	
plus: resource rents transferred out	<i>Tr</i>	159	
equals: net income generated	<i>NIGEN</i>	760	5.4%

Adjustment 2: Remove Proceeds of Tax Net Operating Loss Sales. For several years prior to 1984, all U.S. corporations could sell taxable net operating losses (NOLs) to one another. Tax law changes in 1984 eliminated this option for everyone *except* the ANCSA corporations.

Pursuant to the 1984 Native corporation exemption, some profitable corporations sought out the Alaska Natives looking for losses to buy, but due to some vagueness in the law, the Natives' share of the resulting tax benefits was too low to attract resources into crafting large deals.

In response to this vagueness, Alaska Senator Ted Stevens introduced what he termed a "clarifying amendment" as a floor amendment to the 1986 Tax Reform Act.³⁴ Passed by voice vote with no debate, the amendment clearly stated that ANCSA corporations were the only remaining legal sellers of tax NOLs in the country. Introducing the bill, Stevens argued that it was fair compensation for reductions in resource values caused by delays in land conveyances under ANCSA. At the same time, he was well aware that several corporations desperately needed to be rescued with a cash infusion. Still, he claimed that the fiscal impact of the amendment would be "substantially less" than \$50 million.³⁵

With their position as monopoly sellers of tax NOLs firmly established, the ANCSA corporations attracted a steady stream of Fortune 500 corporations to Alaska. According to proxy statements (Shee Atika 1987), annual reports, and several participants in the process,³⁶ the market for taxable losses quickly stabilized at a price of about 80 cents paid per dollar of reduced taxes. Since most of the early deals carried income back to the era of the 46% rate, this meant that the Alaska Native corporations were receiving about 36 cents in cash per dollar of taxable loss.

While some of the early NOL deals involved the sale of hard cash losses, corporate attorneys quickly realized that most ANCSA land was conveyed, for tax purposes, during the period from 1980 to 1982 -- when timber and oil prices were at a cyclical peak. By 1986, these prices had fallen dramatically, especially when computed on a stumpage, wellhead or other netback basis. Any resulting difference between the tax basis (based on high 1980 prices) and the actual sale price received for severing the resource was a taxable loss that could be sold for up to 36 cents on the dollar. Since the Natives paid no actual cash for the land, all of these resource-based losses were on paper only and all of the resulting sales proceeds were windfall income.

This rent seeking opportunity caused almost all of the regional and village corporations to conduct reappraisals of resources already sold and in some cases to accelerate pending sales to

³⁴The amendment became section 1804(e)(4) of the Act.

³⁵Congressional Record- Senate, June 23, 1986, p. S 8175.

³⁶personal communications: John Shively, NANA Corporation, 6/12/94; Tom Hawkins, Bristol Bay Native corporation, 6/20/94; Mark Copeland, Anchorage Attorney, 6/20/94.

generate large amounts of tax losses. When Congress became aware of the magnitude of the transactions in 1988, it promptly ended the privilege. In most cases the actual cash proceeds were placed in escrow pending final IRS approval of the transactions and some corporations did not show the sales as income on their books until after approval. Thus most NOL sales proceeds show up as accounting income between 1986 and 1990.

The total amount of this windfall income booked through 1993 by the twelve regional corporations was about \$417 million.^{37,38} The money probably saved Bering Straits and Chugach from chapter 7 bankruptcy and essentially recapitalized many regional and village corporations. Table 6 shows the NOL proceeds received by each regional corporation, and compares them to the initial ANCSA cash settlement. A “recapitalization ratio” is computed after adjusting both NOL proceeds and ANCSA cash for inflation.

Table 6: Regional Corporation Proceeds from NOL Sales

	(1) total nominal NOL proceeds 1986-93 \$ million	(2) NOL sales proceeds per shareholder	(3) total real NOL proceeds 1986-93 million '93\$	(4) total real ANCSA cash million '93\$	(5)=(4)/(3) recapital- ization ratio
Ahtna	4.9	4,440	5.9	11.9	0.50
Aleut	3.1	940	3.7	35.5	0.10
Arctic Slope	2.5	669	3.0	41.2	0.07
Bristol Bay	19.2	3,697	23.0	66.0	0.35
Bering Straits	35.3	5,695	41.9	71.3	0.59
Calista	17.9	1,346	21.9	146.7	0.15
Chugach Natives	33.0	15,668	43.3	20.5	2.11
Cook Inlet	96.9	14,792	112.1	67.1	1.67
Doyon	76.6	8,454	93.1	103.2	0.90
Koniag	16.9	4,539	20.2	36.4	0.55
NANA	2.7	540	3.3	53.0	0.06
Sealaska	107.7	6,859	131.4	178.9	0.73
Total	416.8	5,561	502.9	831.8	0.60

³⁷The largest sale of all was not booked until 1994, when Arctic Slope Corporation recorded income of \$121 million from the sale of about \$450 million in taxable losses. Since the sample period used for this paper only extends through 1993, this \$121 million is not included in the analysis.

³⁸ The village corporations made at least \$500 million in additional NOL sales.

Inspection of Table 6 shows the uneven distribution of the NOL windfall. Some of the poorest corporations (Aleut, Calista, Koniag) received some of the smallest distributions per capita and remained poor. The richest (Cook Inlet) received the second largest amount per capita. Chugach Natives and Doyon went from poor to rich. It seems that NOL sales were an extremely blunt public policy instrument for rescuing the Native corporations from financial distress.

The impact of adjusting net income for NOL sales proceeds is shown in Table 7. The net proceeds are estimated as 98 percent of the gross proceeds, allowing 2 percent for transactions costs. Removing NOL cash reduces cumulative net income by 50 percent, and the average return on equity drops from almost 5.4 to under 1.5 percent.

Table 7: Adjusting for windfall cash from NOL sales

	symbol	cumulative current \$ (000)	adjusted average ROE
net income generated	<i>NIGEN</i>	760	5.4%
less: net NOL sales proceeds	<i>(R_{nol} - C_{nol})</i>	408	
equals: net income excluding NOLs		352	1.5%

Adjustment 3: Remove Natural Resource Rents. The purpose of adjustment 1 was to undo the effects of the *sharing* of natural resource rents. The rents themselves also represent windfall cash from selling off natural endowments. This is especially true since none of the resources are carried as assets on the corporate books. Thus resource rents are shown as accounting income when they actually represent asset sales.³⁹ Table 8 shows that when these asset sales are removed from net income, the resulting measure of cumulative net income is negative. The average ROE drops to negative 2.3 percent. The regional corporations lost money, even before adjusting for inflation, from the sum total of their active and passive investments.

³⁹Most of the valuable timber sold by Sealaska, Chugach, and other timber-holding corporations is not renewable on an economically meaningful time scale.

Table 8: Adjusting for Natural Resource Rents

	symbol	cumulative current \$ (000)	adjusted average ROE
net income excluding NOLs		352	1.5%
less: natural resource rents	$(R_{nr} - C_{nr})$	480	
equals: net income from invested capital (passive and active)		(128)	-3.0%

Adjustment 4: Remove Passive Investment Income. The third net income component that is easily isolated is income from passive financial investments in stocks and bonds. This income is generally reported directly. In computing net income from this source I allow for 2 percent of the reported revenue as a money-management cost. Table 9 shows that a large amount of cash was earned from passive investment. With this component removed, the resulting losses are significant and equal in magnitude to the original ANCSA cash settlement of \$440 million⁴⁰.

Table 9: Removing Passive Investment Income

	symbol	cumulative current \$ (000)	adjusted average ROE
net income from invested capital (passive and active)		(128)	-3.0%
less: passive investment income	$(R_p - C_p)$	532	
equals: [net income from business operations minus social overhead]	$[(R_{bus} - C_{bus}) - F]$	(660)	

I do not attempt to further adjust the return on equity figures. To do so would require allocating each corporation's capital structure (debt and equity) to passive or active investment assets, and there is no reasonable basis for such allocations. This was not a problem for adjustments 1 through 3 because neither NOL sales nor resource rents have associated opportunity costs of capital.

Adjustment 5: An Allowance for Social Overhead Costs. With revenue sharing effects, tax loss sales, resource rents, and passive investment income removed from reported net income, the remaining quantity is $[(R_{bus} - C_{bus}) - F]$. The final adjustment is to add back fixed social overhead F to arrive at an accurate measure of net income attributable to business

⁴⁰ Recall that the regional corporations received 45% of the total cash settlement.

operations. To estimate a reasonable amount for social overhead I looked at the regional corporations' actual general and administrative costs for their early years of operation. Based on this assessment, I assume F to range between about \$1 and \$3 million per year, depending on the number of shareholders and amount of land holdings.⁴¹ My formula for assigning social overhead cost to corporation i , in millions of 1993 dollars, is simply:

$$F_i = 1.0 + (AREA_i / maxarea) + (SHAREHOLDERS_i / maxshareholders)$$

where

$AREA_i$ is corporation i 's land area;

$maxarea$ is the largest land area (belonging to Doyon);

$SHAREHOLDERS_i$ is the number of shareholders; and

$maxshareholders$ is the largest number of shareholders (enrolled to Sealaska).

Using this formula, the cumulative social overhead for all twelve regional corporations is \$279 million. Adding this back in to the quantity obtained in Table 9, the estimated overall net income from active business operations from 1973-1993 is *minus* \$380 million. If one believes my estimates of social overhead are too high, the amount of estimated business losses would simply rise one-for-one with any reduction in the assumed overhead amount.

5.3. Summary of Adjustments

In making the adjustments above I have assigned values to all the terms of equation (5) in the accounting model of section 4.2:

$$(R_{bus} - C_{bus}) = NIGEN - (R_{not} - C_{not}) - (R_{nr} - C_{nr}) - (R_p - C_p) + F \quad (5)$$

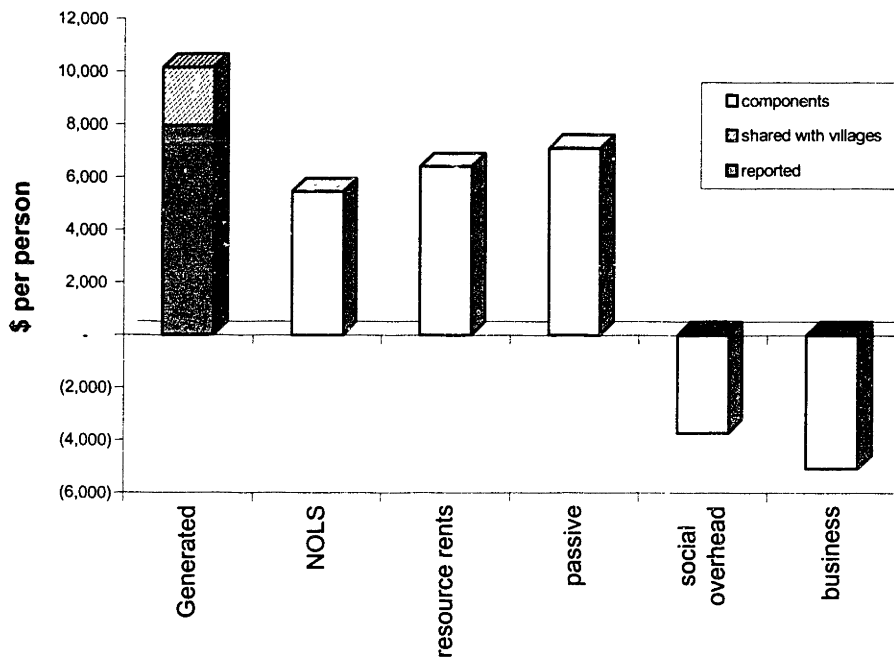
Table 10 restates the condensed balance sheet, originally presented as Figure 4 above, to show these components of income. Figure 6 shows the components in real 1993 dollars per capita. The overall picture is the same with or without correction for inflation.

⁴¹In 1974, actual general and admin costs ranged from about 0.6 million to about 3.5 million real 1993 dollars.

Table 10:
Regional Corporations' Financial History, with Components of Income

	symbol	Total \$ million	dollars per Capita
Shareholder Equity Start of 1973		0	4
plus: ANCSA Cash Inflow		440	5,870
plus: Other Capital Inflow		273	3,641
plus: Accounting Net Income	<i>NI</i>	596	7,956
composed of:			0
Net NOL Sales Proceeds	<i>(R_{nol}-C_{nol})</i>	408	5,450
+ Natural Resource Rents	<i>(R_{nr}-C_{nr})</i>	480	6,408
+ Passive Investment Income	<i>(R_p-C_p)</i>	532	7,101
+ Business Operations Income (Loss)	<i>(R_{bus}-C_{bus})</i>	(380)	(5,074)
- Unavoidable Social Overhead	<i>F</i>	(280)	(3,738)
=Pre-tax, pre-sharing net income	<i>NIGEN</i>	760	10,147
- Net 7i Transfers to villages	<i>Tr</i>	(159)	(2,126)
- Taxes	<i>t</i>	(5)	(64)
=Reported Net Income (Loss)	<i>NI</i>	596	7,956
Total Sources of Wealth		1,309	17,467
less: Dividends Paid		(243)	(3,249)
plus: Adjustments to Retained Earnings		14	190
= 1993 Shareholder Equity		1,080	14,408

Figure 6: Components of Regional Corporation Net Income
 In real 1993 dollars per Native shareholder



This decomposition paints a far different picture of economic progress than the increases in gross revenues or assets shown in Figure 3. It shows that the ANCSA regional corporations survived financially on windfall resource endowments, windfall tax preferences, and their passive financial investments. The cash flows from these sources financed a combination of social overhead costs -- mostly land management -- and business losses that together totaled more than \$650 million.

When returns on book equity are recomputed after excluding first NOL sales and then (in addition) natural resource rents, the changes move some corporations from positive to negative accounting profits. The overall ROE for the group drops from 5.4% (pre-tax, pre-sharing), to 1.5% when NOL sales are excluded, and to -3.0% when resource rents are also excluded. Since this number still includes passive income, the actual ROE from business alone is significantly lower still.

Table 11: How adjustments Affect Regional Corporation ROEs

	Reported	pre-tax Generated	Excluding NOLs	Excluding resource rents
Ahtna	4.5%	4.3%	2.9%	1.8%
Aleut	-9.3%	-11.9%	-13.0%	-13.0%
Arctic Slope	13.1%	27.2%	26.7%	2.8%
Bristol Bay	5.0%	2.1%	-0.6%	-0.7%
Bering Straits	-40.7%	-48.7%	-63.0%	-66.9%
Calista	-7.5%	-24.6%	-28.0%	-28.0%
Chugach Natives	5.3%	4.0%	-7.4%	-13.4%
Cook Inlet	12.0%	16.8%	14.9%	7.3%
Doyon	12.8%	12.6%	1.9%	0.8%
Koniag	10.7%	4.8%	-12.1%	-12.2%
NANA	2.7%	4.8%	4.5%	0.5%
Sealaska	7.7%	10.2%	3.5%	-3.2%
Overall (weighted)	3.9%	5.4%	1.5%	-3.0%

5.4. Further Evidence from the Village Corporation Sample

The data from the sample of 18 village corporations paint roughly the same picture of business losses covered by windfalls. In addition to being an incomplete panel, the village sample suffers from more noise in the measurement of natural resource rents since these rents are not subject to sharing (hence reporting) requirements.

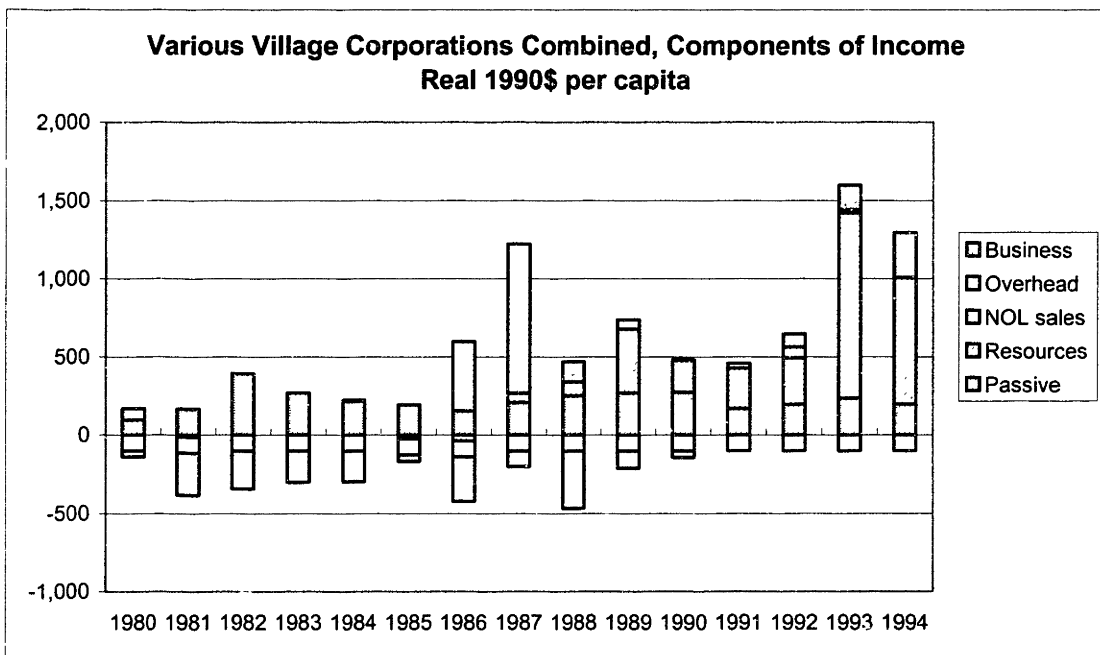
Table 12: Combined Return on Equity for Village Corporations

5.2% using NI as reported
 4.7% using NIGEN (pre-tax, pre-sharing)
 2.7% removing NOL sales
 -0.1% removing resource rents

Note that the first adjustment, for the sharing of resource rents, decreases the village corporations' return on equity. Village corporations as a group are net recipients of shared rents.

Figure 7 shows the components of income over time for the village sample, in real dollars per village corporation shareholder. (I use per capita amounts to control for the changing size of the panel). The figure clearly shows the windfall effects of tax loss sales and, later, of the one-time sales of mature timber by the Southeast Alaska village corporations.

Figure 7: Village Corporation Components of Net Income



5.5. Discussion of Specific Hypotheses

The preceding analysis separated windfalls from economic production. With production isolated I can now consider the five broad hypotheses set out in section 2 above. To measure productive performance I use the adjusted return on equity obtained above by removing windfalls from tax loss sales and resource rents. I call this *nonwindfall* income. For the regional corporations a group the nonwindfall return on equity was -3.0%, as shown in Table 11.

H1: Productive Efficiency. Hypothesis one states that the corporations made productive use of capital by investing in active business operations only up to the point where the return had dropped to that available in the world market. The analysis strongly rejects this efficiency conjecture. The regional corporations *lost* more than \$380 million from active investments, while they earned normal returns on their passive portfolios.

H2: Employment-Profit Tradeoffs. Hypothesis two states that profits are low because employment is high. There is scanty data on employment over time. A 1991 snapshot shows that the group employed about 7,500 people in direct operations and subsidiaries, but only 2,000 of these people were Native shareholders.⁴² Most important for the hypothesis, more than 90 percent of the employed shareholders were employed by only three corporations: Cook Inlet, Arctic Slope, and Nana. Cook Inlet and Arctic Slope had the *highest* nonwindfall returns on equity of the entire group, in a sharp rejection of the hypothesis. The Nana corporation, however, managed to employ more than 20% of its entire shareholder population and had an adjusted return of about 0.5 percent, which was the 5th best of the group. Nana has always claimed that its primary goal is jobs, even at the expense of profits, so the tradeoff may be an efficient one for them. For the group as a whole, and for everyone but Nana separately, the data strongly reject the hypothesis of an efficient tradeoff between employment and profits. Essay 2 considers this hypothesis in more detail.

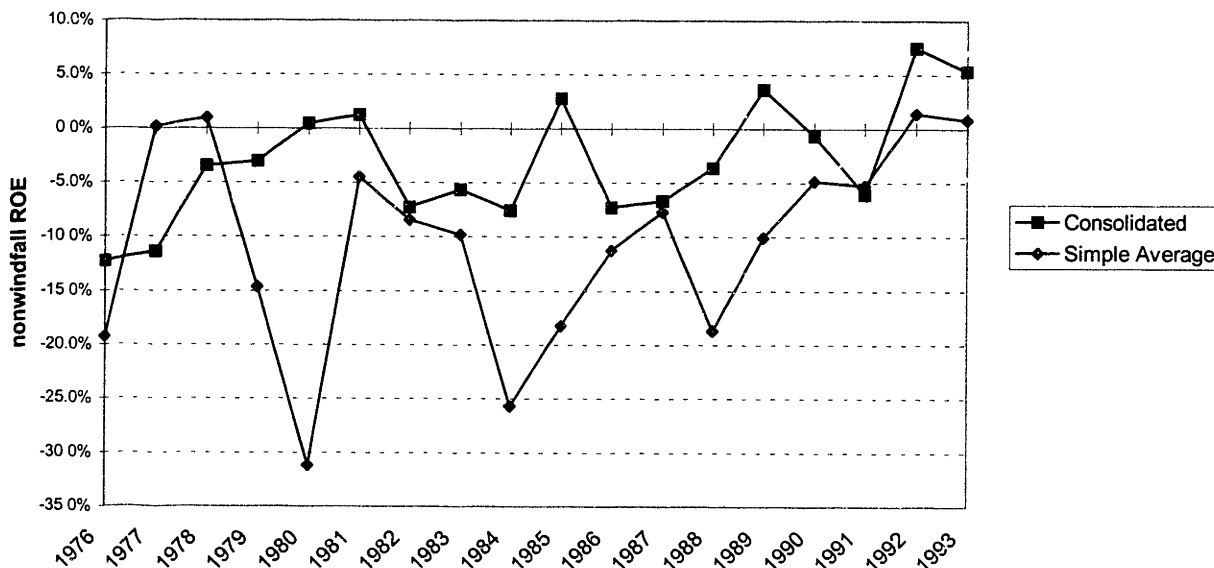
H3: Learning. Hypothesis three states that performance improved as learning took place. A simple regression of consolidated nonwindfall ROE on time produces a statistically significant positive trend suggesting that for the regional corporations taken as a group, ROE improved at an average rate of 0.44 percentage points per year ($t=2.42$). However, this apparent improvement is a statistical artifact arising from the use of a consolidated ROE figure that weights the

⁴² The data source is a mail survey conducted by the author and the Alaska State Chamber of Commerce.

performance of each corporation by the amount of its equity. Over time, successful corporations grow and laggards stagnate. Eventually, the consolidated performance of the group is heavily dominated by the successful

To measure learning over time each corporation should be weighted equally.⁴³ Figure 8 shows both the *consolidated* regional corporation nonwindfall ROE and the *simple average* of each corporation's nonwindfall ROE values. While a steady improvement in consolidated ROE can be seen, no such trend is apparent in the simple average. The regression of simple average ROE on time confirms this: The trend is weakly positive (0.3% percentage points per year) but not significant ($t=0.89$). Other variations on this theme such as t-tests of the average values during two separate time periods produce similarly insignificant results. In summary, there is no evidence of learning effects in the time series of simple average nonwindfall ROE values.

Figure 8: Regional Corporation Consolidated ROE and Simple Average of Individual ROEs



⁴³ Weighting by relative number of shareholders might also be appropriate. Any weighting scheme that is not correlated with performance will avoid survivor effects.

H4: Institutions and Growth. I have shown that the both the regional and village corporations lost large amounts of wealth in the first twenty years after a policy shock that gave them clear title to 44 million acres of land and 1 billion dollars, and exposed them to the full marginal opportunity cost of their actions in the marketplace. This poor economic performance provides one strong piece of evidence against the argument that a *group-based* policy shock in favor of clear property rights and an outward orientation towards markets is sufficient to propel the poor minority group into sustained growth. The data are silent on the question of whether a similarly large transfer directly to individuals would have produced remotely similar results. In addition, the "insufficiency result" obtained here does not refute the proposition that strong property rights are *necessary* parts of some larger whole.

H5: Restrictions on Stock Sales. To test the hypothesis that stock sales restrictions were a critical constraint on performance with no countervailing benefits, I consider the political economy of changes to ANCSA and the implementation of its provisions relating to the sales restrictions. The original ANCSA legislation stated that restrictions on stock sales would be lifted *automatically* in 1991. In 1985, the Inuit Circumpolar Conference commissioned a review of ANCSA based on public meetings in almost every Alaska village. Hundreds of Natives showed up at the meetings and expressed themselves on the record. The resulting report (Berger 1985) was highly critical of the corporate structure of ANCSA, but contained no reports of shareholders wanting to sell their stock. Instead, the overwhelming fear expressed was that somehow the traditionally communal land assets would be lost through corporate transactions or mismanagement.

This sentiment was carried forward to the U.S. Congress in 1987, when several amendments to ANCSA were passed. The most important of these protected the undeveloped land base from adverse possession and changed the rules on stock sales restrictions so that the restrictions remained in place indefinitely until removed by a vote of the shareholders. The political pressure felt by Congress was for tightening, not loosening, the restrictions.

Almost seven years have passed since each corporation gained the ability to remove its restrictions on the sale of stock. During this period there have been numerous active and sometimes highly credible dissident campaigns to overthrow entire boards of directors or to liquidate large parts of various corporations (Bernton 1992, Jung 1995, Melzer 1994). Other major changes, such as issuing new shares to large groups of children (with substantial dilution

effects on existing stock), have been debated and approved. Special trust funds have been set up to provide cash benefits to elders. These changes and activities clearly demonstrate that shareholders can overcome organizational barriers and free-riding to effect “regime changes” within their corporations.

During this same time period, only one of the more than 200 village and regional corporations has even entertained the idea of lifting the restrictions on stock sales. Cook Inlet, Inc. is far and away the most financially successful Native corporation, with 1993 book equity in excess of \$66,000 per shareholder. When Cook Inlet shareholders addressed the issue of accessing their wealth, they quickly moved from a consideration of simply lifting restrictions to a complicated set of proposals for limited stock buybacks and stock-for-debt swaps -- all of which would keep the company under Native control with diffuse control rights (Whitney 1995).

The evidence thus shows that while shareholders have had the right to activate the “exit” mechanism through the use of “voice,” only one group has even entertained the idea in five years, and this group quickly rejected full tradability. This evidence does not prove that stock restrictions are efficient, but it does suggest that even in the face of large efficiency costs, the shareholders prefer to maintain the Alaska Native corporations as corporations of Natives.

5.6. Problems and Caveats

One reason for studying Alaska Native corporations is simply that, unlike tribal governments or closely held businesses, they are required to divulge a relatively large amount of accounting data. These data allow the construction of tests about certain detailed aspects of corporate performance. In interpreting these tests, however, one must keep in mind that the ANCSA corporations were only one set of institutions with limited influence over the lives of the Native people. Although they may have behaved like them at times, Native corporations are not tribes or governments. In any case, the major economic and social force in Alaska during the past 25 years has been the rapid development of North Slope oil. ANCSA was only one part of the social and political response to oil. The Natives' response to ANCSA is hopelessly confounded with Alaska's response to oil (Colt 1993). There is no significant control group of Alaska Natives who did not participate in ANCSA.⁴⁴

⁴⁴Three Native groups that had reservation status prior to statehood elected to retain that status and forego the corporate structure and cash benefits of ANCSA. However these groups have also foregone to some degree the

It is also important when extrapolating these results to remember that Alaska Natives were extremely well-positioned numerically to reap the benefits of transfers from the surrounding economy. They are a large portion (about 15 percent) of the Alaska voting population, giving them a substantial call on the State's federal representatives. But, unlike groups of Indian tribes, they are a numerically trivial group compared to the United States population and tax base. The result has been a steady stream of federal transfers to the ANCSA corporations and to Alaska Natives generally.

6. Conclusions

ANCSA as Compensation. The Alaska Native Claims Settlement Act is a rare example of a large-scale lump-sum transfer, albeit a transfer directed to groups. It was intended to be both a compensation package and a development tool. As compensation, ANCSA was generous by historical standards. It can be thought of as a side payment that enabled North Slope oil development to proceed. Compensation is backward-looking while successful economic development is forward-looking. The Native corporations were charged with melding these objectives into a coherent set of actions, and the task was not easy. They were expected to serve both as the stewards of a communally owned ancestral land base and as the promoters of individual capitalistic success. Whatever their financial shortcomings, *all* of the ANCSA corporations have held on to their millions of acres of land.

ANCSA as a Development Tool. The corporations were effective at channeling resources into investment in the face of the Natives' pressing needs for current consumption. However, the investment resources were largely dissipated in a continuing series of active business losses. When windfall cash flows from tax loss sales and natural resource asset sales are removed from the data the regional corporations lost more than \$380 million between 1973 and 1993, an amount equal to about 80 percent of their initial cash from the claims settlement. Their average consolidated return on equity for the 1976-1993 period drops from +5.4% to -3.0% when windfalls are excluded from income. These losses were not traded for badly-needed jobs. Only

benefits of the oil boom. A systematic comparison of these three groups with the rest of the Natives would be interesting but beyond the scope of this paper.

three corporations generated significant employment, and two of these were also the two most profitable among the group.

These results provide a clear counterexample to several current hypotheses about the determinants of growth and development in isolated pockets of poverty such as Indian reservations and in larger entities such as developing countries. First, the Native corporations effected investment, but the investment was unproductive, thus challenging the maintained hypothesis of much growth theory that a lump-sum transfer of capital will not reduce aggregate production. Second, the ANCSA experience also challenges the notion that sustained development can be effected by relatively simple changes in economic policies and institutions. Even a dramatic transfer of productive assets, hardening of property rights to land, and increased exposure to external market discipline may not be sufficient to halt or reverse economic stagnation. Of course, some or all of these things may still be necessary, and a similar transfer to individuals rather than groups might have produced different results.

ANCSA and the Theory of the Firm. Finally, some authors have argued that the lack of a market in shares was the specific cause of inefficient performance. According to this view, the control rights to assets were dangerously diffuse. I argue that this constraint on behavior was not decisive for the overall outcome because not one of the 212 corporations has even tried to exercise the option to make shares tradable. This does not mean that inalienability does not matter; it almost certainly does increase principal-agent slack between shareholders and management with real efficiency costs. The point is rather that the shareholder-owners have shown a strong revealed preference for the continuation of closed, communal ownership. This suggests that there are complementary benefits from the restrictions, such as the preservation of cultural identity.

Relevance to Other Claims Settlements. The ANCSA corporations' experience can serve as a lesson for other indigenous minorities seeking land-claims settlements. It shows that merely transferring endowments is not sufficient to ensure rapid development. It can serve as a reality check on institutional design and inflated expectations. Like ANCSA, other settlements will probably be group-based and built around some poorly defined mixture of two goals: providing compensation for the past and promoting future prosperity. This paper shows that corporations can channel compensation into investment aimed at the future. But if the investment is systematically unproductive, there is no prosperity and the compensation is effectively undone.

Beyond material prosperity, self-determination and the retention of group identity are professed goals of many indigenous minorities and well-meaning majority governments. This paper shows that vesting property rights in a quasicommunal corporation with inalienable shares may have very large efficiency costs. But retaining Native control of these rights seems to provide major social benefits sufficient to keep shareholders from voting to lift restrictions on stock sales. It remains a challenge for other claims settlements to somehow retain the benefits of group self-determination and the equity of communal ownership while sharpening the incentives for monitoring and managerial performance.

Relevance to Small Countries. Any generalization from an ANCSA Native corporation to an entire country is fraught with peril. Indigenous minorities within advanced countries are surrounded by relatively strong, modern economies and have broad continuing political claims on those countries' resources. This was certainly the case in Alaska, where the 75,000 Natives comprised less than 3 hundredths of one percent of the surrounding United States population. If anything, the Natives' success at political rent seeking was enhanced rather than diminished by their ownership of land and business corporations.

While one could think of a very small poor country as being in the same position relative to the rest of the rich world, the two situations differ greatly in the degree of integration. It would therefore be grossly inappropriate to generalize a sufficiency result from successful ANCSA corporations to other underdeveloped regions that are not tightly connected to wealthy neighbors. However, the converse is not true: Precisely because the ANCSA corporations *failed* to promote growth in spite of the surrounding social safety net and a booming oil economy, they stand as one piece of valid evidence against the efficacy of group-based lump-sum asset transfers as a development policy tool.

Further Research: Individual Variation Among Regions. The group did poorly, but some individual corporations did a fairly good job of delivering economic benefits. Cook Inlet has paid out almost as much money in dividends as has Alaska's oil wealth Permanent Fund, and it retained a 1993 book equity of \$66,000 per shareholder to fuel future growth. Other corporations, such as Nana, have emphasized shareholder employment and investment in their own human capital at the deliberate expense of accounting profits. In 1991 Nana directly employed almost 20 percent of its 5,000 shareholders.

These sporadic bright spots on a generally bleak economic picture cry out for further exploration. Why did Cook Inlet earn \$44,000 per shareholder while Calista lost its entire endowment of \$7,000? Why did Nana manage to regularly employ hundreds of its people while its geographic and cultural neighbor Bering Straits employed only 12?⁴⁵ Are these disparities decreasing or increasing over time? These questions are taken up in the following essay.

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⁴⁵based on 1991 data

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II. Exploring Variation among Alaska's Native Regional Corporations

Abstract

Behind the generally poor performance of the Alaska Native regional corporations is a surprising amount of cross-sectional variation. I explore this variation using models from development theory and political economy. In a multi-sector framework, local business ventures based on the traditional economy earned positive returns, but were limited by the small size of the market. Statewide enterprises outside the oil industry made persistent losses of more than 20% per year. Oil investments produced mixed results. Joint ventures with established non-Native firms performed better than wholly owned operations. Quasirents from Native shareholder employment were important to only three firms -- the rest lost money without any countervailing employment. Case history evidence suggests that internal sharing networks and common preferences helped the high-employment firms to deliver both jobs and dividends. Overall, most variation in performance remains unexplained.

1. Introduction

The Alaska Native Claims Settlement Act (ANCSA) of 1971 was an institutional shock that transferred one billion dollars of cash and 44 million acres of land to 75,000 Eskimos, Indians, and Aleuts. The settlement had many attributes of a one-time, lump-sum transfer, but the transferred endowments were vested in business corporations and the Native shareholders could not sell their stock. ANCSA was a deliberate repudiation of previous United States Indian policy based on reservations and federal oversight. It was intended to be a development tool as much as a claims settlement,¹ a means for one of America's poorest minority groups² to escape from poverty on a self-determined path.

In Essay #1 I showed that the consolidated financial performance of the Alaska Native corporations over the past 25 years was poor. The twelve regional corporations lost about \$380

¹ "The bill before you is not just a question of land,' said John Sackett, an Athabascan Indian, as the U.S. Senate considered the initial settlement. 'It is a grasp, a handhold for the development of our future.' " quoted in Bernton 1992.

² In 1966 a front-page New York Times story reported: "The worst slums in the United States are not in the racially turbulent quarters of New York, Cleveland, Chicago or Los Angeles. By all available indices of poverty, they are sparsely strewn, like garbage on an ice floe, along the nation's desolate sea frontier with the the Soviet Union." (Bigart 1966)

million ---more than three-quarters of their original cash endowment --- in business operations between 1973 and 1993. Behind this poor average performance, however, is a surprising amount of cross-sectional variation. Per capita dividends varied from zero to \$17,000. The average accounting return on book equity was 3.9% for the consolidated group, but the range runs from -71% to +13%. And beyond financial returns, several corporations have provided hundreds of high-wage jobs for their Native shareholders, while others have provided none.

What accounts for this variation? Why have several corporations become largely moribund while others have grown and provided dividends and jobs in a difficult economic climate? In this paper I explore these questions using ideas from development economics and political economy to generate testable hypotheses about differential performance. I develop data on each firm's asset allocations, joint venture participation, and shareholder employment over time and exploit this variation to augment the small cross-sectional sample.

The regional corporations made money in local village enterprises, but faced rapidly diminishing returns to investment in these very small markets. The evidence suggests that the Natives exploited their locational advantages in these businesses and handled the diminishing returns by respecting the limited size of their own local markets and not encroaching into those of other regions. In contrast, financial losses were large and widespread in statewide enterprises outside the oil industry, such as fishing, construction, real estate, and hotels. And in spite of the underlying strength of Alaska's North Slope oil industry, petroleum-related investments produced mixed results.

Within each sector, there was wide variation among corporations due to management effects. By importing scarce management, joint ventures with established non-Native firms lost less money than wholly Native-owned operations. Controlling for this strategy, however, does little to reduce the importance of persistent firm-specific fixed effects in explaining performance (Cockburn & Henderson 1996).

Allowing for job creation changes the picture only slightly. Three corporations provided significant cash flows to their shareholders in the form of wages, while sacrificing little in the way of profits. In contrast, those who made the greatest financial losses produced little or no employment. These data are inconsistent with the hypothesis of an efficient trade-off of profits for wages across firms.

Finally, the pattern of profits and losses provides mixed support for the concept of economic dualism in a remote, resource-dependent region. The Alaska Natives gained control of land, natural resources, and capital, but could not parlay that control into profits and in fact suffered huge losses in the attempt. Modern sector enterprises provided jobs and sometimes profits, but were limited to a fixed pool of opportunities. Attempts to create new opportunities generally failed.

These results provide the first systematic explanation of some of the variable performance across ANCSA firms. They may be useful to the Alaska corporations themselves and to other indigenous groups and majority governments involved in land claims processes. The Natives' experience provides insight into the process of place-based development in a remote regional economy. ANCSA corporations tried many of the same strategies that have been proposed, at one time or another, as answers to the problems of northern development. The large losses they suffered are a sobering lesson about the difficulties of the process.

These results may also hold lessons for Indian reservations, where the stubborn persistence of poverty has inspired much discussion about what tribes and governments can do to improve welfare. A central issue in these debates is whether aid should be directed towards individuals, tribes, or places (Cornell & Kalt 1992). The Alaska corporations tried all of these basic strategies to some degree, as well as different contracting relationships such as joint ventures, partnerships, and leases. Their experiences may provide lessons for other American Indians, especially those tribes with recent cash windfalls from gambling.

The paper proceeds as follows. Section 2 offers background and motivates the inquiry. Section 3 considers economic dualism and asset allocation in a multi-sector context. Section 4 considers firm-specific fixed effects and the use of the joint venture form to import management skill. Section 5 considers employment as a substitute for profits. Section 6 considers individual incentives and the internal political economy of Native corporations as a source of differential performance. Section 7 closes with conclusions. A data appendix provides further detail on the construction of the asset allocation and employment data set.

2. Background and Motivation

2.1. Variation in Dividends and Jobs

The Alaska claims act was a natural experiment, of sorts, in economic empowerment and accelerated development.³ Every Alaska Native was enrolled in one of twelve regional corporations endowed with about \$6,000 per person. Most were also enrolled to a village corporation within the region. All corporations faced similar initial conditions including the general stability of the surrounding economy and the statewide (and worldwide) menu of investment opportunities circa 1972. But there were also important differences in natural resource endowments, in the size of local markets, and in human capital and cultural background.

Table 1 summarizes the wide variation in regional corporation performance that developed during their first 20 years. Cumulative per capita dividends varied from zero to 17,000 dollars. Per capita equity varied by a factor of 100 to 1. The average accounting return on book equity was 3.9% for the consolidated⁴ group, but the range runs from +13% to *minus* 71%.

The cross-sectional variation in returns is not due to unequal endowments or windfall transfers. Column 4 of the table shows that when natural resource rents and tax windfalls are removed from income, the average "nonwindfall" return on equity drops to -3.0% and the range remains essentially the same, running from -67% to +7%. The variation also persists over time. The time trend of annual between variances is slightly negative but insignificant. The typical cross-sectional variance of nonwindfall returns in any given year exceeds the typical variance over time for any given corporation by about 30%.

³ There were no untreated Native controls within Alaska, but in the broader context of national policy, the American Indians on reservations in the lower 48 states constitute a control group.

⁴ equivalent to a weighted average of individual returns with the weights equal to relative amounts of equity.

TABLE 1: SUMMARY OF VARIATION IN FINANCIAL PERFORMANCE

Corporation Name	Cumulative		Average ⁽¹⁾	Average ⁽¹⁾
	Real per capita Dividends 1976-1993 (1993\$)	Per capita Book Equity at 1993 (1993\$)	Reported Return on Equity 1976-1993	Nonwindfall ⁽²⁾ Return on Equity 1976-1993
Ahtna	3,269	21,965	4.3%	1.8%
Aleut	661	4,282	-11.9%	-13.0%
Arctic Slope	4,918	25,170	27.2%	2.8%
Bristol Bay	2,554	9,788	2.1%	-0.7%
Bering Straits	166	4,693	-48.7%	-66.9%
Calista	65	668	-24.6%	-28.0%
Chugach Natives	847	(1,180)	4.0%	-13.4%
Cook Inlet	16,952	66,453	16.8%	7.3%
Doyon	2,603	15,573	12.6%	0.8%
Koniag	0	6,215	4.8%	-12.2%
NANA	3,770	10,017	4.8%	0.5%
Sealaska	5,366	13,489	10.2%	-3.2%
Overall (consolidated)	3,721	14,412	5.4%	-3.0%
Unweighted Average ⁽³⁾	3,431	14,761	0.1%	-10.4%

Notes:

(1) Arithmetic average of annual returns

(2) Adjusted to remove tax loss sales and natural resource rents from sales of assets not carried on the books

(3) Simple average of each corporation's quantity, without weighting by equity or number of shareholders

For many Alaska Natives jobs are more important than dividends. Table 2 shows that in 1991 two corporations managed to employ more than 20% of their shareholders, a notable achievement considering that both of them are in especially remote areas. Others generated only token numbers of jobs.

TABLE 2: REGIONAL CORPORATION EMPLOYMENT IN 1991

Corporation	Corporate Offices	Joint Ventures	Subsidiaries	Total	Shareholder Employment	% of shareholders employed
Ahtna	25	250	100	375	55	5%
Aleut	9	13	176	198	5	0%
Arctic Slope	53	247	2,162	2,462	827	22%
Bristol Bay	11	0	300	311	7	0%
Bering Straits	12	0	3	15	9	0%
Calista	n/a	n/a	n/a	n/a	n/a	n/a
Chugach	20	75	60	155	39	2%
Cook Inlet	66	434	722	1,222	120	2%
Doyon	24	156	0	180	69	1%
Koniag	7	0	0	7	4	0%
NANA	33	1,408	609	2,050	978	20%
Sealaska (1)	n/a	n/a	n/a	560	n/a	n/a
Total	260	2,583	4,132	7,535	2,113	3%

2.2. Anecdotal Evidence on Performance⁵

Behind the statistics are some striking and sometimes tragic stories. The following sketches provide a sample.

Bering Straits. Located just miles from Russian Siberia, the Bering Straits region is devoid of obvious economic opportunities other than sporadic gold mining. Undeterred by these bleak conditions, the Bering Straits Native Corporation simply bought up a raft of existing statewide enterprises in mobile home sales, real estate, banking, and other industries. To finance these acquisitions, they used not only their own share of ANCSA payments, but also the money designated for the village corporations in their region. A Bering Straits board member funneled all of the money into one co-mingled account in a Fairbanks bank.

While the bank earned more than \$1 million in fees from all the transactions, Bering Straits lost more than \$55 million by 1988, an amount which greatly exceeded its own ANCSA cash assets. When the villages found out that their money was also gone they sued the company, and both sued the bank. The bank failed and the FDIC assumed a debt to the villages. The corporation entered chapter 11 bankruptcy with its own villages as the chief creditors. The sale of tax losses saved Bering Straits from liquidation and after more costly litigation with its own villages it signed over all of its subsurface ANCSA lands to them.

Just to the north of the Bering Straits region, things turned out quite differently for the **Nana Corporation**. From the start, Nana leaders sought to cast the corporation as an extended family of shareholders, a source of cultural pride and stability during the turbulent oil pipeline construction era. In 1980, they quietly merged the regional corporation with its 10 constituent village corporations. At the same time, they put their initial business investments close to the huge cash flows generated by the North Slope oil fields, operating the water, sewer, and electric utilities on the slope and using joint ventures to enter the lucrative construction camp catering business.

While these early ventures produced jobs and modest profits, Nana methodically selected lands containing the world's largest zinc deposit. Rather than simply auction the mineral rights, however, they negotiated for years with potential partners and finally extracted a broad array of employment and training benefits from Canadian mining giant Cominco. By 1996 Nana shareholders held almost 50% of all mine jobs. Never a big producer of cash dividends, Nana focused on employment. Through a combination of break-even local business, the zinc mine, and cautious expansion into tourism, the corporation was able by 1991 to employ almost 1,000 shareholders, or 25% of the working-age population.

The **Calista Corporation** is one of the largest, with more than 13,000 shareholders scattered among 50 villages up and down the tundra-covered banks of the Yukon and Kuskokwim rivers. There are no roads and few trees in the area, and unemployment hovered at around 60 percent in 1971. Vowing to "pursue every available employment [sic] for shareholders,"⁶ the new corporation plowed the first receipts of its \$80 million dollars of ANCSA cash payments into a new construction business in Anchorage. Lacking construction projects, Calista built a huge new downtown hotel that was more than \$30 million over budget before it was half-finished. It bought fish from shareholders at inflated prices and resold them into the world market at a loss. It poured \$6 million into an artificial crabmeat plant in Washington.

Led by the hotel, which was finally sold at a loss of more than \$40 million, all of these businesses failed miserably. By 1988 Calista had lost more than \$98 million in business operations and its shareholder equity was down to only \$400 per person. Sales of tax losses and

⁵ This section relies heavily on Strohmeyer (1993).

⁶ Calista Corporation 1974 *Annual Report*.

shared revenues from other regions' oil and timber sales have kept Calista marginally solvent since then. In 1991 the corporation employed less than 10 people. In 1993 the president was arrested in the Anchorage airport with a suitcase full of illegally hunted geese.

Unlike Calista, Anchorage-based **Cook Inlet Region Incorporated** was able to select known oil and gas reserves as part of its land entitlement. But because the State of Alaska had already taken much of the land in the Anchorage region, Cook Inlet went back to Congress in 1976 and pleaded hardship. In exchange for giving up several million acres of land, they got bidding rights at federal auctions of surplus properties, including military bases and the FDIC's inventory of real estate from failed banks. During the next 20 years the corporation used these rights to purchase more than \$200 million worth of real estate, or more than 7 times their original ANCSA cash entitlement.

Cook Inlet parlayed these assets and its oil and gas earnings into a string of broadcasting acquisitions throughout the U.S. with partners who could take advantage of the Natives' minority status to gain preferences from the FCC. By 1988 the corporation had earned more than \$260 million, more than four times as much as the combined total of the other 11 regional corporations.

3. Asset Allocation and Dualism

Even from the anecdotes above, it is clear that the Native corporations tried investments in many different sectors of the Alaska regional economy. This problem of where to invest is a major one for a small group that receives a sudden increase in its wealth endowment. It is particularly important when the endowment is vested in a corporate organization whose ostensible purpose is to pursue investment and production on a scale that individuals could not undertake on their own, and when there is a presumption that the economic activities are to be largely place-based, i.e., within Alaska.

To generate testable propositions about the importance of sectoral choice I use the concept of economic dualism, which Todaro (1989) defines as “a persistent set of undesirable differences between two sectors.” The dualism paradigm takes at least some factor prices and factor proportions as essentially exogenous. If wages differ among sectors and fixed proportions create a queue for high-wage jobs, then a Native group may wish to invest capital to allow its people to enter the high-wage sector. But this strategy could be constrained by a key feature of

the arctic economy: random, fixed deposits of natural resources. If resource deposits limit the size of the "modern" sector and capital is a complement to this fixed factor, then embedded capital can earn positive economic profit while marginal capital may make losses no matter where it is invested.

This multisector approach can generate hypotheses that might be logically untenable in a more aggregated growth model. In particular, it is easier to justify a persistent difference between prevailing modern sector wages set in urban labor markets and the low opportunity cost of Native labor in a remote village. This opportunity cost of village labor is often set at the margin by some combination of subsistence hunting and fishing opportunities and transfer payments (Knapp and Huskey 1988). With significant quasi-rents embodied in modern sector wages, the pursuit of modern economy market share is a form of rent seeking. It is a good strategy for a small group with political clout, even though it does nothing to increase overall output (Rama 1993).

3.1. Dualism as a Development Paradigm

Lewis (1954) was one of the first to use a two-sector model in which wages are not equalized between sectors. In his framework the size of the modern, high-wage sector is limited over time by the supply of capital and at any moment by the necessity of paying the high modern wage. In the traditional sector the marginal product of labor is zero and each worker receives the average product as a subsistence wage. Harris & Todaro (1970) generated an urban unemployment equilibrium by equalizing the expected urban sector wage and the low but certain traditional wage. Like Lewis, they simply assumed the existence of a parametric urban wage and then traced its effects and policy implications.

Although the concept of a dual economy has proven difficult to formalize, the idea of dualism remains useful in studies of the Arctic, where unemployment and underemployment are persistent facts of life (Alaska Federation of Natives 1991). First, it informs the observation of sometimes widely differing technologies in use in what appears to be the same economy. Second, it provides a useful basis for generating testable empirical propositions. Perhaps for these reasons, concepts of dualism and conflict between the "modern" and "traditional" economies are a common thread running through applied research on northern remote regions (Huskey and Morehouse 1992).

Notions of dualistic development naturally emerge from the geographical juxtaposition of ultra-modern resource extraction and primitive traditional subsistence that typifies the remote circumpolar north. However, the coexistence of such different activities in space need not require the conclusion that the two sectors constitute a "persistent set of undesirable differences," to use Todaro's phrase. Human capital theory provides a direct and efficient explanation for the existence of apparently dual labor markets. Complex resource extraction projects may import all of their labor at high wages simply because local people do not have the required skills.

Dualism in the arctic: evidence from Canada

Stabler (1989) tested for dualism in Canada's Northwest Territories by analyzing differential employment patterns conditional on simple measures of human capital. As an example, he found that among employed male high school graduates aged 15-24, 65% of the non-Natives had jobs in the primary sector, while only 57% of the Natives held such jobs. Overall, his conclusions were mixed: Although equally experienced or educated Natives have lower participation rates than whites in what he called "primary" jobs, the difference goes away as the required human capital increases.

Although Stabler lacks a detailed model of dualism and hence has no compelling alternative hypotheses, his formal tests corroborate a long anecdotal history of discrimination against northern Native people. In light of this evidence, one must take seriously the notion that individual Alaska Natives faced fundamental difficulties participating in the modern resource-extraction sector of the Alaska economy. Even if there is a solid basis in human capital differences for differential employment patterns, the simple existence of the two very different types of activities may lead to important strategy considerations for a Native corporation dedicated to long run development.

The modern economy in Alaska: capital-limited or resource-limited?

It is clear from the historical record that Native leaders and policymakers had a notion of dualism in mind when framing ANCSA.⁷ The corporation was viewed as the overt means by which the Natives could enter the modern economy. It is also likely that many participants had a

⁷ See, e.g., the extensive congressional hearing records surrounding ANCSA (U.S. Senate, 1968, 1970) or the transcripts of the retrospective inquiry conducted by the Inuit Circumpolar Conference (1975).

Lewis-type model in the back of their minds. That is, capital was seen as the bottleneck factor limiting development of modern, high-wage enterprise in rural Alaska.

In contrast to this Lewis-type model where capital is the limiting factor, I will also consider a resource-limited economic base model. In this model, the supply of capital is unlimited in response to adequate rates of return, but the supply of profitable opportunities is strictly limited by natural resource deposits.

3.2. A Simple Model of Investment in the Remote Northern Economy

To begin, I make the following baseline assumptions about the arctic economy as epitomized by Alaska. There is a *modern* economy and a *traditional* or subsistence/transfer economy. In the modern economy agents continuously exhaust all opportunities for earning economic profits through direct resource extraction and provision of associated support services. This economy is tightly integrated with national and global markets, and responds quickly to changes in world prices of goods and factors. Within the modern economy, it is also useful to distinguish between existing oil development and production from North Slope fields, which I will call the *oil* sector, and the rest of the modern economy, which I will call the *statewide* sector. Note that the modern sector includes investments in processing natural resources, such as minerals and timber, but excludes the simple sale of these assets *in situ*, which activity merely earns rents for the owner. Because the Native Corporations did not buy the land, I treat natural resource asset sales as cash windfalls, and exclude them when calculating profits.

The traditional economy includes hunting and trapping, small-scale fish harvesting, and small-scale local services. It is limited at the extensive margin by the fish and wildlife base and the amount of government transfers flowing to rural areas (Knapp and Huskey 1988). I use the term *local* sector to refer to the opportunities for corporate business activity tied to the traditional economy.

These definitions are admittedly vague, and the proper boundaries between the sectors are ultimately a subject for empirical inquiry. But with the definitions in place, several fundamental questions can be posed: Which sectors offer the best returns to the aspiring Native corporation? Are the returns in each sector the same across corporations? Which matters more, asset allocation to the right sector or management skill within a sector? Which sectors can be

tapped for Native jobs? To give these questions empirical content, I use the following very simple asset allocation model.

The null hypothesis: equal returns in all sectors

Suppose there are only four places to invest: external financial capital markets (the *PASSIVE* sector); the modern oil sector (the *OIL* sector), the modern non-oil economy (the *STATEWIDE* sector) and strictly local business supported by the traditional sector (the *LOCAL* sector). Then Native corporation *i*'s *ex post* realized profit in year *t* from invested capital is given by the following accounting identity:

$$\pi_{it} \equiv \alpha_{it} PASSIVE_{it} + \beta_{1it} OIL_{it} + \beta_{2it} STATEWIDE_{it} + \beta_{3it} LOCAL_{it} \quad (1)$$

where $PASSIVE_{it} + OIL_{it} + STATEWIDE_{it} + LOCAL_{it} \equiv 1$ are fractions of total assets deployed in each sector and α_{it} , β_{1it} , β_{2it} and β_{3it} are the average realized rates of return for corporation *i* in year *t*. Although (9), with all its subscripts, holds as an identity, it can be used to test hypotheses about Native corporations and possible dualism in their economic environment. If the economy is in a unified efficient equilibrium, then the marginal risk-adjusted returns in all sectors are equal. Although this does not necessarily mean that the *average* returns are equal, if the Native corporation is small relative to the economy, then all of its investments can be considered marginal. Thus, a useful null hypothesis is that the returns to all sectors are constant over time, constant across firms, and equal to each other:

$$\alpha_{it} = \alpha_{js} = \alpha; \beta_{1it} = \beta_{1js} = \beta_1; \dots \text{etc.},$$

$$\text{and, } \alpha = \beta_1 = \beta_2 = \beta_3$$

Unequal returns across sectors

As a first alternative to the null hypothesis of equal returns, the capital-limited Lewis-type model says that profitable projects abound. Since all Native corporations received equal amounts of capital per capita, they should all develop equally. Indeed, because the traditional economy has been historically starved of capital, the marginal product of capital is high in the local sector. Under asymmetric information banks in distant urban centers will be less willing to lend to the rural periphery, thus passing up viable projects. Transferring wealth to the local

people brings the opportunity cost of capital to the agents with the private information about how best to use it. The corporations from these poorer, remote areas should do better. In the modern statewide sector, Native firms can also earn normal profits (and generate employment at market wages) from modest investments at the margin, such as buying and expanding an existing fish processing plant or building a new hotel. The profit-maximizing Native corporation will invest actively in each of the oil, statewide, and local sectors until the marginal project yields the [risk-adjusted] passive rate of return. The capital-limited model implies:

H1 (Capital-limited modern economy): The returns in the statewide and local sectors equal or exceed those from passive investment. $\beta_2 = \beta_3 \geq \alpha$.

A second alternative is generated by the following stylized version of a resource-limited model. At any time t there is a fixed number of viable large-scale resource extraction projects N_t determined by geological accident, fluctuating world market prices, etc. Output in the oil sector is produced by applying to each project $m = \{1, N_t\}$ an amount K_{mt} of composite human and physical capital to produce project-specific output Y_{mt} . I assume the composite capital input has diminishing returns within each project, so that external capital flows in until the return in equilibrium equals the world market opportunity cost r :

$$Y_{mt} = f(K_{mt}), \quad f'(K_{mt}^*) = r, \quad \text{for all } m$$

For example, a sudden increase in oil prices spurs additional investment in development drilling at producing fields. Each resource project may generate inframarginal rents. The rents may be captured by landowners, government, labor, or owners of capital. Since human and physical capital are combined in fixed proportions, the number of jobs is strictly limited by the amount of physical capital invested and ultimately by the number of viable projects. Finally, almost all inputs (capital, labor, services) used in the direct resource extraction activities are purchased through long-term contract rather than on competitive spot markets.

The resource-limited model says that, absent increases in the resource base N , there are *no* positive-NPV projects at the margin anywhere in the economy. What looks like capital starvation in the traditional economy is actually a rational response to rapidly decreasing marginal productivity. The only ways for a Native group to grow its GDP are 1) to discover and develop new resource extraction projects on their own lands or 2) to usurp rents from existing

markets by stealing market share. The Native corporation facing this situation must compete in the business and political arena for access to the rationed contracts offered by the major oil companies and their prime contractors. The barriers to entry are largely political. Of course, a third option for increasing group welfare is passive external investment. This provides dividend income ("GNP"), but without the benefits of employment, human capital development, and learning by doing.

In a resource-limited world, the average return to oil sector investment may contain some rents and exceed passive financial returns, but such investments are rationed. Any investments in the non-oil statewide sector or the traditional sector will make economic losses. The resource-limited model implies:

H2 (Resource-limited modern economy): $\beta_2 \approx \beta_3 < \alpha$ and $\beta_1 > \alpha$. The returns from statewide and local investment are less than those from passive investment, and returns to oil exceed passive returns.

The regression equation

Under the unified economy hypothesis and neglecting risk premia,⁸ (1) becomes a regression equation with testable restrictions:

$$ROE_{it} = \alpha PASSIVE_{it} + \beta_1 OIL_{it} + \beta_2 STATEWIDE_{it} + \beta_3 LOCAL_{it} + \varepsilon_{it}; \quad (2)$$

with $\beta_1 = \beta_2 = \beta_3 = \alpha$ as the testable hypothesis that all sectors yield equal returns. To test hypotheses about unequal returns, I estimate equation (2) with two minor adjustments. First, I add an additional sector, *PUBWORKS*, to capture investments made by the Arctic Slope Regional Corporation in order to complete large, lucrative construction projects for the North Slope Borough.⁹ These projects were financed by property taxes levied on the North Slope oilfields. No other regional corporation had access to this type of opportunity, so I treat it as a separate sector. Second, to make the interpretation of the coefficients more straightforward I add and subtract the term $\alpha(1 - PASSIVE)$ from the right side of (2) and rearrange terms. I measure

⁸ It makes most sense to account for risk premia when interpreting the coefficients rather than imposing additional restrictions on the model.

⁹ A borough in Alaska is equivalent to a county elsewhere.

the overall rate of return π_{it} as ROE_{it} , the nominal return on book equity excluding windfalls.¹⁰

The resulting regression equation is:

$$\begin{aligned} ROE_{it} = & \alpha + \gamma_1 OIL_{it} \\ & + \gamma_2 STATEWIDE_{it} \\ & + \gamma_3 LOCAL_{it} \\ & + \gamma_4 PUBWORKS_{it} + \varepsilon_{it} \end{aligned} \quad (3)$$

The constant term α measures the baseline return to passive investment. The regression coefficients $\gamma_1 = (\beta_1 - \alpha)$, $\gamma_2 = (\beta_2 - \alpha)$, etc. on the active asset shares measure the *differential* returns to those sectors over and above the baseline passive return. The *t*-statistics on each coefficient are test statistics for hypotheses of the form $\beta_i > \alpha$. These hypotheses compare active returns to passive returns.

3.3. The Asset Allocation Model: Identification, Data and Results

Identification Issues

Because the asset allocation fractions are chosen by management in an effort to maximize some objective function, there is a potential endogeneity problem if the choice of projects in any given year is a function of the actual returns from the project. Projects are chosen prior to their actual financial return becoming known, but if returns are correlated over time, managers can potentially make choices based on actual returns. If these feedback effects are strong, the coefficients estimated in (3) will be biased versions of the true returns to sectors.

I address this problem in two complementary ways. First, I assume that asset allocations to the *OIL*, *LOCAL*, and *PUBWORKS* sectors are largely exogenous. Since it was fairly obvious that contracting with the major oil companies was lucrative work, Native firms got what oil-related contracts they could. The contracts were arguably rationed by political means and secured through political skill. Sometimes lawsuits were used to secure them.¹¹ In other cases firms came up with novel ways to tap the rents from the industry.¹² In a similar vein, local business

¹⁰ The adjustments to remove windfalls are significant and are discussed in Essay #1.

¹¹ Ahtna Corporation fought hard for maintenance contracts related to the Trans-Alaska oil pipeline, arguing that they had been promised such work as a quid pro quo for supporting the project. (Ahtna 1977 *Annual Report*).

¹² While other Native firms were struggling to land oil-related construction contracts, Nana corporation entered the electric, water, and sewer business on the North Slope oilfields.

opportunities were quickly seized by several corporations, but the size of the market was quite limited. (In many cases the ANCSA *village* corporations took these opportunities.) In summary, I assume that exogenous endowments and constraints were mainly responsible for the allocations to these sectors.

The second part of my approach to identification is to generate an instrument for the *STATEWIDE* sector asset allocation fraction. The exogeneity assumption is less reasonable for asset allocations to this sector. The menu of opportunities here was broader and entry was politically easy. Clearly managers were more free to choose projects on the basis of expected economic benefits. The corporations' persistent losses suggests that they were unable to choose these projects based on their actual profits. It seems clear, however, that they could and did choose projects based on their expected employment benefits.

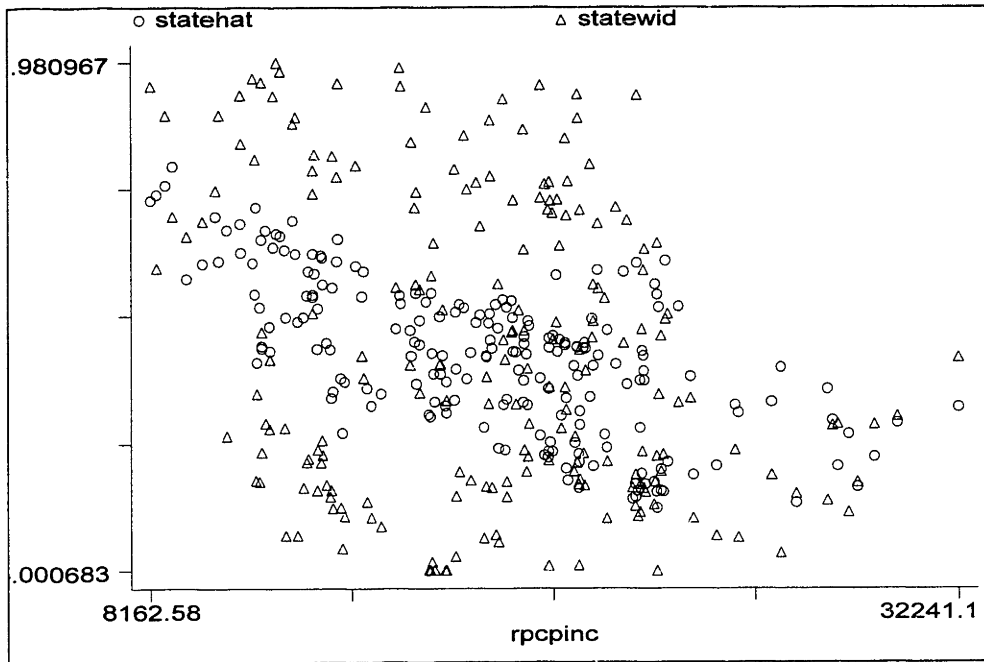
The instrument *STATEHAT* is a fitted value for *STATEWIDE* from the following regression:

$$\begin{aligned}
 STATEWIDE_{it} = & .715 - .0000025 NEED_{it} \\
 & (.026) \quad (.000001) \\
 & + .00038 OPPORTUNITY_{it} - .139 NOLFRAC_{it} \\
 & (.000018) \quad (.057) \\
 & + \gamma_i + \varepsilon_{it}
 \end{aligned} \tag{4}$$

The variable *NEED* is real per capita income in corporation region *i* in year *t*. It captures (with its negative sign) the intensity of pressure on management to "do something" to promote development. The variable *OPPORTUNITY* is total real private sector income for the region divided by the number of Native shareholders. It excludes government wages and is intended to capture the perceived size of the corporation's opportunity set. *NOLFRAC* is the share of current-year windfall cash from tax loss sales in year-end assets. It captures the exogenous decline in the statewide sector asset share that occurred during the years of tax loss sales. The large cash inflows from the sales were placed in passive investment, driving down the statewide sector fraction.

The coefficients in (4) are all highly significant. Figure 1 shows the negative relationship between per capita regional income and the actual and fitted values of the *STATEWIDE* asset fraction.

FIGURE 1: ACTUAL STATEWIDE ASSET ALLOCATIONS (*STATEWIDE*) AND FITTED INSTRUMENT VALUES (*STATEHAT*) AS A FUNCTION OF PER CAPITA REGIONAL INCOME (*NEED*).



regional per capita personal income (*NEED*)

I use the instrument *STATEHAT* to check the robustness of the financial returns results presented in this section. In section 5, below, I use the instrument in all specifications involving wages and quasirents.

The data

I estimate equation (3) using pooled data for $N=12$ corporations over $T=17$ years. I constructed the data on asset allocation from accounting data in annual reports. The data measure the assets deployed at the beginning of the year for which the return is measured. The data appendix discusses the allocation process and the operational definitions of the sectors in more detail.

Figure 2 summarizes the time path of the data. There are three important patterns to note. First, in 1980 there was a large increase in passive holdings because the bulk of the ANCSA cash settlement payments were actually made in that year. During the next six years, this cash was deployed into active business. Second, from 1986 through 1990 there were numerous write-downs of these physical assets and cash infusions from windfall tax loss sales, both of which

served to shift the mix of asset holdings towards cash and securities. Third, the figure clearly shows how the local sector allocation was never very large to begin with and steadily declined over time.

FIGURE 2: AVERAGE OF ASSET ALLOCATIONS BY YEAR

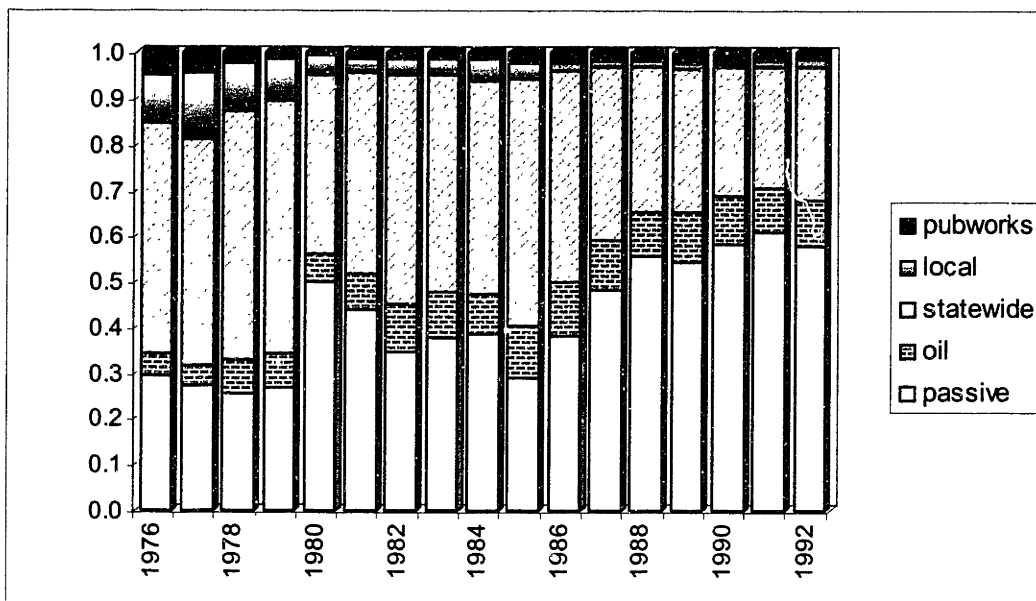
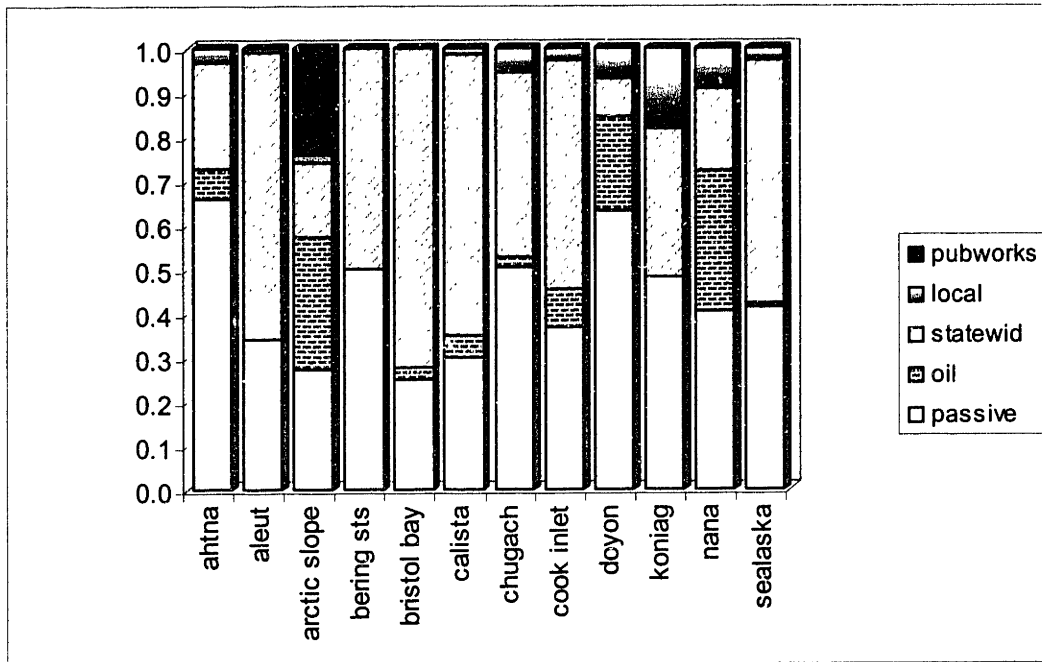


Figure 3 summarizes the data in cross-section, showing the average (over time) allocation fractions for each corporation. Of course these summaries hide a great deal of change within each group over time. Still, the figure shows that there was substantial cross-sectional variation. Overall, there appear to be reasonable degrees of freedom in both dimensions.

Analysis of individual corporations and years strongly suggests that the disturbances are heteroskedastic (even though earnings are normalized by using rates of return) and correlated across corporations due to common time shocks. The heteroskedasticity arises because some corporations experienced periods of very low equity, leading to extremely volatile measures of ROE during those periods. Others used aggressive accounting procedures that added volatility to earnings. I test for this error structure using a Breusch-Pagan LM test (Greene 1993, p. 454) and correct for it using feasible GLS with estimated covariances across groups.

FIGURE 3: AVERAGE ASSET ALLOCATION BY CORPORATION
(unweighted averages over time)



Asset Allocation Regression Results

Table 3 presents the asset allocation regression using GLS.¹³ Columns 1 and 2 show the basic results. Columns 3 and 4 are robustness checks discussed below. The estimated return to passive investment shown in panel *A* is a reasonable 6.7%. In panel *B*, column 1 shows the differential returns to active investment as specified in equation (3). Investments in the oil sector, for example, produced estimated returns 6.8 percentage points below the baseline passive returns. The statewide sector provided an estimated differential return of -26.7%. The returns are all significantly different (at 5%) from passive returns. Column 2 of panel *B* restates the estimated coefficients as average absolute returns and shows the estimated standard errors of these constructed coefficients. These provide test statistics against the less interesting null hypotheses that the returns in each sector are zero.

¹³ The LM test confirming XC correlation is highly significant ($\chi^2(66) = 99.6$) and the efficiency gains over OLS are large. The magnitude of all coefficients is reduced from the OLS estimates as the more volatile data are damped by the GLS weights. In particular the differential return on statewide investment changes from -45% to -27% as the volatile data from the highly unprofitable Bering Straits Corporation are downweighted by GLS.

TABLE 3: ESTIMATED AVERAGE RETURNS IN EACH SECTOR

	(1)	(2)	(3)	(4)
estimation method:	FGLS	FGLS	IV	FGLS
Investment sector	dependent variable = nonwindfall return on book equity			dep. var. = net income / assets
<i>A. Absolute Return to Passive investment:</i>				
Passive Investment	.067* (0.013)	.067* (0.013)	.043* (0.016)	.054* (0.010)
<i>B. Differential and Absolute Returns to Active Investment in:</i>				
	Differential	Absolute	Absolute	Absolute
Oil sector (OIL)	-.068* (0.035)	-.001 (0.028)	.130* (0.038)	-.015 (0.022)
Statewide sector (STATEWID or STATEHAT)	-.267* (0.024)	-.200* (0.016)	-.128* (0.030)	-.122* (0.008)
Local sector (LOCAL)	.148* (0.069)	.215* (0.068)	.089 .100	.014 (0.047)
Local public works (PUBWORKS)	.526* (0.145)	.592* (0.148)	.629* (0.158)	.477* (0.095)

notes: Differential return is over and above return to passive investment.

Absolute return = passive return plus differential return.

Pooled sample of N=12 corporations over T=17 years.

Estimated by GLS with correction for groupwise heteroskedasticity and cross-sectional correlation. Standard errors in parentheses.

IV estimates in column 3 use fitted value for fraction of assets in statewide investments.

All of the estimated active sector investment returns are somewhat surprising. The differential return to oil is negative and the absolute return is zero, contradicting the popular view that Natives made money in the oil service business. The negative sign of the statewide sector returns is not surprising given the well-known business failures, but the magnitude is remarkable. So too is the large magnitude -- +52% -- of the differential returns to local public works. These are the rents that Arctic Slope Corporation earned from its monopoly on regional government construction contracts funded by oil property taxes.

Most surprising, however, is the +14.8% estimated differential return to local sector investments. This is more than 40 percentage points higher than the return to statewide sector investments. The estimate casts serious doubt on the conventional wisdom that there are no good investments in the local private economy. It also raises the question of why a higher share of assets was not invested in the local sector. One explanation for both the high returns and the low investment shares is that the local markets offered lucrative but very limited opportunities.

Because these markets were isolated, the diminishing returns were apparent to all, preventing overcapacity. Fixed setup and transport costs can explain why these locational rents were not competed away.

The explanatory power of this model is not great: the R^2 using OLS is only .12. Still, the coefficients are large and significant, while the addition of time trends, time dummies, and proxies for the overall health of the Alaska economy all yield insignificant coefficients. Taken together, the estimates suggest that the set of profitable opportunities was very limited; that the Native corporations correctly observed this fact in their own local markets; and that, as a group, they failed to appreciate it for statewide investments. The result was a long string of business losses.

Robustness Checks

Column 3 of Table 3 uses the instrument *STATEHAT* in place of *STATEWIDE*. The pattern of the IV results is not very different from the basic GLS results in column 2, but the magnitude of the returns is attenuated. The losses on statewide investments average only -12.8% and the return to *OIL* jumps up.

Column 4 provides another check of the results by using net income divided by total assets as the dependent variable. Total assets were far more stable than equity during the early years when many corporations had wild swings in the return on equity simply because their equity was so low. Since the numerator remains the same, all coefficients should be scaled down somewhat. The very low coefficients on the *OIL* and *LOCAL* sectors in column 4 suggest that these estimates in the basic equation are in fact being influenced by extreme values from data points with low equity. In particular, the high *LOCAL* sector coefficient in columns 1 and 2 could be due to the fact that allocations to this sector were high during the same early years when the equity base was very low.

Summary of Asset Allocation Tests

In this section I considered the Natives' asset allocation problem in a multi-sector world. The null hypothesis that all sectors are in a unified equilibrium yielding equal returns to capital is strongly rejected by the data. Alternative hypothesis **H1** said that capital is the limiting factor for growth of the modern sector and that the Alaska Natives, with their new supplies of capital, could find many profitable projects in all sorts of industries throughout the state. The data

strongly reject this hypothesis for the oil and statewide sectors. The return in the statewide modern sector was hugely negative (minus 27%), and the return in the oil sector was essentially zero.

Alternative **H2** said that fixed resource deposits limit growth and that the only way to make money in active business is to steal market share in an existing oil-related industry. The results support the resource-limited hypothesis for the statewide and oil sectors.

Finally, the surprising positive estimated average return of 21.5% in the local sector is consistent with elements of both alternatives. The high return suggests that the local areas were initially starved for capital, but the very limited scope of investment in this sector suggests that this need was quickly met, leaving no room for further profitable expansion.¹⁴

Overall, the concept of undesirable dualism is not well supported by these tests. The Alaska Natives gained control of land, natural resources, and capital, but could not parlay that control into profits and in fact suffered huge losses in the attempt. This outcome is consistent with Knowler's (1989) findings that absentee ownership of natural resources in Canada's Yukon has advantages for local people because nonwage income is less stable than wage income. Absentee ownership exports this volatility to other places. In contrast, the ANCSA corporations may have imported the volatility of shaky statewide ventures into their home regions.

4. Management Effects and Joint Venture Participation

In the previous section I considered investment opportunities as technologically fixed, with each yielding up a predetermined level of profits. Yet in spite of their willingness to accumulate factors of production and to deploy these factors in all sectors of the surrounding economy, most ANCSA Native corporations still lost large amounts of money. The circumstantial evidence is very strong that management skill was a critical scarce resource affecting economic success.

I now focus on the corporations as business firms and consider *internal* performance and the evidence for strong management effects. My approach follows that of Cockburn &

¹⁴ Another, complementary explanation for the declining asset allocations to this sector is that the village corporations took over production to meet local demands. There is much anecdotal evidence about village corporation control of fuel dealerships, hardware stores, electric utilities, and other basic services that supports this view.

Henderson (1996), who found persistent and large firm-specific fixed effects among pharmaceutical firms engaged in competitive research races.

In this section I test two broad hypotheses about the importance of management as a scarce factor. First, I test for the extent and magnitude of management fixed effects by allowing firm-specific returns in the statewide sector of the asset allocation model. Second, I test for the effectiveness of the joint venture as a solution to the agency problem of importing scarce management while maintaining Native control of the corporation.

4.1. Management Effects in the Asset Allocation Model

The anecdotal evidence suggests that some corporations -- like Cook Inlet -- did relatively well in many sectors, while others -- like Bering Straits -- did poorly. The broad hypothesis that management matters more than sectoral allocation can be stated as:

H3.(Importance of management). The variation across corporations in rates of return for any one sector greatly exceeds the variation of common returns across sectors.

The simplest way to capture unobserved management effects on returns is to allow a full set of firm-specific returns to each sector.¹⁵ The regression model of equation (3) then becomes a set of 12 seemingly unrelated regressions, one for each corporation. Although this completely unrestricted model could be estimated as a stacked SUR system, there are not enough degrees of freedom in the data to estimate all the parameters with any precision. Economic theory and the accounting data both strongly suggest that the returns to passive investment are not subject to strong management effects, so that the restriction $\alpha_i = \alpha$ is valid.¹⁶ The coefficient β_i on the local public works "sector" is already unique because only one corporation had access to these contracts. Finally, since the oil and local sectors are relatively homogeneous I assume that there are common returns to these sectors.

These restrictions leave firm-specific returns to the statewide sector as the reflection of fixed management effects and lead to the following modified version of (4):

¹⁵ An F-test strongly rejects the hypothesis of a totally pooled model (estimated by OLS) in favor of 12 separate OLS equations.

¹⁶ Most of these passive investments were in relatively conservative, professionally managed portfolios.

$$\begin{aligned}
ROE_{it} = & \alpha + \gamma_1 OIL_{it} \\
& + \sum_i \gamma_{2i} (D_i \times STATEWIDE_{it}) \\
& + \gamma_3 LOCAL_{it} \\
& + \gamma_4 PUBWORKS_{it} + \varepsilon_{it}
\end{aligned} \tag{5}$$

where D_i is a firm-specific dummy variable.

Table 4 shows the estimates of these firm-specific returns from (5). Columns 1-3 all report the same underlying coefficients from the basic model. The dummy variables in these columns are constructed in different ways to emphasize different interpretations and to yield as their estimated standard errors the test statistics for different hypotheses (Suits 1984). Columns 4 and 5 provide the same robustness checks as reported above.

Column 1 shows the common passive return in panel *A*, the common differential returns from the oil, local, and public works sectors in panel *B*, and the 12 firm-specific differential returns from the statewide sector in panel *C*. This is equation (5) "as written." The standard errors from these coefficients allow inference about whether a particular corporation had a large or small differential statewide return. For example, panel *C* shows that the Bristol Bay corporation earned an estimated return of 3% below passive in the statewide sector, but this differential return was insignificant.

TABLE 4: RETURNS TO SECTORS WITH MANAGEMENT FIXED EFFECTS

	(1)	(2)	(3)	(4)	(5)
	Dependent variable = nonwindfall return on book equity				net income/ assets
	FGLS estimates		IV estimates		FGLS
Investment sector					
<i>A. Absolute Return to Passive Investment</i>	.047* (0.013)	.047* (0.013)	.047* (0.013)	-.004 (0.019)	.054* (0.011)
<i>B. Average Returns (over all firms) to Active Investment in:</i>	Relative to Passive	Relative to Passive	Absolute	Absolute	Absolute
Oil sector	-0.083 (0.043)	-0.083 (0.043)	-0.036 (0.038)	.059 (0.050)	-.093* (0.030)
Statewide sector (Average of all 12 corporations)		-.599* (0.052)	-.552* (.051)	-.425* (0.056)	-.282* (0.033)
Local sector	.306* (0.084)	.306* (0.084)	.353* (0.080)	.349* (0.098)	.051 (0.061)
Local public works	2.04* (0.282)	2.04* (0.282)	2.09* (0.281)	1.99* (0.298)	1.281* (0.202)
<i>C. Firm-Specific Returns to Statewide Sector Investment by:</i>	Relative to Passive	Relative to average of Peers	Absolute	Absolute	Absolute
Ahtna	-0.082 (0.071)	.517* (0.070)	-.035 (0.067)	0.027 (0.052)	-.013 (0.054)
Aleut	-.281* (0.061)	.318* (0.070)	-.234* (0.058)	-.256* (0.120)	-.198* (0.053)
Arctic Slope	-2.74* (0.463)	-2.14* (0.422)	-2.69* (0.464)	-1.84* (0.372)	-1.42* (0.300)
Bering Straits	-1.36* (0.249)	-.759* (0.239)	-1.31* (0.250)	-1.60* (0.440)	-.454* (0.066)
Bristol Bay	-0.030 (0.038)	.569* (0.057)	.017 (0.034)	.0418 (0.062)	-.004 (0.015)
Calista	-.386* (0.091)	.213* (0.095)	-.339* (0.091)	-.434* (0.131)	-.199* (0.033)
Chugach	-.594* (0.107)	0.005 (0.117)	-.547* (0.107)	-.348 (0.207)	-.376* (0.057)
Cook Inlet	0.037 (0.032)	.636* (0.059)	.084* (0.028)	.142* (0.047)	.107* (0.031)
Doyon	-.769* (0.148)	-.170 (0.150)	-.722* (0.146)	-.104 (0.087)	-.409* (0.102)
Koniag	-.700* (0.100)	-.101 (0.089)	-.653* (0.102)	-.489* (0.190)	-.479* (0.074)
Nana	-0.134 (0.088)	.466* (0.089)	-.086 (0.086)	-.073 (0.044)	.128 (0.079)
Sealaska	-.154* (0.039)	0.445* (0.062)	-.107* (0.033)	-.168* (0.080)	-.064* (0.019)

notes: Columns 1,2,3,5 Estimated by feasible GLS with correction for heteroskedasticity & cross-sectional correlation. Column 4 IV estimates use fitted value for fraction of assets in Statewide sector.

Std. Errors in parentheses. N=12 corporations over T=17 years.

* indicates significant at 5% level.

The column 1 estimates show great variation across corporations in their returns from statewide investment, but the overall results from the simple asset allocation model of Table 3 hold up quite well. Only Cook Inlet shows a positive differential return in the statewide sector. All other corporations have negative differential returns, consistent with the previous common estimate. In addition, the common coefficients on the oil and local sectors are relatively stable.¹⁷

Column 2 shows the same underlying regression formulated to show an average statewide return plus 12 individual statewide returns whose sum is constrained to equal zero. The standard errors of these deviations allow immediate inference about whether corporation *i* performed significantly better or worse than its peers. Continuing the example, column 2 of panel *C* shows that Bristol Bay earned statewide returns 56.9 percentage points higher than the average differential statewide return of -59.9% (shown in panel *B*.)

The Column 2 estimates emphasize the wide range of performance relative to peers. Ten of the 12 corporations had significantly higher or lower returns relative to the average of -59.9%, and these performance differentials ranged from -76 percentage points for Bering Straits to +64 percentage points for Cook Inlet.

Column 3 shows the estimated absolute returns to each corporation from each sector. In this "bottom line" formulation the coefficient magnitudes are interesting, but the standard errors allow inference about whether accounting profits were positive or negative. These are less economically meaningful but useful for comparison with other results.

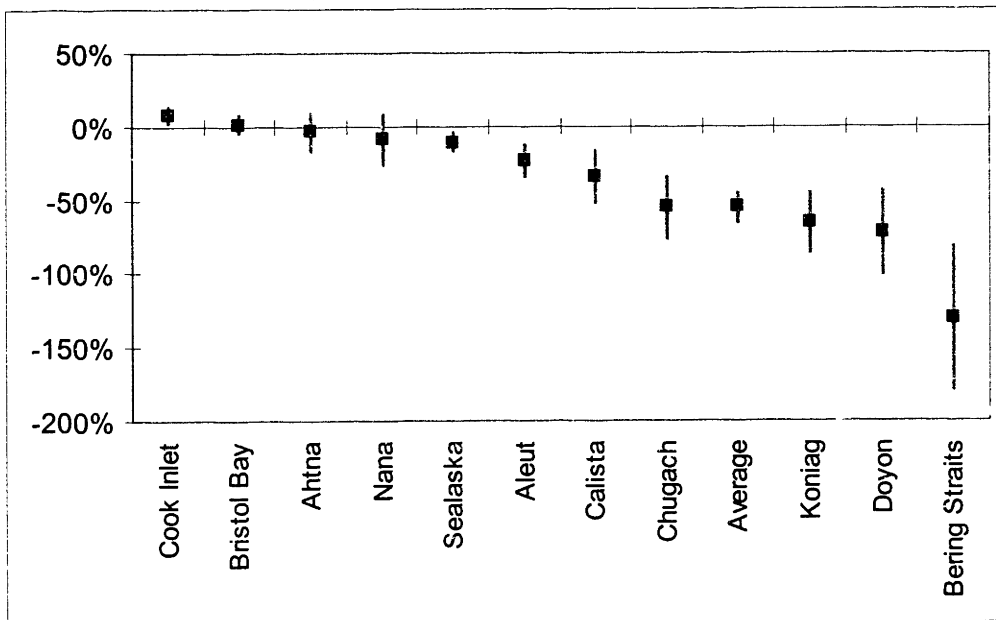
Finally, columns 4 and 5 use the IV estimates and the alternative measure of financial return (net income / assets) to check the robustness of the estimates. With a very few exceptions, the management fixed effects are similar under IV to their basic values in column 3. This suggests that in fact there was little feedback from actual returns on equity to the choice of projects. The column 5 estimates are scaled down as expected, and the coefficient on the *LOCAL* sector again drops dramatically, reinforcing the idea that most of the returns from this sector were earned early when equity was very low.

The results from Table 4 are summarized in Figure 4, which shows the absolute accounting returns to statewide investment. The average absolute return, -55%, is heavily influenced by the Bering Straits and Arctic Slope (not shown) values. Excluding these two, the

¹⁷ It is probably a statistical fluke that the returns to Arctic Slope corporation bifurcate into a very large positive return to local public works and a very large negative return to statewide investments.

average of estimated statewide returns is -28%, which is reasonably close to the value of -20% from the pooled model of Table 3.

FIGURE 4: ESTIMATED STATEWIDE SECTOR ABSOLUTE RETURNS
(ARCTIC SLOPE NOT SHOWN)
(bars show 95% confidence intervals)



Pairwise tests of the equality between these estimated statewide sector coefficients and the common values for the oil and local sectors show mostly significant differences (Table 5). The general hypothesis of equal returns across sectors is strongly rejected.

TABLE 5: PAIRWISE TESTS OF EQUALITY BETWEEN SECTOR RETURNS
(Chi-squared values from Wald tests)

returns from:	compared to return from:	
	Oil	Local
Oil Sector		20.0
Statewide sector (average of all corporations):	53.6	70.4
Statewide sector individual coefficients:		
Ahtna	0.0	12.6
Aleut	7.1	37.5
Arctic Slope	32.3	40.2
Bering St	24.5	33.6
Bristol Bay	1.0	13.8
Calista	8.0	32.1
Chugach	19.9	55.3
Cook Inlet	6.1	11.1
Doyon	21.6	40.0
Koniag	34.9	49.2
Nana	0.2	9.5
Sealaska	1.9	28.2

note:
Chi2 critical values are 3.84 (5%) and 6.63 (1%)

4.2. Joint Ventures

While management expertise may have been initially scarce among Native leaders,¹⁸ it could be purchased in the market. In this section I consider the use of the joint venture organizational form as a way of importing scarce management skill.¹⁹ Joint venture partnerships potentially offer instant access to management and production expertise and to rationed contractual opportunities. However, they are fraught with agency problems, particularly selection bias. If a Native corporation has no scarce resources to bring to the partnership, then it is not clear why established firms with good projects would want to share the benefits with them. If the Natives offer nothing but naivete and capital, they will end up with nothing but bad joint ventures or, worse, bad wholly-owned subsidiaries (this seems to be what happened to Bering Straits).

¹⁸ see, e.g., Forker (1996), Richardson (1990), Fuerst (1988). Willie Hensley, former president of Nana Corporation, said: "when the act itself was passed, there was no business experience in the Native communities- literally, from one end of the state to the other. It had been a bartering community." (Forker 1996, p. 58).

¹⁹ Of course, management inputs could also be imported simply by hiring non-Native managers. Rigorous analysis of the effects of individual managers is not currently possible with the available data.

In fact, the Native corporations did have some scarce resources to offer to joint ventures. These included their legal status as disadvantaged minorities, which earned official preferences in public contracts. Probably more important was their political and even moral clout. Major resource developers quickly realized that it was very useful to have Native corporation stakeholders on board when pushing politically sensitive projects and agendas. For example, several corporations secured maintenance contracts from the major oil companies for sections of the transalaska oil pipeline that ran through their lands, apparently based on political negotiations and promises made when Congress was considering the project.

Ultimately it is an empirical question whether joint ventures tended to help or hurt performance. To generate a crisp hypothesis I assume that all of the owners of bad projects managed to sell them outright to naive Natives, while those with good projects in need of "Native clout" formed JV partnerships. Under these assumptions JVs are a good option:

H4: Assets allocated to joint ventures earn positive excess returns relative to assets in wholly owned projects in the same sector.

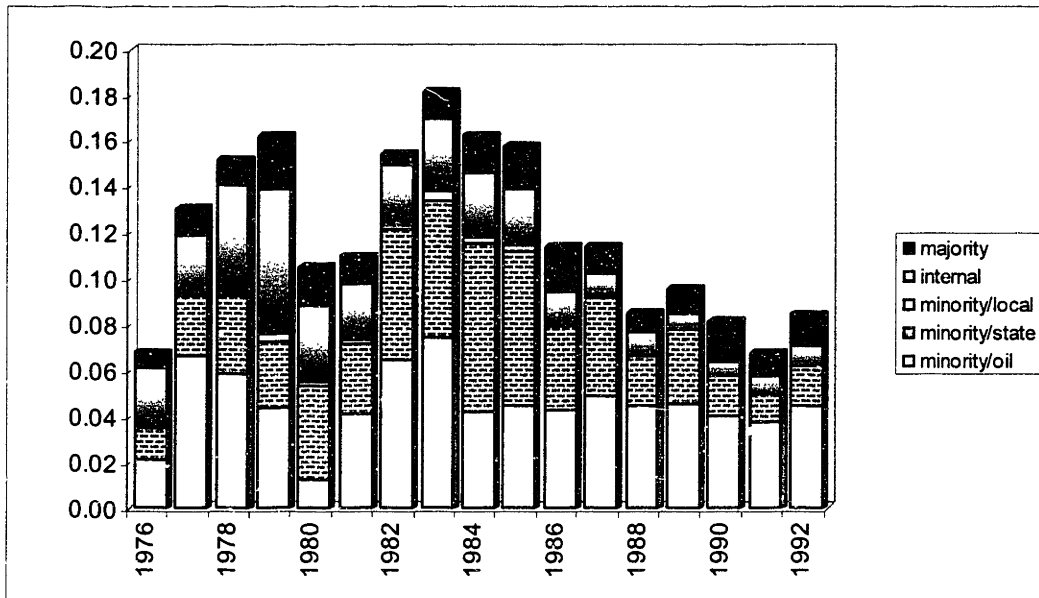
The data on joint ventures

Standard accounting practice shows JV participation in two ways on balance sheets. When the Native corporation is a minority participant, its equity in the JV is typically shown as a specific net asset. This is the equity method of accounting and it is supposed to be reserved for those projects over which the corporation has little management control. When the Native corporation is the majority participant, the entire project is typically listed as an asset and the partner's equity is shown as a liability. This is the standard, or cost method.

To implement the test in **H4** I identified assets allocated to specific joint ventures and coded them as fractions of total assets. I coded separate fractions for minority participation with non-Native partners in the oil, statewide, and local sectors. In addition I coded two allocation fractions that cut across sectors. The fraction JV_INT is the portion of total assets allocated to "internal" JVs: projects run by consortia of ANCSA corporations with no non-Native partners. These ventures by definition could not produce gains from non-Native expertise, and in fact may have offered the worst possible combination of attributes. They likely combined a common pool of at-risk capital, no clear responsibility for failure, no external market in tradable shares, and little or no external monitoring from the bond markets. The premium to internal JVs should be negative.

The fraction JV_LIAB is the portion of total assets allocated to ventures with non-Natives where the Native corporation is the majority partner. Altogether there are five categories of joint venture assets, and they are mutually exclusive. Figure 5 summarizes the data over time and shows that about 10% of assets were consistently allocated to joint ventures.

FIGURE 5: ASSET ALLOCATIONS TO JOINT VENTURES



Joint venture effects: results

Table 6 shows the results from including joint venture asset fractions as additional regressors in equation (5) along with the individual corporation returns to statewide investment. It is useful to think of each panel of the table as showing an additional set of "treatment effects" applied to the assets. Panel *A* shows the absolute return to passive investment. Passive assets are the "controls." Panel *B* shows sector effects: the additional returns to a dollar of assets placed in wholly Native owned projects in the oil, statewide or local sectors. The firm-specific returns to statewide investment are not shown in the table; panel *B* simply shows the constructed average of the 12 coefficients. Panel *C* shows the further additional treatment effects of importing management by putting assets in joint ventures. The estimated effects are substantial and generally significant. In the oil sector, the additional return from being a minority share JV partner is 16%. In the statewide sector the premium is 36.5% and significant. The 588% JV premium in the local sector is an artifact of the small number of data points in this cell.

TABLE 6: RETURNS TO SECTORS WITH JOINT VENTURE EFFECTS

Investment sector	nonwindfall rate of return on book equity
A. <i>(Baseline). Absolute return to passive investment:</i>	-.052* (0.013)
B. <i>(Sector Effects).</i> <i>Additional returns (relative to passive)</i> <i>from 100% Native-owned investments in:</i>	additional return
Oil sector	-.440* (0.065)
Statewide sector (Constructed average of 12 corporation coefficients)	-.566* (0.060)
Local sector	.240* (0.094)
Local public works	1.950* (0.325)
C. <i>(Organization Effects).</i> <i>Additional returns (relative to 100% Native-owned) from participation in:</i>	
Oil Sector JVs with non-Native majority partners	0.160 (0.092)
Statewide sector JVs with non-Native majority partners	.365* (0.133)
Local sector JVs with non-Native majority partners	5.88* (1.404)
All-Native ("internal") JVs in any sector	-.233 (0.182)
JVs in any sector with minority non-Native partners	1.24* (0.144)
notes: Regression estimated with 12 firm-specific coefficients on statewide sector assets. The average reported above and its std. error are constructed from these estimates. Estimated by feasible GLS with correction for heteroskedasticity & cross-sectional correlation. Std. Errors in parentheses. N=12 corporations over T=17 years. * indicates significant at 5% level.	

Although not significant, the return premium to wholly Native JVs is -23%, consistent with a pool of assets being appropriated rather than invested. (Much of the internal JV data is generated by an "all-Native" bank that failed). Finally, the premium to majority-owned JVs is 124% and significant. Further inspection of the data shows that this coefficient essentially reflects the successful oil drilling business of the Doyon corporation.

Including JV effects does not noticeably change the common sector returns in panel B or the firm-specific returns (not displayed), with the notable exception of the oil sector. There, the return had been unstable and close to zero in previous specifications such as shown in Table 3.

With JV assets separated out, the oil coefficient resolves itself into three quite different returns. The estimated return to 100% Native-owned projects is -44% (panel B), while at the opposite extreme the return to majority-owned JVs is +124% and dominated by the single Doyon Drilling enterprise. In the middle are minority-share JVs, where the JV premium of +16% only offsets a part of the estimated average losses.

Summary of management and joint venture tests

In this section I augmented the simple asset allocation model to accommodate firm-specific returns and the effects of joint ventures. Hypothesis H3, couched in deliberately strong form, said that sectoral differences are not important and only management matters. The results do not support this hypothesis. Both management within a sector and sectoral choice are important to performance. The differences between sectors in the simple model are not just a proxy for differences in management. They persist when individual returns are introduced. But within the statewide sector the estimated returns (mostly losses) do vary tremendously across corporations - from +8% to -131%²⁰ The "within-sector" variation in statewide sector returns among corporations exceeds the "between-sector" variation, but the magnitude of the ranges is roughly the same.

The estimated return premia earned through joint ventures with non-Native partners are consistently positive, while the premium on internal consortia is negative. These results support hypothesis H4, which predicts that joint ventures with external partners will be good for Natives.

5. Tradeoffs Between Profits and Wages

In this section I broaden the focus to include shareholder employment as a measure of economic success. Persistent unemployment was perceived as the most important economic problem by several ANCSA corporations. If the social opportunity cost of shareholder labor is significantly below market wages, or if there are significant benefits from human capital accumulation or just being able to work with Native peers, then it could be efficient for managers to provide jobs at the expense of profits. Table 2 at the start of this paper shows the tremendous variation in shareholder employment for the year 1991.

²⁰ excluding Arctic Slope, whose estimated statewide return of -269% is juxtaposed against an estimated return to local public works of +209%.

The analysis of financial returns presented above shows that most corporations made significant financial losses in statewide sector enterprises. The evidence on the oil sector is mixed, and the local sector seems to have provided positive but limited profits. Since participation in the money-losing statewide sector was optional, an efficient asset allocation can only be inferred if there is a marked tradeoff between profits and the quasirents from employment.

Employment quasirents are not the same thing as wages. To count as quasirent, a given wage must exceed the social opportunity cost of the particular shareholder who holds the job. If Native corporation jobs simply attract otherwise employable shareholders and pay roughly market wages, then they are not providing net benefits via employment.

I formulate these notions into the following general null hypothesis:

H5: Native corporations traded off financial profits for payroll quasirents along an efficient frontier within and across economic sectors. Different outcomes across corporations reflect different preferences and trace out a single technical production possibilities frontier.

Of course **H5** is impossible to prove in the affirmative, but it is potentially falsifiable. I now use the asset allocation model to consider the tradeoffs between profits and employment quasirents.

5.1. Generation of Payroll and Quasirent Estimates

There are no consistent data on Native shareholder employment or payroll. I generated estimates of shareholder payroll for each corporation and year from my own mail surveys, several special studies, and a careful reading of the corporation annual reports and the Alaska business trade press. The coding process is discussed in the Data Appendix to this paper.

To convert payroll to quasirents I use the relative shortfall between 1990 Native per capita personal income in each region and the overall (all races) 1990 per capita personal income in Anchorage:

$$QUASIRENTS_{it} = PAYROLL_{it} \times (1 - (Native\ per\ capita\ Income_i / Anchorage\ Income))$$

Anchorage has a well-developed labor market and the highest per capita income in the state. The shortfall going into this formula takes into account both regional poverty and the Native-white income differential.

Table 7 summarizes the data on shareholder payroll and presents my estimates of payroll quasirents. It confirms that Arctic Slope and Nana were indeed very successful at generating wages for shareholders. The Ahtna corporation was also a standout, based on its small shareholder base and its early entry into the construction and security businesses. The Anchorage 1990 per capita income used as the benchmark for estimating quasirents is \$22,940, so the average estimated quasirent fraction of payroll is about 50%. It is significantly higher in many of the more remote areas., including the Ahtna and Nana regions.

TABLE 7: SUMMARY OF SHAREHOLDER PAYROLL AND ESTIMATED QUASIRENTS

Corporation	Average Annual Shareholder Payroll \$000	Average Annual Shareholder Payroll per Shareholder \$	Average Shareholder Payroll return on equity %	per capita Native Income in 1990 \$	Average Annual Payroll Quasirents per Shareholder \$
Ahtna	1,600	1,455	15.5%	9,388	859
Aleut	353	109	3.1%	14,179	42
Arctic Slope	9,450	2,528	32.1%	12,120	1,192
Bering Straits	266	43	5.7%	6,373	31
Bristol Bay	177	34	0.6%	9,273	20
Calista	994	75	4.6%	5,589	56
Chugach Natives	869	412	4.0%	15,637	131
Cook Inlet	1,410	215	1.2%	10,632	115
Doyon	1,924	212	3.2%	7,603	142
Koniag	245	66	3.8%	12,237	31
NANA	8,115	1,623	20.3%	7,236	1,111
Sealaska	5,251	334	5.2%	11,723	164
Unweighted Average	2,555	592	8.3%	10,170	325

5.2. Quasirents in the Asset Allocation Model

The estimates of "payroll return on equity" and "quasirent return on equity" can be used as alternative measures of economic return in the asset allocation model. These variables are clearly endogenous. Because of the causal link between actual payroll and the amount of assets allocated to the statewide sector, I keep the measures of returns from payroll on the left side of the regression and use the fitted value *STATEHAT* as an instrument for the fraction of assets in the statewide sector. As an initial test for the presence of an efficient wage-profit tradeoff, I

simply regress different measures of the "return on equity" on the asset shares. I consider wages (payroll), quasirents, and combinations of profits and payroll. Table 8 reports the results.

TABLE 8: WAGES AND QUASIRENTS IN THE ASSET ALLOCATION MODEL

	(1)	(2)	(3)	(4)	(5)
	dependent variable = returns on equity in the form of:				
Investment sector	Profits	Wages	Quasirents	Profits plus Wages	Profits plus Quasirents
<i>A. Absolute Return to Passive Investment:</i>					
	.043*	.021*	.003*	.058*	.033*
	(0.016)	(0.001)	(0.0004)	(0.014)	(0.017)
<i>B. Absolute Returns to Active Investment in:</i>					
Oil sector (OIL)	.130*	.288*	.164*	.434*	.354*
	(0.038)	(0.010)	(0.006)	(0.049)	(0.049)
Statewide sector (STATEHAT)	-.128*	-.005*	.003*	-.142*	-.137*
	(0.030)	(0.001)	(0.001)	(0.027)	(0.032)
Local sector (LOCAL)	.089	.025*	.007*	.443*	.404*
	.100	(0.001)	(0.001)	(0.098)	(0.097)
Local public works (PUBWORKS)	.629*	.758*	.332*	1.35*	.900*
	(0.158)	(0.050)	(0.027)	(0.149)	(0.157)

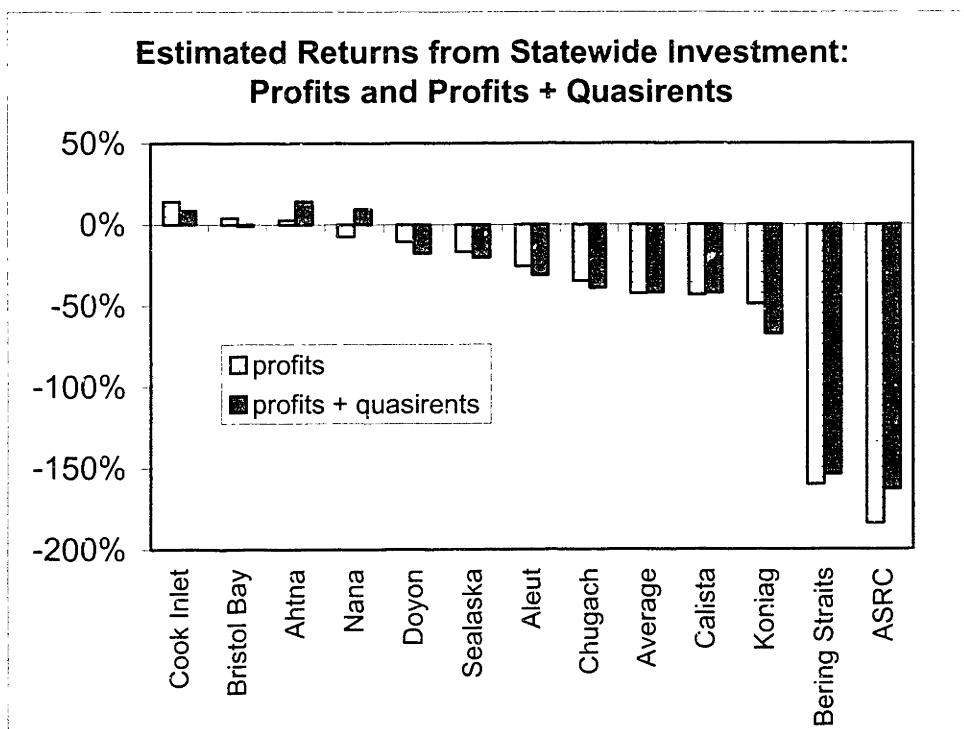
notes: Estimated by feasible GLS, using fitted values for the fraction of assets in the statewide sector.
Std. Errors in parentheses. N=12 corporations over T=17 years.
* indicates significant at 5% level.

There appear to be clear and large payroll payoffs to investment in the oil, local, and local public works sectors. Surprisingly, however, the estimated wages return on equity in the statewide sector is *minus* 0.5% and significant. The quasirent statewide sector return (column 3) is barely positive, and in any case completely insufficient to offset the negative profits from this sector, as shown in columns 4 and 5. Overall, these simple estimates cast immediate doubt on the hypothesis of an efficient wage-profits tradeoff.

Table 9 adds firm fixed effects to the specification. Column 1 repeats the previous IV estimates of profit return on equity from section 3 above. Columns 2 and 3 show that with firm fixed effects, the average statewide sector wage and quasirent returns on equity are positive and significant. However, they are still far too small to keep the combined returns from profits and payroll from being strongly negative. The oil sector combined return from profits and quasirents jumps to about 14% and the local sector appears to provide very large combined returns.

Inspection of the firm-specific returns to statewide investment confirms that Ahtna, Arctic Slope, and Nana earned large positive quasirent returns. For these three firms, the change in economic performance when estimated quasirents are counted is dramatic.²¹ The tiny Ahtna corporation has the highest combined return on statewide investment, and Nana moves from -.7% to +10%. Figure 6 summarizes these changes to firms' individual returns. The major message of these results is that with the exceptions just noted, most corporations generated little or zero quasirent offset to their negative profits from statewide investment. For these firms, the evidence strongly rejects the hypothesis (H5) of an efficient wage-profit tradeoff.

FIGURE 6: ESTIMATED STATEWIDE SECTOR ABSOLUTE RETURNS WITH AND WITHOUT PAYROLL QUASIRENTS INCLUDED AS "PROFIT"



²¹ As noted above, Arctic Slope's very negative statewide return is probably a statistical fluke mirroring their similarly large positive coefficient on the local public works sector. The important thing to note here is the positive *change* in return from including labor income in their statewide sector return.

TABLE 9: PAYROLL RETURNS WITH FIXED MANAGEMENT EFFECTS

	(1)	(2)	(3)	(4)	(5)
dependent variable = absolute returns on equity in the form of:					
Investment sector	Profits	Wages	Quasirents	Profits plus Wages	Profits plus Quasirents
<i>A. Absolute Return to Passive Investment</i>	-.004 (0.019)	.013* (0.001)	.004* (0.000)	.059* (0.016)	.038* (0.018)
<i>B. Average Absolute Returns (over all firms) to Active Investment in:</i>					
Oil sector	.059 (0.050)	.099* (0.006)	.058* (0.003)	.200* (0.065)	.141* (0.061)
Statewide sector (Average of all 12 corporations)	-.425* (0.056)	.134* (0.012)	.068* (0.006)	-.372* (0.061)	-.421* (0.059)
Local sector	.349* (0.098)	.016* (0.002)	.006* (0.001)	.583* (0.114)	.566* (0.107)
Local public works	1.99* (0.298)	.267* (0.074)	.131* (0.034)	2.31* (0.258)	2.15* (0.277)
<i>C. Firm-Specific Absolute Returns to Statewide Sector Investment by:</i>					
Ahtna	0.027 (0.052)	.293* (0.034)	.176* (0.020)	.248* (0.063)	.143* (0.055)
Aleut	-.256* (0.120)	-.006 (0.005)	-.001 (0.002)	-.330* (0.119)	-.314* (0.120)
Arctic Slope	-1.84* (0.372)	.746* (0.093)	.337* (0.044)	-.131* (0.354)	-1.634* (0.365)
Bering Straits	-1.60* (0.440)	-.011* (0.001)	-.003 (0.001)	-.152* (0.432)	-1.54* (0.438)
Bristol Bay	.042 (0.062)	-.019* (0.003)	-0.007* (0.001)	-.032 (0.061)	-.010 (0.061)
Calista	-.434* (0.131)	.028* (0.007)	.025* (0.005)	-.412* (0.128)	-.423* (0.128)
Chugach	-.348 (0.207)	.201* (0.096)	.031 (0.034)	-.246 (0.242)	-.391 (0.219)
Cook Inlet	.142* (0.047)	-.011* (0.003)	-.004* (0.002)	.065 (0.053)	.085 (0.052)
Doyon	-.104 (0.087)	-.005 (0.005)	.005 (0.003)	-.215* (0.091)	-.179* (0.091)
Koniag	-.489* (0.190)	-.020* (0.002)	-.007* (0.001)	-.721* (0.186)	-.674* (0.189)
Nana	-.073 (0.044)	.295* (0.035)	.208* (0.024)	.176* (0.061)	.095 (0.053)
Sealaska	-.168* (0.080)	.114* (0.017)	.067* (0.009)	-.175* (0.071)	-.203* (0.075)

notes: Columns 1,2,3,5 Estimated by FGLS with correction for heteroskedasticity & cross-sectional correlation. Column 4 IV estimates use fitted value for fraction of assets in Statewide sector.

Std. Errors in parentheses. N=12 corporations over T=17 years.

* indicates significant at 5% level.

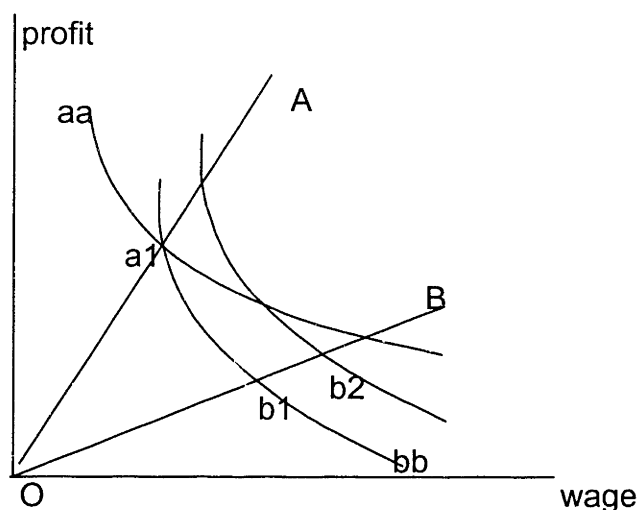
5.3. Using Grouped Data to Test for Efficient Wage-Profit Tradeoffs

Although it is not possible to directly identify the "tradeoff coefficient" in a regression of profits on quasirents, it is possible to use grouped data to generate an alternative test of the efficient tradeoff hypothesis. In a simple regression of the form

$$PROFITS_{it} = \alpha + \beta \times QUASIRENTS_{it},$$

the coefficient on quasirents is unidentified because the desired wages-profits combination is an endogenous outcome of maximization over preferences subject to the constraints provided by the menu of available projects. The observed profit-wage combination is also a function of luck. Figure 7 helps clarify this point. Suppose corporation A prefers profits and has an optimal expansion path OA, while corporation B prefers wages and tries to expand along OB. Relative to point a1, corporation B is better off at b2 while corporation A is worse off. If we observe a collection of points like a1 and b2, we cannot tell whether profits are being efficiently traded off for wages across firms. If, however, we observe points b1 and b2 *and* each of those points is an estimate of a different firm's average returns, with shocks removed, then it would be possible to conclude that some firms are simply more productive than others.

FIGURE 7: PREFERENCES FOR PROFITS AND WAGES

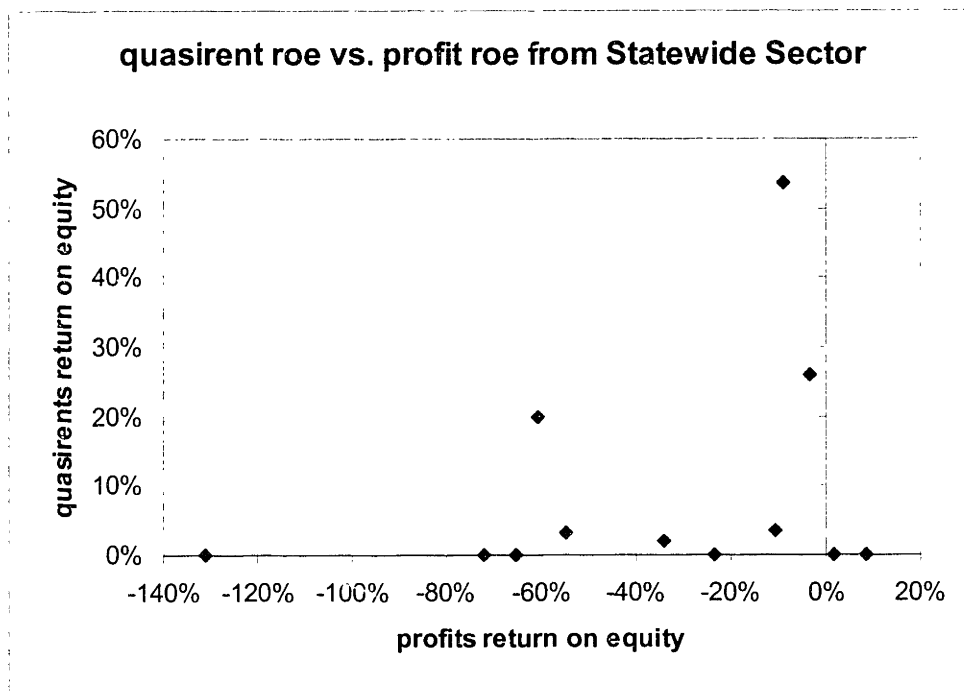


Using grouped data provides a way to carry out this test. Assuming each firm has fixed preferences, then the combination of the average profit rate of return and the average quasirent rate of return for firm *i* provides an estimate of firm *i*'s position on its own technical frontier. Each pair of estimated returns for firm *i* is for a given set of preferences and averages out the

lucky and unlucky realized returns. In order to be tracing out an efficient production possibilities frontier that trades off profits for wages across firms, the points must have a generally negative correlation. If the points lie strictly above and to the right of one another, then some firms are inefficient relative to their peers. They have lower profits *and* lower quasirents.

Figure 8 shows the set of combinations of profit return on equity and quasirent return on equity for the 12 corporations' statewide sector operations. The returns are estimates from separate equations such as those in column 1 and column 3 of Table 9. The scatterplot has a generally positive slope. The simple correlation coefficient between profits and quasirents is 0.28. In particular, Ahtna and Nana show very high rates of quasirent return on equity without making great sacrifices of profits.

FIGURE 8: AVERAGE PROFIT-QUASIRENT COMBINATIONS (ACROSS FIRMS) FROM STATEWIDE SECTOR INVESTMENT



Summary of Evidence on Profit-Wage Tradeoffs

Several regional corporations generated large amounts of payroll paid to their shareholders. The returns on equity in the form of payroll or quasirents are high in the oil and local sectors and in the statewide sector for certain firms. Ahtna, Nana, and Arctic Slope have significantly higher rates of return from statewide investment when quasirents are added to

profits. Overall, however, the evidence is not consistent with an efficient tradeoff of profits for wages. Most corporations made huge losses in the statewide sector even when the entire shareholder payroll is counted as part of the return on equity. Furthermore, grouped data show a generally positive correlation between average realized profits and average realized quasirents across firms. This test rejects the hypothesis (**H5**) of a single efficient profit-payroll frontier. As a rule, the firms that lost the most money provided the fewest jobs.

6. Persistent Fixed Effects, Internal Incentives, and Preferences

The results presented above show that persistent firm-specific factors explain a significant proportion of the variation in performance after controlling for natural resource endowments, asset allocations, employment benefits, and the use of joint ventures as a direct substitute for internal management skill.²² These fixed effects could be the expression of deeper causes that are hard to quantify or to embed in an individual optimizing framework (Cockburn & Henderson 1996). Notwithstanding this ambiguity, the historical record gives the strong impression that some Native corporations ran smoothly in spite of external shocks while others seemed to be caught in a perpetual quagmire of bad projects, management turnover, litigation, and internal discord.

In this section I briefly consider the roles of individual incentives and heterogeneous preferences as possible sources of these fixed effects. This approach to variable performance moves the focus from outside to inside the firm, toward the amorphous concepts of shared norms, culture as a public good, and concepts of "social capability" and culture.²³ I provide some evidence in support of the importance of internal factors and draw connections between the exogenous attributes of some Native groups, the internal political economy of their corporations, and the resulting economic performance. Unfortunately the small sample size and lack of data make it hard to test these propositions beyond confronting them with case histories.

²² In OLS versions of the asset allocation regressions presented in sections 4 and 5 above, the adjusted R^2 rises from .13 to .37 when firm-specific returns from the statewide sector are introduced.

²³ Abramovitz (1986) borrows the term "social capability" from Ohkawa (1973).

6.1. Agency problems and preference aggregation problems within ANCSA corporations

It has long been recognized that the structure of property rights within the firm and the incentives they generate can greatly affect the actual achievable output (Shapley and Shubik 1967, Jensen and Meckling 1979). On the outside, a Native corporation may appear to be a unified business firm. But on the inside, the structure of inalienable and permanently diffuse control rights makes the organization more like an American Indian tribe or very small country. To be successful, such groups must confront and solve two related internal problems. There is an agency problem and a preference aggregation problem.

Agency problems in Native corporations

Like other firms, ANCSA corporations face standard governance problems from the separation of ownership and control. These agency problems are exacerbated by the fact that stock cannot be traded and by the lack of good monitoring skills among the all-Native boards of directors. The shareholders' inability to use "exit" as a discipline mechanism (Hirschmann 1972) clearly gives management, employees, and outside parasites more leeway to pursue their rent-seeking objectives, including shirking, empire-building, or nepotism. (Karpoff and Rice 1989, Milgrom and Roberts 1988, Buchanan, Tollison & Tullock 1967).

The huge financial losses of many Native corporations show that these problems were real and important. Given the ease with which dissipation could occur, the interesting question is why some corporations managed to *avoid* financial disaster. Since the law imposed the same formal corporate structure on all 12 Native groups, it is not possible explain relative success stories without considering the *match* between this formal structure and the pre-existing collection of norms, rules, and beliefs that each group brought to their new corporation (Cornell and Kalt 1995). This shifts the focus of inquiry to the preference aggregation problem.

The preference aggregation problem

Even if all agents act as perfect instruments of the principals' wishes, there remains the problem of multiple principals with multiple objectives and conflicting preferences. Should the corporation maximize current dividends, future dividends, or jobs? In neoclassical competitive theory, this problem is solved by a version of the Fisher separation theorem, which guarantees that shareholders can divorce their optimal consumption plans from any one firm's production

plans. These shareholders can unanimously support the maximization of market value as the firm's sole objective (Milne 1974). But with no trading in shares and a fixed communal land base as their chief asset, the Alaska Natives could not separate wealth maximization from optimal consumption.

With fixed, diffuse stock ownership, the shareholder preference aggregation problem closely resembles that of a small country choosing among economic plans. Under these circumstances, Boylan, Ledyard and McKelvey (1996) recently demonstrated that even if complete commitment to a multiperiod economic plan is possible, a majority-rule equilibrium will not exist. Under different commitment assumptions, political business cycles are also possible, as are median-voter outcomes. In short, anything can happen when consumption and investment plans are politically determined as a joint bundle. This indeterminacy echoes Bates' (1990) assertion that the aggregation of preferences by means other than markets is the central -- and least understood -- feature of developing societies.

An Alaska Native corporation will have serious problems choosing strategies and projects when shareholder preferences are highly heterogeneous. One problem is timing. Many Natives were illiquid and, *ceteris paribus*, would seem to favor dividend distributions over reinvestment, even to the point of partial liquidation of the firm. A second problem is that the returns from some projects accrued as high wages to a few lucky shareholder-workers rather than as dividends. The gains might also accrue solely to top managers as inflated salaries, human capital, prestige, or power. In this environment, a board of directors faced with strong tradeoffs between shareholder wages, human capital, and cash returns must choose whether to maximize measured accounting profits by sending resources outside the region to earn safe but low returns or whether to maximize long-run "Native GDP" by investing locally.

The internal political economy of the group is a source of potentially serious constraints on these choices and, hence, on *ex post* profitability. Specifically, if the group has social mechanisms in place to redistribute income and wealth across time and individuals, then a socially productive investment can be chosen without regard for the distribution of the benefits. If, on the other hand, the group consists of narrowly selfish individuals, many projects may not be politically feasible and the strictly egalitarian alternative of external investment must be used to achieve a constrained maximum.

In strong form, the basic premise underlying the internal incentives approach to differential performance is that beneficial projects do exist. These projects could come from all quarters -- the sector doesn't matter. The successful corporations somehow align their preferences and internal incentives to solve two problems. First, they check outright dissipation from opportunism and ineptitude. Second, they manage to efficiently take the returns from these projects in one of three forms: accounting profits, payroll quasirents, or additions to human capital. The unsuccessful corporations dissipate the returns outright or simply avoid projects because they can't internalize the social benefits of jobs and human capital formation.

I now consider two potentially observable means by which these internal problems might be overcome. The first is the use of external investment and debt finance as a discipline device to check rent seeking. The second is a fortuitous pre-existing tendency toward cooperation, which may be fostered by group size, geographic proximity, or more inscrutable aspects of the group's traditional culture.

6.2. Using external investment and debt to check rent seeking

Tornell and Velasco (1993, TV) provide a formal model where capital flight from countries is rational because external returns are secure while internal investments are subject to appropriation, driving the private return below the social. In what TV call an internal equilibrium, the private (post-appropriation) return to internal investment is equated by a no-arbitrage condition to the safe but low external return. What TV call extreme equilibria are also possible. In these cases the appropriation rates can be arbitrarily high or arbitrarily low. The model admits both a pure Hobbesian struggle and a utopian cooperative solution arbitrarily close to the first best.

The main insight of the TV model in this context is that the option of external investment provides a source of discipline which can help check internal appropriation. First, the Native corporation board (acting as subprincipal) can restrain management from empire building and nepotism by periodically removing resources from their control. (As always, the credible threat need not be carried out to be effective in equilibrium.) Second, the board (as agent) can bond itself to the shareholder body by establishing restricted passive investment funds.

External investment takes current cash holdings out of agents' hands. In a dynamic analogue of this concept, Jensen and Meckling (1976) argue that debt finance serves the same

purpose by taking future cash flows out of management's hands. The use of debt also induces external monitoring by bondholders. The theory of external investment as discipline suggests the following proposition:

H6(a): Corporations that have successful active business operations will also have some funds invested passively and some outstanding debt, while the biggest failures at active business will have all their assets committed to it with little associated debt.

Unfortunately this is a very weak test, since there are other good reasons for passive external investment and issuing debt. The establishment of permanent shareholder trust funds restricted to passive investment is a stronger sign that the board or the shareholder body is trying to control internal dissipation. A weak test for this is:

H6(b): The establishment of restricted passive investment funds is highly correlated with recent business losses and the receipt of windfall cash flows.

6.3. Externalities, Social Accounting and Social Capability

Tornell and Velasco demonstrate extreme equilibria featuring either a Hobbesian free-for-all or near perfect cooperation. These demonstrations provide formal backing for the elusive concept of social capability (Okhawa, 1973). As Abramovitz (1986) argues, "Tenacious societal characteristics normally account for a portion, perhaps a substantial portion, of a country's past failure to achieve as high a level of productivity as economically more advanced countries." (p. 387).

One measure of social capability is the ability of the group to aggregate preferences by internalizing positive externalities. For Alaska Natives, two possible externalities from active business ventures are private human capital accumulation and high wages.²⁴ The evidence presented in section 5 above shows that payroll quasirents were indeed very important to several corporations. If the human capital acquired by managers and employees remains with the corporation, measured profits may eventually go up. If it stays with a Native shareholder that goes elsewhere, it nonetheless benefits total Native income. But other shareholders may revolt if a few get all the benefits in the form of new skills and high wages. Because of long gestation times, effective human capital formation could require a significant intergenerational transfer

²⁴ Agglomeration economies from increased local economic activity have also been mentioned by Native leaders.

from the old to the young. In the same way, high wages paid to shareholder-workers with low opportunity costs are transfer payments that contribute to total Native income but do not show up as measured corporate profits.

The President of the Nana corporation summed up these dilemmas in a statewide 1977 speech:

Getting jobs for your Native stockholders is a costly proposition. You give up profits for this type of objective. I'm not saying that's wrong. We're doing it. Not making much of a profit but we're doing it. But is this what we want our regional corporations to do? ²⁵

A willingness to accept income to others as income to the group is one possible attribute of social capability. Driving this willingness could be actual or perceived sharing mechanisms such as the kin-based networks historically used by many Alaska Natives to buffer uncertainty in subsistence harvests. Another source of this internalizing capability could simply be small group size or proximity to one another.

Whatever the deep sources, I hypothesize that smaller or more historically cohesive Native groups are better able to choose the cooperative equilibrium in an appropriation game. Due to the proximity and repeated interactions of their members, they have more social capital per capita, such as internal sharing and disciplining networks, and they can monitor and control internal rent seeking at lower cost. As a result, they can take advantage of projects with high social returns that may be unequally distributed, outside the accounting boundaries of the company's books, or susceptible to outright appropriation. This general proposition can be narrowed into a series of weak tests:

H7: *Ceteris paribus*, smaller corporations will be more profitable.
Controlling for size, village corporations will be more successful at active business than regional corporations, due to their physical coherence.
Regions with continued high reliance on traditional subsistence activities will have higher employment at the expense of profits.

²⁵ John Shaeffer, President, Nana Corporation, speech to Alaska Federation of Natives Convention, November 11, 1977. Mimeo, available from the author.

6.4. Evidence on Internal Incentives, Employment, and Success

Evidence on external investment and debt as a discipline device (H10)

Table 10 reports the results of several simple cross-section regressions using the estimated active business ROE in the statewide sector from Table 4 above.²⁶ Proposition **H6(a)** says that the best performers have significant debt and passive assets in their portfolios. The regression of ROE on the share of debt in total assets does not support this directly; the estimated coefficient of return on debt fraction is -1.12, which has the wrong sign. Evidently the worst performers also carried high debt loads. The second result in panel A is weakly consistent with **H6(a)**. Corporations that held back a higher share of their assets in passive investment during the early decade 1977-86 had slightly higher returns. This estimate is not significant, however. In panel B there is modest support for **H6(b)**, which said that high losses would lead the board or shareholders to check dissipation by formally setting aside resources in restricted passive investment funds. The regression in panel B uses the change in the passive share of total assets as the dependent variable and the estimated coefficient is negative and significant, indicating that the worst performers between 1977 and 1986 did have the largest subsequent jumps in their passive asset shares.

Anecdotal evidence also supports the proposition that alert shareholders acted to take resources out of management's hands, especially when large sums of cash from tax loss sales became noticeable on the corporate books (Bauman 1991, Associated Press 1994a). It is also instructive to note that although it ended up with debt finance for its hotel, the Calista corporation initially sank *all* of its own equity into the project with very little external debt. Only when cost overruns began accruing did they seek major external finance. At that point they required a government loan guarantee from the BIA in order to complete the project.

²⁶ I assigned a return of zero to Arctic Slope, which had the unlikely combination of -270% (statewide) and +209% (local public works).

TABLE 10: ACTIVE BUSINESS RETURNS, DEBT, AND PASSIVE INVESTMENT

Independent variable	(1) dependent variable	(2) change in passive share of total assets statewide between (1977-86 sector ROE and (1987-92)
<i>A. ROE as a function of:</i>		
share of debt in total assets	-1.124 (0.600)	
Early (1977-86) share of passive assets in total assets	0.125 (0.951)	
<i>B. Change in passive share of total assets between (1977-86) and (1987-92)</i>		
Statewide sector ROE		-0.437 (0.138)
notes: } cross section of 12 corporations		

Evidence on size and success

Hypothesis **H7** states that smaller corporations (measured in terms of shareholders) and village corporations would have better performance due to the lower costs of monitoring agents and aggregating preferences. A simple regression testing this claim is:

$$ROE = -.083 - .00000174 (SIZE) + .061 (VILLAGE)$$

(.00000861) (.066)

where *SIZE* is the number of shareholders in a mixed sample of regional and village corporations and *VILLAGE* is a dummy variable for village corporations. Although extremely imprecise, these estimates support the proposition that size and geographic dispersion across a region do hinder performance. The magnitude of the *SIZE* effect is trivial, but the village corporation effect is a substantial 6-percentage point increase in ROE.

Evidence on social capability

The most financially successful corporation, Cook Inlet, took a hands-off approach to broader social goals. They focused solely on profits and took advantage of their location in the "big city" of Anchorage to pursue active business without regard for jobs. President Roy

Huhndorf once said, "we hire shareholders, but we don't overburden ourselves. If we fail in business we are worthless."²⁷ One reason they succeeded may have been that their shareholder base was already well assimilated into the market economy and knew what to expect and look for from their ANCSA corporation. In particular, Cook Inlet appears to have had an effective board that was able to monitor both Native management and a large number of non-Native technocrats that were hired in to run specific operations.

In contrast to Cook Inlet and its embrace of financial profits, the evidence in section 5 above confirms that both Nana and Arctic Slope provided large numbers of jobs to their shareholders even though located in very remote areas. A third corporation (Ahtna) achieved the highest overall return from active statewide investments when payroll quasirents are added to profits. But the rest of the group was largely unable to balance business losses with shareholder payroll.

The distinguishing feature of the successful employment-oriented groups is their relative isolation from the white majority society and their internal political and social cohesion. The same political elite that emerged as the Arctic Slope management demonstrated its prowess early on by organizing a new borough (county) on the North Slope in order to usurp for themselves the property taxing power over the Prudhoe Bay oil field. They took the tax money and funneled it sideways to their regional corporation, mostly in the form of high-paying construction contracts. Because their traditional (and still intact) subsistence economy was based on offshore whaling, it required a strictly hierarchical division of labor coupled with widespread kin-based sharing of the catch. When the Arctic Slope Corporation was formed, all of the senior management were whaling captains and one leader called the corporation "the new harpoon."²⁸

Nana's approach to its role as a Native corporation is equally striking. In 1976 Nana's president John Shaeffer told an interviewer that the mission of the corporation was to "provide people with an opportunity to participate in western culture at whatever pace and degree they feel is possible for them."²⁹ In other words, Nana saw itself as a bridge to western society which no one had to cross if they did not wish to.

²⁷ Roy Huhndorf, President, Cook Inlet Incorporated, quoted in Strohmeier (1993, p. 185)

²⁸ Edwardsen 1974.

²⁹ John Shaeffer, personal interview with Victor Fischer, 1975. Recorded as part of Fischer's "ANCSA Regional Corporations Study." Notes on file at: Institute of Social and Economic Research, Anchorage AK.

From this basic self-conception followed a number of operating practices that appear to be unique among all regional corporations. These include the early and consistent separation of ceremonial leadership from day to day operations, a continuing emphasis on pride in culture, and an almost fanatical pursuit of employment on terms compatible with traditional Eskimo subsistence. Nana was the first (and Ahtna the only other) regional corporation to merge with its villages, and when the question arose in 1991 of whether to issue new stock to the young Natives not originally included in ANCSA, the Nana shareholders quickly changed their bylaws to grant new shares to all descendants of original shareholders, forever. Only two other corporations have voted to grant any inclusion to succeeding generations, and one of these was Arctic Slope (Associated Press 1994b).

Ironically, further evidence of the importance to Nana's success of a tightly integrated shareholder group comes from recent changes to that group. Recently, Nana has started offering its shareholder-employees that work at the zinc mine free transportation between the mine and Anchorage. According to a senior Nana executive, many young workers have left their villages and moved to the city, and they do not share cash wages in the same way that they share housing and food within the village. The resulting stress on social networks has led to increased calls (from non-employees) for dividends instead of jobs and special benefits for elders.³⁰ The mine, in fact, has been run at a loss since startup but provides almost 200 jobs.

Evidence on social discord

The Bering Straits debacle stands in stark contrast to the Nana outcome. The Bering Straits regional leadership co-mingled the village and regional assets without informing the villages, then tried to merge when the ploy was discovered. The merger attempt backfired and degenerated into a series of legal battles between Bering Straits and its own village corporations, all of whom shared the same putative owners. After one of several management shakeups, the 1981 annual report revealed that there had been 108 separate lawsuits pending against the company in January 1978 --only two years after business operations started up in earnest.

As early as 1978, a new non-Native vice president was planning a full retreat from the initial money-losing business ventures that had already brought the company to the brink of bankruptcy. But this passive investment strategy was not good enough for the regional political

³⁰ Sarah Scanlan, Nana director of human resources, personal interview, January 3 1996.

leadership. The outside manager was soon forced to resign as part of a plan to return the company to all-Native management and to embark on speculative oil investments in the Bering Sea.³¹

Eventually the regional corporation went formally bankrupt but its chief creditors were its own village corporations, and as a result, the regional corporation signed over much of its subsurface land rights to the villages that already owned the surface³².

Bering Straits was not the only group to exhaust itself through internecine legal warfare. The Koniag corporation experienced similar problems when it attempted a merger with its villages. After the merger was initially complete, one village sued to overturn it, claiming that Koniag was expropriating its timber resources, which was technically true. The courts ordered a "demerger" that returned half of the village corporations to independent status. While this wrangling went on the entire ANCSA cash settlement was lost in failed business ventures. The saga -- but not the losses -- ended when the entire board and management were overthrown.

Both Bering Straits and Koniag had active subsistence activities going on in their regions when ANCSA was passed, but neither region was economically or socially connected through kin-based sharing networks. The Koniag people had interacted extensively with the Russian colonists and many had adopted the Russian Orthodox faith. Their subsistence activities were oriented outward, to the sea. And in the Bering Straits region, one detailed field report suggests that the area was balkanized into strictly defined hunting areas defended by individual tribes, sometimes in shifting alliances with one another (Ray 1967).

7. Conclusions

In this paper I have considered the large variation in economic performance among 12 Alaska Native corporations that were established by fiat in 1971 and charged with improving the lives of a poor indigenous people living in a remote, harsh region. The average performance of the group was poor, but several relative success stories stand out against the backdrop of several hundred million dollars in business losses.

³¹ Bering Straits Corporation *Annual Reports*, 1978-81.

³² Alaska Superior Court, Case 3AN-80-6815 (Civ).

Asset allocation to different sectors was a significant determinant of overall returns (measured net of windfalls). Surprisingly, the only positive profit returns to active investment were in local enterprises, where the small size of the market limited the scope of activity in a way that was probably observable to all. The Native corporations' losses were spread among many statewide enterprises outside the oil industry, such as fishing, construction, real estate, and hotels. In the statewide sector, the estimated average annual return on equity is -20% in a pooled regression and ranges between -130% and + 8% when individual corporation returns are allowed to vary. Contrary to popular belief, the estimated average return in the oil sector was zero -- or negative if the project had no joint venture partner.

The use of the joint venture offered a mechanism for importing scarce management and production expertise and securing rationed contracts with the oil industry. Joint ventures with established non-Native firms lost slightly less money than wholly owned operations, while the few wholly Native joint ventures returned a significant negative premium.

The evidence strongly rejects the hypothesis of an efficient wage-profit tradeoff across firms. Shareholder employment provided significant benefits to only three corporations. For these three, however, the economic returns in the form of payroll quasirents were quite large. When profits are augmented by quasirents, the top two employment generators had the highest economic returns from active statewide investment. The two most successful job creators, Nana and Arctic Slope, appear to have high levels of social cohesion, political capacity, and subsistence-based sharing. These mechanisms, however, may be under stress as economic and social integration with non-Native society proceeds.

The pattern of profits and losses provides mixed support for the concept of economic dualism in a remote resource-dependent region such as Alaska. Modern sector enterprises connected to the existing oil industry provided jobs and sometimes profits, but were limited to a fixed pool of opportunities. In some cases the Natives managed to tap existing contractual opportunities with joint venture partners, but the evidence on wholly-owned investments suggests that attempts to create new opportunities on their own generally failed.

Both the persistence of business losses through time and the wide range of firm-specific returns to statewide investment suggest that in some cases profitability was simply ignored or submerged in a sea of ineptitude and dissipation. Because shareholders could not sell their shares and had poorly developed monitoring skills, a large amount of rent seeking undoubtedly

occurred. In the Bering Straits case in particular, the data suggest that the Natives simply paid inflated prices for nonperforming business entities. They suffered huge capital losses to outside opportunists even before operations began.

There are no easy answers to the question of what made some Alaska Native corporations respectable performers while most lost millions in repeated business failures. Capital was not the scarce factor limiting the Natives' economic advancement. Instead, they were stymied by rapidly diminishing returns to that capital. Some corporations dealt with this problem adroitly, but for lack of good management most did not. Firm-specific fixed effects are statistically important but have few easily observable causes. The search for these deeper sources of success remains an intriguing and important challenge for future research.

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Data Appendix

The regional corporation data form a complete panel for 12 corporations over the 18 years from 1976 to 1993. The starting year of 1977 is the first year of useful data on assets allocations, because the asset allocations from the end-of-year balance sheet are used in the regressions as beginning-of-year allocations for the following year.

Financial performance data

I developed the data on financial performance directly from the corporation annual reports. The data were adjusted to remove windfall transfers and the sales of natural resource assets, as described in detail in Essay #1. The basic data series that results from these adjustments is a set of annual returns on book equity resulting from business and passive financial investment. This I call nonwindfall income

Allocation of assets to sectors

Using the assets side of the corporate balance sheet as a starting point, I first excluded trade receivables, which are usually balanced on the liability side by trade payables, and other general assets such as the corporate headquarters building, if owned. I then allocated all invested assets to specific identifiable business ventures, such as "fishing vessels," "equity in oilfield catering venture," or "inventory at local hardware store." To minimize potential coding bias, I made no attempt at this stage to aggregate the allocated assets into the broad categories used in the regressions. After all the assets had been allocated to specific businesses for all corporations and all years, I returned to the top of the dataset and classified each business venture as primarily serving one of the following sectors:

Oil Sector. The Oil sector includes existing oil operations and enterprises dependent on the flow of oil and cash from the large and profitable North Slope fields. These include activities such as contract drilling, oilfield services, running the electric power plant or the sewage plant at Prudhoe Bay, security services along the pipeline, and pipeline or construction camp catering. It does not include speculative investment in unproven leases or investment in infrastructure to serve speculative demand in an unexplored area. These ventures were be coded as "statewide."

Statewide Sector. The business ventures coded as statewide span a wide potential range of industries that actually included everything from mobile home sales to dog food manufacturing. They are distinguished from the "local" sector by the geographic dispersion of demand. For example, a fish processing venture confined to one plant in one town is still a statewide venture, because the product is sold into external markets. Heavily represented statewide industries include construction, real estate, fish processing, active logging (value added beyond stumpage), and tourism (hotels). Also included is speculative entry into unproven oil and gas operations, eg, a venture not dependent on the cash flow generated by the Prudhoe Bay field and funneled through the major oil companies. Generally, construction was coded as a statewide business.

Local Sector. The local sector is distinguished by the local and largely private sources of demand. It would include such ventures as renting apartments or offices, retail trade, or strictly local tourism services, such as a small hotel in a village. The local sector offers a potentially higher degree of monopoly power (in part because of small market size, locally increasing

returns, and cultural loyalty to the Native provider). Competition is minimal in most cases, but the truly local market is also limited because almost by their nature any business activities supported by exogenous demand will face statewide competition.

Local Public Works. I created a separate sector called local public works to reflect construction (and some other services such as fuel distribution) for which the source of demand is local government and competitive bidding is either not used or is attenuated by local preferences that vastly favored the Native corporation. In practice, this sector only applied to the Arctic Slope Regional Corporation, which was favored by the demands of the regional Native-controlled government of the North Slope Borough. Throughout the study period, the Borough controlled essentially unlimited wealth due to its property taxing authority over the North Slope oil fields.

Passive Financial. This sector includes investments in broad portfolios of stocks and bonds, as well as long-term interest-bearing notes receivable. There is an unfortunate grey zone that arises in the numerous cases where physical business assets were sold on payment terms, and were thus converted to a note receivable. In many cases these assets had been losing money, and in some cases the new buyer was similarly unable to make them perform, thus defaulting on the associated debt. For the most part, however, the notes from these asset sales paid interest at competitive rates, and thus performed similarly to low-grade bonds purchased through the market.

The resulting mean values (across corporations) of the allocation fractions are shown in Table A-1.

Asset allocation to joint ventures

Data limitations. Standard accounting practice shows JV participation in two ways. When the Native corporation is a minority participant, its equity in the JV is typically shown as a specific net asset. This is the *equity method* of accounting and it is supposed to be reserved for those projects over which the corporation has little management control. When the Native corporation is the majority participant, the entire project is typically listed as an asset and the partner's equity is shown as a liability. This is the standard, or *cost method*. In both cases the data are biased downward compared to the true measure of the fraction of assets that is under some form of joint management. In the minority case, the use of a pure equity stake as a measure excludes the associated debt and thus understates the "size" of the project. In the majority case, the minority participant's equity stake similarly understates the size of the project. Furthermore, the accounting data give no indication of which partner is actually managing the project, although generally accepted accounting principles urge that projects over which the corporation has substantial management control be carried at cost.

Minority-share joint ventures. I coded individual assets in minority-stake joint ventures from information in the notes to the financial statements. Almost all annual reports contain summary balance sheet and income data for assets invested in joint ventures and affiliates. I allocated each asset into the JV_OIL, JV_STATE, or JV_LOCAL "sectors". according to the rules described above for allocating total assets.

TABLE A-1: MEANS OF ASSET ALLOCATION FRACTIONS

year	sector				
	passive investment (PASSIVE)	established oil sector (OIL)	non-oil statewide (STATEWIDE)	local enterprise (LOCAL)	local public works (PUBWORKS)
1976	0.29 [.20]	0.05 [.08]	0.50 [.33]	0.11 [.15]	0.05 [.16]
1977	0.27 [.19]	0.05 [.09]	0.50 [.27]	0.14 [.16]	0.04 [.14]
1978	0.25 [.20]	0.08 [.13]	0.54 [.30]	0.11 [.15]	0.02 [.07]
1979	0.27 [.19]	0.08 [.16]	0.55 [.29]	0.09 [.12]	0.01 [.05]
1980	0.50 [.21]	0.06 [.14]	0.39 [.25]	0.04 [.05]	0.01 [.02]
1981	0.44 [.19]	0.08 [.15]	0.44 [.22]	0.03 [.04]	0.01 [.04]
1982	0.34 [.21]	0.11 [.15]	0.50 [.26]	0.03 [.04]	0.02 [.05]
1983	0.38 [.21]	0.10 [.14]	0.47 [.25]	0.04 [.06]	0.01 [.04]
1984	0.39 [.21]	0.09 [.14]	0.46 [.26]	0.05 [.09]	0.01 [.05]
1985	0.29 [.17]	0.11 [.17]	0.54 [.29]	0.04 [.07]	0.02 [.07]
1986	0.38 [.25]	0.12 [.19]	0.46 [.31]	0.02 [.02]	0.02 [.07]
1987	0.48 [.24]	0.11 [.15]	0.38 [.28]	0.01 [.02]	0.02 [.06]
1988	0.56 [.26]	0.10 [.12]	0.31 [.26]	0.01 [.01]	0.02 [.07]
1989	0.54 [.25]	0.11 [.13]	0.31 [.26]	0.01 [.01]	0.02 [.08]
1990	0.58 [.25]	0.10 [.13]	0.28 [.24]	0.01 [.01]	0.02 [.07]
1991	0.61 [.24]	0.10 [.11]	0.26 [.23]	0.01 [.03]	0.02 [.05]
1992	0.58 [.25]	0.10 [.10]	0.29 [.25]	0.01 [.03]	0.02 [.05]

notes: standard deviations in square brackets. Each mean is over 12 corporations.

Internal (all-Native) joint ventures. There were not many of these operations. The most important was a statewide bank owned by a group of regional corporations. Another consortium bought and held speculative oil leases.

Majority-share joint ventures. To conserve degrees of freedom lumped all majority-share JV assets into one category without regard for the underlying sector. The Doyon corporation's oil drilling operation was a majority-stake JV for many years and the data from these assets form a large part of the total in this category.

Estimates of Native Corporation Shareholder Payroll

Published data on shareholder employment and wages are available only incidentally and from a variety of scattered sources including annual reports, special studies (Waring 1989, McDowell 1985), and the business trade press. (*Alaska Business Monthly* 1986-1993, *Alaska Business and Industry*, 1976-1982) To buttress these data I conducted a mail survey soliciting employment data for 1991, 1984, and 1976. I filled in the remaining gaps using a variety of proxies, trends, and extrapolations. These can be characterized as variations on the "jobs method" and the "payroll method."

The "jobs method" consists of estimating numbers of jobs and then earnings per job. The chief challenges are (1) imputing seasonality to the many jobs that are clearly not full-time and (2) imputing an appropriate wage. I used rules of thumb to impute seasonality (chiefly in the construction and fishing industries) and published data on wage levels by industry and year to impute monthly wages.

The "payroll method" uses payroll data directly. These data are available less often. The major challenge here is to impute the correct fraction of a firm's *total* payroll to its shareholder-workers. This is complicated by the fact that many shareholders appear to work fewer months per year than their nonshareholder peers within the same company. For example, certain corporation fish-processing operations employed more than one hundred shareholders, but only for several weeks. Variations on the payroll method were sometimes available. Some corporations report contributions to defined-contribution pension plans. In other cases anecdotal data points on payroll could be tied to accounting data on expenses. The accounting data could then be extrapolated through time until another firm estimate was available.

III. Indian Gaming and Indian Welfare

Abstract

Gambling on American Indian reservations has grown rapidly during the past 15 years and now generates more than \$5 billion in gross revenue to tribes, but little systematic evidence exists about its welfare effects on individual Indians. I estimate these effects using differences-in-differences techniques applied to U.S. census microdata from 1980 and 1990. The dramatic economic decline of one large non-gaming tribe generates spurious average treatment effects from high-stakes bingo. When this tribe is removed from the data the estimated gains to bingo Indians in average hours worked, income, or poverty status are plausible but insignificant. Using bingo revenue as a measure of treatment intensity I find modest and significant positive effects of bingo revenue on hours worked and income. Using white people as additional controls corroborates these results and highlights the overall economic decline of Indians relative to whites. Against this decline any gains from bingo are small.

1. Introduction

"Gaming on reservations has emerged...throughout the Nation as a means for tribal communities to climb out of the most dismal economic conditions that exist anywhere."

-- New Mexico Indian Gaming Commission (1995)

"Only a small fraction of Indian people actually get money from gambling. Here at Fond du Lac, we get a ham."

-- Jim Northrup, member of the Fond du Lac band of Lake Superior Chippewa¹

As a possible antidote to persistent deep poverty, gambling on American Indian reservations offers economic hope for Indians and represents an important innovation in federal Indian policy. According to extensive anecdotal evidence, reservation gambling has brought jobs, income, and hope to many tribes. Stories abound of sudden success as tribes boast of

¹ quoted in Lawrence 1995.

unemployment eliminated, health care provided for all, schools built, and spirits restored.² One tribal chairman has compared the gains from gambling to the “return of the buffalo.”³

Yet gambling can bring costs as well as benefits to Indian people. Gambling allows the federal government to reduce transfers while promoting “Indian self-sufficiency.” It favors those tribes already blessed with the economic opportunities that come with proximity to large population centers. In remote areas, it may simply redistribute income from poor white people to Indians and from poor Indians to tribal elites. Beyond these immediate effects on equity, there are possible long-run efficiency costs as well. Too much cash can distort investment in physical and human capital⁴ and promote costly internecine struggles within and between tribes.⁵ And, especially for those far from markets, the false hopes of easy money may divert scarce tribal capital, management, and social resources toward overbuilt casinos⁶ and away from the more difficult development of other productive enterprise. Due to the continuing involvement of federal agencies in supplying these resources, the general public is likely to bear a good portion of these costs.

In this paper I estimate the effects of Indian high-stakes bingo on the economic well-being of Indian individuals. Rather than attempting to deduce these effects as the net sum of a complicated set of direct and indirect impacts and transfers among sectors, regions, and groups, I compare a treated group of Indians experiencing high-stakes bingo to a set of “controls” (Imbens & Rubin 1997). I use the differences-in-differences estimator applied to census microdata from 1980 and 1990 to identify the treatment effect of bingo by controlling for the unobserved fixed effects of being in the treatment group. Further identifying power comes from two additional strategies. The first uses a continuous variable, the level of per capita bingo gross revenues, to measure the intensity of the treatment. I also use a geographically-matched sample of non-Indian controls to capture the effects of local economic shocks that may be correlated with the presence or scale of bingo operations.

² See, eg, Waldman 1994, Fromson 1998, Gaines 1996, Pico 1997.

³ Anthony Pico, Chairman of the Viejas Tribe of southern California.

⁴ The Pequot Tribe is spending \$135 million on a tribal museum next to its Foxwoods casino.

⁵ Glaberson (1996) chronicles one such struggle: “To his supporters, Ray Halbritter is the kind of leader Indian people have needed for generations...now, they say, he is using gambling as a foundation for rebuilding his nation...But to opponents, he is building an old-style political machine that keeps power through intimidation.” One tribal faction deposed Halbritter, and sued the federal government to enforce its coup.

Overall I find mixed evidence that high-stakes bingo caused higher employment and income for Indians as of 1990. The dramatic economic decline of one large non-bingo tribe during the 1980s generates spurious average treatment effects from bingo. When the observations on this tribe are removed, the estimated gains to Indians in bingo areas are well within the plausible range calculated from an accounting model of bingo cashflows, but too small to be statistically significant given the standard errors involved. Using bingo revenue as a measure of treatment intensity I find modest positive effects of bingo revenue on hours and income. Using white people as additional controls corroborates these results and highlights the overall economic decline of Indians relative to whites. Against this decline any gains from bingo are small.

Research Questions and Accounting Stance

I address this basic question: Does Indian gaming improve the economic welfare of individual Indians? Specifically, I ask whether employment and income of Indians increased between 1980 and 1990 because of high-stakes bingo. If so, by how much, and through what broad mechanisms? Who benefited and where? While none of these questions can be answered decisively, the treatment-control framework that I use addresses them head-on.

In this paper I am concerned with Indian well-being and public policies to potentially improve it. My focus is on Indians and not on gambling. My social accounting stance treats groups of Indians as economic nations. Any shift of economic benefits to them counts as a net benefit, even if it is matched by a cost to the “rest of the world.”

By ignoring the many costs to other areas that are the mirror images of benefits to Indians I do not mean to deny their importance. As one U.S. senator recently said, "Gambling is not a way to generate wealth. It is a way to transfer wealth."⁷ This is true. However, the history of relations between Native Americans and the rest of the nation is largely a history of property rights transfers, some with devastating effects. The federal government's recent endorsement of Indian gambling as a pathway to “Indian self-sufficiency” is the latest episode in this history. As a first step toward evaluating such policies it is important to understand their bottom-line effects

⁶ Goodman (1995) warns of the overbuilding problem: "North Dakotans visualize their gaming locations as well-spaced and organized to capture tourists...[but] when viewed regionally, a different reality emerges. From this regional scale, North Dakota is a small player."

⁷ Quoted in Berke (1996).

on the intended beneficiaries. This basic spirit of inquiry motivates my definition of benefits and costs.

Policy Context and Importance of this Research

The federal government's encouragement of gambling on American Indian reservations is arguably the most important *de facto* economic policy innovation affecting Indian welfare since removal to the reservations more than a century ago. To the government, reservation gambling offers an attractive way to finance a withdrawal of direct transfers by bestowing property rights to a monopoly franchise while proclaiming the goal of Indian "self-sufficiency." In its landmark 1987 decision affirming tribes' rights to conduct high-stakes bingo, the U.S. Supreme Court attached significant weight to the presumed economic importance of the existing bingo games:

The federal interests in Indian self-government, including the goal of encouraging tribal self-sufficiency and economic development, are important...Such policies and actions are of particular relevance in this case since the tribal games provide the sole source of revenues for the operation of tribal governments and are the major sources of employment for tribal members.⁸

Congress followed this decision with its own endorsement of full-scale casinos on reservations, and an explosion in Indian gambling operations soon followed.

To Indians, gaming represents hope for an improved economic future. It is important to assess the realism of these prospects for change. For Indian policy, an appraisal of the overall effects of gaming on Indians is important to future decisions. Since most Indian policy and Indian assistance programs come from the federal level, a *national* and *Indian* perspective is critical. This perspective is absent from existing literature and research, most of which is directed at state and local policymakers pondering a specific casino project.

To society, gambling in general has relatively well-known costs (Thompson 1994). A national debate about whether and how to expand legal gambling is underway. Much of the debate is being carried out in the charged atmosphere surrounding specific projects.⁹ A clear-eyed assessment of the benefits of gambling to Indians can promote a more intelligent debate about these larger issues.

⁸ *California v. Cabazon Band of Mission Indians*, 480 U.S. 202, p. 207. Majority opinion by Justice White.

⁹ Voters in Fall River, MA, recently turned down the Wampanoag Tribe's casino proposal, notwithstanding the depressed local economy and the support of state political leaders. (Keller 1998).'

The paper proceeds as follows. Section 2 provides background and develops expected ranges for the regression coefficients to be estimated. Section 3 lays out the treatment-control econometric approach and discusses the challenges raised by the nonexperimental nature of the data. Section 4 briefly describes the data. Section 5 presents the results, and Section 6 concludes.

2. Background and Expected Effects of Bingo

2.1. History

Between 1980 and 1996, American Indians acquired and began to forcefully exercise significant monopoly rights in gambling operations worth billions of dollars in annual rents. This economic shock occurred in two pulses. The first was the gradual growth of high-stakes bingo between 1980 and 1990. The second was the explosion in casino gambling between 1990 and 1997. The tribes generated the first pulse by aggressively asserting their sovereignty with respect to state law. The federal government generated the second pulse when the Supreme Court blessed the tribes' assertions of bingo rights and when Congress extended the blessing to include casino gambling. However implicit and reactive, both federal actions constituted major changes in public policy toward American Indians.

Indian high-stakes bingo began in 1979 when the Seminole Tribe of Florida began offering substantially higher prizes than those allowed under Florida's charitable gaming regulations. The state sued to enforce its prize caps, and the tribe asserted its right as a sovereign nation to ignore the laws. As the matter wound its way through federal courts during the early 1980s, other tribes close to large population centers began offering high-stakes bingo. The Cabazon and Morongo Bands of southern California reaped large locational rents and provoked the State of California to assert jurisdiction over the operations under its criminal laws.

The *Cabazon* case reached the Supreme Court first and was finally decided in 1987 in favor of the tribes.¹⁰ The decision rested on three pillars: one legal, one economic, and one political. The court accepted legal arguments that prize limits and other existing state laws constituted civil regulation and not criminal prohibition. The distinction was crucial because previous Indian law placed civil regulation in the hands of tribes and criminal prohibitions in the hands of states.

¹⁰ *California v. Cabazon Band of Mission Indians*, 480 U.S. 202.

Placing the laws in the civil arena was not a simple matter, however. The high court had to deal with its own previous decisions granting states the right to extend their fiscal and civil reach onto the reservations through sales taxes on cigarettes and the control of alcohol. To escape from this precedent, Justice White made a critical economic distinction between long-running tribal sales of cigarettes and the new gaming enterprises:

The Tribes are not merely importing a product onto the reservations for immediate resale to non-Indians. They have built modern facilities which provide recreational opportunities and ancillary services...the Cabazon and Morongo Bands are generating value on the reservations through activities in which they have a substantial interest.¹¹

Because in the court's view the new bingo enterprises produced valuable goods and services using tribal labor and capital, they came under the umbrella of tribal fiscal sovereignty.

The final pillar supporting the *Cabazon* decision was political deference to the established policies of the executive branch. The court placed great weight on the fact that federal agencies were actively promoting bingo as a means toward tribal "self-sufficiency" and "self-determination."

The *Cabazon* decision opened the legal doors to essentially unfettered casino gambling, and Congress responded to the resulting clamor from the states by passing the Indian Gaming Regulatory Act (IGRA) in 1988. IGRA allocated some regulatory rights to the states and forced tribes and states to negotiate "compacts" before so-called Class III casino gambling could begin. These negotiations typically dragged on for several years and delayed the start of full-scale casino operations until the early 1990s.¹²

Data collection events

These historical milestones are important to this analysis because of how their timing dovetailed with the three data collection "events" that support the empirical work. The first event was the 1980 census. At this time there was essentially zero Indian gambling activity under way. The second "data event" occurred in 1987 when the Bureau of Indian Affairs conducted a nationwide survey on Indian bingo activity. I use this survey to define bingo groups and to measure bingo revenues. By this time high-stakes bingo was in full swing and recognized as a

¹¹ Ibid.

¹² Wilson (1996) provides a more detailed review of this history, particularly the post-*Cabazon* struggles between states and tribes.

critical element of federal Indian policy. Full-scale casino gambling had not begun. The third data event was the April 1, 1990 census. At this time casino gambling was stalled because the tribes were still negotiating their gaming compacts with the states. Casino operations did not take off until late 1990 and 1991.

The order of both timelines is fortuitous: The 1980 census provides a clean view of Indians “pre-bingo,” while the 1990 census provides an observation that is after but close to the 1987 survey of bingo activity that I use to establish the treatment and control groups (the census income variables are measured over 1989). The fact that the casino boom was delayed by state-tribe negotiations until after April 1990 means that there was little or no change in the treatment and control groups between the time when the extent of treatment was measured (1987) and the time when the outcomes were measured by the census (1989-90).

2.2. Previous research

There is very little previous research relating to Indian gambling activity prior to IGRA and the subsequent explosion of casino activity. Cordeiro (1989) used the 1987 Bureau of Indian Affairs survey data on bingo revenue to estimate a simple regression model explaining total revenue as a function of the size of the surrounding population. Other economic and managerial variables were insignificant. Cordeiro did not consider the disposition of the revenue.

Many localized impact studies have been commissioned by tribes or their supporters, presumably for political advocacy purposes.¹³ While these studies provide useful facts about the scope and cost functions of Indian gambling operations, they suffer from numerous drawbacks, especially the double-counting of benefits or the neglect of obvious costs. None uses systematic data on Indians as an input to the analysis.

A typical example of this work is University Associates (1993) which states in its introduction that its “results focus on the positive economic impact of Indian Gaming [sic] in Michigan.” The report notes that the average tribal unemployment rate among Michigan tribes declined from 65% before casinos to 15% after casinos. It produces evidence on the direct growth in employment, payroll, and payroll taxes and the direct reductions in welfare burdens and unemployment in local gaming areas. However, the report focuses on positive local impacts

¹³ Representative examples include University Associates (1993), McGladry & Pullen (1993), and Marquette Advisors (1997).

without considering regional negative impacts, even though it reports that 78 percent of the customers are coming from within the state. And it neglects any consideration of out-of-state effects.

One of the few balanced and more rigorous assessments is presented by Thompson (1994), who collected survey data from 700 individual visitors to three Indian casinos in Wisconsin. He found that 80% of the customers came from within Wisconsin and only 5% came from farther than one state away. He found zero foreign visitors. Thompson's survey also sheds light on spending for complementary goods while on a casino visit. Only 25% of the sample stayed overnight as part of their visits and the average expenditure by the day visitors outside the casino was about \$5 for food and \$2 for transportation. (Thompson 1994, tables 3-6). While Thompson is very aware of the importance of accounting stance, his accounting boundaries are drawn around the state's borders. He counts money coming into Wisconsin as a benefit and money leaving Wisconsin as a cost.

In a special 1995 issue of the *Economic Development Review* devoted to gambling, Goodman (1995) provides a marketing analysis of North Dakota Indian gaming sites. He warns against overbuilding and emphasizes the extent of the competition from other Indian sites in neighboring states. The same issue also features other warnings about the downsides of large casino development at Foxwoods (Peppard 1995), and a review of basic facts about the regional economic impacts of gambling sites. None of the articles attempt a systematic look at how existing Indian casinos are affecting Indian individuals.

In sum, while there has been much discussion of Indian gambling and its aggregate effects on surrounding areas, there has been essentially no systematic research into the effects on Indians themselves. And while the existing impacts literature looks closely at local, regional, and even state economies, none of the analyses adopt a nationwide accounting stance.

2.3. Derivation of expected ranges for coefficient values

In this section I use a simple accounting model of bingo-related cash flows to derive plausible *a priori* expected ranges for the effects of bingo on hours worked and income as they are measured in the census microdata. These plausibly expected ranges will be used as benchmarks against which to assess the empirical estimates that I generate in section 5, below.

I pose two questions to this model. First, is there enough money from bingo flowing through the economy to show up in individual measures of *Indian* employment and income, given the inherent noise in the data? Second, if the gross dollar flows are adequate in principle to produce an observable treatment effect, how large is it likely to be?

The answers to these questions are not obvious for several reasons that are both substantive and statistical. First, the labor income from the bingo payroll may simply substitute for labor income previously earned by the same people in other jobs. Second, both the bingo profits flowing to the tribe and the income flowing to individuals may displace federal transfers. (A shift from nonlabor transfer income to labor income is, however, potentially observable since I analyze labor income and total personal income separately.) Third, even if total gross bingo revenue is large, the money may not actually reach individual Indians due to leakages to non-Indians, flypaper effects (Hines and Thaler 1995), corruption, or inequity in the distribution of jobs, dividends, and tribal purchases. For all these reasons the substantive treatment effect of bingo may be very small.

Finally, the effects may be real, but still not observable. Even if significant bingo money reaches some Indians as net additional income, it will be diluted in the data over a large number of "noise Indians" who have no connection to bingo other than residence within the boundaries of a defined treatment area. This dilution effect may reduce the magnitude of the coefficients to an insignificant fraction of the underlying standard errors in the data.¹⁴

Potential economic impacts of bingo on Indians

The census-defined Public Use Microdata Area, or puma, is the basic geographic unit of this analysis. Since the estimation will be done on puma-level data, I define the *local Indian economy* as the constellation of Indian individuals in the puma. I do not, for example, attempt to distinguish between tribal members and nontribal Indians within the puma, because they cannot be identified in the data.¹⁵ My accounting stance treats individual Indians within a given puma as the locus of benefits. I am therefore interested in how much money enters and recirculates within the Indian population of the puma.

¹⁴ The American Indian population constitutes only 1% of the total U.S. population. Census microdata sample sizes for Indians are correspondingly smaller than those for the general population.

With this accounting stance in mind, it is straightforward to set out the potential impacts leading to plausible expected values for the regression coefficients to be estimated. Following standard methods of regional analysis (U.S. Department of Commerce 1997), I calculate low, mid, and high estimates of the potential "direct effects" using actual financial data from 9 tribal gambling operations: 1 in Oregon, 7 in Michigan, and 1 in California. The sources and details of the calculations are shown in Appendix A. I ignore the possibility of further "multiplier effects" commonly calculated in regional impact studies. The theoretical basis for these effects is tenuous, and, in any case, the possible effects would be diluted among the entire population of Indians and non-Indians, rendering the effects numerically trivial for the Indian population of interest.

The starting point for tallying direct effects is the gross revenue earned by the bingo hall. This is called the 'win' because it is measured net of prize payouts. The typical win for high-stakes bingo is about 20% of money wagered (Cordeiro 1989). Since my data on bingo activity consist of these gross revenue quantities, it is most convenient to compute all cash flows as absolute shares of gross revenue. The gross revenue cash flow leaves the bingo hall and may reach Indians in the following ways:

Purchased inputs. These include food and beverages for resale, utilities, and other nonpayroll bingo operating expenses. They average about 45% of gross revenue. I assume that all of this money leaves the Indian economy immediately.

Direct employment at the bingo hall. Total payroll as a share of revenue is relatively stable among my study establishments. It averages about 27%. The *Indian* payroll share of the gross is about 12%, but can vary widely, especially when the tribe is very small. For example, the Sycuan Band of California has 600+ casino employees but only 25 tribal members (McGladrey & Pullen 1993). For the mid-range estimate I assume that 50 percent of the Indian payroll is displacing Indian labor income previously earned in other jobs. For the low and high estimates I assume that this opportunity cost of foregone previous wages is 100 and zero percent of the payroll.

¹⁵ The 1990 census collected detailed tribal identifications, but the 1980 census did not. In any event, the tribal identifications were self-reported ethnic identities, and bear no consistent resemblance to the reservations or current tribal enrollments.

Direct employment in tribal government and services. This category—part of the the disposition of the bingo rents -- can amount to more than direct employment in the gambling facility for the smallest tribes. The Sycuan Band reports total 1993 employment of about 220 in tribal operations and 625 in gaming, of which total only 25 people are tribal members. It is quite plausible that all working tribal members are in the generally higher-paying tribal operations positions. I assume that the Indian labor share of total tribal spending on government, programs, and infrastructure projects averages 40%, which translates to a 7% share of gross revenue. To account for the opportunity cost of displaced transfers, I deduct 25 percent of this labor income from tribal government and services for the mid-range estimate, and 50 percent for the low range estimate.

Direct employment in complementary services. These include restaurants, hotels, gas stations, and other direct complements to bingo whose revenues are not reported as part of the bingo enterprise. Based on survey data from Wisconsin, Thompson (1994) suggests that total gross revenue in complementary services is about 10% of gross gambling revenue. I assume that Indians can collect 10% of this spending (or 1% of the gross gambling revenue).

Dividends. The Indian Gaming Regulatory Act (IGRA) allows limited cash payments directly to tribal members. These average about 2% of gross revenue.

Total direct effects. Based on these assumptions the total share of Indian direct income in gross bingo revenue is about 22%. Using low and high estimates for each of the components just discussed gives a range of 7% to 32%.

Conversion to changes in hours worked. The steps so far yield a range of labor income received by Indians per dollar of gross bingo revenue. The mid-range values for the sum of all this income are about 12 cents of wage and salary income or 14 cents of total personal income per dollar of gross bingo revenue. To convert labor income to equivalent hours worked I use an average wage of \$10 per hour, which is typical of wages in the gambling industry.

Adjustment for sample truncation. The numbers at this stage relate dollars of income to dollars of bingo revenue, or income per person to revenue per person. However, if one restricts the sample to include only adults, as I do when considering employment and income, then the relevant values entering the regression of, say, income on bingo revenue are $y = \text{income per adult}$ and $x = \text{bingo revenue per person}$ in the puma. (I use revenue per Indian person in the puma as a

consistent measure of treatment intensity that does not vary with the subsample chosen for a particular regression). The regression $y = bx$ will estimate:

$$\begin{aligned}
 b &= (\$/\text{adult}) / (\$/\text{revenue}/\text{person}) \\
 &= [(\$/\text{person}) / (\$/\text{revenue}/\text{person})] \times (\text{persons}/\text{adult}) \\
 &= (\$/\text{revenue}) \times (\text{persons}/\text{adult})
 \end{aligned}$$

Since there are about 2.2 Indian persons for every adult in my subsample of adults between ages 23 and 64, the income shares and hours worked per dollar of bingo revenue must be multiplied by 2.2 in order to be restated in the units that the regression coefficients will take on.

Summary of plausible expected coefficient values

Table 1 summarizes the results of these calculations for changes in income and hours worked as a function of gross revenue per Indian in the puma and calculates the expected average treatment effects.

TABLE 1: SUMMARY OF EXPECTED COEFFICIENT VALUES
TO BE ESTIMATED FROM REGRESSIONS OF THE FORM $Y=bX$

dependent variable Y	plausible range of b :		
	low	middle	high
<i>A. Coefficients when $x = \text{annual gross bingo revenue per Indian}$</i>			
weekly hours worked (HOURS)	0.0001	0.0005	0.0015
annual labor income (INC189)	0.036	0.264	0.622
annual personal income (RPINC89)	0.069	0.316	0.706
<i>B. Coefficients when $x = 1$ if treated</i>			
weekly hours worked (HOURS)	0.03	0.27	0.79
annual labor income (INC189)	19	139	327
annual personal income (RPINC89)	37	166	371
<i>C. Data used to convert marginal coefficients in A. to average effects in B.</i>			
Total Indians in reservation pumas in 1990	796,220		
Total bingo gross revenue imputed to all tribes reporting bingo operations for 1987:	418,589,279		
Average annual gross revenue per Indian:	526		

Table 1 shows, for example, that it is plausible to expect a positive estimated coefficient of between 0.036 and 0.622 in a regression of individual labor incomes on bingo revenue per Indian when the sample includes only working age Indians. Given that the nationwide average bingo revenue per Indian for all pumas with bingo is \$526, the expected average treatment effect of bingo on labor income is between $(0.036) \times 526$ and $(0.622) \times 526$, or between \$19 and \$327. This is the expected value of the regression coefficient on a dummy variable that equals 1 for treated individuals. This range does not include explicit additional allowance for the sampling error in the estimates. It is simply a plausible range for the magnitude of the *actual* coefficient. The other expected coefficient ranges have similar interpretations.

The calculations suggest that the treatment effects of bingo are very modest when averaged over all the Indian residents of a puma. For example, the mid-range expected treatment effect for labor income, \$139, is an increase of less than 1.5 percent for most Indian adults on reservations. Since the standard error of the mean of labor income is about \$60, it is quite possible that treatment effects may be present but not detectable in the statistical noise due to their small size.

In this section I have developed plausible expected ranges for the values of the regression coefficients to be estimated in section 5 below. One final caveat is in order. My analysis focuses on basic flow variables: income, employment, and poverty status. I do not attempt to measure increases in capital stocks or the benefits accruing therefrom. Tribes have spent millions of dollars of gaming revenue on housing, schools, health clinics, and other physical capital. Several have also invested heavily in human capital through education subsidies (Pico 1997, Fromson 1998). The physical increase in schooling, private housing, and sanitation infrastructure is potentially measurable using census microdata, but I assume that such "stock effects" are minimally present in the 1990 data.¹⁶ In any case, the welfare benefits of these tribally-supplied private and community goods are not captured by my approach.

¹⁶ Given the anecdotal evidence on tribal investment in human and physical capital, some of these stock effects, such as housing size and value and education attainment, may be measurable in the 2000 census, unless tribal investment is offset by declines in federal government transfers.

3. Setup and Estimation Strategy

3.1. Treatment-Control Framework

The setup

The differences-in-differences (DD) estimator¹⁷ has enjoyed recent popularity as an efficient and direct way to use large numbers of observations to isolate the effects of a candidate cause, or treatment, on outcomes of interest. Here I briefly describe the adaptation of the basic DD setup to the problem at hand.¹⁸ The goal is to isolate the effects of bingo (the “treatment”) on individual Indians who were exposed to bingo (the “treatment group”) by comparing their outcomes to those of a similar set of individuals (the “controls”) who did not experience bingo. The treatment and control groups together make up the universe U of all observations included in the comparison.

The DD estimation problem is conveniently expressed in a regression framework by using dummy variables to assign individual observations to groups and years. Thus, the welfare outcome w_{ijt} of Indian individual i in group j at time t can be written:

$$w_{ijt} = \alpha + \beta d_t + \gamma g_j + \delta T_{jt} + \lambda' z_{ijt} + \varepsilon_{ijt} \quad (1)$$

where $\alpha =$ a constant

$d_t = 0$ in 1980, 1 in 1990

$g_j = 0$ for control group, 1 for treatment group

$T_{jt} = d_t \times g_j = 1$ for groups with bingo in 1990=1)

z_{ijt} is a vector of observed individual attributes [possibly] correlated with d , g , T

ε_{ijt} is a disturbance assumed to be uncorrelated with T_{jt} .

The identifying assumption needed to pin down the DD estimate δ as a measure of change caused by bingo (treatment) in (1) is simply that ε_{ijt} is uncorrelated with T_{jt} : There can be no contemporaneous group-specific shocks. All group-specific and time-specific shocks are

¹⁷ Gruber (1994) attributes the early use of the term differences-in-differences to Card (1990).

¹⁸ Angrist and Krueger (1998) provide a comprehensive introduction to DD and its use in labor economics research. Card (1990) is an early example of the DD estimator applied to minimum wage legislation.

swept into the fixed time and group effects, although there is no assurance that the estimates of either of these effects represent long-term time trends or structural relationships. They are just shocks that are measured for the sample.

If z is zero, the subgroup or cell means are simple functions of the regression coefficients:

in year:	control group	bingo group ($g_j = 1$)	difference
1980	$\mu_{00} = \alpha$	$\mu_{10} = \alpha + \gamma$	γ
1990 ($d_t = 1$)	$\mu_{01} = \alpha + \beta$	$\mu_{11} = \alpha + \beta + \gamma + \delta$	$\gamma + \delta$
difference	β	$\beta + \delta$	$\delta = \text{difference in differences}$

Outcome and treatment measures

I measure welfare w_{ijt} as one of:

- weekly hours worked week prior to April 1, 1980 or 1990 (HOURS)
- real 1979 and 1989 personal income in 1989 dollars (RPINC89)
- real 1979 and 1989 wage & salary income in 1989 dollars (INC189)
- percent of poverty line (POVERTY) (100.0 = the poverty line)

In some regressions I substitute bingo revenue per Indian (BREV3PC) for the treatment group dummy g_j .

An instrument for individual schooling

There is no need to control for individual effects that are not correlated with the regressors of interest. I do control for individual educational attainment since differential schooling patterns may have been correlated with bingo areas.

To avoid some of the endogeneity in years of school completed as of 1990, I use minimum years of school completed in 1985 as an instrument. This is defined as:

$$\text{SCHOOLX5} = \max \{0, \min[(\text{AGE} - 6) - 5, \text{YEARSCH} - 5]\}$$

where YEARSCH is highest grade completed at the time of the census. This variable is truncated but avoids capturing endogenous changes in schooling during the rapid growth of bingo from 1985 to 1990. The correlation of SCHOOLX5 with YEARSCH is .983.

3.2. Challenges raised by Mobility and endogeneity

Drawbacks of PUMS data

The chief advantage of census microdata is the large number of observations it provides. This precision is important because the scoping calculations of section 2.3 showed that the effects of bingo may amount to less than 1 percent of average Indian income. The PUMS data that I use offers more than 180,000 observations on Indians, allowing for some choice of subsamples such as particular regions or cohorts without losing too much efficiency.

The data have two major drawbacks, however. The first is that the units of geographic identification, the pumas, are relatively large. All pumas contain at least 100,000 people, and some contain more than 300,000. They are a coarse unit of geographic measurement. Within a puma, there is no way to distinguish among Indians. The large pumas introduce noise by (for example) diluting the activities of one small bingo tribe among several other non-bingo tribes in the same puma. The puma does have some merit as a unit of analysis, however. A puma approximates a labor market area and tends to include the nontribal Indians who might be working at the bingo site but would not be captured in an analysis using tribal data.

The second problem is that many of the puma boundaries were redrawn for 1990. In particular, several areas that in 1980 were part of a “balance of county” puma were divided up into several arbitrary collections of places for 1990. I have tried to control for the effect of shifting puma boundaries by reaggregating the pumas into a set of areas that are consistent from 1980 to 1990. The reaggregation leads to even larger geographic units in high-growth areas. These adjustments are listed in Appendix C.

Endogenous migration and the Indian self-identification problem

In addition to standard problems with possible endogenous migration, Indians can also “migrate” from non-Indian to Indian race in the census data because Indians are self-identified. For example, If lots of relatively poor people in bingo areas decide to become Indians because they perceive potential benefits from employment at the bingo hall, they will generate a negative time shock to income that is correlated with bingo.

Eschbach (1992, 1993) studied changes in Indian self-identification between 1970 and 1980 at length. He concluded that the phenomenon was much less prevalent in what he termed

the traditional or “old” Indian region,¹⁹ where the bulk of the reservation population lives. To assess the magnitude of this problem during the more recent 1980-1990 decade, I simulated a cohort aging model and calculated the "overcount ratio" of actual 1990 census Indians to predicted survivors among actual 1980 census Indians. The details are reported in Appendix B. The overall overcount ratio is 1.17 (meaning that there are 17% more Indians than there should be). This compares to an overall overcount ratio of 1.56 for the 1970-1980 decade as computed by Eschbach (1993) using similar methods. Evidently, then, the growth in new self-identifications has moderated considerably. The ratios are fairly evenly distributed across age groups.

Eschbach also calculated region-specific overcount ratios. The old Indian region had a ratio of 1.33 for 1970-80, while the east and west regions had ratios of about 1.90. If this pattern continued through the 1980-1990 decade, then the implied old region overcount would be only 1.10. Based on this analysis, I use the reservation pumas within the old region as an assumed stable area to test for possible bias in estimates from the larger sample of all regions.

The endogenous revenue problem

If bingo activity or the level of bingo revenue are endogenous responses to exogenous opportunity, then the estimated treatment effect attributed to bingo may actually be measuring other things, such as access to large numbers of people. I address this problem in three ways. First, I control directly (but imperfectly) for changes in the population intensity of each puma. Second, I use per-Indian revenue as the measure of bingo treatment intensity. I argue below that per capita revenue is essentially exogenous because the Indian populations in the denominator of the measure are products of historical accident. Third, I use non-Indians living in the same puma to identify the effects of changes in the local economy separately from the effects of bingo.

¹⁹ The old Indian region comprises Arizona, Michigan, Montana, New Mexico, North Carolina, North Dakota, Oklahoma, South Dakota, Wisconsin.

4. The Data

4.1. Distribution of American Indians

Table 2 shows the distribution of American Indians living in the continental U.S. in 1980 and 1990 as measured by the PUMS data. In 1990 there were about 2 million census Indians, and 58% of them lived in pumas with reservations. California had the highest Indian population but only about 30% of California Indians lived in reservation pumas. Some of the greatest population growth between 1980 and 1990 occurred in the nontraditional reservation areas of Michigan, Washington, and Oregon. In spite of this growth, however, as of 1990 more than 67% of all Indians in reservation pumas still lived in the old region.

TABLE 2: DISTRIBUTION OF AMERICAN INDIANS IN 1980 AND 1990

	a		b		c		d		e		f		g = d/a		h = e/b		i = (e-d)/(b-a)		
	All pumas		Pumas with reservations		% chg		1980		1990		% chg		Coverage ratio		Coverage of		change		
	1980	1990	1980	1990	1980	1990	1980	1990	1980	1990	1980	1990	1980	1990	1980	1990	1980	1990	
<i>Total Lower 48 States:</i>																			
	1,469,300	2,123,200		764,720	1,231,060	45%		61%	0.52	0.58									0.71
<i>By Regions:</i>																			
Old	671,680	960,220		556,940	830,900	43%		49%	0.83	0.87									0.95
West	450,680	640,020		166,820	320,140	42%		92%	0.37	0.50									0.81
East	346,940	522,960		40,960	80,020	51%		95%	0.12	0.15									0.22
<i>Top 15 States (based on 1990 population):</i>																			
California	234,160	284,040		76,080	95,520	21%		26%	0.32	0.34									0.39
Oklahoma	172,380	278,760		160,080	278,760	62%		74%	0.93	1.00									1.12
Arizona	153,120	212,860		142,640	178,500	39%		25%	0.93	0.84									0.60
New Mexico	106,520	158,440		98,080	152,340	49%		55%	0.92	0.96									1.05
Washington	62,140	104,220		33,920	76,360	68%		125%	0.55	0.73									1.01
North Carolina	66,240	78,040		6,240	7,320	18%		17%	0.09	0.09									0.09
Texas	50,500	74,660		2,320	2,980	48%		28%	0.05	0.04									0.03
Michigan	45,380	70,520		10,840	23,300	55%		115%	0.24	0.33									0.50
New York	42,960	63,840		14,440	20,260	49%		40%	0.34	0.32									0.28
Montana	38,300	59,460		36,180	57,160	55%		58%	0.94	0.96									0.99
Oregon	30,200	53,720		9,580	32,120	78%		235%	0.32	0.60									0.96
Minnesota	37,200	51,160		17,400	34,220	38%		97%	0.47	0.67									1.20
South Dakota	45,300	48,180		39,800	42,420	6%		7%	0.88	0.88									0.91
Florida	24,420	47,980		1,560	2,620	96%		68%	0.06	0.05									0.04
Wisconsin	31,520	47,820		16,540	34,640	52%		109%	0.52	0.72									1.11

notes: Tabulated from 1980 PUMS 5% sample. Totals do not agree with census 100% counts data.

The old Indian region includes Arizona, Michigan, Montana, New Mexico, North Carolina, North Dakota, Oklahoma, South Dakota, Wisconsin.

4.2. Summary of dependent variables

Table 3 summarizes the sample data on labor income, weekly hours worked, and poverty status for 1980 and 1990. The means of the personal income data are very similar to those of labor income.

TABLE 3: DEPENDENT VARIABLE MEANS

Wage and Salary Income (INC190)			
Indians Ages 23-64	1980	1990	% Change
All Indians	12,123	11,370	-6%
By reservation status:			
PUMAs with Reservations	10,471	9,280	-11%
PUMAs with no Reservations	13,501	13,499	0%
By Metro-Rural Status			
Rural (no part of PUMA in MSA)	9,697	8,799	-9%
Mixed (some part of PUMA in MSA)	10,448	10,350	-1%
Metro (entire PUMA in MSA)	14,092	13,957	-1%
By [Eventual] Bingo Status			
PUMAs with no Bingo in 1987	12,658	12,328	-3%
PUMAs with Bingo in 1987	10,703	9,257	-14%
Hours Worked during Week Prior to Census (HOURS)			
Indians Ages 23-64	1980	1990	% Change
All Indians	23.5	24.3	3%
By reservation status:			
PUMAs with Reservations	21.4	21.6	1%
PUMAs with no Reservations	25.2	27.0	7%
By Metro-Rural Status			
Rural (no part of PUMA in MSA)	21.0	21.4	2%
Mixed (some part of PUMA in MSA)	22.3	24.2	9%
Metro (entire PUMA in MSA)	25.3	26.8	6%
By [Eventual] Bingo Status			
PUMAs with no Bingo in 1987	24.1	25.3	5%
PUMAs with Bingo in 1987	21.8	22.0	1%
Poverty Status (% of poverty line)			
All Indians	1980	1990	% Change
All Indians	146.7	194.9	33%
By reservation status:			
PUMAs with Reservations	139.0	164.4	18%
PUMAs with no Reservations	154.6	232.8	51%
By Metro-Rural Status			
Rural (no part of PUMA in MSA)	137.0	158.9	16%
Mixed (some part of PUMA in MSA)	140.6	184.8	31%
Metro (entire PUMA in MSA)	156.0	235.7	51%
By [Eventual] Bingo Status			
PUMAs with no Bingo in 1987	148.6	210.1	41%
PUMAs with Bingo in 1987	142.4	165.7	16%

4.3. Distribution of the observations

Since bingo was an attractive opportunity for many tribes, it is important to confirm that there are substantial numbers of non-bingo controls in the data and that these controls are reasonably well spread out across states. Table 4 confirms that the data are well dispersed among groups and places. In particular, there are 8 states with reservations but no bingo, and about 40% of the observations in pumas with reservations are non-bingo observations.

TABLE 4: DISTRIBUTION OF OBSERVATIONS

A. Number of States:

	Without Bingo	With Bingo	Total
Without Reservations	17	1 (*)	18
With Reservations	9	22	31
Total	26	23	49

* one Oklahoma tribe runs bingo off-reservation in Missouri

B. Number of Observations in 1990 PUMS sample:

	Without Bingo	With Bingo	Total
Pumas Without Reservations	46,971	314 (*)	69,634
Pumas With Reservations	22,663	36,212	58,875
Total	69,634	36,526	106,160

*1 OK tribe runs bingo off-res. in MO; 1 FL tribe runs bingo on a reservation not identified by the census.

5. Estimation and Results

In this section I present the results of differences in differences estimation in three parts. Part one presents the main DD results using both treatment dummies and bingo revenue as measures of treatment. Part two shows how these basic results are generally robust to changes in universe and treatment groups; to inclusion of additional variables, and to restrictions on the sample. Finally, in part three I introduce white people as additional controls and produce differences-in-differences-in-differences (DDD) estimates of bingo treatment effects on Indians that are broadly consistent with the basic DD results.

5.1. Differences in differences estimates

DD estimates of average effects using treatment dummies

The regression equations implementing the simple DD setup (equation (1) of section 3.1) have the form:

$$w_{ijt} = \alpha + \beta D90 + \gamma BINGO_{nn} + \delta [BINGO_{nr} \times D90] + \lambda z_{ijt} \quad (2)$$

Here α measures the base-level group mean level of w in 1980 for the pumas without bingo, β measures the *time effect* on all Indians in the universe U , γ measures the time-invariant *bingo group effect* of being in a bingo area, and δ measures the *bingo treatment effect*. I use an instrument for schooling (SCHOOLX5) as the sole individual control variable z . The suffixes *nn* on BINGO_{nn} emphasize that I will use different definitions of the bingo treatment group in what follows.

Table 5 presents the DD results for all four indicators of welfare: weekly hours worked, wage and salary income, total personal income, and poverty status. The universe U = all pumas with Indian reservations and the treatment group T = pumas with bingo operations. This lengthy terminology emphasizes the fact that the puma is the unit of analysis; a puma with bingo operations may also contain several reservations without bingo. With this understood I will henceforth use the simpler terms “reservation pumas” and “bingo pumas” to describe these areas.

TABLE 5: DIFFERENCES IN DIFFERENCES ESTIMATES OF AVERAGE BINGO TREATMENT EFFECTS FOR UNIVERSE U = PUMAS WITH RESERVATIONS AND T = PUMAS WITH BINGO

Independent variable	dependent variable:			
	weekly hours worked HOURS	wage & salary income INC189	personal income RPINC89	percent of poverty line POVERTY
Time effect D90	-1.20 (0.37)	-1,864 (219)	-1,823 (231)	-11.0 (0.72)
Navajo group effect NAVAJO	-0.01 (0.63)	228 (378)	-420 (399)	-9.0 (1.01)
Shock to Navajo economy NAVAJO90	-4.44 (0.80)	-1,428 (481)	-1,703 (501)	-19 (1.54)
Bingo group effect BINGO3	-0.56 (0.36)	-391 (217)	23 (232)	3.1 (0.63)
Bingo treatment effect BINGO390	0.47 (0.46)	23 (272)	-370 (290)	-6.6 (0.88)
subsample: N:	ages 23-64 43,475	ages 23-64 43,475	ages 23-64 43,475	all ages 99,789

notes: Huber-White robust std. errors in parentheses.
All regressions include an instrument for education.

The estimated bingo treatment effects on hours worked are shown in the bottom row of the table. The coefficient on hours worked indicates that the Indian adults in bingo pumas worked an average of 0.47 hours per week more than their control counterparts in non-bingo pumas. This estimate is squarely between the middle (0.27) and high (.79) values of the expected range, but not significant. The estimates for the income measures are essentially zero, and poverty status results indicates a significant 7 point decline in the bingo group relative to the non-bingo controls.

The importance of the Navajo tribe

The regressions in Table 5 contain conditioning dummy variables to control for the influential observations of the Navajo and Hopi tribes of northern Arizona (hereafter denoted “Navajo”). The Navajo Nation is by far the largest tribe in the U.S. and the Navajo/Hopi group comprises more than 110,000 Indians, or about 10% of the entire PUMS sample for reservation areas. They are not a bingo group, and they contribute more than 20% of the non-bingo observations to the reservation areas sample. Fortunately, the Navajo are the sole Indian

occupants of a specific puma with unchanging boundaries. This allows me to effectively isolate them in the PUMS data.

Table 5 shows that the Navajo experienced a dramatic decline in average welfare between 1980 and 1990. They started out in 1980 with rough economic parity compared to both the other non-bingo controls and to the bingo treatment group – the Navajo group effects are small and insignificant. During the following decade, all reservation Indians lost ground on average (the time effect), but the Navajo controls suffered large additional declines, while the bingo treatment group showed essentially zero additional losses. The negative shock to Navajo hours worked was especially severe.

As I show below in more detail, the failure to control for the Navajo time shock leads to spuriously high estimates of bingo treatment effects. For example, the treatment effect on hours worked triples from 0.47 to 1.28 and becomes significant because of the increased magnitude.

Of course there is a question of interpretation here. The Navajo did not operate bingo halls, and their fortunes declined dramatically. Is this experience an outlier, or an important piece of evidence about the effects of bingo? It is partly both, but treating these data as outliers makes sense for several reasons. The Navajo are truly a separate nation: a huge, homogeneous group living on very large reservation. They are located far from any non-Indian population center. If they were to operate a bingo hall or casino, it would not attract people from off the reservation. Even if it did, the per capita effects on such a large group would be *de minimis*. Gambling would not work for the Navajo like it has for the Seminole. In all these respects the Navajo resemble the Alaska Natives whose data I dropped from the sample at the outset. They are a special case.

DD estimates using bingo revenue as treatment intensity

By using gross bingo revenue per Indian to measure treatment intensity I exploit variation among pumas within the bingo group. Beyond increased efficiency, this approach has two advantages over the use of yes/no treatment dummies. First, the estimated coefficients on bingo revenue are simply the marginal changes in employment or income per dollar of additional gross revenue. They are easy to interpret and, like all estimates of marginal quantities, relevant both for behavior and for policy analysis.

Second, variation in per capita revenue can partially identify the effects of bingo separately from the effects of overall economic opportunity. Although both total bingo revenue

and the decision to undertake bingo are highly correlated with the presence of a large surrounding economy, the amount of bingo revenue *per Indian* is at least partly exogenous because the size of the gaming tribes varies enormously and generates much of the variation in the per capita numbers. Per capita bingo revenue is the product of *two* historical accidents – a locational accident (the numerator) and a population size accident (the denominator) – and it varies independently of nearness to population.

The regressions on revenue are directly analogous to the treatment dummies approach:

$$w_{ikt} = \alpha + \beta D90 + \gamma \text{BREV3PC}_k + \lambda_1 \text{SCHOOLX5}_{ikt} + \delta [\text{BREV3PC}_k \times D90] + \varepsilon_{ikt} \quad (3)$$

where k indexes pumas and BREV3PC_k = per-Indian bingo revenue, constant for all Indians within a puma and equal to zero for all pumas where there is no bingo. The parameter δ measures the marginal treatment effect of additional bingo revenue. Here I have suppressed the subscript j defining aggregate treatment and control groups to emphasize the puma-level nature of the variation being exploited.

The use of the entire Indian population of the puma in calculating per capita treatment intensity is required because there is no way to distinguish individuals within the puma. Fortunately, the estimated values of marginal treatment effects are not biased by the presence or absence of “noise Indians” in a puma that only contains a few actual treatments.²⁰ The OLS estimate of δ in (3) is a weighted average of cell means for each puma k . Each cell mean is of the form $\delta_k = (1/n_k) \sum_i (w_{ik}/v_k)$ where v_k is per capita revenue in puma k and w is w measured as a deviation from its overall sample mean. Thus total bingo dollars, which probably affect a relatively few of the w_{ik} values within a puma, are diluted in the group mean calculation to the same extent that they are diluted (during data preparation) by the Indian population of the puma.

Since bingo revenue is actually observed, this parameterization of treatment intensity is straightforward and unlikely to introduce specification bias. The main drawback of the approach

²⁰ The presence of “noise Indians” in the defined treatment group is of course important to the *interpretation* of the puma average effects.

is that a significant fraction (about 35%) of the with-bingo observations must be dropped because they have missing data on actual bingo revenue.²¹

In constructing per capita bingo revenue I assigned bingo revenue to place of operation rather than place of residence of the tribal owners. This approach carries an implicit assumption that living in a bingo puma is what determines benefits, rather than living in some other puma containing part of the reservation of the tribal operator. The geographic distinction between the two allocations is not trivial, so I tested this alternative formulation of the benefit variable and found that it mattered little to the results.

Table 6 reports the DD estimates of bingo revenue effects. The time effect is still a dimensionless measure of change, but the group and treatment effects now represent marginal changes in weekly hours worked (or annual income) per dollar of per capita revenue. The coefficients of interest, the marginal treatment effects, are of the expected signs and magnitudes and significant for hours worked and poverty status. The estimate for the hours equation says that every additional dollar of gross bingo revenue leads to .0004 additional weekly hours of work. This value is essentially equal to the middle expected value of .0005. Similarly, the treatment effects on income are in the range of 15 to 23 cents per additional dollar of revenue, close to the middle expected value (0.26) well within the range of $\sim[0.04 - 0.62]$.

Although the coefficients measuring the marginal group effect are not of central interest, they provide some information about whether per capita bingo revenue is merely serving as a proxy for general economic opportunity. Since there was no actual bingo revenue in the real world in 1980, these coefficients should be close to zero. In Table 6 the estimated marginal group effect for hours worked is very close to zero and only 1/40 the size of the marginal treatment effect, but the patterns for income and poverty are not so clear cut. They suggest that per capita bingo revenue may be partly proxying for a strong local economy. As long as this embodied effect did not change over time, however, the bingo treatment coefficients are still unbiased.

²¹ To check for potential bias induced by dropping these data, I constructed an estimated revenue series from an auxiliary regression of revenue on demographic variables and bingo establishment characteristics. DD estimates using this estimated revenue series produced substantially the same results as those reported here.

TABLE 6: DD ESTIMATES OF BINGO TREATMENT EFFECTS
USING PER CAPITA BINGO REVENUE TO MEASURE TREATMENT INTENSITY

Specification / variable	dependent variable:			
	weekly hours worked HOURS	wage & salary income INC189	personal income RPINC89	percent of poverty line POVERTY
<i>A. Basic DD effects</i>				
Time effect D90	-0.54 (0.287)	-1,888 (175)	-1,932 (187)	-13.0 (0.55)
Marginal group effect BREV3PC	-0.00001 (0.00007)	0.107 (0.054)	0.105 (0.051)	0.00083 (0.00014)
Marginal treatment effect REV3PC90	0.00040 (0.00009)	0.149 (0.100)	0.212 (0.117)	0.00097 (0.00039)
<i>B. Control for Navajo effects:</i>				
Navajo group effect NAVAJO	0.41 (0.604)	245 (368)	-588 (387)	-11.5 (0.97)
Shock to Navajo economy NAVAJO90	-5.11 (0.767)	-1,402 (463)	-1,593 (483)	-16.9 (1.47)
age group: N:	ages 23-64 27,090	ages 23-64 27,090	ages 23-64 27,090	all ages 61,386
notes: Huber-White robust std. errors in parentheses. All regressions include an instrument for education.				

5.2. Robustness checks of the DD results

The DD estimates just presented show mixed but insignificant average effects and modest but significant marginal treatment effects from bingo. The very large time shocks to the Navajo component of the data serve as a caution that these simple estimates may be the product of other time shocks specific to the bingo group or correlated with bingo revenue. Section 3.2 suggested three possible sources of such shocks: endogenous migration, changes in local economies, and the Indian self-identification problem (ISI).

In this section I use alternative DD specifications to check the robustness of the core DD results against these three forces. To control for boundary changes and endogenous migration, I use different definitions of the universe and treatment groups. To control for shifts in economic geography, I introduce controls that measure these shifts. To control for ISI, I restrict the sample to regions and cohorts for which ISI effects are likely to be minimal.

Using state of birth to define bingo treatment

The simplest way to eliminate the effects of shifting boundaries and endogenous migration is to define the universe U as a collection of states and the treatment group T as the subset of states in U with Indian bingo activity. State boundaries do not change between 1980 and 1990 and individuals can be defined as treated based on their state of birth, thus eliminating the potential bias from endogenous migration in response to the perceived benefits of bingo.²² The strategy is feasible because there are 8 states with reservations but no bingo. However, the reservations in these control states are largely rural, which leads to possible upward bias on bingo coefficients if reservations in bingo states are generally more urban.

Table 7 presents in column 1 the results for U = reservation pumas and T = reservation pumas in bingo states of birth. The dependent variable is hours worked. The estimate of 0.37 is quite close to the initial value of 0.47 presented above. The high estimate of 0.79 for the bingo group effect is significant, lending some credibility to the fear that the reservation areas in bingo states are simply more urban. But as before, if this effect is not time-dependent, the bingo treatment coefficient remains unbiased.

Reservation effects and Navajo effects

Another approach to controlling for shifting boundaries is to define U more broadly as all Indians and T more broadly as all pumas with reservations. (Only pumas with reservations had bingo.) The broader definitions control for changes in U due to changing pumas and to a lesser extent for similar changes in T . The estimated treatment effect from this combination (not shown) is -1.6 weekly hours, suggesting immediately that there is a *reservation effect* with a time-specific component that dominates any bingo effect. The same phenomenon occurs in the state of birth setup when U is not restricted to reservation pumas.

²² This is strictly true only if one defines the treatment effect as a reduced form outcome that includes the effects of the induced in-migration on the existing population. Although in-migrants to bingo states are not counted as treated individuals under the state of birth definition of treatment, they exert influence over the observed *per capita* treatment effects on the population that is measured, simply by diluting the fixed pool of bingo rents. This would not be a problem if the treatment effect were nonrival, as it is in many situations (such as the study of air pollution control as a treatment affecting health). The reduced form definition is consistent with my overall approach to measuring the “bottom line” effects of bingo on all Indians.

TABLE 7: DD ESTIMATES USING DIFFERENT U , T COMBINATIONS

		(1)	(2)	(3)	(4)
		dependent variable = weekly hours worked			
Universe U :		living in reservation puma and born in reservation state	all Indians	all pumas with reservations, including navajo	pumas with reservations, excluding navajo
Treatment T :		born in bingo state	living in bingo puma	living in bingo puma	living in bingo puma
<i>A. Basic effects</i>					
	Time effect D90	-0.12 (0.84)	1.85 (0.22)	-0.20 (0.33)	-1.23 (0.37)
	Bingo group effect BINGO3 or BINGO4	-0.83 (0.72)	0.79 (0.35)	-0.58 (0.34)	-0.57 (0.36)
	Bingo treatment effect BINGO390 or BINGO490	0.37 (0.87)	0.30 (0.44)	1.28 (0.43)	0.47 (0.46)
<i>B. Effects of additional controls</i>					
	Reservation effect RESAREA3		-4.01 (0.31)		
	Shock to reservation economies RES390 = RESAREA3 x D90		-1.84 (0.41)		
	Individual years-of-school effect SCHOOLX5			2.17 (0.03)	2.16 (0.04)
	subsample:	ages 23-64	ages 23-64	ages 23-64	ages 23-64
	N :	41,400	85,724	43,475	40,383
notes: BINGO3 defines pumas as bingo or nonbingo. BINGO4 applies to entire states.					

Column 2 of Table 7 confirms and isolates the reservation effect and the time shock to reservation economies with dummy variables. The average working-age Indian in a reservation puma worked 4 fewer hours per *week* in 1980 and 6 fewer hours in 1990 than their nonreservation counterpart. Grossed up by labor force participation rates, these differences are 7 and 10 hours per worker. The reservation group effect reflects the problems facing rural Americans generally and reservation Indians in particular; the time shock to reservation economies shows that these problems worsened significantly during the decade.²³

²³ Differential changes in labor force participation cannot help explain these effects because Indian LF participation increased more in reservation pumas (53 to 57%) than in nonreservation pumas (59 to 62%).

Finally, columns 3 and 4 of the table confirm the importance of controlling for the Navajo tribe. Column 3 shows how the estimated treatment effect on weekly hours jumps up to 1.28 when the Navajo observations are included without conditioning dummies. In column 4 I exclude the Navajo from the sample to confirm, by comparison with column 3, that these observations do not have an effect on the estimate of the common coefficient on schooling (SCHOOLX5). Therefore the Navajo can simply be excluded from the sample in lieu of using conditioning dummies.

Controlling for shifts in economic geography

Even if the physical boundaries of U and T did not change between 1980 and 1990, there were significant changes in the local economies of many Indian areas. For example, there are more than 20 Indian reservations in California's Riverside and San Diego Counties, and several of them developed large bingo halls. Some of the most successful bingo halls are located in the urban fringe areas surrounding cities such as Los Angeles and San Diego. These areas grew rapidly during the 1980s and some went from mostly rural to mostly metropolitan. Further analysis of the PUMS data shows that these changes may be correlated with the bingo group. For the non-bingo group, the share of population in part rural, part metropolitan pumas dropped from 11 to 8%, but for the bingo group the share *increased* from 19 to 25%.

I now consider the importance of these effects by using the constructed geographic control variable `MSA_FRAC` which measures the fraction of total puma population living in a census-defined metropolitan statistical area (msa). This variable is essentially an index of urban intensity that is truncated at zero and one. It is a substitute for a set of dummy variables each equal to one for a particular level of msa intensity, and using it rather than the dummies imposes a set of linear functional forms on the relationships between msa intensity and the outcome variables. Despite this drawback, I use `MSA_FRAC` for reasons of tractability and ease of interpretation.²⁴

²⁴ With multiple dummy variables, the number of interactions becomes quite cumbersome for more than 3 categories. I tested the fully-interacted dummy variable approach using three dummies for pumas that were (a) all within msas, (b) mixed, or (c) completely outside msas. The results from these regressions were no different from those using `MSA_FRAC`.

The regression equation for this model is:

$$\begin{aligned}
 w_{ijt} = & \alpha + \beta D90 + \gamma BINGO3 + \lambda_1 MSA_FRAC_j \\
 & + \lambda_2 [MSA_FRAC_j \times D90] + \lambda_3 [MSA_FRAC_j \times BINGO3] + \lambda_4 SCHOOLX5 \\
 & + \delta_1 [BINGO3 \times D90] + \delta_2 [BINGO3 \times D90 \times MSA_FRAC] + \varepsilon_{ijt} \quad (4)
 \end{aligned}$$

Here λ_1 measures the marginal effect of metro intensity on w for the controls in 1980, while λ_2 and λ_3 are differential slope coefficients capturing the differential importance of metro intensity in 1990 and to the bingo treatment group. The treatment effect is measured as the sum of the last two terms. For areas where $MSA_FRAC=0.5$, say, $\delta_1 + (\delta_2 \times 0.5)$ measures the treatment effect of bingo.

Table 8 reports the results of using regression (4) to control for shifting geography. As in the core DD regressions U = reservation pumas and T = bingo pumas. The Navajo are excluded. The bottom-level cell (not shown) contains Indians living in rural areas ($MSA_FRAC=0$) in 1980 ($D90=0$) that are not going to become bingo areas ($BINGO3=0$). The coefficient λ_1 on MSA_FRAC by itself is large and quite significant, but low- and high-level interaction effects are essentially zero.

The treatment effect of interest is a linear combination of the last two rows of Panel *A*. If the puma is entirely rural, the effect is 0.20 weekly hours, and if the puma is entirely metropolitan, the effect is $0.20 + (1.00 \times 1) = 1.20$. In Panel *B* of Table 8 I compute the estimated average bingo treatment effects by inserting the mean value of MSA_FRAC for the bingo group (35%) into the last term of (4). The average treatment effects are 0.56 weekly hours worked and \$124 in labor income. These averages are very similar to the initial DD values.

I also included MSA_FRAC as a simple (not interacted) regressor in the state-of-birth equations reported above in Table 7. The control states in this setup are quite rural compared to the bingo states, but this effect does not change over time, so controlling for metro intensity does not change these results, either. Overall, this exercise shows that metropolitan intensity affects economic outcomes, but in a stable way. I do not include these controls in further regressions.

TABLE 8: DD ESTIMATES WITH CONTROL FOR METROPOLITAN INTENSITY
U= reservation pumas excluding Navajo, *T*=bingo pumas

Independent variable	dependent variable:	
	weekly hours worked HOURS	wage & salary income INC189
<i>A. Regression Results</i>		
Time effect D90	-1.05 (0.461)	-1862 (251)
Group effect BINGO3	-0.66 (0.464)	-739 (258)
Metro intensity effect MSA_FRAC	2.49 (0.647)	2,350 (418)
Metro intensity x bingo MSFRABG3	-0.21 (0.806)	412 (521)
Metro intensity x time MSFRAC90	-0.32 (0.835)	152 (538)
Bingo treatment effect in rural areas BINGO390	0.20 (0.583)	48 (317)
Bingo treatment effect x metro intensity MSBG390	1.00 (1.040)	215 (665)
<i>B. Comparison to previous simple DD estimates</i>		
Estimated average bingo treatment effect:	0.56 (0.46)	124 (271)
Previous simple DD estimates:	0.47 (0.46)	23 (272)
age range:	ages 23-64	ages 23-64
<i>N</i> :	40,383	40,383
notes: Huber-White robust std. errors in parentheses. All regressions include an instrument for education.		

Robustness checks with specific regions and cohorts

I now check the DD estimates for possible bias from endogenous self-identification and immigration by restricting the sample to the old Indian region²⁵ and, separately, to Indians older than age 40. Table 9 presents the results, excluding Navajo observations. The old region contains 69% of the observations in the reservations subsample, so the loss of efficiency in estimating simple DD average effects is not great. However, the old region does not have as much action in

the bingo revenue data as the east and west regions, which contain the key states of Connecticut, Florida, California, and Washington. When using the old region subsample the coefficients on bingo revenue are largely determined by the medium-revenue states of Wisconsin and Minnesota.

There is no substantial change in the pattern of coefficients for the treatment dummies equations (panel A). With the continuing exception of the poverty regression they remain insignificant and small or negative.

The estimated bingo revenue treatment effects reported in the bottom half of panel B are broadly similar to those for the complete sample. The estimated hours effect for the old region is .002 weekly hours per dollar of bingo revenue, which translates to 1 additional hour of work for every \$10 of gross revenue per Indian. This is at the high end of the plausible range. The effects on income are similarly high but not impossible.

More disconcerting are the very high marginal *group* effects of “future revenue” on income in the old region. In the old region the estimated bingo group effect on personal income is 1.15 and fairly precise, but there is no corresponding group effect on hours – that coefficient is negative and very small.

One possible explanation for the very large estimated group effects on income is that in the old region the variation in number of Indians per puma is much less than in the east and west. To the extent that is true, the identifying assumption -- that *per capita* bingo revenue is independent of total gross revenue -- may break down, leaving revenue per capita highly correlated with total revenue. In fact the simple correlation between per capita revenue and total revenue is .80 in the old region, while it is only .42 for all regions together. Total bingo revenue is likely to be a strong proxy for other economic opportunities in these rural areas. For example, the action in the old region bingo revenue data is coming from Wisconsin and Minnesota, and both of these states have well-developed regional resort economies in the areas of the Indian reservations.

²⁵ Arizona, Minnesota, Montana, New Mexico, North Carolina, North Dakota, Oklahoma, South Dakota, Wisconsin.

TABLE 9: RESULTS USING THE OLD INDIAN REGION AND OLDER AGE SUBSAMPLES
U= reservation pumas, *T*=bingo pumas

independent variable / subsample	dependent variable :				
	weekly hours worked HOURS	wage & salary income INC189	personal income RPINC89	percent of poverty line POVERTY	
<i>A. Average treatment effects using treatment dummies</i>					
Treatment effect (BINGO390)					
All regions & relevant ages	0.47 (0.459)	34 (273)	-355 (291)	-6.63 (0.88)	
Old region only	0.19 (0.586)	429 (343)	-59 (360)	-6.00 (1.13)	
Older cohorts only (age 41+)	0.67 (0.734)	95 (470)	-397 (512)	-5.30 (1.69)	
<i>B. Marginal group and treatment effects using bingo revenue</i>					
Marginal group effect (BREV3PC):					
All regions & relevant ages	-0.00002 (0.00007)	0.104 (0.054)	0.101 (0.051)	0.1042 (0.0540)	
Old region only	-0.00031 (0.00062)	0.824 (0.391)	1.150 (0.399)	0.00423 (0.0011)	
Older cohorts (age 41+)	-0.00041 (0.00014)	-0.045 (0.099)	-0.084 (0.082)	0.0011 (0.0006)	
Marginal bingo treatment effect (REV3PC90):					
All regions	0.00040 (0.00009)	0.152 (0.100)	0.215 (0.117)	0.0008 (0.0001)	
Old region only	0.00191 (0.00096)	0.444 (0.591)	0.396 (0.644)	0.0016 (0.0019)	
Older cohorts only (age 41+)	0.00081 (0.00015)	0.177 (0.140)	0.221 (0.130)	-0.0004 (0.0007)	
	age group:	ages 23-64	ages 23-64	ages 23-64	all ages

notes: Huber-White robust standard errors in parentheses.
 All regressions include SCHOOLX5 to control for individual education.
 Sample sizes vary from 9,537 to 40,383
 The old Indian region includes: Arizona, New Mexico, Minnesota,
 Montana, Oklahoma, North Carolina, North Dakota, South Dakota, and Wisconsin.

The regressions on older cohorts are more corroborative of the full sample results. All signs and magnitudes of effects on income and hours are similar. The older cohorts estimated coefficient of hours on bingo revenue is twice as large as the full-sample value, but still squarely in the middle of the expected range. This evidence provides no support for a self-identification

story in which younger and less employed people are more likely to formally identify as Indians in bingo pumas than in non-bingo pumas.

5.3. DDD estimates with non-Indian controls

The previous section showed that controlling (albeit imperfectly) for shifting boundaries, changing geography, and self-identification has little effect on the DD estimates presented in section 5.1. As a final check on these estimates I use individual white people as a second control group to capture the unobserved fixed effects of economic change within both treatment and control pumas. The non-Indian controls pin down all the puma-specific economic shocks to the “off-reservation” economies surrounding *all* reservations. The non-bingo Indian controls pin down the changes occurring “on-reservation” and the shocks to Indians generally, many of which emanate from the federal government. This formulation of the problem leads to the differences-in-differences-in-differences, or DDD, estimator of the effects of bingo on Indians.²⁶ The DDD approach asks the question: Did the difference between Indians and whites change more (between 1980 and 1990) in bingo pumas than in non-bingo pumas?

I use white people as controls to maximize the consistency across pumas of the control population (many Indian reservation areas also have high and time-varying concentrations of other minorities). To create the white control group I drew all the white people from 4 of the 100 PUMS subsamples for all pumas with reservations. This extract provided about 100,000 observations on whites which I added to the 100,000 Indians in the reservation pumas subsample.

Table 10 presents the DDD estimates. The panel A and B regressions use treatment dummies, while those in panel C use bingo revenue as the treatment intensity variable. The main set of estimates in Panel A excludes the Navajo. For comparison Panel B shows some with-Navajo results. The estimated coefficient on the high-level interaction of time, bingo group, and Indian dummies is the **bingo treatment effect on Indians**, shown in the next to last line of panel A. For weekly hours worked, the DDD estimate of this parameter is -.138 and insignificant. For labor income, the estimate is -\$400 per year. The pattern holds for all measures of welfare.

The other estimated coefficients on low level interactions are of some interest in their own right, and they serve to tie together some of the previous results. The low-level *Indian effect*

²⁶ Gruber (1994) provides a clear exposition of the DDD estimator in a similar setting.

(INDIAN) shows that Indians worked 2.5 fewer hours per week than whites in 1980. The low-level *bingo place effect* (BINGO3) is essentially zero, indicating no persistent place effects on Indians or whites in bingo areas. Turning to the second-level interactions, the *time shock to Indians* (INDIAN x D90) shows a dramatic decline over time in reservation Indians' economic status relative to whites. This result echoes previous comparisons of reservation Indians to nonreservation Indians. The estimated *bingo place effect on Indians* (INBINGO3) is negative and significant for income, showing that among reservations the Indian-white disadvantage was even greater in bingo areas.

Interestingly, the estimated *time shocks to bingo places* (BINGO390, a cell which now includes white controls as well as Indians) are all positive and of the expected magnitude for bingo treatment, and the estimates are stable when the Navajo are included in the sample. These coefficients show that there were time- and place-specific shocks to bingo pumas that affected both Indians and whites. Such shocks cannot be attributed to bingo because it is plainly impossible for bingo activity to have boosted *everyone's* per capita income by \$600.

The regressions on revenue levels, shown in panel C, produce significant coefficients well within the expected range. The estimated high-level *bingo revenue effect on Indians* for hours worked with the Navajo excluded is .00039, which is quite significant and exactly equal to the value from the analogous simple DD regression reported in column 1 of Table 6.

These results must be interpreted with some caution, however. When constructing the data for the low-level interaction between treatment intensity and time (REV3PC90), which applies to both Indians and whites, I did not recompute the per capita revenue amounts BREV3PC to take account of the additional white population. Clearly the white controls could not have actually received the same level of per capita revenues as the Indians if the model is one of wider distribution of the fixed revenue pool. However, I am interpreting this low-level interaction as a possible proxy for other economy-wide effects correlated with the levels of per-Indian bingo revenue. That is, the coefficients on this variable should be zero. If not, then the coefficient on REV3PC90 (the *bingo revenue effect on places*) is picking up a puma-specific time shock correlated with per-Indian bingo revenue, such as rapid population growth in an urban fringe area. The estimates of this effect in Table 10 are in fact all very close to zero.

TABLE 10: DIFFERENCES IN DIFFERENCES IN DIFFERENCES ESTIMATES USING WHITE PEOPLE AS ADDITIONAL CONTROLS (U =reservation pumas, T =bingo pumas)

Specification / Independent variable	dependent variable:			
	weekly hours worked HOURS	wage & salary income INC189	personal income RPINC89	percent of poverty line POVERTY
<i>A. DDD using treatment dummies, excluding Navajo from sample</i>				
Time effect	1.98	-300	-572	-3.66
D90	(0.31)	(241)	(272)	(0.52)
Indian effect	-2.42	-1,574	-3,205	-27.64
INDIAN	(0.376)	(252)	(275)	(0.64)
Bingo place effect	0.09	561	692	1.89
BINGO3	(0.301)	(235)	(264)	(0.48)
Time shock to Indians	-2.94	-1,842	-1,676	-6.99
INDIAN90 = INDIAN x D90	(0.48)	(327)	(358)	(0.89)
Bingo place effect on Indians	-0.56	-1,058	-830	1.43
INBINGO3 = INDIAN x BINGO3	(0.471)	(321)	(353)	(0.79)
Time shock to bingo places	0.50	534	671	0.11
BINGO390 = BINGO3 x D90	(0.397)	(318)	(356)	(0.66)
Bingo treatment effect on Indians	-0.14	-400	-872	-6.98
INBG390	(0.607)	(419)	(460)	(1.10)
<i>Compare to previous simple DD estimates excluding Navajo</i>				
Bingo treatment effect	0.47	23	-370	-6.6
BINGO390	(0.46)	(272)	(290)	(0.88)
<i>B. same as A., but including Navajo in sample (with no control)</i>				
Time shock to bingo places	0.50	558	696	0.16
BINGO390	(0.397)	(317)	(355)	(0.66)
Bingo treatment effect on Indians	0.66	-154	-585	-3.61
INBG390	(0.582)	(407)	(448)	(1.05)
<i>Compare to previous simple DD estimates including Navajo</i>				
Bingo treatment effect on places	1.28	286	-65	-3.2
BINGO390	(0.426)	(254)	(271)	(0.82)
<i>C. DDD Estimates of the marginal treatment effects of bingo revenue</i>				
<i>Excluding Navajo from sample</i>				
Bingo revenue effect on places	-0.00001	0.02844	0.02566	0.00005
REV3PC90	(0.00003)	(0.02588)	(0.02664)	(0.0000)
Bingo revenue effect on Indians	0.00039	0.13462	0.20874	0.00089
INREV390	(0.00009)	(0.10301)	(0.11951)	(0.00039)
<i>Including Navajo</i>				
Bingo revenue effect on Indians	0.00045	0.14638	0.22233	0.00118
INREV390	(0.00010)	(0.10321)	(0.12040)	(0.0005)
age range:	ages 23-64	ages 23-64	ages 23-64	all ages
$N \geq$:	56,965	56,965	56,965	118,143
notes: Huber-White standard errors in parentheses. All regressions include instrument for education. Sample sizes vary, table shows minimum N for each column. Sample consists of about 50% Indians and 50% whites.				

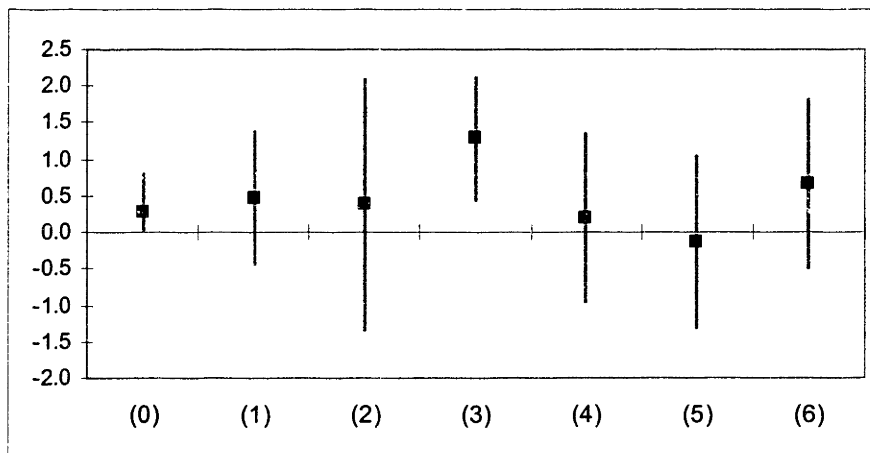
5.4. Summary of results

In this section I first presented simple DD estimates of bingo treatment effects. I confirmed the robust patterns of coefficient values through several alternative specifications that controlled for mobility, geography, and self-identification. The figures that follow summarize these estimates and compare them to the expected ranges derived in section 2.3 above.

Weekly Hours Worked

Average Effects. In Figure 1, the expected range of average bingo effects on weekly hours worked is shown at the left to be [0.03 - 0.79]. The initial DD regression on treatment dummies (1) produces the most plausible estimate because it uses puma-level definition of the treatment with the most closely matched controls – other reservation pumas. Regression (2) produces plausible estimates using state of birth to define bingo, at the cost of large standard errors. Regression (3) includes the Navajo without controlling for them and the jump in the estimate highlights the spurious effects caused by them. Restricting the sample to the old region (4) confirms the results from (1) and (2). However, DDD estimates excluding the Navajo (5) are negative and only increase to within the expected range when the Navajo are included (6).

FIGURE 1: SUMMARY OF ESTIMATED AVERAGE BINGO TREATMENT EFFECTS ON WEEKLY HOURS WORKED



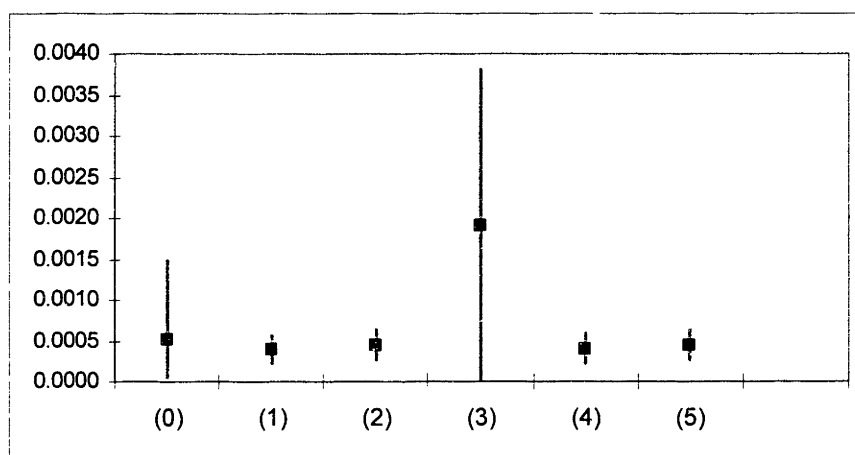
- (0) Expected range
- (1) DD, U =reservation pumas; T =bingo pumas, Navajo included and controlled for
- (2) DD, U =reservation pumas; T =born in bingo state
- (3) DD, U = reservation pumas; T = bingo pumas, Navajo included but NOT controlled for
- (4) DD, U = reservation pumas in old region excluding Navajo; T = bingo pumas
- (5) DDD, U =Indians & whites in reservation pumas excluding Navajo; T =Indians in bingo pumas
- (6) same as (5), but including Navajo (without conditioning)

The DD estimates (1), (2), and (4) are all very close to the middle value of the expected range, but none are significantly different from zero. Considering also the negative DDD result, these estimates cannot reject a null hypothesis that the average bingo treatment effect on hours worked is zero. However, the results are also consistent with the alternative hypothesis of real effects that are simply too modest to be statistically significant given the underlying noise in the data. The stable behavior in (1), (2), and (4) of the DD estimates across alternative combinations of U and T and the closeness of the values to the middle of an expected range calculated by nonstatistical methods from different data²⁷ both provide some support for this interpretation.

²⁷ The data used for calculating the expected ranges comes from gambling operations conducted in 1992-94.

Marginal effects from bingo revenue. Figure 2 summarizes the results for weekly hours using per capita revenue as the treatment variable. The expected range for weekly hours per dollar of per-Indian bingo revenue is [.0001 - .0015]. All of the estimators produce significant coefficients that cluster around the middle expected value of .0005 and are little influenced by the Navajo observations. Regression (3) produces a high but not implausible coefficient for the old Indian region, suggesting that in this region bingo revenues may be proxying for nearness to economic opportunities such as interstate highway exits or resort areas. The DDD estimates in (4) and (5) are insensitive to the Navajo observations and agree quite well with the DD results (1) and (2). The DDD framework identifies bingo as a countering force working against the overall economic decline of reservation Indians relative to neighboring whites.

FIGURE 2: SUMMARY OF COEFFICIENTS OF WEEKLY HOURS ON GROSS BINGO REVENUE PER INDIAN

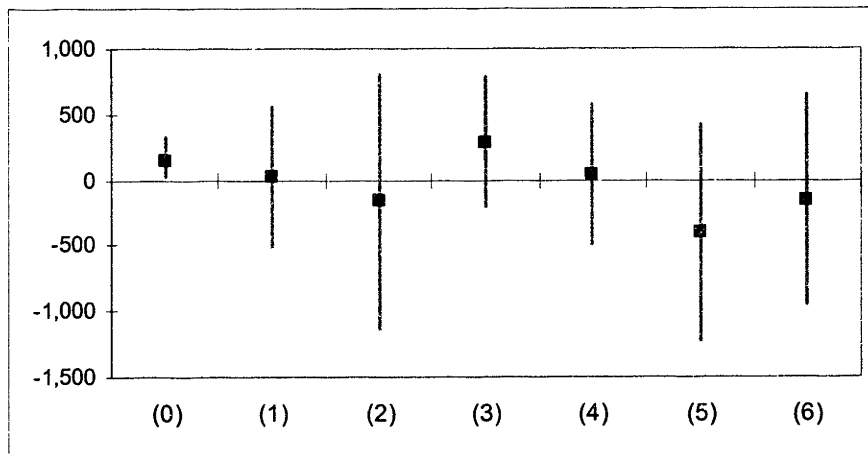


- (0) Expected range
- (1) DD, U =reservation pumas; T =bingo pumas, Navajo included and controlled for
- (2) DD, U = reservation pumas; T = bingo pumas, Navajo NOT controlled for
- (3) DD, U = reservation pumas in old region excluding Navajo; T = bingo pumas
- (4) DDD, U =Indians & whites in reservation pumas excluding Navajo; T =Indians in bingo pumas
- (5) same as (4), but including Navajo (without conditioning)

Wage and Salary Income

Average effects. The expected range for the average bingo treatment effect on annual wage and salary income of working-age Indians, shown at the left of Figure 3, is [\$19 – \$327]. Regressions (1) and (4) produce estimates at the low end of this range while (3) yields a value at the high end due to its inclusion of the Navajo observations. All estimates excluding the Navajo are small or negative, and insignificant. The pattern of these coefficients is very similar to that for hours, but the magnitudes are all lower and the signs sometimes wrong. All of the estimates of treatment effects on wage and salary income have standard errors far larger than the expected range of coefficient estimates. As with the effects on hours worked, it is not possible to distinguish between the null hypothesis of no effects and the alternative of the very small expected effects calculated in section 2.3.

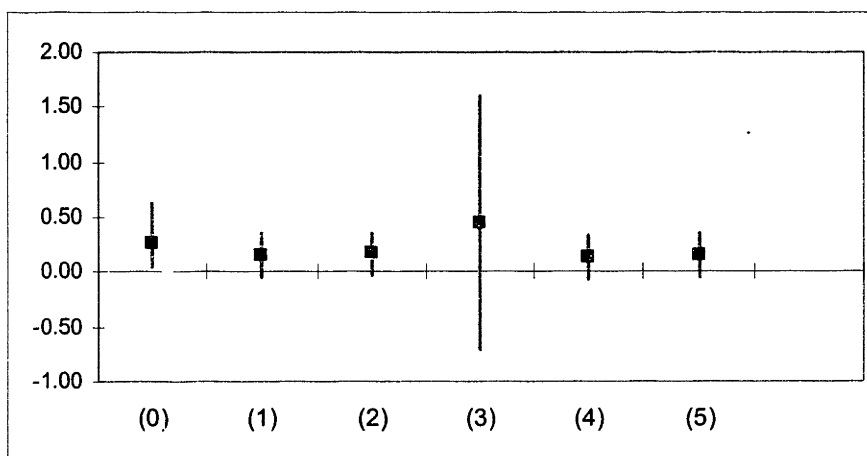
FIGURE 3: SUMMARY OF AVERAGE BINGO TREATMENT EFFECTS ON WAGE & SALARY INCOME



- (0) Expected range
- (1) DD, U =reservation pumas; T =bingo pumas, Navajo included and controlled for
- (2) DD, U =reservation pumas; T = born in bingo state
- (3) DD, U = reservation pumas; T = bingo pumas, Navajo NOT controlled for
- (4) DD, U = reservation pumas in old region excluding Navajo; T = bingo pumas
- (5) DDD, U =Indians & whites in reservation pumas excluding Navajo; T =Indians in bingo pumas
- (6) same as (5), but including Navajo (without conditioning)

Marginal effects from bingo revenue. The coefficient pattern for the effects of bingo revenue on labor income is also very similar to that for hours worked. Figure 4 shows all coefficients at the low end of the expected range of [.04 – 0.62]. The estimate for old Indian regions (3) is high but quite imprecise due to low sample size. As with hours, all of the estimates (1), (2), (4), and (5) are very close to one another and marginally significant. They cluster around the value of 0.15, indicating that 15 cents of each additional bingo revenue dollar per capita reaches an Indian worker as labor income. After adjusting for the difference in units between bingo revenue per capita and bingo revenue per worker (see section 2.3), this equates to an Indian labor share of about 7 cents per dollar of bingo gross revenue.

FIGURE 4: SUMMARY OF COEFFICIENTS OF WAGE & SALARY INCOME ON GROSS BINGO REVENUE PER INDIAN



- (0) Expected range
- (1) DD, U =reservation pumas; T =bingo pumas, Navajo included and controlled for
- (2) DD, U = reservation pumas; T = bingo pumas, Navajo NOT controlled for
- (3) DD, U = reservation pumas in old region excluding Navajo; T = bingo pumas
- (4) DDD, U =Indians & whites in reservation pumas excluding Navajo; T =Indians in bingo pumas
- (5) same as (5), but including Navajo (without conditioning)

6. Conclusions

Throughout the 1980s, American Indian tribes gradually appropriated limited monopoly rights to operate high-stakes bingo halls, and after this transfer was ratified by federal law they rapidly entered the casino gambling industry. In 1987 more than 100 tribes generated more than \$400 million in gross bingo revenue. Today they generate about ten times that amount. But

despite many individual success stories, it is not clear how or even if these cash flows are improving the lives of individual Indians.

Using a simple treatment-control framework with large numbers of observations on Indian individuals, I have found limited evidence that high-stakes bingo was improving the average 1990 employment and income levels of Indians living in census microdata areas with bingo operations. The coefficients obtained with the simplest DD estimators are heavily influenced by the economic decline of the Navajo and Hopi tribes, non-bingo tribes who together contribute more than 10% of the observations. When these observations are controlled for, the estimated average treatment effects of bingo are persistently small, sometimes negative, and statistically indistinguishable from zero.

At the same time, however, the coefficient estimates are generally well within the plausible expected range calculated from a simple accounting model of bingo cash flows. Even with many thousands of observations, the standard errors of the average treatment effects exceed both the expected and the estimated coefficient magnitudes. Thus the data are consistent both with the null hypothesis of zero average effects and with the alternative of real but very modest average effects. In fact, given the standard errors involved, if the estimated average treatment effects *were* significantly different from zero, they would be almost implausibly large. This can be seen clearly in figures 1 and 3 above.

To exploit the variation between pumas within the bingo treatment group, I expressed the intensity of treatment as actual per-Indian bingo revenue. The differences-in-differences estimates of these marginal bingo revenue effects are positive, stable, significant, and within the expected range. The coefficients suggest that it takes \$100 of additional bingo revenue to support an additional hour of Indian employment, and that for every additional dollar of bingo revenue about 7 cents ends up as labor income to Indians.

Finally, I used geographically matched white people to control for the specific economic shocks affecting each area to corroborate the results from the simpler framework. These DDD estimates bring to the foreground the fact that Indians' economic fortunes *relative to whites* declined dramatically between 1980 and 1990. Against this widespread decline, the large gains from bingo that accrued to a few well-situated tribes with low populations are sufficient to generate in the data a significant correlation between more bingo revenue and more Indian income and employment. The estimates suggest that at the margin, about 10 percent of the

additional cash from Indian gambling operations is reaching Indian individuals. This marginal relationship, however, does not translate into average effects that are large enough to be noticeable within the noise of the data. The estimates of average effects merely confirm that *if* these effects exist, then they are quite modest. Thus the economic position of the average Indian was little improved by high-stakes bingo. It remains to be seen whether the subsequent expansion of casino gambling has changed this sobering picture.

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Appendix A: Derivation of Expected Coefficient Values

The data supporting these calculations come from published economic impact studies of 9 tribal gambling operations: 1 in Oregon (Umatilla Indian Tribe 1997), 7 in Michigan (University Associates 1993), and 1 in California (McGladrey & Pullen 1993). I make assumptions to reconcile the different magnitudes into a *pro forma* picture of a typical tribal gambling operation.

Note: In the calculations that follow, a "D" at the start of the row indicates that the row is based primarily on actual data. An asterisk "*" indicates the row is based in part on an assumption. No mark indicates the row is calculated directly from preceding rows.

I. Direct Spending on Reservation

	Total \$ (midpoint)	share of gross revenue		
		low	mid	high
A. Hypothetical Gross Revenue ("win")	1,000,000			
D Purchases of intermediate goods	482,738	0.30	0.48	0.50
D Total Payroll	269,198	0.22	0.27	0.35
D To tribal members	84,463	0.00	0.08	0.10
D To non-tribal Indians	35,894	0.02	0.04	0.08
D To non-Indians	<u>148,842</u>	0.20	0.15	0.17
Operating Income	248,064			
D Capital Charges	<u>51,486</u>			
Net Income to Tribe	196,577	0.15	0.20	0.25
Used for:				
D 25% Tribal Government	48,652	0.02	0.05	0.06
D 27% Tribal Welfare Programs	52,913	0.02	0.05	0.06
D 36% Econ Development Projects	70,319	0.05	0.07	0.10
D 0% Payments to states	788	0.00	0.00	0.05
D 12% Dividends	23,185	0.02	0.02	0.04
B. Direct Spending on associated Goods & Svcs				
D 10% of gross bingo revenue	100,000	0.00	0.10	0.15

II. Computation of Direct Effects on Indians

	Total \$ (midpoint)	share of gross revenue		
		low	mid	high
Indian labor income from gaming jobs:	120,357	0.02	0.12	0.18
* less: Displaced income from other jobs:	(60,178)	(0.02)	(0.06)	0.00
equals: net labor income from gaming jobs:	60,178	0.00	0.06	0.18
Indian labor shares of and income from other sources:				
* 0.50 Tribal govt spending	24,326	0.01	0.02	0.03
* 0.50 Tribal welfare spending	26,457	0.01	0.03	0.03
* 0.25 Econ Development spending	17,580	0.01	0.02	0.03
* 0.10 Nongaming associated spending	10,000	0.00	0.01	0.02
Subtotal:	78,362	0.03	0.08	0.10
* less: Displaced transfers	(19,591)	(0.02)	(0.02)	0.00
net Indian other labor income	58,772	0.02	0.06	0.10
Total Net Indian Labor Income	118,950	0.02	0.12	0.28
D Dividend income	23,185	0.02	0.02	0.04
Total Direct Effect Income	142,135	0.03	0.14	0.32

III. Conversion to plausible regression coefficient values

	midpoint amount	share of gross revenue		
		low	mid	high
A. Increases to Indians in:				
Wage & Salary Income	118,950	0.02	0.12	0.28
Personal Income	142,135	0.03	0.14	0.32
B. Convert WS income to weekly hrs worked				
		(parameter values:)		
* Assumed average wage rate:		12.00	10.00	8.00
Results:		results: (low, mid, high):		
Total hours of employment		1,354	11,895	35,000
Weekly hours of employment		26	229	673
Weekly hours per \$ of bingo revenue		0.00003	0.0002	0.0007
C. Adjust for use of working-age subsample in income and hours regressions:				
Numbers in A. & B. are in units of \$/\$ or (wages/worker)/(Bingo\$/worker), so				
Multiply by ratio of total population to working population:		2.2		

D. Plausible ranges for coefficients b in regressions $y=bx$

dependent variable <i>Y</i>	plausible range of b:		
	low	middle	high
<i>A. Coefficients when x = annual gross bingo revenue per Indian</i>			
weekly hours worked (HOURS)	0.0001	0.0005	0.0015
annual labor income (INC189)	0.036	0.264	0.622
annual personal income (RPINC89)	0.069	0.316	0.706
<i>B. Coefficients when x= 1 if treated</i>			
weekly hours worked (HOURS)	0.03	0.27	0.79
annual labor income (INC189)	19	139	327
annual personal income (RPINC89)	37	166	371
<i>C. Data used to convert marginal coefficients in A. to average effects in B.</i>			
Total Indians in reservation pumas in 1990	796,220		
Total bingo gross revenue imputed to all tribes reporting bingo operations for 1987:	418,589,279		
Average annual gross revenue per Indian:	526		

Appendix B: Notes on the Indian Self-Identification Problem

In these notes I report the results of a simulation designed to test whether the Indian self-identification problem was getting worse or better between 1980 and 1990. I conclude that the census overcount ratio due to new self-identification has declined threefold, from a value of 1.56 (actual:expected Indians) for 1970-80 to a value of 1.17 for 1980-90.

I begin with the 1990 age-sex distribution of census Indians, from complete count data. I then compute cohort-specific 10-year survival rates from the nonwhite life tables. To account for shifting mortality, I compute the average of the values for 1979-81 and 1991. I use separate values for males and females. The survival rates are the Markov transition probabilities from one cohort to the next. Using them, I simulate what the census Indian population ages 11+ should be in 1990, and compare it to the actual. This comparison yields age-specific estimates of the overcount ratio. I do not break the computation down by region, so interstate migration nets out, and the overcount measure gives a reasonable estimate of new self-identifiers.

The overall overcount ratio is 1.17 (meaning that there are 17% more Indians than there "should" be). This compares to an overall overcount ratio of 1.56 for the 1970-1980 decade as computed by Eschbach (1993) using similar methods. Evidently, then, the growth in new self-identifications has moderated considerably. The ratios are fairly evenly distributed across age groups.

Eschbach calculated region-specific ratios. The old Indian region (see text for definition) had a ratio of 1.33 for 1970-80, while the east and west regions had ratios of about 1.90. If this pattern continued through the 1980-1990 decade, then the implied old region overcount would be only 1.10

A. 1990 Census Indians Age-Sex Distribution

Age	1990 Census (1990 CP-1-1 Table 16)			1980 Census (1980 PC80-1-B1 Table 43)		
	All	Male	Female	All	Male	Female
0-5	201950	102628	99322	149275	75803	73472
5-9	199446	101188	98258	146647	74182	72465
10-14	188000	95747	92253	155992	78988	77004
15-19	180516	93058	87458	170215	86202	84013
20-24	165549	85043	80506	149154	74828	74326
25-29	175577	87474	88103	124932	61559	63373
30-34	170668	82744	87924	107219	52407	54812
35-39	150182	72594	77588	84179	41131	43048
40-44	126154	61194	64960	69370	33759	35611
45-49	96817	46993	49824	58089	27932	30157
50-54	76714	36888	39826	51593	24979	26614
55-59	61819	29354	32465	44897	21471	23426
60-64	51389	24192	27197	33919	16010	17909
65-69	42710	19298	23412	28310	12847	15463
70-74	29270	12500	16770	19893	8848	11045
75-79	21152	8460	12692	13760	6099	7661
80-84	12116	4557	7559	7085	2872	4213
85-99	9205	3274	5931	5871	2311	3560

B. Computed Ratios of Inconsistent Identification

Estimated Overcounts after allowing for survival Age at 1990 Census			
Age	All	Male	Female
0-5			
5-9			
10-14	1.26	1.27	1.26
15-19	1.24	1.26	1.21
20-24	1.07	1.09	1.05
25-29	1.05	1.04	1.06
30-34	1.17	1.14	1.20
35-39	1.23	1.23	1.24
40-44	1.22	1.23	1.21
45-49	1.21	1.22	1.20
50-54	1.19	1.21	1.17
55-59	1.18	1.21	1.16
60-64	1.16	1.19	1.14
65-69	1.18	1.19	1.17
70-74	1.17	1.16	1.18
75-79	1.13	1.13	1.15
80-84	1.10	1.10	1.12
85-99	0.90	0.90	0.91

Total expected 1,329,864
 Total actual 1,557,838
 Overcount 1.17

Appendix C: Notes on Data Preparation

C.1. Primary Data Sources

Census PUMS data are from the 1980 and 1990 5% samples. Alaska and Hawaii are excluded. The PUMS geographic equivalency files are supplied with the raw data. I used tract maps from the 1990 Census of Population to locate several bingo operations in the correct puma. I used Census printed reports on Indian areas (1980 PC80-2-1D and 1990 CP-2-1A) to locate tribes in counties and allocate reservation populations to multiple pumas.

Tiller's Guide to Indian Country (Tiller 1996) was a valuable resource for general and sometimes crucial information about reservation and bingo locations.

C.2. Summary of PUMS variable recodes

POVERTY (percentage of poverty line (poverty line=100))

1980 census values	recoded to POVERTY=
0 (N/A)	0 (N/A)
1 (0-75)	37.5
2 (75-99)	87.5
3 (100-124)	112
4 (125-149)	137
5 (150-174)	162
6 (175-199)	187
7 (200+)	200
1990 census values	recoded to POVERTY=
0 (N/A)	0 (N/A)
1-200	1-200
201+	200

YEARSCH (years of school completed)

1980 census values for GRADE	recoded to YEARSCH=
0-2	0
3	1 (if grade was finished, else 0)
4	2 (if grade was finished, else 1)
5	3 (if grade was finished, else 2)
.....
22	20 (if year was finished, else 19)

1990 census values	recoded to YEARSCH=
0-3	0
4 (grades 1,2,3, or 4 completed)	2.5
5 (grades 5,6,7 or 8 completed)	6.5
6	9
7	10
8	11
9	12
10	12
11	13
12	14
13	14
14	16
15	18
16	19
17	20

Geographic Area Type Dummies

Variable	1980 Definition	1990 Definition
METRO	entire PUMA in SMSA (AREATYPE= 1,2,3)	entire PUMA in MSA/PMSA (MSAPMSA = 0000-9430 or 9998)
MIXED	mixed metro and non-metro (AREATYPE = 4)	mixture of metro and non-metro areas (MSAPMSA = 9997)
NONMETRO	outside SMSA (AREATYPE = 5)	outside msa (MSAPMSA = 9999)

notes: 1980 census variable AREATYPE includes codes for central city status within an msa. 1990 AREATYPE includes these codes but does not use them, instead 1990 AREATYPE codes run from 60-82, which describes whether a puma is a place, county, independent city etc.

C.3. Original Assignment of pumas to reservation and bingo groups

- Made on the best available location information with tightest possible geography. Bingo operations were initially located using a combination of census maps, a commercial directory of current gambling establishments (Mason & Mason 1997), a Rand McNally Road Atlas, and a directory of Indian reservations (Tiller 1996). For many places census tract maps were required to match the bingo operation to the appropriate tracts. The PUMS geographic equivalency files match tracts to pumas.
- The Poospatuck reservation of New York was dropped to avoid adding entire Suffolk County (long Island) as a reservation area with only 124 Indians on the reservation.
- State reservations not included.

C.4. Reaggregation of 1990 PUMAs to 1980 Levels

Puma boundary redefinition problem

There is a significant difference between 1980 and 1990 pumas in metropolitan areas. In 1980 the pumas were structured around counties. (The 1980 analysis units were called county groups). In 1990 they were resolved into greater detail. In 1980 many populous counties were separated into two pumas: one for the central city and one for the balance of the county. In 1990 many of these “balance of county” pumas were divided up into numerous pumas, partly because the old definition encompassed far too many people. A typical example of this process is Maricopa County, Arizona. In 1980 there were two county groups: one for Phoenix City and one for the balance of Maricopa County. In 1990 Phoenix was divided into 8 pumas and the balance of the county was divided into 7 pumas. This process can lead to reclassification of beltway bingo operations from city to mixed geography, and can mean the reclassification of urban Indians out of the puma to which the bingo has been allocated. For example, in Riverside County California, home to more than 11 Indian reservations all within the Riverside-San Bernardino MSA, the 1990 pumas are collections of disjoint geographic elements, and the collection is based on metro-rural status. Some pumas collect together all the larger towns and small cities, while others collect together the residual territory, which typically includes the Indian reservations. In this case the makeup of some bingo pumas went from more to less urban.

The variables RESAREA3 and BINGO3 are coded 1 for reservation areas and bingo areas as defined by the 1980 pumas. The 1980 pumas are larger and typically include entire "balance of county" areas that are subdivided in 1990. Thus these variables are based on 1980 actual pumas and 1990 pumas aggregated up to the 1980 levels for "balance of county" type areas.

The states affected by this recode are:

- AZ04 Arizona Add back balance of Maricopa County outside Phoenix and balance of Pima County outside Tucson.

- CA06 California Add back large parts of Riverside, San Bernardino, San Diego Counties and small parts of Sonoma and Santa Barbara Counties.

- NM35 New Mexico RESAREA for 1980 is entire state except Albuquerque City. in 1990 Albuquerque City is comingled with its close suburbs. The only meaningful way to conform these two schemes is to make the entire Bernalillo county RESAREA3=1 area. For BINGO3 this also involves adding in albu city for 1980 and adding an albuquerque area to the 1990 pumas.

- NY36 New York Added a part of Onondaga County surrounding Syracuse. Added a part of Niagara county to make complete Niagara county as in 1980. Added parts of Erie County to make balance of Erie County complete. The Poospatuck reservation (population 124 Indians) on Long Island was dropped to avoid labeling the entire Suffolk County (population 1.2 million in 1980) a reservation area.

- OK40 Oklahoma Added puma 10 Oklahoma City back to reservation areas for 1980 because it is not broken out in 1990.

- TX48 Texas Added back pumas in El Paso County to make complete El Paso County as it was in 1980.

- WA53 Washington Add back parts of Snohomish County to make this county complete. Add back parts of balance of King County to make complete balance of King County (excluding Seattle city)

The effect on presence /absence of bingo is to switch observations from non-bingo (BINGO1=0) to bingo (BINGO3=1) in the following places:

```

-> Arizona
-----+-----
      Total |      1168 |      1168
-----+-----

-> California
-----+-----
      Total |      1340 |      1340
-----+-----

```

```

-> New Mexico
-----+-----
Total |      377      170 |      547
-----+-----

-> New York
-----+-----
Total |      61      61 |
-----+-----

-> Washington
-----+-----
Total |      546      546 |
-----+-----

```

C.5. Construction of Geographic Control Variables

A simple strategy for controlling for changes in the geographic mix of the treatment group is to introduce dummies for different types of places. The census variable *AREATYPE* cannot be used directly for this purpose because the 1990 categories are not mutually exclusive. In order to conform the two sets of classifications, I can only group areas into 3 classes: rural (entire puma outside msa), metro (puma lies entirely within one or more msas), and mixed. (It is not possible to distinguish the central city category in 1990.)

To capture the metropolitan intensity of the mixed pumas I used the puma equivalency files to construct the variable *MSA_FRAC* which is the fraction of the total puma population (not just Indians) living in an MSA.

There seems to be bingo treatment-group-specific change in metro intensity within the mixed type. The following table decomposes changes in the metro-intensity variable into a) changes in area type shares and b) change in metro intensity within share for the mixed type. The table shows that the bingo group experienced an overall *decrease* in *MSA_FRAC* even while its mixed pumas as a share of total pumas increased. The opposite pattern holds for the nonbingo group: their share of type mixed went down but their overall metro intensity measured by *MSA_FRAC* went up. Simply using dummy variables for rural mixed and metro types cannot capture these two effects simultaneously.

DECOMPOSITION OF CHANGES IN MSA_FRAC,
THE SHARE OF TOTAL PUMA POPULATION LIVING IN MSA AREAS

	nonbingo		bingo		all	
	weights	means	weights	means	weights	means
1980 mean MSA_FRAC		0.24		0.38		0.32
composed of:						
rural	0.69	0	0.50	0	0.58	0
mixed	0.11	0.36	0.19	0.40	0.15	0.39
metro	0.20	1	0.31	1	0.26	1
1990 mean MSA_FRAC		0.24		0.34		0.30
composed of:						
rural	0.72	0	0.50	0	0.58	0
mixed	0.08	0.47	0.25	0.36	0.19	0.38
metro	0.20	1	0.25	1	0.23	1

C.6. Selection of the non-Indians subsample

Since Indians account for less than 1% of the population, a non-Indian subsample using one of the 100 possible PUMS random subsamples is approximately comparable “in the large.” Since I am sampling for white people in areas that are sometimes heavily represented by minorities (Indians and Hispanics), I use a set of 4 subsamples. The first was chosen based a random seed, and the remaining 3 were chosen to be equally spaced across the spectrum, to minimize clustering effects as suggested by the Census Bureau (PUMS technical notes, p. 4-6). Thus the 4 subsamples chosen are 11,36,61,86.

All white people in these subsamples were drawn as an extract.

The extract of whites was combined with the existing (entire) sample of Indians. Then I threw out all people living in pumas with no Indian reservations to create U = Indians and whites in pumas with reservations.

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