College of Business and Public Policy
UNIVERSITY of ALASKA ANCHORAGE

Department of Economics Working Paper

WP 2021-11

November 2021

Crossing Frozen Ground: Tiebout, Local Public Goods, Place Amenities, and Rural-to-Rural Migration in the Arctic

E. Lance Howe

University of Alaska Anchorage

Terry Huskey

University of Alaska Anchorage

UAA DEPARTMENT OF ECONOMICS

3211 Providence Drive

Rasmuson Hall 302

Anchorage, AK 99508

http://econpapers.uaa.alaska.edu/

Title: Crossing Frozen Ground: Tiebout, Local Public Goods, Place Amenities, and Rural-to-Rural Migration in the Arctic[ψ]

Authors: E. Lance Howe[*], Lee Huskey
* corresponding author

Howe: Professor of Economics, Department of Economics, University of Alaska Anchorage, 3211 Providence Dr., Anchorage, AK 99508. Phone 1-907-786-5409, E-mail: elhowe@alaska.edu

Huskey: Professor Emeritus of Economics, Department of Economics, University of Alaska Anchorage, 3211 Providence Dr., Anchorage, AK 99508. E-mail: tlhuskey@alaska.edu

[Ψ] Any opinions and conclusions expressed in this paper are those of the authors and do not necessarily represent the views of the U.S. Census Bureau. All results have been reviewed to ensure that no confidential information is disclosed.

Abstract

We estimate the effect of place amenities on rural-to-rural migration decisions for Iñupiat people living in remote Arctic Alaska communities. Using US Census microdata, we test Tiebout's (1956) hypothesis that "people vote with their feet" by examining how migration responds to local public good provision in Arctic places. We find that local public goods are an important determinant of rural-to-rural migration for people living in remote Arctic communities. Better educational opportunities, availability of housing, and modern water and sewer systems serve as important pull factors in rural-to-rural migration decisions. The study uniquely contributes findings for Indigenous people living in remote Arctic regions to the literature on amenity migration.

Keywords: Rural-to-rural migration, place amenities, public goods, Tiebout hypothesis, Indigenous migration, Alaskan Arctic

1. Introduction

Development in any sparsely settled region will both affect, and be affected by, regional migration patterns. Strong economies are likely to attract migrants, and the skills and talents of a region's migrants will influence its economic potential. The composition of a region's migration flows not only determine the size of its population and its demographic future, but affect the demand for public infrastructure, and other types of capital. Understanding the North's complex migration flows is a key to enhancing the potential of rural regions and communities.

Migration plays a significant demographic role across the sparsely settled regions of the circumpolar North (Heleniak, 2014). Over any period, most regions experience migration both into and out of the region, and across the North, migration out of the region has been the dominant pattern (Wang, 2019). A similar migration pattern occurred over the last decade in Arctic Alaska, but natural increase has offset outmigration in a number of communities (Sandberg, 2018). Yet, the migration story in the North is more complex and nuanced than simply understanding population change as a mixture of outmigration and natural increase (Hamilton et al., 2016).

Migration in Arctic Alaska, as throughout much of the sparsely settled North, is complex; it involves significant in-migration, out-migration, and temporary migration (Huskey et al., 2004; Huskey and Howe, 2010). Some communities thrive while others decline, and lateral, rural-to-rural, migration contributes toward demographic change (Howe, 2009). Historically, the focus of public policy and academic literature is on rural-to-urban migration (Carr, 2009; Lucas, 1997), yet lateral, internal migration in rural regions is significant and contributes to community resilience or fragility (Berman et al., 2017; Carr, 2009; Cattaneo and Robinson, 2020; White and Lindstrom, 2019). In Alaska, rural-to-rural migration has accounted for around 30-40% of all place to place migration for people moving to or from an Arctic place (Howe, 2009). In this paper, we explore rural-to-rural migration by examining the place-level push and pull factors in Arctic migration decisions. Using US Census microdata, we test whether Alaska Native people living in remote rural Arctic Alaska communities move toward communities that offer superior bundles of local public goods. For instance, we test the effect of educational attainment, modern water and sewer systems, subsistence opportunities, and public safety on migration to and from Arctic communities.

As such, we examine how individual moving decisions between remote Arctic Alaska communities respond to public good provision, a test of Tiebout's (1956) model of migration. Tiebout (1956) hypothesized that local public goods influence migration patterns; all else equal,

communities with a preferred set of local public goods will experience net in-migration. Over time, ceteris paribus, communities with more desirable attributes attract higher levels of human capital and a richer set of public goods due in part to migration. According to Tiebout (1956), moving decisions reflect the "consumer-voter's demand for public goods" (p. 420) as people "vote with their feet" and move to communities with more desirable amenities and leave places that are relatively less desirable. Several studies have explored the role of place amenities in migration patterns, including Sørensen (2018), who found place based physical capital in rural parishes in Denmark had a positive effect on migration, Elshof et al., (2017), who identified varied effects of scenic beauty, service amenities, accessibility, and housing on net-migration, Qi et al. (2019) who found economic drivers were the main determinant in urban-to-rural migration in China, and Wang and Chen (2019) who found economic pull factors to outweigh place amenities in rural-to-urban migration decisions in China. In this paper we provide additional evidence as to the role of place amenities in rural-to-rural migration decisions, testing the Tiebout hypothesis using individual level microdata from remote rural Alaskan communities.[1]

2. Background

Rural-to-rural migration in the Alaskan Arctic differs in many ways from rural-to-rural migration in other contexts, such as the European Arctic or other rural/peripheral contexts where the majority of migration is by non-Indigenous people and is often related to natural, lifestyle or recreational values of rural amenities (Argent et al., 2014; Elshof et al., 2017; Gosnell and Abrams, 2011). Iñupiat people make up the vast majority of movers in the Alaskan Arctic (Howe, 2009). Also, migration in Arctic Alaska differs from migration of Indigenous people in many low income countries, where migration from one rural area to another often occurs due to push factors like soil exhaustion and population growth and/or pull factors like the availability of new agricultural land (White and Lindstrom, 2019). These factors have led to increased deforestation, particularly in tropical rainforest areas of Latin America, as forest areas are converted to agricultural land (Carr, 2009). Frequently Indigenous people are those at the edge of rural "frontiers" and are the most likely to push into new territories to support subsistence and small scale agriculture production (Carr, 2008; Figueroa et al., 2009).

Instead of opportunities for enhanced agricultural production, the abundance of fish, berries, eggs, marine mammals, reindeer, caribou and other land mammals play an important role in rural-to-rural migration decisions for the Indigenous people of the Arctic. A number of

[1] Explicit empirical tests also include Banzhaf and Walsh (2008), Cameron and Mcconnaha (2006), Graves and Waldman (1991), and Kahn (2000).

existing studies highlight the importance of hunting and gathering of wild foods (i.e. subsistence) for Indigenous people across the Arctic (Poppel, 2014). Research has found that Arctic country level policies that support subsistence opportunities as a livelihood strategy make it more likely for Indigenous people to remain in Arctic communities (Berman, 2021). For Iñupiat residents of Arctic Alaska, Berman (2009) finds household subsistence production possibilities play an important role in migration decisions; similarly, Howe et al. (2014) find that subsistence opportunities are an important determinant in stepwise migration for Iñupiat people when moving down a migration hierarchy. In the Russian Arctic, the overall population has declined significantly since 2000 (Heleniak, 2015), but migration patterns of Indigenous people are unclear due a variety of complex factors (Petrov, 2008). However, the development of the Indigenous obshchiny, Indigenous salmon quota, and the role of Indigenous people in transboundary marine mammal management in the Russian Arctic serve as pull factors for Indigenous people (Aho and Meek, 2020; Gerkey, 2016). Cooke and Bélanger (2006) have highlighted the importance of personal and community networks for Indigenous people in both sending and receiving communities in the Canadian Arctic .

To test for the role of place amenities in rural-to-rural Arctic Alaska migration decisions, our approach addresses two challenges identified by Banzhaf and Walsh (2008). First, most related studies rely on aggregate data at the census tract level rather than at the community level. Our estimates use individual responses, rather than aggregate place level data, allowing us to control for individual, household, and place characteristics. In studies based on aggregate data, the large size of some census tracts may hide demographic changes due to changes in local public goods, since changes may only affect a part of the census tract. Census tracts also introduce boundary problems when changes in public goods in one tract affect population in neighboring tracts. In our analysis we focus on community level variables and the communities in our study region are small and separable such that local public goods are contained within community boundaries.

Second, we avoid endogeneity of place amenities, an issue for existing tests of the Tiebout hypothesis (Banzhaf and Walsh, 2008; Kuminoff and Pope, 2012). That is, place amenities may not be completely independent of migration flows. Arctic Alaska is not subject to this problem for a couple of different reasons. First, key local goods such as housing stock, water and sewer, and power are supported by regional, state, or federal programs and most decisions are exogenous to small changes in local migration.[2] County level governments such as

[2] Regional Housing Authorities use federal and state funds to provide the vast majority of housing in rural Alaska (Ganley et al., 2005). Further, most village land is owned by an Alaska Native Village or Regional Corporation and housing is not constrained by a lack of buildable land. Communities must solve a collective action problem in adopting a water and sewer project (e.g. choose the

the North Slope Borough and the Northwest Arctic Borough contribute toward community place amenities, but their contributions are a function of oil, gas, and mineral revenues which are independent to the migration during our study period. In addition, regional, state, and federal governments provide the largest share of cash employment opportunities for Arctic residents through jobs, construction projects, and support of non-profits, which are also independent of community population during our study period (Goldsmith, 2007). Finally, given that most local public goods in Arctic communities are not a direct function of local tax revenue, we avoid the 'Tiebout bias' problem (i.e. that individuals sort during the migration process which also impacts votes for local taxes and related public goods (Goldstein and Pauly, 1981; Kuminoff et al., 2013)).

The distance between communities, size of communities, and geographic location also make the Alaskan Arctic well suited to explore the Tiebout hypothesis since community boundaries are relatively small and easily separable. Like remote regions in other contexts, Arctic places are geographically isolated in that there are few road or river connections, moving is very costly, and households are income constrained because of limited employment opportunities. At the same time, migration is common. About 20% of the Alaska Native population living in the Arctic moved to or from an Arctic place; 30% of these moves were within the Arctic (Howe, 2009). Communities in the Alaskan Arctic vary along several dimensions including community cohesion, quality of education, and safety, and it is reasonable to expect that these differences affect migration decisions.

3. Theory

Consider migration behavior in an equilibrium setting, where changes in location-fixed amenities can only be achieved by moving (Knapp and Graves, 1989). As in Tiebout (1956), assume that individuals are fully mobile and have preferences for local amenities. In this context, people move from one location to another when utility in the destination, net of moving costs, is greater than utility in the origin and other potential destinations.

Further, assume that the probability that an individual is living in a particular destination is a function of relative local public goods along with other factors such as relative wages, migration costs, and personal and household characteristics. All else equal, people move to communities where preferences for local public goods are best satisfied. In the Alaskan Arctic context, important local public goods include quality of local schools, local subsistence

location for a lagoon, allocate project costs equitably across households, etc.); to the extent migration complicates this problem, water and sewer availability could be influenced by migration.

opportunities, medical care, water and sewer, housing availability, and local alcohol control options.

Migration in the Alaskan Arctic follows a hierarchical stepwise pattern and subsistence related place amenities vary along the hierarchy (Howe et al. 2014). When moving up the hierarchy (i.e. from villages to regional centers and regional centers to urban areas), some place amenities, such as housing availability, medical care, modern water and sewer, may improve but other place amenities such as subsistence opportunities, family networks, and traditional Iñupiaq cultural activities (e.g. language use, whaling, marine mammal hunting, and other cultural activities) may decline on average. The opposite holds for moving down the hierarchy (e.g. a regional center to a village). Individual preferences for different place amenities determine the relative importance of these different factors on the migration decision and should be reflected in our regression analysis.

Higher expected wages should increase the probability of migration in the Arctic, as in other contexts (Harris and Todaro, 1970). Cash employment opportunities are very limited in most rural Alaskan communities, as so all else equal, those returning to rural communities with more education have a higher probability of securing a good job. In remote Arctic communities, the largest share of cash expenditures are for food, fuel, other utilities, and transportation (Goldsmith, 2007). Cash is also an important input to subsistence and so it plays an important role in benefiting from the place-based subsistence amenities (Kerkvliet and Nebesky, 1997).

Assuming individuals maximize utility, we can represent the probability of individual i living in place j as a function of relative wages (W), migration costs (C), personal and household characteristics (X), and relative place amenities (A), as

$$p_i^j = p(W_i^j, C_i^j, X_i, A^j)$$

where wages and moving costs are a function of both individual and place characteristics.

As described in more detail below, we estimate the probability of migration from one Arctic place to another Arctic place using a simple probit binary choice model where the probability of migration (0,1) is regressed on a vector of individual and place characteristics. In the probit regressions, we restrict the analysis to individuals living in the Arctic, and marginal effects from the probit estimates are used to explore how differences in place amenities and wages influence the probability of migration.

In light of this framework, we test the following hypotheses for remote rural places in Arctic Alaska.

H1: All else equal, the probability of moving to places with more desirable place amenities is greater than to places with less desirable place amenities. We explore this hypothesis in several domains including education, housing, economic opportunity, and community safety.

H2: All else equal, better place level subsistence opportunities in the origin, such as whaling opportunities, reduce the probability of out-migration.

H3: All else equal, higher relative wages in a destination increases the probability of out-migration. We test this hypothesis in light of migration decisions from Arctic villages to other Arctic villages and between all communities in a region.

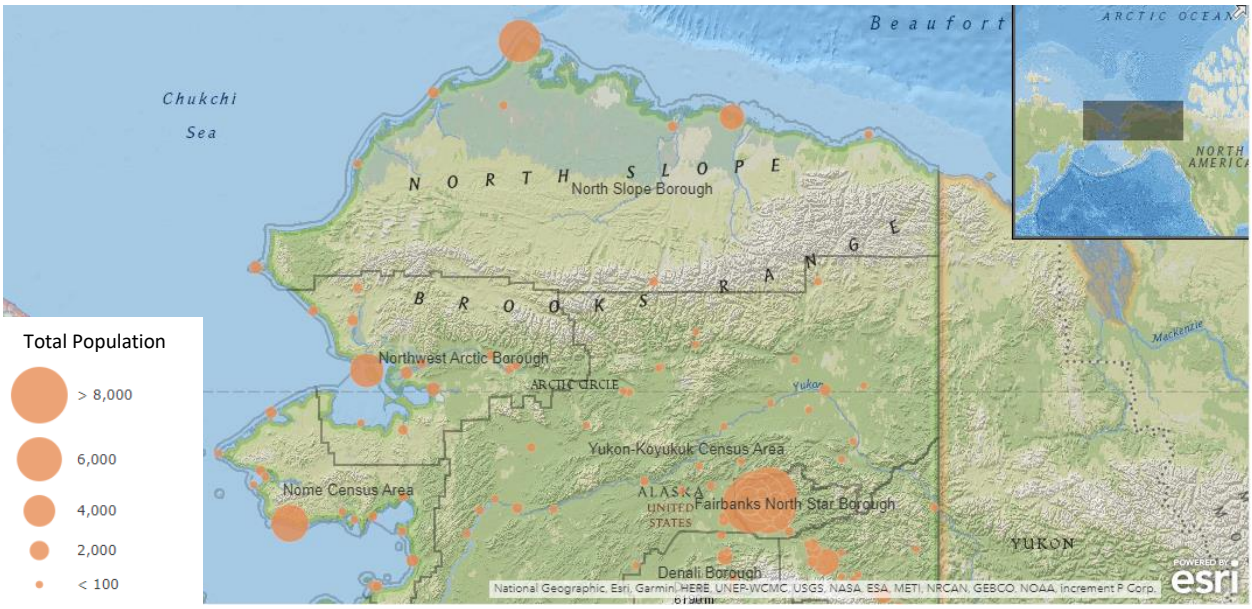
4. Regional characteristics

The Alaskan Arctic, as we have defined it, consists of three geographic regions: The North Slope Borough, the Northwest Arctic Borough, and the Nome Census Area. This is a vast region, comprising 163,823 square miles, roughly equivalent in size to the country of Sweden, and it is sparsely settled. The region is home to about 26,500 people,[3] the majority of whom are Alaska Native (70%); indigenous Iñupiat people make up more than 86% of the Alaska Native population in this region (US Census, 2010). About 42% of the population live in one of three regional centers, Utqiagvik (formerly Barrow), Kotzebue, and Nome, all others live in one of 35 communities that range in size from about 151 (Kobuk) to 674 (Point Hope) (US Census, 2010).[4] Each rural Arctic community is a US Census designated place. The Alaskan Arctic, as we have defined it, is illustrated in Figure 1.

[3] 26,500 was the population of the region in 2010 based on the 2010 Decennial US Census. As of the date of this writing, 2020 Decennial Census data is not publicly available.

[4] The Arctic population grew about 10% from 2000 to 2010 and has become somewhat more concentrated in Arctic Villages (from 53% to 58%) (US Census, 2010, 2000). Our set of rural arctic communities includes all incorporated cities and unincorporated census designated places (CDPs).

Figure 1. Map of Study Region (2010 total population)



Source: ESRI, ArcGIS, Tele Atlas, U.S. Census, National Geographic World Map.

As indicated in Figure 1, Arctic Alaska is geographically isolated. Yet, each of the three regional centers anchor an important regional network. Services are concentrated in the regional center of each region and regular air taxis go out from regional centers to villages at consistent intervals. Each regional center operates a larger hospital, a regional school district, and in the case of Kotzebue and Utqiagvik, a Borough government. Because of resource rents from oil and gas and the Red Dog mine, the North Slope Borough, and the Northwest Arctic Borough, respectively, also have Borough government infrastructure in regional centers and provide additional funding to Borough communities for special projects and initiatives. The hub and spoke system reduces the cost of air travel and facilitates strong links between communities in each region.

Outside of Arctic Alaska, Alaska's place hierarchy includes three larger urban areas, other regional hubs, and about 100 villages. The state's two largest urban areas, Anchorage (population 291,826) and Fairbanks (population 31,535), are the urban destinations for many who choose to leave rural Arctic regions (Howe, 2009; Howe et al., 2014). Within rural regions, there is also considerable migration. Each of Alaska's rural regions has many small villages and a larger town or regional center. Regional centers serve as transportation, administration, and service centers for the region and are often destinations for people leaving regional villages. Economic markets and related job opportunities, as well as population, increase along the hierarchy.

As such, there are essentially four hierarchical destination alternatives for individuals living in Arctic Alaska Villages. A move can be made to another village, to one of three regional centers, to a larger urban area outside of the Arctic, or to an out of state destination. This place hierarchy has a considerable influence on migration patterns. In related research, we found that migration in the Alaskan Arctic proceeds in a stepwise fashion, in which migrants move from smaller to larger places when leaving the region and larger to smaller when returning (Howe et al., 2014). In this "stepwise" migration, Arctic outmigrants leaving a village are more likely to move to a regional center (in the same region) and outmigrants from a regional center are more likely to move to an urban area (Anchorage or Fairbanks) relative to other destinations (Howe et al., 2014). Individuals moving laterally, to another Arctic village during our study period (1995-2000), overwhelmingly moved within the geographic region (North Slope, Northwest Arctic or Nome) of the origin community (Howe, 2009).

5. Material and methods

5.1 Data description

The 2000 Decennial Census, which we use for our analysis, was the last US census in which a long form (e.g. income, employment, and migration questions) was distributed to roughly 50% of households in rural Alaska during the Census year. The current American Community Survey, which includes revised traditional long form questions, is distributed to roughly 5% of households in rural Alaska communities each year, across seasons.[5] Consequently, margins of error for most long form variables (e.g. income, employment, and migration) are significant (Spielman et al., 2014), and error is especially large in rural Alaska in part due to the small size of places, temporary migration, and the different enumeration schedule relative to the rest of the United States. High margins of error in the ACS have made comparisons within and between rural places a particular challenge (Folch et al., 2016), and this is especially true in Alaska. In addition, the ACS has transitioned from the five-year permanent migration question to the one-year migration question due to the shift to an annual sample.[6]

[5] As indicated in the ACS methodology report "In both the main and supplemental samples, the month assigned for each Remote Alaska HU address is based on certain types of geographical entities in which it can be contained. All addresses located in each specific geography of these types are assigned to the same month, either January or September. The assignment of each specific geographical entity to either January or September is done in such a way as to balance workloads between these months and to keep groups of cases together geographically. The addresses for each month are sorted by county and geographical order in the frame, and a sample of 2-in-3 of them is sent directly to CAPI in the appropriate month. The GQ sample in Remote Alaska is assigned to January or September in the same manner as are main sample HU addresses. Up to four months is allowed to complete the HU interviews and GQ data collection for each assigned month." (U.S. Census Bureau, 2006). Table 7-1 in United States Census Bureau, (2017) displays the enumeration schedule followed for Alaska Census areas. In many regions, enumeration took place in both January-April and September-December.

[6] The 2000 question was "Where did this person live 5 years ago? Name of city, town, or post office." The ACS question is "Did this person live in this house or apartment 1 year ago? Where did this person live 1 year ago? Name of city, town or post office."

Given these changes, we cannot currently test rural-to-rural permanent migration with accuracy using ACS data.

In this paper, we use the 2000 US Census Decennial survey microdata to conduct a simple test of migration across rural Alaska communities between 1995 and 2000 using the five-year migration question. We accessed confidential microdata at a US Census Center for Economic Studies (CES) Research Data Center (RDC), The California Census Research Data Center at the University of California, Los Angeles.[7] Data include long and short-form responses for the entire universe of Census respondents and all model estimates are made on the set of Alaska Native respondents living in the Arctic. Migration responses are derived using a place of residence response for all Alaska Native respondents living in the Arctic in 2000 and those who reported living in the Arctic in 1995.[8] That is, the data includes place of origin for each respondent for 1995 and 2000. Migrants were residents who reported living in different places in each period.

Community data used in the analysis come from public records, the State of Alaska, and variables constructed from Census data. Variables include public goods, both broadly defined and specific to the Arctic institutional environment, and government provided infrastructure and services. Summary statistics and sources of place data are provided in Table 1. As indicated, amenities differ across Arctic communities and differences are especially great between villages and regional centers.

[7] Data reported in this paper were screened to ensure that no confidential information was inadvertently disclosed. Any opinions and conclusions expressed herein are those of the author(s) and do not necessarily represent the views of the U.S. Census Bureau.

[8] As with all survey data, these data are subject to sampling error. This type of error is less important in rural Alaska since the long form surveys were administered to about 50% of rural Alaska households instead of the 20% of households who received the long-form survey in the rest of the United States. Error may also be introduced through use of imputations and substitutions for non-response. In some cases, surveys were not complete, or information was inconsistent and the Census used substitutions or a hot-deck type imputation procedure to generate estimates for missing data.

Table 1. Variable definitions and related means (Weighted Arctic Sample, n=1132)		
Variable Name	**Description**	**Mean (Std. Dev)**
mover	dummy 0 if a stayer 1 if moved to another Arctic place (source: US Census 2000)	0.2027 (0.4022)
pwage00_95	predicted wage in 00 destination / predicted wage in 95 origin (source: US Census 2000)	1.0578 (0.3668)
test00_95	8'th grade test scores (% proficient and above in 3 categories) in 00 destination relative to 95 origin (source: Alaska Department of Education & Early Development "Report Card to the Public")	1.1490 (1.00)
bus00_95	number of business licenses in 00 destination relative to 95 origin (source: State of Alaska)	1.0470 (0.3730)
house00_95	number of new housing units in 00 destination relative to 95 origin (source: US Census 1990 and 2000)	1.0506 (0.3686)
plumb00_95	share of houses with complete plumbing in 00 destination relative to 95 origin (source: US Census 2000)	1.2032 (1.322)
pubpct00_95	share of households receiving public assistance in 00 destination relative to 95 origin (source: US Census 2000)	1.0505 (0.3750)
runway00_95	total runway length in 00 destination relative to 95 origin (source: US Federal Aviation Administration NFDC Location ID Database)	1.0206 (0.2445)
origin_dry00	dummy = 1 if the 1995 community is dry (source: Alaska Alcoholic Beverage Control Board)	0.1194 (0.3244)
dry00_place	dummy = 1 if the 2000 community is dry (source: Alaska Alcoholic Beverage Control Board)	0.1153 (0.3200)
origin_whaling	dummy = 1 if the 95 origin had whale strike quota (source: Alaska Eskimo Whaling Commission)	0.3395 (0.4738)
whaling_place	dummy = 1 if the 00 destination had whale strike quota (source: Alaska Eskimo Whaling Commission)	0.3574 (0.4794)
origin_dth	violent death rate in the 95 origin community-homicides, suicides, and accidental deaths (source: Alaska Bureau of Vital Statistics)	0.0087 (0.0053)
dth_place	violent death rate in the 00 destination community-homicides, suicides, and accidental deaths (source: Alaska Bureau of Vital Statistics)	0.0083 (0.0048)
reg_center_95	dummy = 1 if living in a regional center in 1995 (source: US Census 2000)	0.4916 (0.5002)
reg_center_00	dummy = 1 if living in a regional center in 2000 (source: US Census 2000)	0.5147 (0.5000)
emp00_95	ratio of total employment in the 2000 destination relative to the 1995 origin (source: US Census 2000)	1.0182 (0.1859)
female	dummy = 1 for females (source: US Census 2000)	0.5273 (0.4995)
age	age (source: US Census 2000)	34.9290 (12.83)
youth	dummy = 1 if age is >=16 & <=20	0.0911 (0.2879)
elder	dummy = 1 if age is >=65	0.0387 (0.1929)
weight	Individual weight variable (source: US Census 2000)	2.3754 (0.9760)
Region	2=North Slope Villages 4=Nome Villages 6=Northwest Arctic Villages 3= Utqiagvik 5=Nome 7=Kotzebue	

We use three variables to measure community level infrastructure: the percent of houses without complete plumbing (plumb), the average growth rate of the housing stock between 1990 and 2000 (house), and runway length (runway). Across Arctic villages an average of 56% of the houses did not have complete plumbing in 2000, in contrast to only ten% of the houses in Arctic regional centers. Runway length is a determinant of community access since air transport is the primary means of moving goods and people in the Arctic. Longer runways allow for bigger planes which lower the cost of travel and the cost of goods delivered to the community. Housing is considered a public good since in Arctic Alaska the cost of housing is heavily subsidized by government assistance (Ganley et al., 2005).[2] A growing housing stock also signals an improvement in the quality of the community's housing.

As a proxy for community economic opportunity, we use business licenses per capita (bus) and the percent of families receiving public assistance income (pubpct). We assume that economic opportunity is correlated with more business licenses. Fewer families on public assistance could signal more opportunity but organized and supportive communities might also be more effective in applying for public assistance and so this relationship could go either direction. In Arctic villages, about 4.5% of the population had a business license in 2000 which was similar to the 6% in regional centers. An average of 21% of families in villages reported receiving public assistance income; this is more than twice the 10% of families who received public assistance in regional centers (US Census, 2000).

Three additional variables are used to capture community differences that affect quality of life and influence migration decisions. The percent of students who are proficient on the 8th grade standardized tests is our measure of school quality. Across Arctic villages, an average of 26% of students were proficient in 2000; regional centers had higher rates of test proficiency ranging from 36% to 52% (Alaska Department of Education and Early Development, 2000). Second, we use the average number of violent deaths per 1000 people for the 1995-2000 period as a measure of public safety. This rate in the villages was 11.7 (with a standard deviation of 6.7), more than 70% higher than the rate in the regional centers.[9] Third, we used an indicator of local alcohol control. Alaskan communities are allowed to vote to prohibit the sale, distribution, and possession of alcohol (Berman and Hull, 2001). These "local options" are enforced by state and local law enforcement. We use a dummy variable (dry) to identify villages that had voted to ban the possession and sale of alcohol. About 12% of the individuals in our sample lived in dry villages, other individuals lived in villages that permitted the possession (damp) or sale and possession of alcohol (wet).

[9] Violent death rates by community were calculated based on total homicides, suicides, and accidental deaths using data from the Alaska Bureau of Vital Statistics.

Finally, whaling is an important subsistence activity for many coastal Arctic villages and to be successful, communities must be able to organize and cooperate. Eleven coastal Alaska communities are allocated strikes annually by the International Whaling Commission; with each strike there is a high likelihood of harvesting a whale. Whaling crews are led by captains who are generally respected men in the community possessing leadership and planning skills. Whaling communities must work together to harvest and process whales and the fruits of the harvest are shared broadly across the community (Baggio et al., 2016; Burnsilver et al., 2019; Stephen R. Braund & Associates, 2018). A binary variable is used to indicate whaling communities in which roughly 36% of our sample lived in 1995.

We include a total of 12 place amenities in our regression analysis. For binary variables, local alcohol controls, strike allocations for whales, and regional center indicators, and for the violent death rate, we include a coefficient for both the origin and the destination to demonstrate magnitudes of push and pull factors. For other place characteristics, including test scores, business licenses per capita, housing, plumbing, percent of households receiving public assistance and runway length, we use a single coefficient that indicates a relative measure. That is we provide the ratio of the destination value / origin value. A value of one indicates the relevant place amenities are equal between the origin and destination, a value of less than one indicates place amenities were lower in the destination, and a value greater than one indicates amenities were higher at the destination. Related summary statistics are provided in Table 1.

5.2 Estimation Strategy

A standard probit model is used to estimate the probability of migration from one Arctic Alaska place to another, where the binary choice to migrate (1 if an individual moved to a different community, 0 otherwise) is regressed on a vector of individual and place characteristics. For the regression which included the regional centers, we restrict analysis to individuals living in the Arctic in both 1995 and 2000 and exclude anyone who moved to or away from the Arctic during this period.[10] For the village only regressions we exclude residents of the regional centers in 1995 and 2000. These results are also robust when selecting one household adult and using household weights rather than individual weights.

While we control for migration costs using the runway length variable, we assume that explicit migration costs are relatively constant across Arctic Alaska places. Most moves occur by plane and travel costs from an Arctic village to an Arctic regional center (i.e. Utqiagvik,

[10] In Howe et al. (2014) we model and test migration decisions for locations outside and within the Arctic. As indicated in Table 2 of Howe (2009), 3,710 Alaska Native people moved to or from the Arctic between 1995 and 2000; of these, 1,125 moved within the Arctic.

Kotzebue, or Nome) are similar; some transportation involves travel by barge or boat in summer, and in winter, snow machine or use of an ice road to travel to a regional center is a possibility for a some communities. Most villages in our study region have access to the same type of summer and winter transportation as other communities in the same region.

Costs of acquiring place specific information are low in our study region due to close family connections, local radio and newspapers, and frequent travel between communities in the region. Information about relative changes in local public goods, hunting, and employment opportunities spreads quickly through dense social networks reducing the costs of acquiring information (Baggio et al., 2016; Burnsilver et al., 2019). Consequently, we assume that information costs associated with moving are relatively constant across communities in our study region.

Expected relative wages are calculated using individual wage predictions for an origin and all possible destinations (Howe et al., 2014). Because we only observe wages for employed people, a Heckman two-step selection model was used to estimate wages for each location based on the sample of employed residents in 2000 (Heckman, 1976). In the first stage we assume that the probability of working is a function of individual, household, and place characteristics. In the second stage, the wage rate was assumed to be a function of individual and place characteristics. From these estimates we predicted wages for each individual across destinations. One set of regressions used expected wage estimates to capture individual differences and a second set uses individual descriptors as explanatory variables instead of predicted relative wages. Findings are robust across specifications.[11]

6. Results

We test hypotheses using estimates in Table 2. Sample data includes Alaska Native people who were 18 or older in 2000 and who lived in an Arctic Alaska village or regional center in 1995 and 2000. Migrants are people who reported living in different communities in 1995 or 2000. In both tables, the first set of regressions (columns 1 and 2) includes residents of all Arctic communities. The second set of regressions (columns 3 and 4) include only residents of Arctic villages in 1995 and 2000. These specifications capture differences between villages and regional centers in scale, access, and economic activity. Predicted wages, used in specifications 1 and 3, were estimated using the two-step Heckman procedure where the selection equation is made up of individual

[11] Wage regressions are similar to those reported in Howe et al. (2014) and are available upon request.

Table 2. Probit Migration Regressions[a] (Y= mover, individual moving decision, person weights)				
	All Arctic Places		Arctic Villages	
	(1)	(2)	(3)	(4)
pwage00_95	1.31** (0.5825)		2.82** (1.1608)	
test00_95	1.48*** (0.5152)	1.42*** (0.4997)	1.91*** (0.6309)	1.63*** (0.6247)
bus00_95	2.86*** (0.9236)	2.87*** (0.9902)	0.73 (1.2102)	1.00 (1.2916)
house00_95	2.86*** (0.7465)	2.92*** (0.7364)	4.96*** (1.3380)	4.31*** (0.9721)
plumb00_95	1.58*** (0.5666)	1.67*** (0.5860)	0.71** (0.3307)	0.88*** (0.3554)
pubpct00_95	5.63*** (1.3110)	5.77*** (1.3398)	2.97*** (1.1619)	3.47*** (1.2046)
runway00_95	0.89* (0.5218)	1.11** (0.5281)	0.82* (0.5097)	0.91 (0.5674)
origin_dry00	-2.92*** (0.9731)	-3.17*** (0.9951)	-3.39*** (1.1473)	-3.94*** (1.2673)
dry00_place	2.81*** (0.9134)	3.02*** (0.9491)	3.35*** (1.1171)	3.84*** (1.2567)
origin_whaling	-1.02 (0.7183)	-1.08 (0.7564)	-4.62*** (1.2723)	-4.07*** (1.0292)
whaling_place	0.60 (0.7585)	0.57 (0.7312)	4.26*** (1.3155)	3.55*** (1.0670)
origin_dth	171.01*** (35.53)	181.43*** (36.48)	98.97*** (38.3438)	124.68*** (37.5843)
dth_place	-139.03*** (40.14)	-149.70*** (41.59)	-73.46* (43.3982)	-100.53** (43.1380)
reg_center_95	-2.61*** (0.8170)	-3.05*** (0.8142)		
reg_center_00	2.07*** (0.8056)	2.47*** (0.7847)		
emp00_95		0.59 (.47)		0.25 (1.3393)
female		-0.21* (1.74)		-0.25* (0.1479)
age		-0.00 (.24)		-0.01 (.0103)
youth		0.12 (.59)		0.06 (.2482)
elder		-0.67* (1.87)		-0.41 (.4666)
_cons	-18.21*** (3.3966)	-17.73*** (3.9549)	-16.67*** (3.8020)	-13.65*** (3.5449)
N	1132	1132	531	531
Wald Chi2	229.76***	280.13***	83.94***	130.41***
Pseudo R2	0.6875	0.6786	0.5336	0.4894
Log Likelihood	-423.61	-435.63	-237.20	-259.65

[a]weighted regressions; robust standard errors in parentheses.
***, **, * statistically significant at the 1%, 5%, and 10% levels.

socioeconomic characteristics. Because of the lack of jobs, the importance of subsistence work, and the seasonal nature of market work, wage predictions for villages are imperfect. To account for this, we also estimate our migration equations omitting wages and directly accounting for individual socioeconomic characteristics as explanatory variables (columns 2 and 4).

As defined in Table 1, several independent community level variables are introduced as a ratio; the value in the destination community relative to the value in the origin community. Positive values indicate a relatively greater value in destination relative to origin. So, for instance, the average test scores were about 15% greater in destinations than in origins. Other variables enter the equation independently as levels in the origin and destination. For instance, about 11.5% of people lived in a community in 2000 that had voted to be a "dry" community, and about 35% of people lived in a "whaling" community in 2000.

Results in Table 2 support the Tiebout hypothesis, all else equal, people move to improve their consumption of local public goods. Using mean values for the probit coefficients, the estimated probability of moving between Arctic villages is about 15% (columns 3 and 4, Table 2) and is about 20% when including Arctic regional centers (columns 1 and 2, Table 2). Even when controlling for wages and other personal or household characteristics, place specific variables are often significant. Below we summarize key findings.

1. Improved housing, education, and economic opportunity attract migrants.

Consistent with Tiebout's (1956) predictions and empirical findings from Banzhaf and Walsh (2008), regression coefficients are positive for local public goods when a move would improve well-being, even when controlling for relative wages. Coefficients on origin and destination variables follow a similar pattern.

Access to housing and availability of modern water and sewer systems are linked to migration decisions as one would expect. In Arctic Alaska there is large variability in water and sewer conditions across villages; in 1999 most Arctic villages had fewer than 60% of homes with water and sewer pipes or an enclosed haul system (Haley, 2000). We find that across all specifications a relatively greater share of housing units with complete plumbing facilities increases the likelihood of migration (Table 2). Related probabilities suggest that for migrants, moving to either villages or regional centers, increasing in the relative share of households with complete plumbing facilities by 10%, increases the probability of migration by about 6% (columns 1 and 2, Table 2).

An increase in the housing stock has a similar effect. Results are statistically significant across all four specifications and related probabilities are particularly high for village-to-village

migration. A 10% increase in a village's housing stock, increases the probability of migration by about 15% (columns 3 and 4, Table 2).

Education is also important in the migration decision and relative school quality, as measured by average test scores, influences migration as expected. In all four specifications coefficients are statistically significant and suggest that a relative increase in test scores of 10% increases the probability of migration between 5% and 10% (Table 2.).

We use business licenses per capita and public assistance income as a proxy for relative economic activity. As indicated in Table 2., business licenses are associated with a greater probability of migration for data that includes villages and regional centers, but there is no effect in the village-to-village sample. A 10% increase in the relative number of business licenses increases the probability of migration by about 10% in specifications 1 and 2 (Table 2.).

The percent of households on public assistance, which perhaps indicates limited economic opportunity, is the only economic community characteristic with an unexpected sign. Instead of a negative sign, the percent on public assistance had a significant and positive sign. People were more likely to move to communities with a greater share of the households receiving public assistance. As described earlier, public assistance could be an indicator of a community's ability to organize so members can apply for and receive federal and state transfers; the community's support for processing and filing related documents may represent a potential for increased well-being in these communities.

2. Safe and dry communities attract migrants.

Coefficients are positive for local public goods that are correlated with safety, cooperation, and community cohesion. These variables, which enter the equations as origin and destination values, include binary variables for whaling communities, dry communities, and a continuous variable for the violent death rate. We find that the probability of migration is reduced when the origin is either a whaling community and for communities that ban the possession and sale of alcohol. Similarly, the probability of leaving a community is greater for communities with relatively higher rates of violent deaths. In-migration patterns are similar. People are more likely to move to villages that are dry, that are whaling communities, and that have relatively lower rates of violent deaths compared to other Arctic places.

Studies have found that rates of violent death in the Arctic are highly correlated with other community characteristics; for instance, relatively higher average income, the overall

share of married couples, and the number of traditional elders, are correlated with a lower incidence of violent deaths (Berman, 2014; Berman et al., 2000). Consistent with these observations we find that out-migration is associated with higher rates of violent deaths; a ten percent relative increase in violent deaths in the origin increases the probability of outmigration from about 3% to 5% (columns 3 and 1 respectively).

Migration patterns also differ between "dry" communities and communities that allow the sale and/or the possession of alcohol. Across all four equations we see that this variable has a strong impact on the probability of out-migration particularly in the village-to-village sample. For village-to-village migration (columns 3 and 4), starting out from a wet village (relative to starting from a dry village) increases the probability of moving to a dry village by about 83%. When the regional centers are included, individuals starting out from a damp or wet village or regional center increases the probability of migration only about 4% relative to starting out from a dry village (columns 1 and 2).

Whaling is an important indicator of community cohesion as successful whaling communities must cooperate, share, and plan for two large harvests annually. The presence of whaling captains also enhances community leadership and cohesion. Whaling captains are esteemed community leaders who invest significant personal funds in the whaling activity and facilitate cooperation and sharing within communities. Harvested whales are distributed widely within a community and with other communities and families in the region (Stephen R. Braund & Associates, 2018). As indicated, whaling variables are significant in the village-to-village migration equations (columns 3 and 4). Starting in a whaling village reduces the probability of migration significantly and, for those who move to another village, they are more likely to move to a whaling community all other things equal.

3. Relative wages influence migration as expected.

Consistent with Harris and Todaro (1970), relative wages significantly affect the direction of individual migration. Across specifications individuals migrate towards communities that offer a higher expected wage. As relative wages increase 10% the probability of migration increases by about 4% for the entire Arctic; the effect is about double when restricting analysis to village-to-village migration. Similarly, we find in related research that Arctic movers consider potential economic opportunity as they move up through a place hierarchy from small villages to regional centers to larger urban destinations (Howe et al., 2014).

7. Discussion of Results

We find strong evidence supporting our first hypothesis: All else equal, the probability of moving to places with more desirable place amenities is greater than to places with less desirable place amenities. Similar to related research, we find that migration decisions are influenced by place amenities (Jauhiainen, 2009; Sørensen, 2018). For instance, using place level data Sørensen (2018) finds that rural place-based physical and human capital are positively correlated with population growth in Denmark. And, in northern Finland, Jauhiainen (2009) finds that rural place amenity improvements facilitated by the EU Seniorpolis policy, increase the probability of urban-to-rural migration for the elderly. Migrants to Arctic Alaska places are attracted by similar place based amenities, in addition to subsistence amenities, unique to the Arctic environment.

With respect to water and sewer place-based amenities, we find that communities with relatively better water and sewer systems had a strong and statistically significant increase in the probability of migration. For an entire community that transitions from honey-buckets to a closed water and sewer system (i.e. a 100% increase) the probability of migration would increase by about 60%. In our study region there was (and remains) significant variation in water and sanitation systems. Overall, 56% of housing units in the three regions lacked plumbing facilities. Out of the 11 communities in the Northwest Arctic Borough, for instance, 6 communities had full piped service to 70% or more of homes, whereas the 5 other communities relied on honey-buckets and a central washeteria and showers (Haley, 2000). A lack of adequate water and sanitation systems has led to water scarcity in some Northwest Arctic communities, leaving less water available for hygiene and other household needs (Eichelberger, 2010). Alaska has a history of high rates of infectious disease in many communities because of poor sanitation; in the 1950s safe water access points were added to many villages significantly reducing the incidence of disease (Eichelberger, 2010). Even today adequate water and sanitation systems are positively correlated with better health outcomes.

We also find that an increase in the housing stock has a similarly strong effect. An increase of about 10% in available housing stock increases the probability of migration by about 15%. Most communities in our study region had limited housing availability. As indicated in Ganley et al., (2005), there were shortages of approximately 400 housing units in the North Slope Borough region, 883 units in the Northwest Arctic Borough, and 1060 housing units in the Nome Census area in the early 2000s. Similarly, a 2004 Housing and Urban Development survey found significant overcrowding in our study region, 1,324 housing units in the Nome region, 889 housing units in the North Slope Borough, and 906 housing units in the Northwest

Arctic region (Ganley et al., 2005). Our estimates are consistent with the fact that communities with available housing attract in-migrants.

Better educational opportunities, as reflected by relatively higher test scores, is also associated with a higher likelihood of in-migration. Test scores across the region vary considerably; average 8th grade proficiency in reading, writing and math among villages in 2000 was roughly 27%, with a high of 61% and a low of 0%. Average proficiency in regional centers was 46%. Consistent with other contexts (Dustmann and Glitz, 2011; Sørensen, 2018), we find that Alaska Native people living in the Arctic invest in their own education and in the educational attainment of their children and it affects migration decisions.

Provision of housing, water and sewer, and education in rural Arctic Alaska communities, while heavily dependent on State and Federal transfers, also involves coordination at several levels. First, local communities must effectively communicate to regional and borough governments and tribal organizations community needs. Borough governments, tribal organizations, and Alaska Native Corporations petition the State of Alaska and the Federal government to fund projects within the Borough or Regional Corporation boundaries. Community village corporations and tribal governments also directly apply for State and Federal funding for local capital projects, such as a new washeteria, generator, or runway improvements. In addition, local communities must solve a collective action problem before receiving federal or state funding. For instance, communities that can share administrative services and facilities across tribal, corporation and municipal entities can lower costs (Haley, 2000), and communities need to agree on other aspects of a large water and sewer project in order to receive funding (e.g. a lagoon location, timeline, and a fee schedule). Solving this collective action problem is similar to the problem solved when Arctic communities approve new oil and gas development (Haley, 2004). Cohesive communities, where tribal governments, municipal governments, Alaska Native Village Corporations, and Alaska Native Regional Corporations also work in tandem, should be more successful in attracting State and Federal funding for large public goods projects than less cohesive communities.

Finally, in terms of economic opportunity, we use two simple measures, business licenses and the percentage of households on public assistance. Business licenses per capita had a positive and significant effect in the cluster of communities including regional centers (equations 1-2); this effect persists with and without relative wages. Second, we find that the percent of the population on public assistance has a significant and positive effect on migration. As indicated earlier, we interpret this as an indicator of a community's ability to cooperate. For instance, through the late 1980s and 1990s the State of Alaska STEP program (State Training and Employment Program), Alaska's REDI program (Rural Economic Development Initiative) and

the Federal School To Work Opportunities Act emphasized public and private partnerships (Blatchford, 1994). Under REDI, for example, communities proposed development projects to the State of Alaska based on community needs and through a competitive process communities received funding and related development assistance (Blatchford, 1994). Communities more competitive in related processes would have higher levels of public assistance vis-à-vis other communities and presumably would attract migrants. Our results are consistent with this interpretation. Isserman et al. (2009) explore the effects of rural "place prosperity" on demographic change in the United States and find supporting evidence but note that Alaska is excluded in their analysis given limited data availability. Our findings suggest that place prosperity is an important component of the migration decision.

Our second hypothesis is that, all else equal, better subsistence opportunities and higher measures of community resilience in the origin community, reduce the probability of out-migration. Subsistence harvests our study region (i.e. Arctic Alaska) are greater than in other rural Alaska regions and of these harvests, whale and other marine mammals make up the largest share of Arctic subsistence (Fall, 2016). We designate the 11 Arctic communities with a strike allocation from the International Whaling Commission as a "whaling place" and use this variable as a proxy for strong place-based subsistence opportunities. With respect to migration, Berman (2009) models the relationship between subsistence and moving decisions and, using a "desire to move" question from the Survey of Living Conditions in the Arctic, finds that eliminating subsistence opportunities in the origin, increases the desire to move as much as a loss of employment opportunities. Our findings, using a much more general indicator of subsistence, are consistent with those reported by Berman (2009) and Berman (2021).

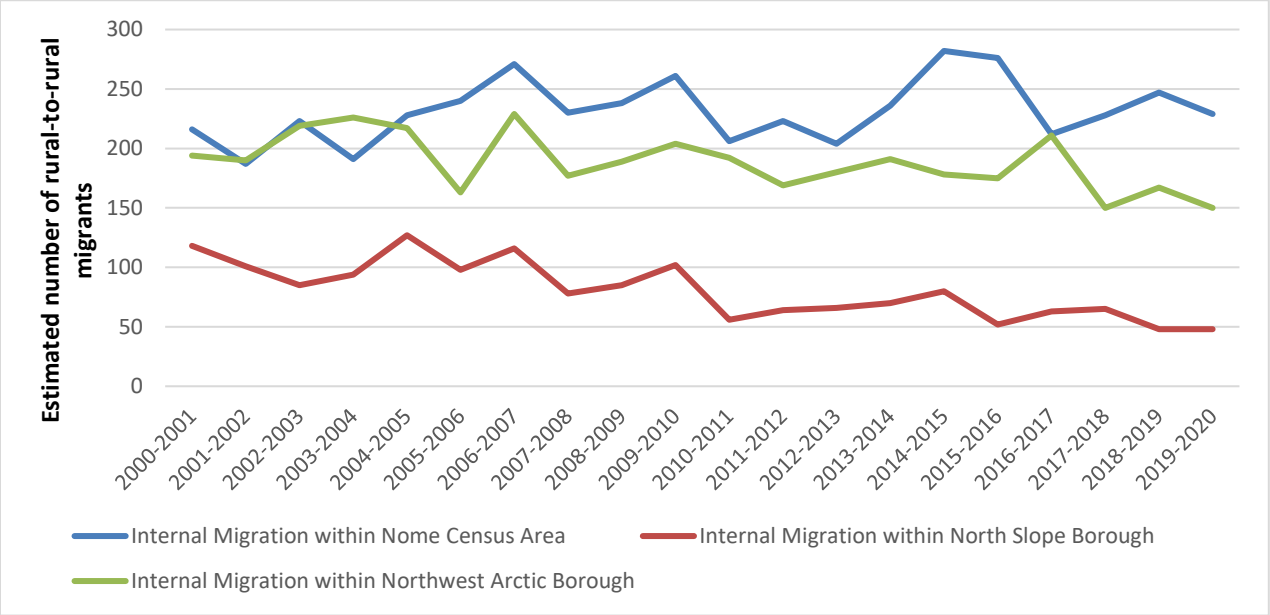
We also find that safe and healthy communities, as indicated by a relatively lower violent death rate, influence migration patterns in the expected direction. Similar, to our results, Berman (2009) finds those had experienced violence in the past year were more likely to consider moving to another community. This complements the subsistence finding, since hunting and sharing of wild foods not only contributes to food security but deepens social relationships and resilience of Arctic communities (Burnsilver et al., 2019). We also find that migration patterns are affected by local options that govern the sale and/or the possession of alcohol. In movement between villages, local options that allow the sale and possession of alcohol result in a type of "push" migration; starting out from a wet village (relative to starting from a dry village) increases the probability of moving to a dry village by about 83%. This is likely the case because, as described in Berman et al. (2000) and Berman and Hull (2001), local options to restrict the sale and possession of alcohol in a community reduce injury deaths and reduce many of the negative effects of alcohol abuse in a community. The fact that a community

agrees to restrict alcohol may also signal something about shared values, leadership, and collective action in a community.

Our results support the hypothesis that relatively higher wages in a destination increases the probability of out-migration. As in other analyses of Arctic migration decisions, we find a strong effect of expected earnings on migration decisions (Howe et al., 2014; Huskey et al., 2004). Overall in the Arctic, an increase in 10% in predicted relative earnings in the destination increases the likelihood of migration by about 4%.

Finally, while our results are based on 2000 US Census data, significant rural-to-rural Arctic migration has persisted since the 2000 Decennial US Census. As discussed, 2000 was the last decennial census to use Census long form questions, including the 5-year migration question. It was also the last US Census to collect a large oversample of households in rural Alaska. While we cannot test the same set of hypotheses with more recent ACS data, we can confirm some of the general patterns of migration using origin and destination matrices published by the State of Alaska. These public data are based on applications for the Permanent Fund Dividend, an application all Alaskans submit each year, or they forgo receipt typically of over $1,000 from the State. Given the financial incentives, almost all eligible children and adults submit annual applications. As illustrated in Figure 2, patterns of internal migration are constant over the period for each region, and have remained similar to levels observed in 2000.

Figure 2. Internal Migration within Arctic Alaska Census Areas based on Alaska Permanent Fund Dividend Application data, 2000-2020



Source: Alaska Department of Labor and Workforce Development

8. Conclusion

To summarize, we find place specific amenities have a strong influence on rural-to-rural migration decisions even with control variables; migration between Iñupiat villages in the Alaskan Arctic is a function of a community's relative bundle of local public goods, including amenities like subsistence opportunities which are integrally linked to Iñupiat culture. Our findings are specific to rural-to-rural migration decisions among remote Arctic Alaska communities and, as such, contribute to a larger body of literature addressing Indigenous migration (Carr, 2009; Figueroa et al., 2009) and amenity migration in rural places of the UK, northern Europe or high amenity areas in Australia or the continental United States (Argent et al., 2014; Elshof et al., 2017; Gosnell and Abrams, 2011). Our research also complements the economics literature, much of which has focused on rural to urban migration (Fuwa, 2011; Lucas, 1997; Taylor and Martin, 2001) or urban-to-rural migration (Stockdale, 2016; Wang and Chen, 2019); related economic studies highlight the relationship between migration and economic opportunities, environmental change, and migration as a means to spread risk across locations and households (Curran, 2002; Fuwa, 2011; Lucas, 1997).

Migration in the Alaskan Arctic supports Tiebout's (1956) observation that people "vote with their feet" to improve access to local public goods. Our findings are robust under a number of specifications. Most importantly, the results hold whether the Arctic regional centers are included or omitted. This means the patterns identified are not simply a stepwise pattern of migration from smaller to larger communities. Existing studies of rural-to-rural migration have highlighted enhanced income opportunities, balancing risks, or adapting to changes in the environmental resource base as drivers of the migration decision (Bijker et al., 2012; Curran, 2002; Elshof et al., 2017). Our study adds other factors to the explanation of rural-to-rural migration, factors that are particularly relevant to a remote Arctic and Indigenous context.

For Arctic Alaska, these results have important policy implications. The economic and demographic health of Alaska's small rural communities has been a long-term concern of Alaska public policy. Small, rural, remote communities also play a central role in the culture of Alaska Native people. While Arctic communities provide an ideal environment for traditional subsistence activities, they often have fewer formal sector job opportunities, hence there are high rates of unemployment and income measures of poverty. Our results help explain why many Arctic communities faced with similar economic conditions still attract in-migrants and have not experienced significant net outmigration. The Tiebout story suggests publicly provided goods and services may influence the demographic health of Arctic communities as much as economic opportunity. Investment in community infrastructure is a critical component to sound public policy for development of remote, rural Arctic communities.

Funding
Support from the National Science Foundation (award # 0427889) for the US Census Data Centers is gratefully acknowledged. The authors also gratefully acknowledge the support of the National Science Foundation (awards #0457662 and #1216399) to conduct this research.

References

Aho, K.B., Meek, C.L., 2020. Transboundary marine mammal management in the Northern Bering-Chukchi Sea Large Marine area. Polar Geogr. https://doi.org/10.1080/1088937X.2020.1798539

Alaska Department of Education and Early Development, 2000. Alaska Standards Based Assessment [WWW Document]. URL https://education.alaska.gov/TLS/Assessments/results.html (accessed 1.1.10).

Argent, N., Tonts, M., Jones, R., Holmes, J., 2014. The Amenity Principle, Internal Migration, and Rural Development in Australia. Ann. Assoc. Am. Geogr. 104, 305–318. https://doi.org/10.1080/00045608.2013.873320

Baggio, J.A., Burnsilver, S.B., Arenas, A., Magdanz, J.S., Kofinas, G.P., De Domenico, M., 2016. Multiplex social ecological network analysis reveals how social changes affect community robustness more than resource depletion. Proc. Natl. Acad. Sci. U. S. A. 113, 13708–13713. https://doi.org/10.1073/pnas.1604401113

Banzhaf, H.S., Walsh, R.P., 2008. Do People Vote with Their Feet? An Empirical Test of Tiebout's Mechanism. Am. Econ. Rev. 98, 843–863. https://doi.org/10.1257/aer.98.3.843

Berman, M., 2021. Household harvesting, state policy, and migration: Evidence from the survey of living conditions in the arctic. Sustain. 13. https://doi.org/10.3390/su13137071

Berman, M., 2014. Suicide among young Alaska Native men: community risk factors and alcohol control. Am. J. Public Health 104 Suppl, S329-35. https://doi.org/10.2105/AJPH.2013.301503

Berman, M., 2009. Moving or staying for the best part of life: Theory and evidence for the role of subsistence in migration and well-being of Arctic Inupiat residents. Polar Geogr. 32, 3–16. https://doi.org/10.1080/10889370903000356

Berman, M., Hull, T., 2001. Alcohol control by referendum in northern native communities: The alaska local option law. Arctic 54, 77–83. https://doi.org/10.14430/arctic765

Berman, M., Hull, T., May, P., 2000. Alcohol control and injury death in Alaska native communities: wet, damp and dry under Alaska's local option law. J. Stud. Alcohol 61, 311–9.

Berman, M., Kofinas, G., BurnSilver, S., 2017. Measuring Community Adaptive and Transformative Capacity in the Arctic Context, in: Fondahl, G., Wilson, G.N. (Eds.), Northern Sustainabilities: Understanding and Addressing Change in the Circumpolar World. Springer International Publishing, Cham, pp. 59–75. https://doi.org/10.1007/978-3-319-46150-2_6

Bijker, R.A., Haartsen, T., Strijker, D., 2012. Migration to less-popular rural areas in the Netherlands: Exploring the motivations. J. Rural Stud. 28, 490–498.

https://doi.org/10.1016/j.jrurstud.2012.07.003

Blatchford, E., 1994. Working together for community economic development in rural Alaska. Econ. Dev. Rev. 12, 41–45.

Burnsilver, S.B., Magdanz, J.S., Stotts, R., Kofinas, G.P., Berman, M.D., 2019. Are Mixed Economies Persistent or Transitional? Evidence Using Social Networks from Arctic Alaska. Am. Anthropol. 118, 121–129. https://doi.org/10.1111/aman.12447.This

Cameron, A.T., Mcconnaha, I.T., 2006. Evidence of Environmental Migration. Land Econ. 82, 273–290.

Carr, D., 2009. Population and deforestation: Why rural migration matters. Prog. Hum. Geogr. 33, 355–378. https://doi.org/10.1177/0309132508096031

Carr, D., 2008. Migration to the Maya Biosphere Reserve, Guatemala: Why place matters. Hum. Organ. 67, 37–48.

Cattaneo, A., Robinson, S., 2020. Multiple moves and return migration within developing countries: A comparative analysis. Popul. Space Place 26, 1–21. https://doi.org/10.1002/psp.2335

Cooke, M., Bélanger, D., 2006. Migration theories and first nations mobility: Towards a systems perspective. Can. Rev. Sociol. Anthropol. 43, 141–164. https://doi.org/10.1111/j.1755-618x.2006.tb02217.x

Curran, S., 2002. Migration, Social Capital, and the Environment: Considering Migrant Selectivity and Networks in Relation to Coastal Ecosystems. Popul. Dev. Rev. 28, 89–125.

Dustmann, C., Glitz, A., 2011. Chapter 4 - Migration and Education, in: Hanushek, E.A., Machin, S., Woessmann, L.B.T.-H. of the E. of E. (Eds.), Handbook of The Economics of Education. Elsevier, pp. 327–439. https://doi.org/https://doi.org/10.1016/B978-0-444-53444-6.00004-3

Eichelberger, L.P., 2010. Living in utility scarcity: Energy and water insecurity in Northwest Alaska. Am. J. Public Health 100, 1010–1018. https://doi.org/10.2105/AJPH.2009.160846

Elshof, H., Haartsen, T., van Wissen, L.J.G., Mulder, C.H., 2017. The influence of village attractiveness on flows of movers in a declining rural region. J. Rural Stud. 56, 39–52. https://doi.org/10.1016/j.jrurstud.2017.07.004

Fall, J.A., 2016. Regional Patterns of Fish and Wildlife Harvests in Contemporary Alaska. Arctic 69, 47–64.

Figueroa, F., Sánchez-Cordero, V., Meave, J.A., Trejo, I., 2009. Socioeconomic context of land use and land cover change in Mexican biosphere reserves. Environ. Conserv. 36, 180–191. https://doi.org/10.1017/S0376892909990221

Folch, D.C., Arribas-Bel, D., Koschinsky, J., Spielman, S.E., 2016. Spatial Variation in the Quality of American Community Survey Estimates. Demography 53, 1535–1554.

https://doi.org/10.1007/s13524-016-0499-1

Fuwa, N., 2011. Should we track migrant households when collecting household panel data? Household relocation, economic mobility, and attrition biases in the rural Philippines. Am. J. Agric. Econ. 93, 56–82. https://doi.org/10.1093/ajae/aaq114

Ganley, E., Haehnel, G., Holden, B., Holden, J., Lowe, N., Modrow, S., Mowrey, D., Peirce, J., Pruitt, S., 2005. 2005 Alaska Housing Assessment Part I. Fairbank.

Gerkey, D., 2016. The Emergence of Institutions in a Post-Soviet Commons: Salmon Fishing and Reindeer Herding in Kamchatka, Russia. Hum. Organ. 75, 336–345. https://doi.org/10.17730/1938-3525-75.4.336

Goldsmith, S., 2007. The remote rural economy of Alaska.

Goldstein, G.S., Pauly, M.V., 1981. Tiebout bias on the demand for local public goods. J. Public Econ. 16, 131–143. https://doi.org/10.1016/0047-2727(81)90021-9

Gosnell, H., Abrams, J., 2011. Amenity migration: Diverse conceptualizations of drivers, socioeconomic dimensions, and emerging challenges. GeoJournal 76, 303–322. https://doi.org/10.1007/s10708-009-9295-4

Graves, P.E., Waldman, D.M., 1991. Multimarket amenity compensation and the behavior of the elderly. Am. Econ. Rev. 81, 1374–1381.

Haley, S., 2004. Institutional assets for negotiating the terms of development: Indigenous collective action and oil in Ecuador and Alaska. Econ. Dev. Cult. Change 53, 191–213. https://doi.org/10.1086/423258

Haley, S., 2000. Financing water and sewer operation and maintenance in rural Alaska. Anchorage, AK.

Hamilton, L.C., Saito, K., Loring, P.A., Lammers, R.B., Huntington, H.P., 2016. Climigration? Population and climate change in Arctic Alaska. Popul. Environ. 38, 115–133. https://doi.org/10.1007/s11111-016-0259-6

Harris, J.R., Todaro, M.P., 1970. Migration, Unemployment and Development: A Two-Sector Analysis. Am. Econ. Rev. 60, 126–142.

Heckman, J.J., 1976. The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables and a Simple Estimator for Such Models. Ann. Econ. Soc. Manag. 5, 475–492.

Heleniak, T., 2015. Arctic populations and migration, in: Larsen, J., Fondahl, G. (Eds.), Arctic Human Development Report. Nordic Council of Ministers, pp. 53–103. https://doi.org/https://doi.org/10.6027/TN2014-567

Heleniak, T., 2014. Migration in the Arctic, in: Heininen, L., Exnor-Pirot, H., Plouffe, J. (Eds.), Arctic Yearbook. Nothern Research Forum, pp. 82–104.

Howe, E.L., 2009. Patterns of migration in Arctic Alaska. Polar Geogr. 32, 69–89.

Howe, E.L., Huskey, L., Berman, M.D., 2014. Migration in Arctic Alaska: Empirical evidence of the stepping stones hypothesis. Migr. Stud. 2, 97–123.

Huskey, L., Berman, M., Hill, A., 2004. Leaving home, returning home: Migration as a labor market choice for Alaska Natives. Ann. Reg. Sci. 38, 75–92. https://doi.org/10.1007/s00168-003-0141-1

Huskey, L., Howe, L., 2010. The Complex Geography of Alaska Native Migration in the Arctic, in: Southcott, C., Huskey, L. (Eds.), Migration in the Circumpolar North: Lessons Learned, Questions Remaining. Canadian Circumpolar Institute Press.

Isserman, A.M., Feser, E., Warren, D.E., 2009. Why some rural places prosper and others do not, International Regional Science Review. https://doi.org/10.1177/0160017609336090

Jauhiainen, J.S., 2009. Will the retiring baby boomers return to rural periphery? J. Rural Stud. 25, 25–34. https://doi.org/10.1016/j.jrurstud.2008.05.001

Kahn, M.E., 2000. Smog Reductions Impact on California County Growth. J. Reg. Sci. 40, 565–582.

Kerkvliet, J., Nebesky, W., 1997. Whaling and wages on Alaska's north slope: A time allocation approach to natural resource use. Econ. Dev. Cult. Change 45, 651–665. https://doi.org/10.1086/452295

Knapp, T. a., Graves, P.E., 1989. On the role of amenities in models of migration and regional development. J. Reg. Sci. 29, 71–87.

Kuminoff, N. V., Pope, J.C., 2012. The Value of Residential Land and Structures during the Great Housing Boom and Bust. Land Econ. 89, 1–29.

Kuminoff, N. V., Smith, V.K., Timmins, C., 2013. The New Economics of Equilibrium Sorting and Policy Evaluation Using Housing Markets. J. Econ. Lit. 51, 1007–1062.

Lucas, R.E.B., 1997. Internal migration in developing countries, in: Handbook of Population and Family Economics. Elsevier, Amsterdam; New York, pp. 721–798.

Petrov, A.N., 2008. Lost Generations? Indigenous Population of the Russian North in the Post-Soviet Era. Can. Stud. Popul. 35, 269. https://doi.org/10.25336/p6jw32

Poppel, B., 2014. Subsistence in the Arctic, in: Michalos, A.C. (Ed.), Encyclopedia of Quality of Life and Well-Being Research. Springer Netherlands, Dordrecht, pp. 6464–6466. https://doi.org/10.1007/978-94-007-0753-5_2910

Qi, W., Deng, Y., Fu, B., 2019. Rural attraction: The spatial pattern and driving factors of China's rural in-migration. J. Rural Stud. 1–10. https://doi.org/10.1016/j.jrurstud.2019.03.008

Sandberg, E., 2018. Migration in Alaska, Alaska Economic Trends.

Sørensen, J.F.L., 2018. The importance of place-based, internal resources for the population

development in small rural communities. J. Rural Stud. 59, 78–87. https://doi.org/10.1016/j.jrurstud.2018.01.011

Spielman, S.E., Folch, D., Nagle, N., 2014. Patterns and causes of uncertainty in the American Community Survey. Appl. Geogr. 46, 147–157. https://doi.org/10.1016/j.apgeog.2013.11.002

Stephen R. Braund & Associates, 2018. Description of Alaskan Eskimo Bowhead Whale Subsistence Sharing Practices Including an Overview of Bowhead Whale Harvesting and Community-Based Need Final Report Acknowledgements.

Stockdale, A., 2016. Contemporary and 'Messy' Rural In-migration Processes: Comparing Counterurban and Lateral Rural Migration. Popul. Space Place 22, 599–616. https://doi.org/10.1002/psp.1947

Taylor, E.J., Martin, P.L., 2001. Human Capital: Migration and Rural Population Change. Handb. Agric. Econ. 1, 457–511. https://doi.org/10.1016/S1574-0072(01)10012-5

Tiebout, C., 1956. A Pure Theory of Local Expenditures. J. Polit. Econ. 64, 416–424.

U.S. Census Bureau, 2006. Design and Methodology - American Community Survey\n. Tech. Pap. 423.

United States Census Bureau, 2017. American Community Survey Design and Methodology Chapter 7: Data Collection and Capture for Housing Units.

US Census, 2010. US Census 2010 Summary Data Files 1-4.

US Census, 2000. US Census 2000 Summary Data Files 1-4.

Wang, S., 2019. Net Migration in the Arctic [WWW Document]. Nordgregio. URL https://nordregio.org/maps/net-migration-in-the-arctic/

Wang, Z., Chen, L., 2019. Destination choices of Chinese rural–urban migrant workers: Jobs, amenities, and local spillovers. J. Reg. Sci. 59, 586–609. https://doi.org/10.1111/jors.12444

White, M.J., Lindstrom, D.P., 2019. Internal Migration, in: Poston Jr. D. (Ed.), Handbook of Population. Springer, Cham. https://doi.org/https://doi.org/10.1007/978-3-030-10910-3_16