# Do better property rights improve local income?:

## Evidence from First Nations' treaties

## Online Appendix

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## A   Description of variables

Note: I use bold and italics format (e.g. ***varname***) to refer to variables from the Census raw microdata.

- age: Age (in years), same as ***age***.

- band population: number of individuals living on reserves held by band.

- CSD population: Population size of CSD of residence, same as ***pop***.

- dwelling needs major repairs: Dummy equal to 1 if dwelling needs major repairs: ***rpair***==3.

- educational attainment: Highest education level. This variable is based on ***hcdd*** for 2006, and in ***hlos*** for previous years. This variable identifies the minimum comparable categories of ***hcdd*** and ***hlos*** to make them comparable over time. Categories are: 0 "Non applicable", 1 "None (less than high school certificate)", 2 "High school certificate", 3 "Above High school but below Univ bachelor degree (incl trades, college , etc)", 4 "University bachelor level or above" and 5 "Masters and PhDs".

- employed: Dummy variable equal to 1 if individual is employed, conditional on being in labor force. Individual is considered employed if ***lf71*** is between 1 and 5.

- employment income: Real income from employment sources (***empin***/local CPI).

- female: Dummy equal to 1 if individual is female: ***sex***==1.

- <u>government transfers</u>: Real income from government transfers (***govti***/local CPI).

- <u>high school completed</u>: Dummy equal to 1 if individual's highest education level is high school or above: educational attainment$>= 2$ (see above for definition of education attainment).

- <u>hours work</u>: Hours per week worked for pay or in self-employment, same as ***hours***

- <u>house value</u>: Dwelling value, same as ***value***.

- <u>house rent</u>: Gross house rent, same as ***grosrt***.

- <u>household size</u>: Number of household members in survey (i.e. 15 years and older), equal to maximum of ***persno*** by household.

- <u>labor force</u>: Dummy equal to 1 if individual is part of the labor force (i.e., employed or seeking a job).

- <u>lived in same CSD 5 years ago</u>: Dummy equal to 1 if individual lived in same CSD 5 years ago: ***mob5***$>= 4$ & ***mob5***$<= 5$.

- <u>industry of occupation</u>: Industry division, based on the SIC 1980. This variable is equal to ***inddivf*** for year 2001. For 1991 and 1996, I obtain industry divisions from variable ***ind80***, which also uses SIC 1980. For year 2006, I use variable ***naics97***. I use information from 2001 to construct a translator from NAICS 1997 to SIC 1980.

- <u>is treaty band</u>: Dummy equal to 1 if CSD corresponds to an Indian reserve held by a band that implemented a treaty between 1991 and 2006.

- <u>nominal income</u>: individual income: ***totinc***.

- <u>Nr. rooms</u>: Number of rooms in dwelling, same as ***rooms***.

- <u>labor force</u>: Dummy equal to 1 if indvidual, age 15 or older, is in labor force, i.e, employed or unemployed.

- <u>labor force activity</u>: Same as ***lf71***. Categories are: 1 "Employed - absent in reference week - Armed Forces", 2 "Employed - absent in reference week - Civilian", 3 "Employed - unpaid family worker", 4 "Employed - paid - Armed Forces", 5 "Employed - paid - Civilian", 6 "

Not in labor force - Excluding institutional residents", 7 " Not in labor force - Institutional residents", 8 "Unemployed - Looked for work - experienced", 9 "Unemployed - Looked for work - inexperienced", 10 "Uenmployed - On temporary layoff".

- <u>other income</u>: Real income from sources other than employment, government transfers, or unemployment benefits = ( **totinc** - **empin** - **govti** - **uicbn**)/local CPI.

- <u>owns house</u>: Dummy equal to 1 if dwelling is owned by a member of the household: **tenur** ==3

- <u>primary maintainer</u>: Dummy equal to 1 if individual is primary maintainer: **hmain**==3

- <u>real income</u>: individual income in 1991 CAD: **totinc**/local CPI.

- <u>real wage</u>: Implied hourly wage in 1991 CAD:(**wages**/52)/**hours**)/local CPI.

- <u>registered Indian</u>: Dummy equal to 1 if individual is registered Indian, i.e,. has official Indian status: **rgindr**==2.

- <u>sef-government implemented</u>: Dummy equal to 1 if the CSD corresponds to an Indian reserve held by a band that started implementing a self-government agreeement before the Census year.

- <u>treaty implemented</u>: Dummy equal to 1 if the CSD corresponds to an Indian reserve held by a band that started implementing a treaty before the Census year.

- <u>unemployment benefits</u>: real income from employment insurance benefits (**uicbn**/local CPI).

- <u>urban</u>: Dummy equal to 1 if individual lives in urban area.

# B   Local consumer price index

I construct a band-specific local consumer price index using information on local housing costs. The index resembles the local CPI 1 in Moretti (2013).

To construct the index, I first obtain measures of housing costs at band level. Following Moretti, my preferred measure of housing costs is house rents. In particular, I take the average

gross rent paid by tenants in a band and normalize it to be 1 in 1991. There are, however, several cases with no information on rental costs over time. In those cases, I use self-reported house prices instead. Note that the change in housing costs does not reflect individual changes but instead the average conditions in local housing markets.

Second, I obtain measures of non-housing costs using consumer price indexes at province level. In particular, the non-housing cost for a band in province $p$ in year $t$ is $\frac{CPI_{pt}-w_pH_{pt}}{1-w_p}$, where $CPI_{pt}$ is the aggregate consumer price index, and $H_{pt}$ is the price index of shelter costs at province level. $w_p$ is the expenditure share in shelter. The consumer price indexes and expenditure shares correspond to the 2009 basket.[1] I also normalize this measure of non-housing costs to be equal to 1 in 1991.

Finally I construct the band-specific local price index by taking a weighted average of housing and non-housing costs. As weights I use the province-level expenditure share of shelter costs. This weight varies for years 1986, 1992, 1996, 2001 and 2006 (Statistics Canada, 2013c).

## C   Additional figures and tables

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[1]The information on province-level price indexes and expenditure shares comes from Statistics Canada (2013a) and Statistics Canada (2013b).

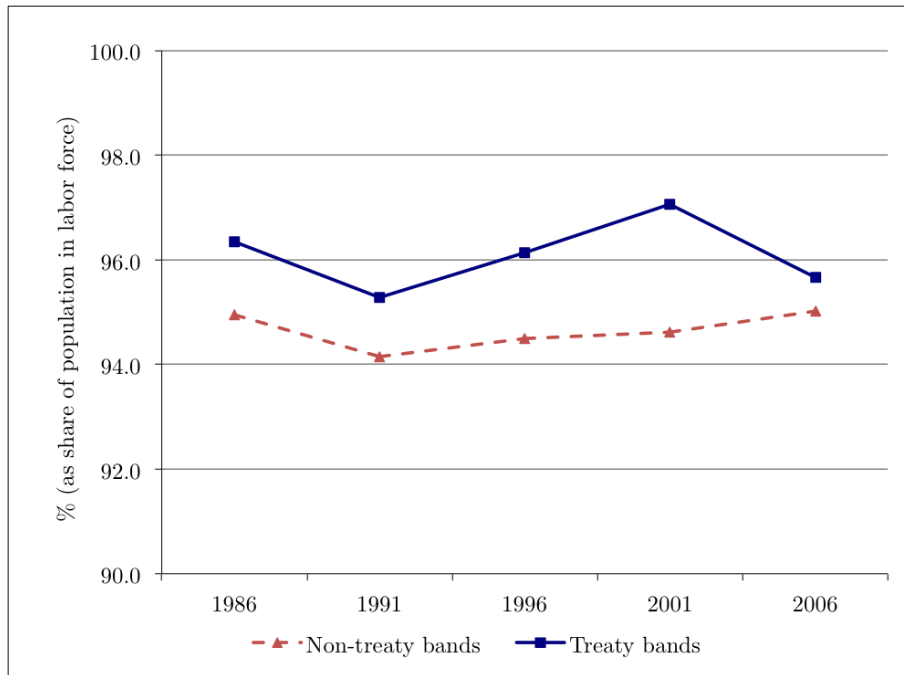Figure C.1: Employment rate in treaty and non-treaty bands, by Census year



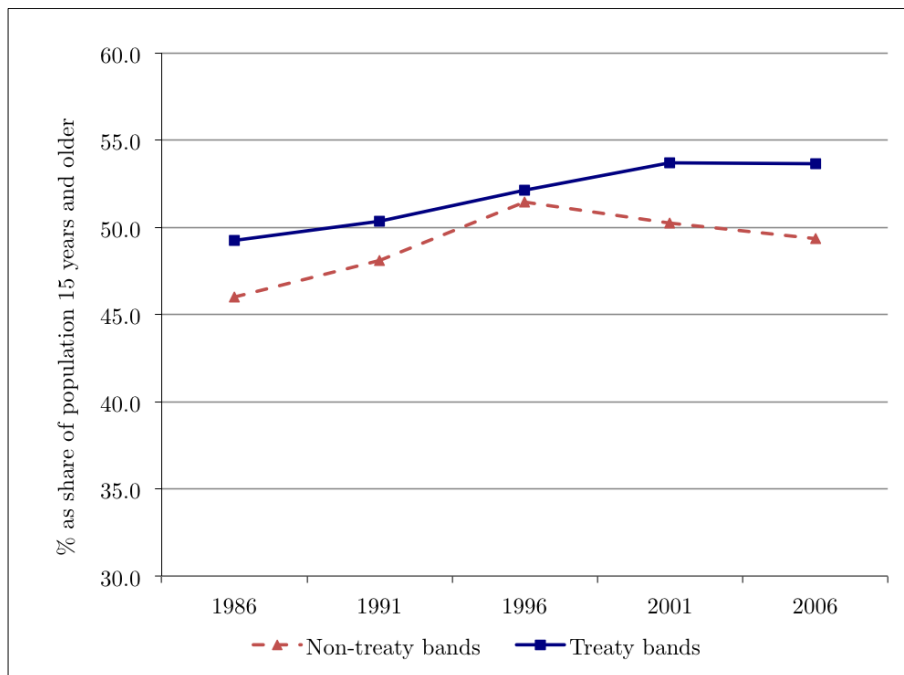Figure C.2: Participation rate in treaty and non-treaty bands, by Census year

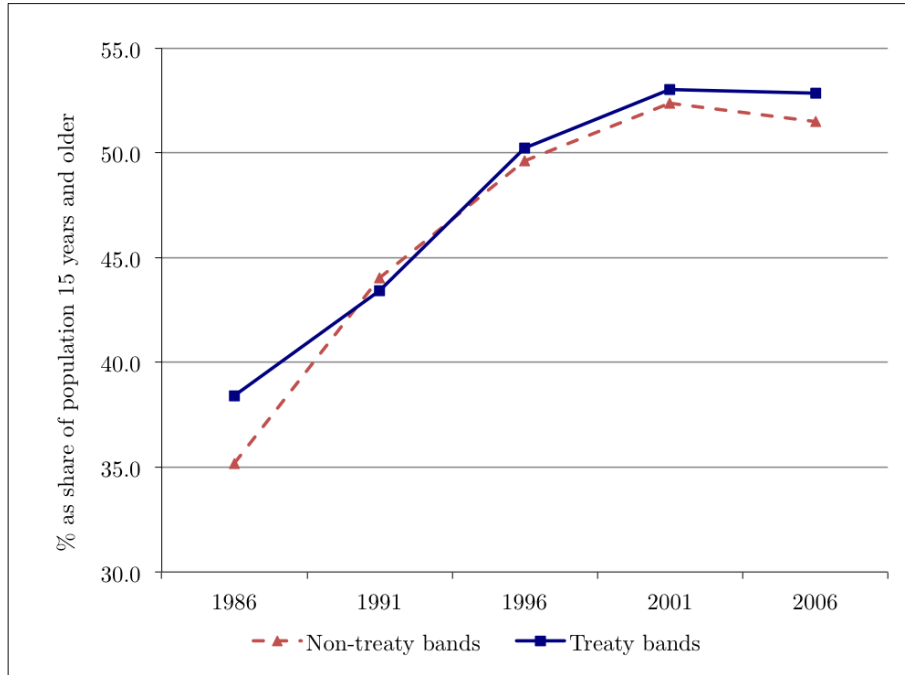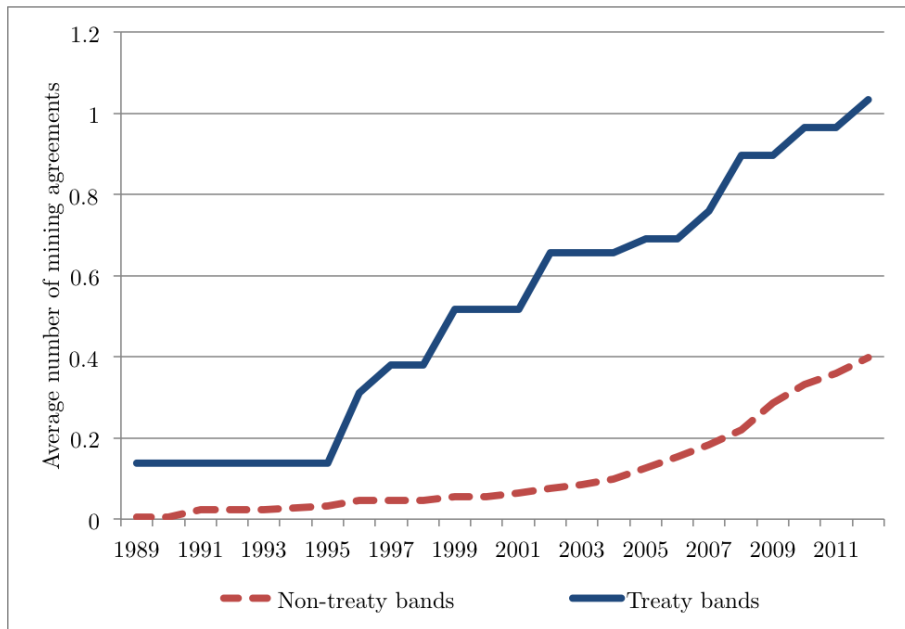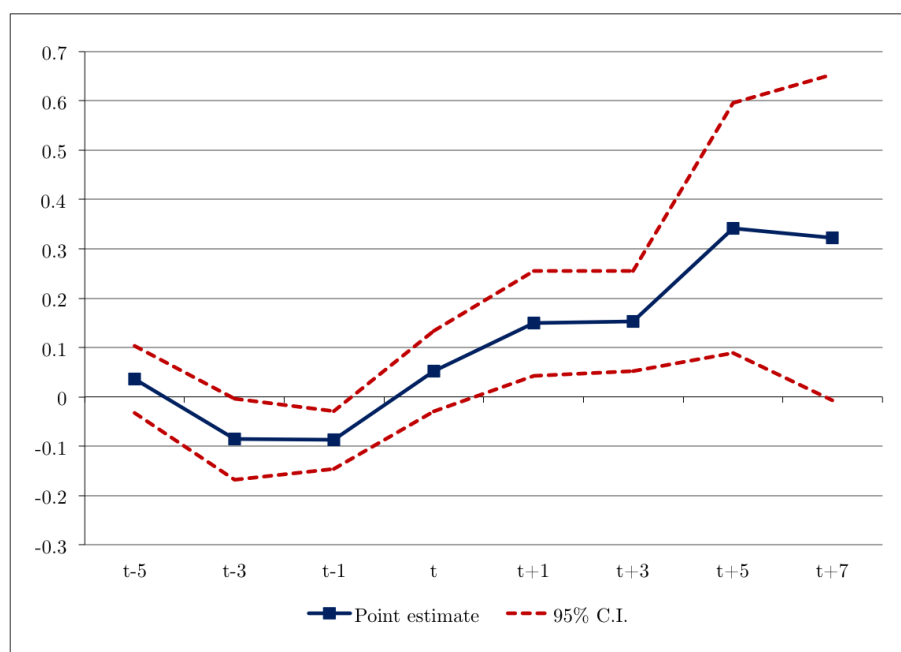Figure C.3: Share of high school graduates in treaty and non-treaty bands, by Census year



Figure C.4: Average number of mining agreements



Note: Sample includes only bands in BC, NT, and YK.

Figure C.5: Effect of treaties on mining agreements, by year since treaty implementation



Note: See footnote 67 for further details.

Table C.1: List of signatory bands, by implemented modern treaty

| Treaty id. (see Table 1) | Signatory bands |
|---|---|
| 1 | Tetlit Gwich'in, Gwichya Gwich'in, Aklavik, Inuvik Native |
| 2 | Tulita Dene, Fort Good Hope, Deline First Nation, Behdzi Ahda" First Nation |
| 3 | First Nation of Nacho Nyak Dun |
| 4 | Vuntut Gwitchin First Nation |
| 5 | Teslin Tlingit Council |
| 6 | Champagne and Aishihik First Nations |
| 7 | Little Salmon/Carmacks First Nation |
| 8 | Selkirk First Nation |
| 9 | Tr'ondëk Hwëch'in |
| 10 | Nisga'a Village of Gingolx, Nisga'a Village of New Aiyansh, Nisga'a Village of Laxgalt'sap, Nisga'a Village of Gitwinksihlkw |
| 11 | Ta'an Kwach'an |
| 12 | Dog Rib Rae, Wha Ti First Nation, Gameti First Nation, Dechi Laot'i First Nations |
| 13 | Kluane First Nation |
| 14 | Carcross/Tagish First Nations |
| 15 | Kwanlin Dun First Nation |

Table C.2: Characteristics of implemented modern treaties

| Treaty characteristics | Treaty id. (see Table 1) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Include self-government provisions | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Eliminate Indian reserves | ✓ | ✓ | | | | | | | | ✓ | | ✓ | | | |
| Include financial settlement | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Give bands a share on gov. resource royalties | ✓ | ✓ | | | | | | | | | | ✓ | | | |
| Give bands ownership of forests | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Give bands some mineral rights | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Give bands hunting, fishing, and harvestingrights | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Increase bands' participation in land use and resource management | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Increase bands' participation in management of local public services | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Create some local tax capacities | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Table C.3: Determinants of treaty implementation

|  | Is treaty band (1) |
|---|---|
| Longitude | -0.688*** |
|  | (0.246) |
| Latitude | 1.223* |
|  | (0.644) |
| ln(mean real income) | -3.586*** |
|  | (1.267) |
| ln(band population) | 4.681** |
|  | (2.076) |
| % workers in extractive industries | 29.67** |
|  | (15.11) |
| % workers in trade | -26.44 |
|  | (17.67) |
| % workers in public services | 14.61* |
|  | (8.485) |
| % workers in non-public services | 4.793 |
|  | (14.31) |
| % high school completed | 9.673 |
|  | (8.811) |
| % registered Indians | 4.168 |
|  | (4.252) |
| Participation rate | -3.271 |
|  | (9.000) |
| pseudo $R^2$ | 0.799 |
| Nr. of obs. | 145 |

Notes: Robust standard errors in parentheses. * denotes significant at 10%, ** significant at 5% and *** significant at 1%. Estimates obtained using a logit model. The unit of observation is a band in 1991. Each observation was obtained by aggregating micro-data at band level using sample weights. Regression uses only bands located on non-metropolitan areas in BC, YK and NT. *Is treaty band* is a dummy equal to 1 if band started implementing a treaty between 1991 and 2006.

Table C.4: Mean of main variables in 1986 and 1991, and D-i-D estimates

| Variables | Non-treaty bands | | Treaty bands | | D-i-D |
| | 1986 | 1991 | 1986 | 1991 | p-values |
| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Household size | 3.7 | 3.5 | 4.1 | 3.7 | 0.566 |
| Band population | 651.0 | 648.7 | 569.6 | 648.9 | 0.797 |
| Nr. rooms | 5.3 | 5.6 | 4.6 | 5.1 | 0.579 |
| House price | 42,408.7 | 61,330.3 | 40,276.5 | 52,830.6 | 0.319 |
| Urban | 0.118 | 0.010 | 0.000 | 0.000 | 0.268 |
| Nominal income | 11,672.7 | 14,611.2 | 12,650.5 | 15,339.8 | 0.882 |
| Real income | 14,478.8 | 14,611.2 | 15,961.3 | 15,339.8 | 0.684 |
| share_nonempin | 41.9 | 43.0 | 32.2 | 38.8 | 0.252 |
| Age | 38.5 | 39.1 | 38.9 | 38.5 | 0.345 |
| Female | 0.415 | 0.441 | 0.424 | 0.445 | 0.714 |
| High school or above | 0.352 | 0.440 | 0.384 | 0.434 | 0.570 |
| Primary maintainer | 0.461 | 0.461 | 0.444 | 0.429 | 0.528 |
| Labor force | 0.460 | 0.481 | 0.492 | 0.504 | 0.867 |
| Employed | 0.949 | 0.941 | 0.963 | 0.953 | 0.899 |
| Hours worked (per week) | 15.7 | 16.0 | 18.4 | 18.2 | 0.836 |
| Real wage | 11.9 | 11.0 | 12.2 | 12.3 | 0.496 |

Notes: Columns 1 to 4 display the mean for years 1986 and 1991 for both non-treaty and treaty bands. Means are calculated using sampling weights and rounded due to confidentiality requirements. Samples includes bands in non-metropolitan areas in BC, YK, and NT. Column 5 reports the p-values of significance test of a D-i-D estimate. Estimates obtained by regressing each outcome variable on a dummy for year 1991, variable "*is treaty band*", and the interaction term. Standard errors are clustered at band-year level.

Table C.5: Treaty implementation and real income, by period

|  | ln(real income) |
| --- | --- |
|  | (1) |
| Treaty implemented (t -5 to t-1) | 0.137 |
|  | (0.136) |
| Treaty implemented (t to t+1) | 0.122 |
|  | (0.122) |
| Treaty implemented (t+2 to t+3) | 0.627*** |
|  | (0.184) |
| Treaty implemented (t+4 to t+6) | 0.332** |
|  | (0.141) |
| Treaty implemented (t+7 to t+11) | 0.292** |
|  | (0.114) |
| Treaty implemented (t+12 and more) | 0.533*** |
|  | (0.122) |
|  |  |
| R-squared | 0.331 |
| Weighted nr of obs. | 115905 |

Notes: Robust standard errors in parentheses. Standard errors are clustered at band-year level. * denotes significant at 10%, ** significant at 5% and *** significant at 1%. The set of controls and sample is similar to baseline regression in column 1, panel A, in Table 4.

Table C.6: Employment and income shares of extractive industries

| Industry | % total employment | | % total income | |
| --- | --- | --- | --- | --- |
|  | 1991 | 2006 | 1991 | 2006 |
|  | (1) | (2) | (3) | (4) |
| Agriculture | 0.021 | 0.009 | 0.022 | 0.020 |
| Fishing and trapping | 0.045 | 0.014 | 0.055 | 0.020 |
| Logging and forestry | 0.073 | 0.024 | 0.097 | 0.049 |
| Mining, quarry and oil | 0.015 | 0.017 | 0.014 | 0.029 |
| Total | 0.154 | 0.063 | 0.189 | 0.117 |

Table C.7: Treaties and real income, using sample of less mobile population

|  | ln(real income) | |
| --- | --- | --- |
|  | (1) | (2) |
| Treaty implemented | 0.390 | 0.395 |
|  | (0.114)*** | (0.132)*** |
|  | [0.141]*** | [0.168]** |
|  | {0.139}** | {0.171}** |
| Sample | Individuals who lived in same CSD 5 years ago | Individuals who lived in same address 5 years ago |
| Weighted nr. of obs. | 95,295 | 71,940 |
| R-squared | 0.298 | 0.305 |

Robust standard errors clustered at band-year level in parentheses. Robust standard errors clustered at band level in brackets, and clustered at province-year level in braces. * denotes significant at 10%, ** significant at 5% and *** significant at 1%. Sample includes only individuals living in Indian reserves in non-metropolitan ares of BC, YK, and NT. The set of controls is similar to the baseline regression (column 1, panel A, in Table 4).

Table C.8: Treaties and housing characteristics

|  | Owns house (1) | Dwelling needs major repairs (2) | Number of rooms (3) | Persons per room (4) |
| --- | --- | --- | --- | --- |
| Treaty implemented | 0.004 | -0.030 | -0.034 | -0.017 |
|  | (0.019) | (0.016)* | (0.063) | (0.017) |
|  | [0.020] | [0.018] | [0.061] | [0.017] |
|  | {0.013} | {0.019} | {0.078} | {0.021} |
| Weighted nr of obs. | 59,260 | 59,260 | 59,260 | 59,260 |
| R-squared | 0.185 | 0.059 | 0.215 | 0.609 |

Notes: Robust standard errors clustered at band-year level in parentheses. Robust standard errors clustered at band level in brackets, and clustered at province-year level in braces. * denotes significant at 10%, ** significant at 5% and *** significant at 1%. All regressions include band and year fixed effects. Sample definition and control variables are similar to the baseline regression (column 1, panel A, in Table 4), but the unit of observation is the household. In case of individual level variables, they correspond to the household's principal maintainer.

Table C.9: Treaties, population, and migration in neighbouring areas

| | ln(CSD pop.) | Lived in diff. CSD 5 years ago |
|---|---|---|
| | (1) | (2) |
| Within 10 km of reserves held by bands with treaty implemented | 0.402 [0.719] | 0.034 (0.043) [0.013]** 0.042 |
| Weighted nr. of obs. | 46 | 20635 |
| R-squared | 0.268 | 0.051 |

Notes: Robust standard errors clustered at CSD-year level in parentheses. Robust standard errors clustered at level in brackets, and clustered at province-year level in braces. * denotes significant at 10%, ** significant at 5% and *** significant at 1%. The sample includes individuals living in Census subdivisions within 10 kilometers of Indian reserves held by treaty bands. It excludes individuals living on Indian reserves. All regressions include census subdivision and year fixed effects. Column 2 uses data aggregated at CSD-year level.

# References

**Moretti, Enrico**, "Real wage inequality," *American Economic Journal: Applied Economics*, 2013, *5* (1), 65–103.

**Statistics Canada**, "Table 326-0021 - Consumer Price Index (CPI), 2009 basket, annual (2002=100 unless otherwise noted) CANSIM (database)," Accessed on November 27, 2013 at `http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=3260021&paSer=&pattern=&stByVal=1&p1=1&p2=37&tabMode=dataTable&csid=`. 2013.

⸺ , "Weighting Diagram of the Consumer Price Index - 2009 Basket at 2009 Prices, Canada, Provinces, Whitehorse and Yellowknife," Accessed on November 27, 2013 at `http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getDocumentationLink&Item_Id=113531&qItem_Id=113530&TItem_Id=113530&lang=en&db=imdb&adm=8&dis=2`. 2013.

⸺ , "Weights for the Consumer Price Index, several years," Accessed on November 27, 2013 at `http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getDocumentation&Item_Id=138353&TItem_Id=138353&lang=en&db=imdb&adm=8&dis=2`. 2013.