



Responsible Land Governance: Towards an Evidence Based Approach

ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY
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MEASURING INFORMAL HOUSING & ITS SOCIO-ECONOMIC OUTCOMES: FIRST NATION RESERVES IN CANADA

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Abstract

Informal land holdings on Canadian Indian Reserves are not recognized under the *Indian Act*. To estimate whether informal land holdings hinder economic development, this paper presents a method for measuring informal housing (a measure of informality) using spatial data from the Indian Lands Registry. This paper examines 169 Reserves in British Columbia and Ontario for whom Community Well-Being (CWB) data is available. CWB, used as a measure of development, is an aggregate of Income, Education, Housing, and Labour Force Activity. Using OLS and SUR techniques, the findings highlight a negative relationship between informal housing and CWB. A 10% increase in informal housing leads to a CWB decrease of 0.9 points for BC and 0.83 points for Ontario. Informality significantly hinders development for the Reserves studied. The main contribution of this paper is a tool to empirically calibrate informal land holdings on Reserve and a methodology to examine its impact on development.

Key words:

Informality, Indigenous lands, socio-economic outcomes, community well-being

This paper does not necessarily reflect the views of Natural Resources Canada or the Government of Canada



1. Introduction

By any standard, Canada's First Nations who live on Reserves are less well-off than the national average. There are some 400,000 First Nations peoples living on Indian Reserves across Canada. Reserve land is held in trust by the Crown and managed by Indigenous and Northern Affairs Canada (INAC), as per the *Indian Act*. Land holdings on Reserve are formally recognized under the *Indian Act* through Certificates of Possession and Leases. However, a largely unknown portion of Reserve land-holdings are informal (not recognized by the *Indian Act*, and not under the purview of INAC). Economic theory suggests that informal land holdings are economically inefficient. The lack of formal property rights supposedly increases uncertainty over ownership, increases transaction costs, and reduces incentives to invest (e.g. infrastructure, resource extraction). There have been recent developments to eliminate customary holdings through a process of registration and formalization.¹ These are significant undertakings based on the theory that customary holdings are wholly detrimental to economic development.

However, the reality is more ambiguous. Some Reserves with a large degree of customary holdings have very poor socio-economic conditions; whereas others have a standard of living similar to the national average. There are many manifestations of informality and many motivations (cultural, spiritual, and historical). Focusing on Reserves in British Columbia and Ontario, this paper contributes to the literature in two manners. Firstly, there exists no methodology for determining the extent of informal land holdings; no central database documents these holdings. The method developed here, using spatial data from the Indian Lands Registry and the Canada Lands Survey System, will be of use to future researchers. Secondly, the results from the regression analysis undertaken suggest that informality significantly reduces economic outcomes. This is a result that runs parallel to the existing body of economic theory.

Section 2 is a review of the existing literature concerning formal and informal property rights. Section 3 is an overview of the land tenure regimes on Canadian Indian Reserves. Section 4 concerns the methodology used in this research. Sections 5 and 6 present the findings and section 7 concludes.

¹ These include the *First Nations Land Management Act* (in operation) and the Indigenous Land Titles Initiative (in development).



2. Background

2.1. *Classic economic theory of formal land tenure, from theory to practice*

The issue of informality of land tenure on Indian Reserves is often viewed through the lens of classical economic theory, in which formal tenure of land increases incentives to invest, lowers transaction costs, increases bargaining efficiency, lowers costs of defense, internalizes externalities, and increases economic efficiency.

A supplementary theory put forth by Hernando de Soto in *The Mystery of Capital* (2000) holds that valid title allows owners of real property to collateralize this asset and use the resulting loan to lift themselves out of poverty and into the formal economy. *The Mystery of Capital* was in response to the people living on the periphery of major cities, extra-legally, in slums, shantytowns, barrios, and favelas. It is fair to say that the book was widely embraced and inspired countless urban land-titling reform projects. Many of these, such as the Commission for the Official Registration of Informal Property (COFOPRI), in Peru, reduced the time to obtain a title from 7 years to 45 days (Dubé, 2015, 9). Since its creation, COFOPRI has issued roughly two million property titles.

Despite such international excitement, having valid title to land does not increase an applicant's access to credit. The most glaring counterexample was in Peru between 2000 and 2003. More than half of all credit granted by legal financial institutions in Peru was to people who did not need to demonstrate that they had valid title to land. Banks did not use valid title to secure loans. This is not exclusive to Peru. In Africa, Brazil, India, and other developing countries, it is clear that formal titles did not facilitate credit accumulation (Payne, et al., 2009). This is also the case in Canada; when applying for a mortgage, banks are not concerned with the applicant's title to land. The bank is concerned with the ability of the applicant to repay and, as such, typically demands proof of employment and income.

However, while increased collateralization has largely failed to transpire, formal property rights in the developing world – specifically for urban slums – have been shown to improve several economic outcomes. In Peru, those with formal title feel less need to physically defend their house from eviction and can afford to increase their labour force participation (Field, 2007). Furthermore, in the former slums around Buenos Aires, those with title invest more in their infrastructure, have a reduced fertility rate, smaller household size, and have higher educational outcomes (Galiani & Schargrodsky, 2005). In Canada, formal property rights in the form of modern treaties reduce transaction costs, increase resource extraction on traditional Aboriginal lands, and increase local income for participating First Nations



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(Aragon, 2015). Although increased collateralization has not been observed, formality in property rights has a variety of positive implications for economic growth.

Despite this, there has been an observed reversion back to informal land holdings in the developing world. This reversion flies in the face of classic economic theory and is of great interest – and perhaps concern – to policy-makers. Galiani and Scharfrodsky published an initial paper in 2006 concerning former squatters on the outskirts of Buenos Aires. It is in this paper that the improvements in education, physical infrastructure, and fertility following formalization are first observed. They returned in 2011 to observe that a fair proportion of households had reverted back to informality. This de-regularization typically occurs after formalization is challenged (i.e. death, divorce, sale). Similarly, many households in Peru have reverted back to informality following the initial COFOPRI program. One studied example is of parents, who own their house formally, making informal additions to house their grown children and their families. Being informal, it is not clear who legally owns the supplementary units. It is estimated now that a mere 21 percent of second property transactions in Peru’s recently titled areas are being registered formally (Dubé, 2015). In the case of Argentina and of Peru it appears that the costs of regularization exceed the benefits. The quality of the property is too low to justify the costs associated: “titling premiums on these low value parcels is insufficient to justify the legal costs of remaining formal” (Galiani & Scharfrodsky, 2011, abstract).

Informality in land tenure is not always a binary phenomenon. The land may be formal, but the house not. The occupation may be illegal but the dwellers may pay rent. Experts tasked with monitoring informality often have a difficult time accurately measuring informality. There are several definitions of housing informality: security of tenure; access to public utilities; compliance with urban norms; and the physical quality of housing (Smolka & Biderman, 2009). This paper seeks to strip away any ambiguity and focus on informality of land at its most elemental form: security of tenure.

2.2 Theories of informality

Within contemporary economic thought, there is a tendency to see formality as unambiguously good and informality as unambiguously bad. This view regards formality as the application of law and reason, and informality as the existence of chaos and incoherence. However, by definition, informality is merely the absence of an invariable formality, and can take a variety of forms. Ellickson (1993) states that “customary land rules are not a shapeless jumble, but instead form an unauthored strategy that cleverly allocates a prized resource with confusingly complex attributes” (p. 1319). Formality is the extension of



static law, and exists as a static definition of property rights. Meinzen-Dick and Pradhan (2002) articulate how, rather than a static definition of property rights, there is a multitude: state, customary, religious, project, and local laws. While this can create confusion and uncertainty, especially in times of conflict, the dynamism of the property rights offers flexibility for people in dealing with land. This dynamism in property rights is lost after the introduction of a static statutory legal framework. Thus, informality can be the perfectly viable outcome of a heterogeneous populous dealing with a heterogeneous resource.

Fundamentally, successful informal land regimes are not divorced from the people to whom they apply. In “many social contexts, land rules arise not so much from law as from customary norms that are enforced through diffuse social sanctions” (Ellickson, p. 1319). Williamson and Kerekes (2011) examined what makes property rights secure. They undertook regression analysis to gauge how culture – a proxy for ‘informal institutions’ – effectively secures property rights. Culture was measured as a combination of levels of trust, respect, control, and obedience. The results found that informal institutions are the underlying channels that secure well-defined property rights. Formal institutions have no significant effect on securing property. These results underscore the importance of informality. Instead of being tossed aside wantonly, informality deserves consideration when examining the link between land, property rights, and economic development.

3. Indian Reserves in Canada

3.1. Background

Although Canada is a developed country, its prosperity is not equally shared amongst all groups of its citizens. First Nations lag in income attainment, rate of employment, quality of housing, years of education, and life expectancy (Flanagan & Beauregard, 2013, p. 1). There are roughly 600 First Nation communities (Indian Reserves) across Canada. To be clear, each First Nation community is comprised of five Reserves on average, meaning that there are roughly 3,100 Reserves in total. Reserves come into being either through treaty (by which Aboriginal peoples ceded their traditional lands to the Crown), Order in Council (an order of the Privy Council – Cabinet), or – more recently – Ministerial Order (from the Minister of Indigenous Affairs and Northern Development - ‘INAC’).



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INAC uses the Community Well-Being metric (CWB) to measure the socio-economic condition of each First Nation community. The CWB is derived from census data and is an aggregate representation of a community's level of income, education, employment, and housing quality, scored from 0 to 100.² Some communities enjoy a very high CWB, similar to the Canadian average. Others live in near developing-world conditions. Understanding and addressing the causes of this discrepancy is a matter of national concern.

The land tenure regime for most Reserves is set by the *Indian Act*. Most responsibilities for land management fall to INAC; the First Nation's role is negligible. The land tenure regime on Reserve differs greatly from the land tenure regime off-Reserve. All lands reserved for First Nations are held by the Crown to be used by the First Nation. The *Indian Act* provides a statutory basis for formal property rights on Reserve. The strongest form of property right is the Certificate of Possession (CP). Introduced in the 1951 *Indian Act*, s.20, the CP provides Band members with statutory property rights pertaining to individual tracts of Reserve land. With the CP, underlying (allodial) title remains with the Crown, the certificate is registered in the Indian Land Registry System (ILRS) and is recognized by the courts. The CP is allocated by Band council and is approved by the Minister of INAC. The CP can only be sold or bequeathed to a Band member.

The *Indian Act* also allows for three types of leasing of Reserve land: short-term, long-term, and leases granted on behalf of a CP holder. Non-members can lease Reserve land. All leases and permits are approved by the Band Council and the Minister and are issued by INAC. As formal instruments, they are registered in the ILRS.

Customary holdings refer to all informal land tenure on Reserve. These holdings are not considered lawful possession under the *Indian Act*; their existence follows the First Nations choosing to 'opt out' of the *Indian Act* (as it pertains to land management). Customary holdings are created through a range of mechanisms: they are granted by Chief and Council to a member, granted from one member to another, granted to a non-member, or held by a family since time immemorial. They may be granted with documentation typically associated or not (verbally, per oral traditions). Their creation is not overseen by INAC or the Minister, they have no legal status, and are not enforceable in Canadian courts. This is significant informal land tenure for a developed country with very robust legal institutions.

² There are issues concerning the CWB regarding the response rate to the census of certain Reserves. These issues are more explicitly outlined in the methodology section.



3.2 Rethinking the Indian Act

Examining how customary holdings impact development is crucial to the current discussion about land management on Canadian Reserves. As First Nations continue to occupy a growing portion of the national consciousness, the policy and governance of Reserve land is evolving. The Report of the Standing Committee on Aboriginal Affairs and Northern Development, “Study of land management and sustainable economic development on First Nations Reserve lands,” (Warkentin, 2014), summarizes the perceived issues and makes recommendations. The oversight from INAC, concerning formal holdings, impedes and delays simple land transactions on Reserve (such as mortgages and development). These transactions require multiple approvals and can take up to five times longer to complete in comparison to formal land transactions off-Reserve. The committee heard that this greatly hinders economic development and discourages transactions and investment. The recommendations include: enhance land-use planning on Reserve; lift restrictions whereby property cannot be used as collateral; streamline department procedures; and, crucially, document and register customary holdings.³

The Indigenous Land Title Initiative (ILTI) is proposed as an alternative lands-management regime in *Beyond the Indian Act: Restoring Aboriginal Property Rights* (Le Dressay, Flanagan, & Alcantara, 2010). ILTI is not operational; legislative nuances are being ironed out. This is a rejection of the *Indian Act*, whereby participating First Nations will have their Reserve land transformed into fee-simple ownership with a Torrens system of titling, rather than deeds. This will abolish all Certificates of Possession, leases, and customary informal holdings, and would create ownership of land identical to how people off-Reserve own land. This will eliminate Crown oversight, reduce uncertainty over ownership, increase incentives to invest, attract outside investors, and – the theory goes – grow the local economy. Championed by at least eleven First Nations, ILTI is a bottom-up initiative with voluntary opt-in. Despite the fact that it is voluntary, ILTI is opposed by some First Nations.

Another reform, this one operational, is the *First Nations Land Management Act* (FNLMA). The FNLMA was enacted in 1997 with the purpose of delegating responsibility for 40 land management functions from INAC to participating First Nations. Nineteen years on, there are 57 First Nations that are operational under FNLMA and another 55 that are in the development stage (in the queue to become operational). FNLMA is a bottom-up, grass-roots initiative proposed by 13 First Nations in the 1990s, led by Westbank First Nation, in central British Columbia, and Whitecap Dakota, in central Saskatchewan.

³ The recommendation to document and register customary land holdings has no clear advocates. That is to say, the recommendation exists despite a lack of empirical evidence.



Such passion for a different regime has led to the creation of a Lands Advisory Board (and its subsidiary, a Resource Centre) to assist First Nations making the transition between regimes. Flanagan and Beauregard (2013) found that participating First Nations have a higher CWB, but this correlation may reflect self-selection or selection bias. Chen (2015) and Knauer (2010) found that the FNLMA has no significant impact on economic outcomes, but these results are based on a very small sample over a very short time. Alcantara (2007) undertook a comparative case analysis to determine how adoption of the FNLMA reduces transaction costs in land transactions. KPMG (Alexander, 2014), the global auditing company, also undertook a comparative case analysis based on survey data to determine the change in economic development following the adoption of the FNLMA. The anecdotal evidence suggests an increase in investment, in new businesses, and in job opportunities.

3.3 Extent of formality

Formality on Reserve is not evenly distributed throughout Canada. In 2012, there were 40,841 Certificates of Possession, mainly concentrated in British Columbia, Ontario, and Quebec. This amounts to 113,032.76 hectares, equivalent to 2.93 percent of total Reserve area. Brinkhurst and Kessler (2013) used regression analysis to examine why the Certificate of Possession is used so infrequently and so unevenly. Their use, it turns out, requires a relatively educated community, low levels of poverty, and a favourable geographic location. Furthermore, the CP is not primarily used to stimulate economic development.

The extent of informality on Canadian Reserves is largely unknown. As Flanagan and Beauregard write: “there are probably tens of thousands of customary rights on Canadian Indian Reserves, but no one is sure of the number because there is no central list of such land holdings” (2013, p. 9). Furthermore, their existence has largely been ignored by empirical researchers. Bastien (2006) estimated that 50 percent of all Bands do not use the *Indian Act* system of lands registry at all. In 2006, 272 out of 577 Bands were not using the ILRS. Of the 286 Bands using it, 97 were doing so very minimally. It is important to note that many Reserves comprise a mixture of formality and informality (a mixture of the CP, leases, and customary holdings).

There is no single manifestation of informality on Reserve. The Uashat Reserve in Quebec has a Wal-Mart on a CP parcel and residential subdivisions on customary holdings. Many western First Nations, such as Siksika Nation, Piikani Nation, and Blood Tribe have customary rights formalized under survey, registration, Band Council Resolution, community recognition, and dispute resolution. Millbrook



First Nation in Nova Scotia has a well-surveyed subdivision of homes; Mount Currie in British Columbia has an effective mapping system in place. Members of Cowichan Tribes in BC are able to obtain mortgages for their informal holdings from the Canadian Mortgage and Housing Company (CMHC).

The range of informality on Reserve creates a range of socio-economic outcomes. Some are equitable, some are not. For example, the Blood 148 Reserve in Alberta – Canada’s largest Reserve at 1413.87km² – has most of the land owned by 12 percent of the people. This is a very inequitable outcome of informality, and is reflected in the relatively low CWB score of 47. Millbrook First Nation has a more equitable distribution of land and has a significantly higher CWB score of 68.⁴ (The national average in 2011 was 79; the First Nations average was 59.)

In sum, too little is known of informal holdings. Far more research must be undertaken. For example, little is understood as to why informal holdings arise at all. Do they arise as a rejection of the *Indian Act*, as a choice by the First Nation to keep the state at arm’s length? This is plausible as, historically, many First Nations have suffered losses of land, culture, and sovereignty through actions of the state. Further, are informal holdings seen as more efficient than dealing with INAC? Do they eliminate transaction costs? Or, are informal holdings a rejection of the commodification of land, a rejection of the view that holds land as units of production? Clearly, informality on Reserve is not borne from only one seed. Neither does it bear only one fruit. The success of informality for some First Nations must give pause to the mantra that informality is the path of poverty and formality is the path of prosperity (Alcantara & Flanagan, 2002).

4. Methodology

There are 198 First Nations in BC and 139 in Ontario (INAC, 2015). Population is not spread out evenly across all Reserves for a First Nation; there is usually a population centre in one Reserve. As such, this research focuses on the main Reserve for each First Nation. However, a number of First Nations in BC and Ontario have opted out of the *Indian Act* with regards to land management and manage their land under the *First Nations Land Management Act*. These Reserves do not have instruments registered in the ILR, and this brings the sample size down to 143 in BC and 128 in Ontario (LABRC, 2016). Further research must be undertaken to explore why certain First Nations enter the FNLMA to determine whether

⁴ CWB scores are gleaned from CWB data publicly available on INAC’s website.



there is selection bias at play in the creation of this Reserve sample. Given these parameters, what follows below is a description of the constructed cross-sectional dataset.

There are obvious issues concerning external validity when choosing to focus solely on Reserves in BC and Ontario. Firstly, BC was largely ignored by historic treaties. There are 111 First Nations bands in BC, roughly 70% of the Indigenous population, currently participating in the treaty process (Aragon, 2015). Furthermore, the mountainous geography of BC led to the development of a large number of First Nations and a fragmented mosaic of Reserves. Also, both Ontario and BC have a higher level of Certificate of Possession ownership than First Nations in the prairies (Flanagan, 2016). Lastly, Ontario also has more remote First Nations than any other region in Canada. Although the findings may be confined to BC and Ontario, the methodology developed can be used on a national scale.

The dependent variable reflects the state of economic development on Reserve: the *Community Well-Being Index (CWB)*. CWB is a metric used by Indigenous and Northern Affairs Canada (INAC) and is created using data from the Statistics Canada 2011 Census of Population and the National Household Survey (NHS). The CWB, a value between 0 and 100, is an aggregate metric of a Reserves level of income, education, housing, and labour force activity. *Income* captures total income per capita; *education* captures how many members have at least a high school education and how many a university degree; *housing* reflects if homes are overcrowded or in need of repair; *labour force activity* is a standard employment metric. CWB is a very informative tool, but it is by no means perfect. Each of the four indicators is equally weighted (which may seem arbitrary). However, these disaggregated indicators are presented as well, which allows an examination of the impact of informality on *education, housing, income, and labour force activity*.

Data concerning First Nations in Canada is far from perfect. An Indigenous Population Profile is not available for every First Nation on the National Household Survey website. Statistics Canada outlines three possible reasons: the census area does not meet the threshold of 250 of Indigenous population; the data has been suppressed for confidentiality reasons; some Reserves are incompletely enumerated as some opt out of the census (Statistics Canada, 2011). As such, a CWB indicator is only available for 169 Reserves in BC and Ontario. Furthermore, only 78 Reserves have data for the measurements of education, labour force activity, income, and housing.

The independent variable of interest is the extent of informality on Reserve: the *proportion of housing that is informal*. Under the *Indian Act*, all houses that are not considered formal are by definition informal. CPs and leases (formal holdings) are registered in the ILR, and everything else on Reserve is taken as informal. The Electronic Registry Index Plan (eRIP) available on the ILRS provides electronic



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maps using Geographic Information System (GIS) technology. These maps are dependent on the Parcel Identification Number between the ILRS and the NRCan Canada Land Survey System (CLSS). The eRIP shows how land is held on each Reserve. Certificates of Possession are shown in orange on the eRIP; leases, in stripes. Using the eRIP's tools, informal houses outside parcels with CPs or Leases were manually counted for each Reserve (see Figure 1). The total number of houses on each Reserve (the sum of informal and formal) is per the 2011 Census – National Household Survey (NHS). This paper defines *informality* as the ratio of housing on Reserve held outside CPs and Leases.

To counter the issue of omitted variable bias, this paper includes several control variables. The first is *Reserve population*. This is available on the NHS website or the Reserve Profile on the INAC website. The second is *Reserve area*. These two, coupled, can determine population density. There is academic precedence for inferring that populations with high levels of density have high levels of development. Population density is often a result of development (Acemoglu et al. 2002). Thus, theory suggests that higher density might cause higher CWB.

Location is crucial to development for a variety of reasons, including access to markets, and cost of living. If a remote Reserve has poor economic outcomes, (a low CWB), this may be due to location and not to the extent of informality. As such, this paper includes two location variables: *Closeness to service centre* and *Closeness to urban centre*. A service centre refers to the nearest town with the most basic services. An urban centre has a population of over 50 000. Both metrics are included in the INAC Reserve profile in increments of 0-50km, 50-300km, and more than 300km. These increments are fairly vague, so this paper calculates exact distances (on road) using Google Maps.

One final control variable is the *Global Non-Response* rate (GNR). GNR is the percentage of a community who opt not to participate in the census. GNR rates, normalized, range from zero to one (zero being 'total response' in which the census captures the entire population). GNR rates greater than 0.50 are deemed to be of little use and are suppressed by StatsCan. The GNR variable, available with the CWB data, is useful as it reflects a community's engagement with the wider state. GNR can function as a proxy for civic engagement, which has been shown by Qian et al. (2015) as an important engine for economic growth in a democracy. Furthermore, on a deeper level, those who feel the incentive to respond to the census see value in the institutions that support governance, both on-Reserve and nationally. Functioning First Nation governance, with thriving institutions, increases democratic capital, which is argued by Persson and Tabellini (2009) to be a key driver of growth. The working hypothesis here is that lower



Global Non-Response rates reflect better civic engagement and more robust democratic institutions, and will be correlated with higher levels of CWB.⁵

The original sample size is significantly reduced by First Nations participating in the FNLMA and by a lack of available CWB data for several Reserves. As such, the largest sample size analyzed in this paper is 169 Reserves (95 in BC, 74 in Ontario). The influence of informality on CWB is analyzed by OLS regression:

$$CWB_i = \alpha + \beta \text{informality}_i + X_i' \theta + u_i \quad (1)$$

Where X_i is a vector of control variables, and u_i is an error term uncorrelated with the covariates.

For 34 Reserves in BC and 44 in Ontario, data is available not only for CWB, but also for its components: income, education, housing, and labour force activity. For these 78 Reserves, the following OLS regressions are run:

$$\text{Income}_i = \alpha + \beta \text{informality}_i + X_i' \theta + u_i \quad (2)$$

$$\text{Education}_i = \alpha + \beta \text{informality}_i + X_i' \theta + u_i \quad (3)$$

$$\text{Housing}_i = \alpha + \beta \text{informality}_i + X_i' \theta + u_i \quad (4)$$

$$\text{LFA}_i = \alpha + \beta \text{informality}_i + X_i' \theta + u_i \quad (5)$$

However, given the small sample size and the fact that the error terms are assumed to be highly correlated, the Seemingly Unrelated Regression (SUR) method is used instead.

5. Total sample: Informality & socio-economic outcomes measured

Over the full sample of 169 Reserves, 55.1% of the total housing count of 23,614 was informal. The level of informality was similar across the two sub-sets: 56% in Ontario (with 11,917 houses *in toto*) and 55% in BC (with 11,697 houses *in toto*). The summary statistics for both provinces are very similar, except for *area*. Indian Reserves in Ontario are, on average, much larger than those in BC (see Table 1).

⁵ It would also be beneficial to include Aboriginal Governance Indicators developed by the Frontier Centre for Public Policy. These indicators reflect the quality of First Nation governance. However, these indicators are only available for First Nations in Manitoba, Saskatchewan, and Alberta.



Running the OLS regression with CWB as the dependent variable produces significant findings with trends that are the same in both provinces (see Table 2). Crucially, if informal housing increases by 10% in BC, CWB is predicted to decrease by 0.9 points. For Ontario, the reduction is 0.83 points. This forms the main finding of the paper: informality hinders socio-economic development. Interestingly, all control variables appear insignificant, with the exception of *population* and *distance to city* for Ontario. *Distance* seems intuitive (greater distance impedes development), but *population* does not.

6. Sub-sets: Individual socio-economic outcomes measured

Table 3 has the summary statistics for the 78 Reserves with disaggregated CWB data. As before, the real disparity is *Reserve area*. The *population* statistics are uncannily similar. For BC Reserves, a marginal increase in the percentage of informal housing reduces income attainment, participation in the labour force, and housing quality. *Education* also suffers, but at the 0.071 significance level. Consequently, *Community Well-Being* suffers. It is fascinating to note that no other variables are significant (see Table 4). Ontario mirrors BC in many respects (Table 5). The marginal effect is significantly negative for *Income*, *Education*, and *LFA*. *Housing*, too, at the 0.164 significance level. The CWB coefficient is identical to that of BC.

7. Conclusion

The findings are largely in line with conventional economic theory: informality hinders development on Canadian Indian Reserves. It does so through reduced income generation, educational attainment, housing quality, and labour force activity. This paper cannot answer or address as to why this is the case. In fact, there are surely underlying causes which go unnoticed in this analysis that lead some Reserves to have more informal housing and some less. Good governance and institutions on-Reserve play a role, but these metrics are difficult to measure and do not enter into this analysis. For example, First Nations with higher CWB might have more instruments. With such potential reverse-causality, these findings are imperfect.

Imperfect, yes, but not useless. The real contribution of this paper is its presentation of a novel method to measure the extent of informal land holdings. The use of the eRIP's for a visual representation



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of housing informality is of use to future researchers. This methodology may be in its infancy, but it gives a great snapshot of the use of instruments on Reserve. Future iterations can refine the tool to more accurately capture the nebulous extent of informal land holdings.

Such refinement is necessary to address the paucity of research done on informality on Canadian Indian Reserves. It will change, however incrementally, the current methodology of land tenure reform: from theoretical assertions to empirical analysis.



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Tables:

Table 1
Summary Statistics of 95 Reserves in British Columbia and 74 Reserves in Ontario*

	Average	Max	Min
CWB	61, 63*	82, 75*	45, 38*
Population	337, 448*	2604, 2592*	70, 68*
GNR	0.20, 0.19*	0.50, 0.48*	0.02, 0.01*
Area (ha)	1246, 5222*	13283, 42614*	10, 13.4*
S. Centre (km)	149, 161*	691, 600*	1, 7.4*
City (km)	273, 262*	886, 600*	1, 7.4*
% housing inform.	75, 72*	100, 100*	2.55, 5*

Table 2
169 Reserves in BC and Ontario using OLS
 $CWB_i = \alpha + \beta \text{housinginformality}_i + X_i'\theta + u_i$

	British Columbia	Ontario
% housing inform.	-0.09, -3.68~	-0.083, -3.81~
Population	-0.01, -0.19	-0.004, -2.14~
GNR	10.66, 1.45	0.908, 0.12
Area (ha)	0.001, 1.51	0.001, 1.73
S. Centre (km)	-0.003, -0.48	-0.007, -1.20
City (km)	-0.006, -1.15	-0.02, -2.90~
Cons.	67.72, 25.45~	75.82, 32.24~

Coefficients are displayed first, followed by Student's t statistics.

Robust standard errors are used, 95% Confidence Interval. (Significant if ~).



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Table 3
Summary Statistics of 34 Reserves in BC and 44 Reserves in Ontario*
Informal land tenure and Income, Education, Housing, LFA

	Average	Max	Min
CWB	61, 62*	82, 75*	45, 45*
Income	62, 61*	94, 78*	45, 42*
Education	40, 38*	60, 55*	22, 12*
Housing	76, 75*	96, 94*	53, 47*
Labour Force Activity	67, 73*	81, 87*	47, 56*
Population	662, 662*	2604, 2592*	259, 260*
GNR	0.24, 0.20*	0.50, 0.48*	0.05, 0.07*
Area (ha)	1805, 6797*	13283, 42614*	13, 13
S. Centre (km)	163, 180*	691, 600*	1, 7.4*
City (km)	278, 258*	818, 600*	1, 7.4*
% housing inform.	66, 64*	100, 100*	2.55, 5*

Table 4
34 Reserves in BC using SUR
Regressands: CWB, Income, Education, Housing, LFA

	CWB	Income	Education	Housing	LFA
% housing inf.	-0.1, -2.73~	-0.11, -2.20~	-0.09, -1.81	-0.12, -1.99~	-0.09, -1.96~
Pop.	0.003, 0.98	0.01, 1.24	0.01, 1.24	0.01, 0.39	-0.01, -0.17
GNR	-6.77, -0.73	-9.04, -0.71	-3.76, -0.31	-4.81, -0.31	-10.67, -0.91
Area (ha)	0.01, 1.04	0.01, 1.51	0.01, 0.28	0.01, 0.46	0.01, 1.04
S. Centre (km)	-0.01, -0.43	-0.01, -0.16	-0.01, -0.91	-0.015, -1.31	0.01, 1.32
City (km)	-0.01, -1.22	-0.01, -0.88	-0.01, -0.84	-0.01, -0.77	-0.01, -0.98
Cons.	69.09, 16.88~	68.36, 12.24~	45.88, 8.50~	88.10, 13.03~	75.11, 14.52~

95% Confidence Interval. (Significant if ~).

Coefficients are displayed first, followed by z-statistics.



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Table 5
44 Reserves in Ontario using SUR
Regressands: CWB, Income, Education, Housing, LFA

	CWB	Income	Education	Housing	LFA
% housing inf.	-0.1, -2.87~	-0.089, -2.72~	-0.16, -3.53~	-0.08, -1.39	-0.08, -2.08~
Pop.	-0.01, -1.09	-0.004, -1.81	-0.002, -0.70	-0.01, -0.71	-0.002, -0.99
GNR	-7.52, -0.78	-7.01, -0.78	-25.89, -2.02~	-23.50, 1.52	-15.49, -1.55
Size (ha)	0.00, 0.81	0.001, 1.68	0.00, 0.68	0.00, 0.95	-0.00, -0.33
S. Centre (km)	0.001, 0.02	0.009, 1.29	-0.016, -1.53	-0.005, -0.40	0.009, 1.11
City (km)	-0.023, -2.66~	-0.03, -3.80	-0.03, -2.17~	-0.027, -1.94	-0.005, -0.57
Cons.	77.08, 23.32~	75.84, 24.64~	64.14, 14.64~	84.24, 15.95~	82.97, 24.21~

95% Confidence Interval. (Significant if ~).

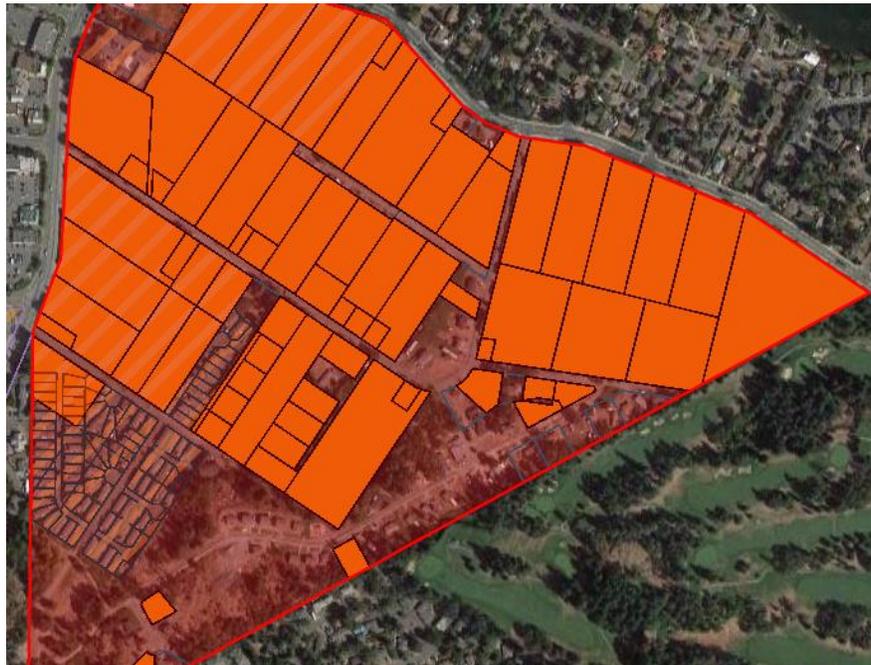
Coefficients are displayed first, followed by z-statistics.



Figures:

Figure 1

An example of a Reserve in the Electronic Registry Index Plan (NRCan, CLSS, 2017)



Certificates of Possession are orange, leases are shaded with stripes. Any visible houses (not orange or shaded) are considered informal.