THE INEQUALITY-GROWTH RELATIONSHIP: EVIDENCE FROM A PANEL OF CANADIAN REGIONS

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Abstract: This paper investigates the effects of income inequality on regional economic growth in Canada over the 1981 to 2011 period. Using standard cross-sectional models, the consistent pattern we find is that regions with initially higher levels of inequality do subsequently experience greater average annual growth rates over the long-run. In contrast, the short-/medium-term responses are different. Results from fixed effects models point to a negative relationship between inequality and growth. Moreover, across both types of models, we find significant differences for urban and rural regions.

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How does inequality affect growth? Evidence from a panel of Canadian regions

1. Introduction

There is a long history of studying regional disparities in Canada[1]. The general consensus among scholars is that the income gap between regions declined from the late 1950s to the mid-1980s, at which point the convergence process lost steam and became more 'episodic' with alternating periods of both convergence and divergence (Brown and Macdonald 2015; Breau and Saillant 2016). The empirical evidence also suggests that regional income disparities remain comparatively high in Canada. They are about 50 percent higher than the average observed across US states (Coulombe 1999) and remain among the top three highest across OECD countries (OECD 2014).

While we would not expect economic disparities between regions to necessarily disappear entirely (Polèse 2014) inter-regional income inequality has been accompanied by increasing social inequality within regions (Breau 2015). This is part of a broader movement towards rising inequality observed in several OECD countries (see OECD 2011) which has led to a resurgence of interest in understanding distributional dynamics among economists and regional scientists (Stiglitz 2012, Piketty 2014, Atkinson 2015, Cavanaugh and Breau 2017). In Canada, overall levels of inequality have increased by almost 15 percent from the late 1970s to 2013 (see Figure 1), and the growth in the concentration of income among the top 1 percent of the population is even more pronounced (almost double what it was 30 years ago). While the trajectory of inequality peaked just before the Great Recession of 2008, levels of inequality in Canada remain at historically high levels.

[Insert Figure 1]

This raises concerns about the impact of inequality on society in general and questions related to the potential impacts of higher inequality on the economic performance of regions in particular. The goal of this paper is to examine the relationship between inequality and growth using a novel panel of regional income distribution measures that covers 284 Census Divisions (CDs) in Canada over the period 1981 to 2011. At first glance (see Figure 2), this relationship appears to be positive whereby regions with higher levels of inequality in 1981 subsequently experience faster average annual growth rates. Yet, with less than 20 percent of the overall variation in regional growth rates during this 30-year period explained by the initial level of inequality, the robustness of those results needs to be ascertained through the inclusion of other factors accounting for economic growth patterns across regions. Empirical studies also show that the length of the study period, the time window examined and the types of regions included yield different results on the direction and strength of the relationship between inequality and growth (Partridge 1997, 2005, 2007; Panizza 2002, Frank 2009). In order to examine the impact of those factors on the relationship between regional economic growth and inequality in Canada we ask the following questions: Does the inclusion of other factors accounting for inequality alter the effects of inequality on growth? Are the effects of inequality on growth persistent only over long periods of time or do the effects vary over the short-/medium-term horizon? Does the inequality/growth relationship vary between urban and rural regions?

Recent evidence suggests that the geography of income inequality varies considerably across the country (e.g., Breau 2015). Figure 3 maps the local indicators of spatial association for the 2011 Gini coefficients to substantiate this claim. The first striking feature of this figure is the apparent east-west

[1] Savoie (2017) provides a nice overview of the history of regional economic development in Canada.

divide where regions in the eastern parts of the country generally have lower levels of inequality (in blue) compared to their western counterparts (in red). The second observation is a strong urban-rural divide, with urban regions generally showing much higher levels of inequality. Thus, just how important are differences between urban and rural regions in terms of influencing the mechanisms that shape the inequality/growth connection?

[Insert Figures 2 and 3]

Using different cross-sectional models we find that levels of inequality are positively related to regional economic growth in Canada over the long-run. However, the short-/medium-term responses are different. Results from our fixed effects models point to a significant negative relationship between inequality and subsequent growth. We also find evidence of significant differences in outcomes between urban and rural regions.

The rest of the paper is organized as follows. In the next section, we review the literature examining the inequality/growth relationship at the (i) cross-country and (ii) sub-national levels. Section 3 then outlines our empirical approach and the data used in the analysis. Section 4 presents the estimation results while section 5 provides a further set of sensitivity analyses to test the robustness of our findings. Section 6 concludes the paper.

2. A brief review of the literature

Ever since the seminal papers of Kuznets (1955) and Kaldor (1957) more than 60 years ago, economists have long been interested in the relationship between economic growth and income inequality. On the empirical front, much of the research examining whether or not there is a trade-off between growth and equity was first carried out at the macro-economic level using cross-country growth regression models typified by the work of Perotti (1993), Alesina and Rodrik (1994) and Persson and Tabellini (1994). In a much cited review paper, Benabou (1996) concluded that the overall consensus of these cross-country studies was that initially high levels of inequality were detrimental to the future economic growth of countries.

More recent macro-economic studies have challenged this consensus on several grounds (e.g., Forbes 2000, Panizza 2002). First, the estimates of several studies finding evidence of a negative effect of inequality on growth are not robust to more elaborate model specifications with additional control variables. Second, measurement error and the lack of consistent and comparable data across countries can lead to either a positive or negative bias on the impact of inequality on growth. Finally, omitted variable bias is also a possible source of important and unpredictable bias.

In an attempt to address some of the above econometric issues, regional scientists have entered the fray arguing that sub-national level data may provide a better platform to investigate the growth-equity relationship because of the consistency of the data collected by national statistical agencies. Within this body of work, much of which has been carried out in the US, there are generally two classes of modeling approaches that are adopted: ordinary least squares (OLS) growth regressions (the standard approach implemented in the cross-country literature) and panel techniques (mainly fixed effects models). Whereas the former approach is preferred when considering the long-term effects of levels of inequality on future economic growth, the latter is considered more appropriate over the short- and medium term when considering how changes in a region's level of inequality may effect changes in its growth performance (Forbes 2000).

Using state-level data from 1960 to 1980, Partridge (1997) was one of the first to investigate the growth-equity trade-off across US regions. Results from his OLS regressions suggest that states with higher levels of income inequality at the beginning of the period (as measured by the Gini coefficient) subsequently experienced greater growth. This finding of a positive relationship between inequality and long-term growth also holds from parsimonious to more complex model specifications.

In reassessing the relationship by using a similar dataset that spanned back to 1940, Panizza (2002) did not find any evidence of a positive correlation between the Gini index and growth across US states. In fact, results from fixed effects and GMMs estimations provide some evidence of a negative relationship between inequality and growth although these results are not robust. Indeed, this is arguably the most important conclusion to be drawn from Panizza's (2002) work: empirical evidence in support of either a positive or negative inequality-growth relationship is highly sensitive to small changes in the data (i.e., how the period of study is defined) and the econometric specification adopted.

In a follow-up study based on an updated panel of state-level data, Partridge (2005) tried to reconcile both long- and short-term perspectives only to acknowledge that minor differences in methodological approaches could indeed lead to mixed empirical results. Like Forbes (2000), he argued that standard OLS approaches focusing on cross-sectional differences across space better reflected the nature of the long-term effects of inequality on growth whereas modeling approaches concentrating on the time-series variation (within regions) were better suited for understanding the short-run effects of inequality on growth. His own estimates again confirmed the positive relationship between inequality and growth over the long-run while providing more ambiguous findings on the short-run dynamics of the relationship. Similarly, Frank (2009) finds that the long-run relationship between inequality and growth is positive in nature and mainly driven by the growing concentration of top-end incomes.

Rupasingha et al. (2002) and Fallah and Partridge (2007) have also examined the relationship across US counties. While the results from both studies point to varying outcomes, one novelty of the Fallah and Partridge (2007) paper is the identification of (i) a positive and significant inequality-growth link in predominantly metropolitan counties vs. (ii) a negative and significant relationship in non-metropolitan counties. Initial conditions are thus very important: even within a state, the central hypothesis of a positive inequality-growth linkage depends largely on whether or not a region is considered urban or rural. Geography matters, in other words, because of differences in the operation of economic incentives, agglomeration economies and the degree/type of social interaction.

To the best of our knowledge, Dahlby and Ferede (2013) are the only ones to have applied the econometric framework developed in previous studies to study the income distribution/growth response within the Canadian context. They do so at the provincial level using real GPD per capita over 5-year growth periods from 1977 to 2006, along with Gini coefficients and the usual 'conditional' variables found as controls on the right hand side of the model (see below for more details). In contrast to US state-level studies, they find only weak evidence of a positive relationship between initial levels of income inequality and subsequent provincial economic growth, the significance of which disappears when further controls are added to the model. Such a finding, however, may not be surprising considering the rather limited potential for cross-sectional variation across provinces (n = 10).

In this paper, we make use of a novel panel dataset of Canadian regions from 1981 to 2011 (defined as Census Divisions, n = 284) to revisit the inequality-growth relationship. We do so using a variety of methodological approaches to test the robustness of the relationship and identify differences in terms of the long- and short-run effects of inequality on growth.

3. Model specifications and data

We begin by estimating a baseline cross-sectional growth model that is specified as follows:

$$AAG(Y_{i2011,1981}) = \alpha + \beta INEQ_{i1981} + \gamma Y_{i1981} + \delta CONT_{i1981} + \theta IND_{i1981} + \varepsilon_i. \qquad \text{Eq. (1)}$$

Here, the dependent variable represents region *i*'s average annual growth rate of median total income (*Y*) between 1981 and 2011. All variables are based on information from the micro-data files from the long-form Censuses of 1981 to 2006 and the 2011 National Household Survey (NHS). It is important to note from the outset that while the 1981 to 2006 Censuses were mandatory (with response rates hovering in the 90% range), the 2011 NHS was conducted on a voluntary basis which resulted in a lower response rate (69%). Though this raises a number of potential data quality issues for the 2011 sample (see, for instance, the discussion in Rheault et al. 2015, Smith 2015), with more than 6.7 million individual-level observations the NHS remains the single largest source of data for regional analysis in the country[2].

For the purposes of our analysis, two income concepts are used throughout. The first is total income which includes wages and salaries, old age pensions, investment income and various forms of government income support programs. The second will focus only on wages and salaries, which refers to gross wages before various deductions (e.g., income taxes, employment insurance, etc.). As mentioned above, growth is defined by looking at changes in a region's median (or average) total income (or wages and salaries). All income figures are deflated using the Consumer Price Index (for provinces) expressed in $2002.

On the left hand side of Eq. (1), the independent variables are all measured at the beginning of each respective growth period in order to minimize the potential for endogeneity problems (this is standard practice in the convergence literature; see, for instance, Panizza 2002 and Partridge 2005). Regional income inequality ($INEQ_{i1981}$) is measured using three different indicators. The Gini coefficient, the most widely used measure of inequality, will be our primary metric. To test the robustness of the inequality-growth relationship, we also supplement the Gini coefficient with two measures of general entropy: the Theil index and half the squared CV (GE2). Whereas both the Gini coefficient and the Theil index tend to be more sensitive to transfers in the middle part of the income distribution, the GE(2) is more sensitive to changes at the higher end of the distribution. Y_{i1981} is the log of region *i*'s median total income (as a proxy for a region's initial level of economic development) and $CONT_{i1981}$ is a vector of control variables reflecting different socio-demographic characteristics. Among these are variables controlling for the stock of human capital (the percentage of the population with less than a high school degree and the percentage with a bachelor's degree or more), the percentage of female workers, recent immigrants and the age structure of regions (i.e., the percentage young (< 16 years of age) and senior (65+)). We also include a region's unemployment rate (to control for general economic conditions) and the log of its

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[2] The models estimated in the paper were also re-estimated using 2006 (instead of 2011) as the end-year for the different growth episodes (see next section) examined. By and large, results for these models were qualitatively similar.

total population (as a coarse proxy for agglomeration effects). Finally, IND_{i1981} controls for differences in the industrial composition of regions[3] and ε_i is the error term.

While Eq. (1) is estimated by standard OLS and focuses on the long-term effects of the initial level of inequality on growth, a second model (following Forbes, 2000) investigates the relationship by focusing on short-/medium-term changes using a fixed effects model specified as:

$$AAG\left(Y_{it,t-1}\right) = \beta INEQ_{it-1} + \gamma Y_{it-1} + \delta CONT_{it-1} + \theta IND_{it-1} + \alpha_i + \eta_t + \varepsilon_{it}, \qquad \text{Eq. (2)}$$

where $AAG(Y_{it,t-1})$ represents the annual average growth rate of median total income from period *t-1* to *t* (over 10-year growth cycles), α_i denotes region *i*'s fixed effect, η_t is a decade-period dummy and ε_{it} is the error term. All other variables are defined as in Eq. (1). From our perspective, the key difference is in the interpretation of β. Whereas in Eq. (1), β reflects the relationship between a region's initial level of inequality and its growth over time, in Eq. (2) β is interpreted as a measure of the correlation between changes in inequality over time and changes in growth within a given region (Forbes 2000; Panizza 2002).

Before moving on to the estimation of Eq. (1) and (2), it is important to note that one of the key challenges for longitudinal analyses of income growth and inequality at the regional-level is dealing with the spatial reconfiguration of geographic units from one census cycle to another over the 30-year period of study. Here, regions are defined as Census Divisions (CDs) and the number of CDs increased from 266 in 1981 to 293 in 2011 (with the majority of boundary changes to CDs occurring in the provinces of Quebec, Alberta and British Columbia). To develop a time-consistent panel of regions, a GIS was used to overlay the 2011 CD boundaries to all other censuses. Of the 120 CDs that experienced boundary changes over time, we were able to retrace and recreate a consistent geography using the smaller Census Subdivision (CSD) boundaries. Boundary changes to the outline of the remaining 7 CDs had to be absorbed as part of larger aggregated CDs. In the end, our dataset contains 284 consistently defined CDs. From a comparative perspective, ignoring the issue of geographic consistency when building a panel dataset can lead to significant problems and biases when making statistical inferences (Goodchild, Anselin, & Deichmann, 1993; Martin et al. 2002; Puderer, 2008).

4. Estimation and results

4.1. Long-run effects

Table 1 reports the first set of empirical results for the cross-sectional growth model specified in Eq. (1). Column 1 shows the descriptive statistics (mean and standard deviation) for each independent variable based on its initial values at the beginning of the growth period (1981). The weighted OLS results are presented in column 2 and not surprisingly, given the pattern from Figure 1, we find that the estimate for the Gini coefficient is positive and significant. In other words, regions with higher initial levels of income inequality do subsequently experience faster economic growth over the long-run (from 1981 to 2011). This is broadly consistent with the long-run impacts of inequality on growth across US states reported by Partridge (1997, 2005). Coefficient estimates for the other independent variables are also

[3] We have 15 industry-level variables measuring the percentage of the workforce employed in a given industry. These industries are agriculture, mining, manufacturing, construction, transportation and warehousing, utilities, wholesale trade, retail trade, information and cultural services, finance and insurance, knowledge intensive business services, management services, education and health, arts and entertainment, and public administration.

generally as expected. The coefficient for the level of economic development is negative and significant, suggesting that poorer regions have grown more rapidly than richer regions which is consistent with the catch-up effect described in the convergence literature (see, for instance, Breau and Saillant 2016). Regions with higher shares of highly educated (bachelor's degree or more) and female workers also experienced faster average annual growth rates.

[Insert Table 1]

Column 3 presents the estimates obtained from a spatial lag model. As suggested by the pattern observed in Figure 2, both the average annual growth rate and Gini coefficient variables are highly clustered across the country (with Moran's I values of 0.552 and 0.486, respectively) which means the estimates from the previous OLS model could be biased and inconsistent (Rupasingha et al. 2002). Based on the analysis of a connectivity histogram, a K-6 nearest neighbour spatial weights matrix was used for estimation purposes (results from the Lagrange Multiplier test also point to the preference for a spatial lag model). The key result here is that after accounting for spatial variation, the estimate for the Gini coefficient remains positive and significant. Most of the other results are also consistent with those presented in column 2[4].

Following Fallah and Partridge (2007), we allow for the possibility that the inequality-growth transmission linkages vary between urban and rural areas. In the Canadian context, earlier work by MacLachlan and Sawada (1997) and Bolton and Breau (2012) suggests that the levels (and growth rates) of inequality are higher in metropolitan settings than elsewhere. To explore this possibility, the last two columns of Table 1 show regression estimates separately for urban and rural census divisions. The urban/rural classification is based on a revised and updated definition of Beale codes in Canada which is developed mainly through consideration of population size and remoteness (see Appendix for more details). The results here confirm the importance of urbanization effects: whereas the regression estimates for the Gini coefficients are both positive in columns 4 and 5, it is only significant in the case of urban regions. In other words, it is in metropolitan areas where the subsequent growth effects of higher levels of inequality are most felt over the long-term. This could be related to urban agglomeration economies, i.e., the greater efficiency provided by the proximity of specialized production and labor activities which can also lead to greater wage differentials and the attraction of more highly skilled workers (for which the coefficient estimate is also positive and significant at the .10 level).

In Table 2, we present the results of the pooled OLS estimates of Eq. (1) where we have divided the 1981 to 2011 period into three 10-year growth episodes (1981 to 1991, 1991 to 2001 and 2001 to 2011) and recalculated the average annual growth rate of median total income for each of those period. In addition to the explanatory variables specified in Eq. (1), we also add decade dummies in the pooled model to control for possible aggregate shocks in specific time periods. In the overall model (column 1), results for the Gini coefficient again point to a positive and significant inequality-growth relationship over the 10-year periods. The pooled OLS estimations in columns 2 and 3 also confirm that the equity/growth trade-off stems primarily from urban regions. One interesting observation here is that

[4] Note that while we explicitly control for spatial dependence in this model, all other OLS and FE regression models presented throughout the paper are estimated using Stata's cluster function. This allows us to assume that the residuals may be correlated across certain geographic clusters (which are defined as five aggregate regions: the Atlantic provinces, Quebec, Ontario, Prairie provinces and British Columbia) but uncorrelated across of the clusters. It is an indirect way of controlling for the possibility of spatial autocorrelation in our models.

population aging, over time, appears to have a negative impact on the long-term growth responses of regions (see also Breau and Saillant 2016).

[Insert Table 2]

In sum, results from our cross-sectional models reveal that over the long-run, regions with initially higher levels of inequality do subsequently experience greater growth. Furthermore, this positive inequality-growth relationship appears to be driven predominantly by Canada's metropolitan regions[5].

4.2. Short-/Medium-run effects

In this section, we switch our focus to the fixed effects estimation of Eq. (2). Since we use only 10-year panels for this model, the coefficient estimates on the Gini coefficient reflect how changes in inequality may impact changes in growth over the short- to medium-term horizon. The interpretation of results is thus slightly different. Of course, one of the advantages of a fixed effect model is that it also controls for a region's unobserved time-invariant characteristics.

[Insert Table 3]

The results here are quite different than those reported earlier. In the global model, we find that changes in the Gini coefficient have a negative though weakly significant (at the .10 level) effect on regional growth profiles. Such a finding is consistent with the work of Panizza (2002) and Partridge (2005) for US states. And again, by re-estimating the model separately for rural vs. urban regions, we find that metropolitan areas are driving this result.

As an interesting aside, the coefficient estimate for the percentage of immigrants is positive and significant suggesting that regions with higher immigrant shares benefit from higher economic growth over time. This is consistent with recent work by Kemeny and Cooke (2017) in the US that finds that metropolitan areas with a greater range of immigrant diversity and more inclusive institutions will see higher productivity levels.

5. Sensitivity analysis

As mentioned earlier, one of the key findings of the empirical literature on the equity/growth trade-off is that regression results can be very sensitive to minor changes in model specifications (see, in particular, Panizza 2002). In this section, we test the robustness of our findings by re-estimating Eq. (2) in a variety of different ways to test whether or not the negative short-/medium-run effects of inequality on regional growth described above are robust.

We begin by re-estimating the model using different measures of inequality. In addition to the Gini coefficient, which we have used throughout our models, we include the Theil index and the GE(2) as alternate indicators of income inequality. In both cases, we see that changing the measure of inequality does not affect our main result of a negative growth/equity trade-off (see Table 4). That said, given the

[5] The results presented here are for the fully specified models. Acknowledging the possibility that including so many control variables may introduce multicollinearity problems, we also re-estimated more parsimonious versions of the models. The main finding of a positive inequality-growth link over the long-run is robust to these specifications.

sharp increase in the concentration of top incomes in Canada over the last few decades, we were surprised to see the coefficient estimate on the GE(2) being much smaller in magnitude and only significant at the .10 level[6].

[Insert Table 4]

In addition to using different indicators of inequality, we also re-estimated the model using different income concepts. Whereas median income is considered the preferred proxy for growth (Partridge and Weinstein 2013), we also looked at average total income and average wages. In all cases, the relationship between inequality and regional growth remains negative and significant.

Another possibility is that the short-/medium-term impact of inequality on growth depends on a region's level of economic development. To test this, we divide regions into three separate income categories based on 1981 figures (measured in $2002) and re-estimate Eq. (2) for each group. Interestingly, the negative and significant relationship holds for all but the lowest income category. This is perhaps not surprising given our earlier findings that urbanization effects are important in predicting the strength of the relationship, especially since 84% of regions in the lower income category are defined as rural.

This finding also led us to re-estimate the model across different Beale code categories. As expected, evidence of the negative short-/medium-run effects of inequality on growth is found in both large and medium sized metropolitan CDs, though the impact is largest in the latter (e.g., typified by regions such as Halifax, Quebec, Waterloo, Hamilton, Saskatoon-Battleford and Victoria).

Lastly, the bottom row of Table 4 presents the results from a general methods of moments (GMM) approach (Arellano and Bond 1991). Though we have mainly focused on the FE approach to examine the short-/medium-run effects of inequality on growth, it is possible that including a lag of the endogenous variable in Eq. (2) may introduce bias in the estimation. The advantage of the GMM approach is that it first-differences the variables in order to eliminate the region-specific effects and allow for the use of lagged variables as instruments (Forbes 2000). In applying the GMM estimation, we used shorter 5-year panels to ensure a larger number of periods. Again, the finding of a negative short-run impact of inequality on regional growth responses holds true.

6. Conclusion

This paper examines the relationship between income inequality and growth across Canadian census divisions. In doing so, we find that the long-run and short-/medium-run dynamics of the inequality-growth relationship are similar in Canada as those observed across US regions. Over the long-run, regions with initially high levels of inequality are found to experience greater subsequent growth. In contrast, short-/medium-run changes in both economic development and inequality are negatively correlated with each other. And in both the long- and short-/medium-run cases, we find significant differences in outcomes based on whether a region is urban or rural.

[6] Such a finding is likely related to the fact there are much smaller numbers of top end income earners in certain regions which causes complexities when the population weights are used in Stata to estimate sampling variances (on this note, see STB-48, 1999).

Like most cross-sectional analyses, this analysis is exploratory. Although the relationship between inequality and economic growth is robust, we cannot identify the causal channels that explain why inequality results in lower short-term growth and higher long-term growth. Establishing and examining those channels at the sub-national scale would be an important area of future research.

Hence, while these results provide new insights into the dynamics of the inequality-growth relationship across Canadian regions, we recognize that we are only beginning to scratch the surface of these complex linkages. A particularly fruitful avenue for future research would be to explore newly developed methodologies emphasizing the potential for non-linearities in the equity-growth trade-off. As Grigoli and Robles (2017) point out, most of the relevant literature has so far assumed that the relationship is best represented by a linear specification. Their own empirical evidence suggest that there may be a 'tipping point' (see also Weinstein and Partridge 2013) beyond which the relationship can change.

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Figures

Figure 1. Evolution of income inequality in Canada, from the late 1970s onwards

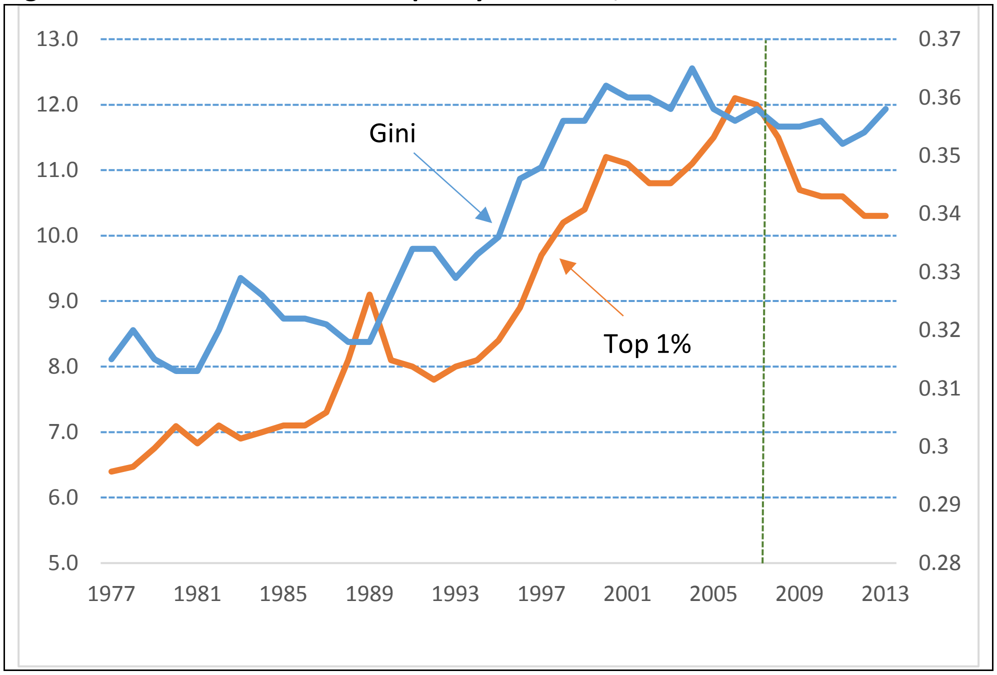


Figure 2. 1981-2011 average annual growth and 1981 Gini coefficient

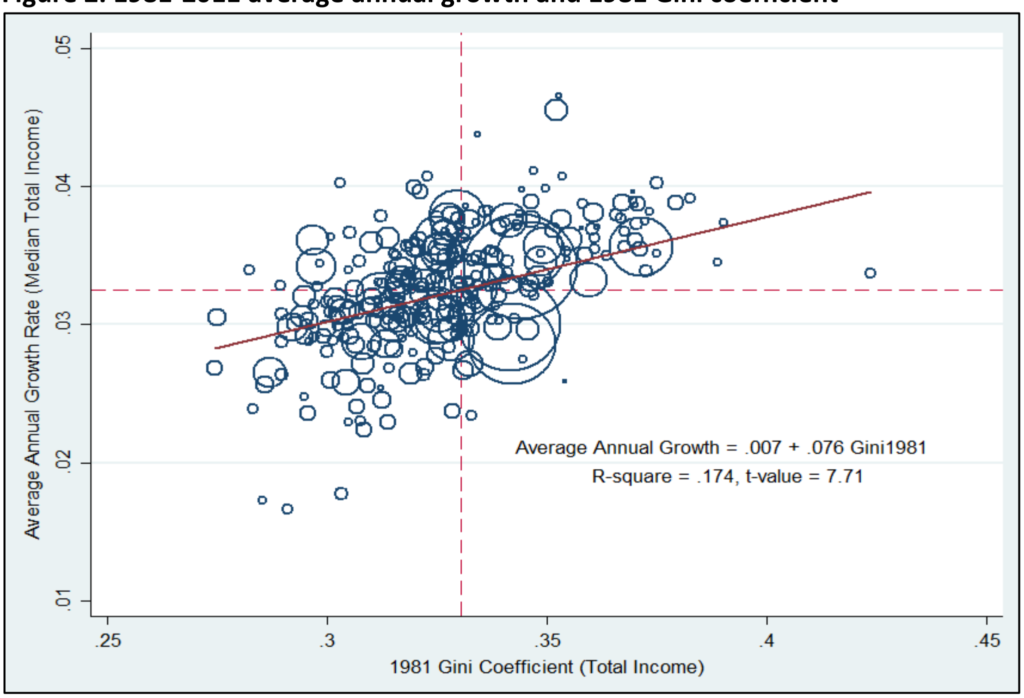
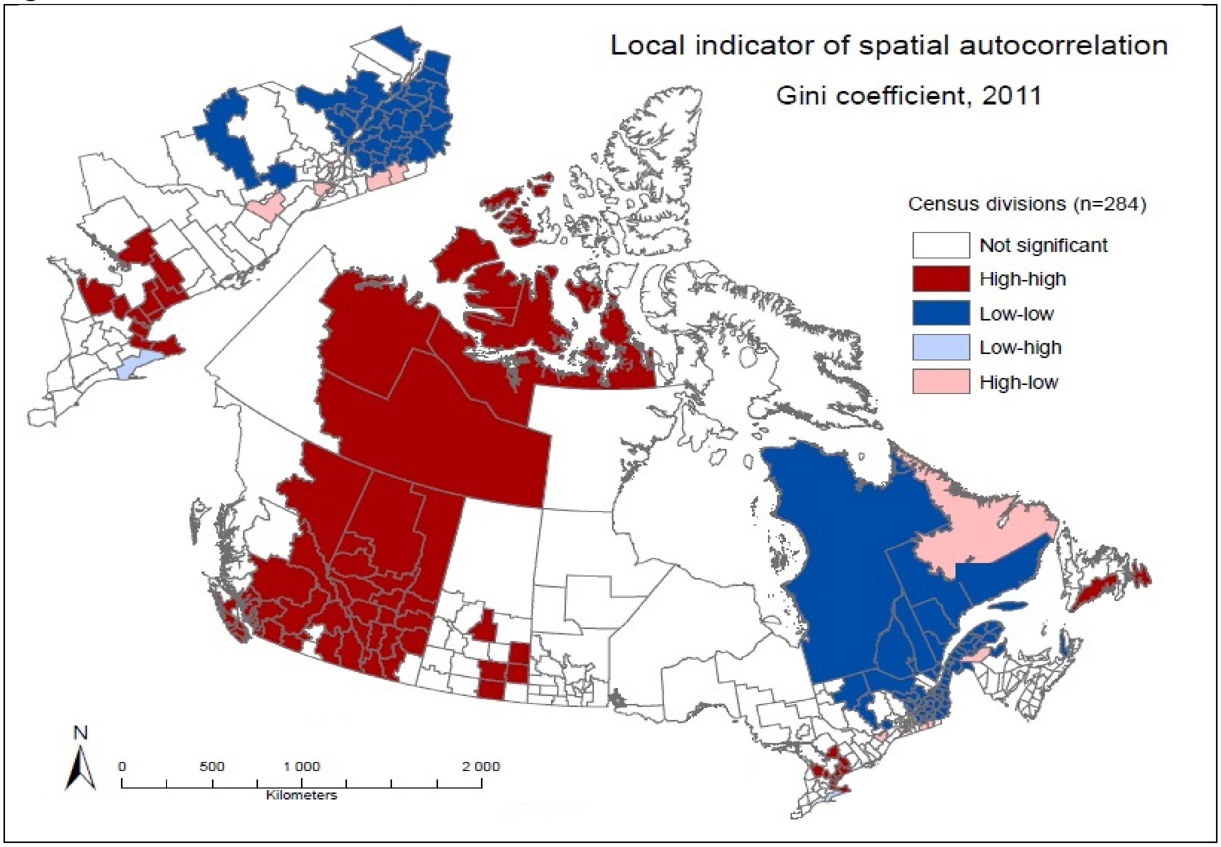


Figure 3. LISAs of Gini coefficients, 2011



Tables

Table 1. Cross-sectional regressions, 1981 to 2011

	Mean (SD)	Weighted OLS	Spatial OLS§	Weighted OLS	
				Rural	Urban
$Gini_{1981}$	.330	.049**	.030**	.061	.052**
	(.019)	(.012)	(.011)	(.032)	(.014)
Ln(median income)$_{1981}$	9.83	-.015**	-.013**	-.019**	-.016**
	(.123)	(.004)	(.002)	(.004)	(.003)
% less than high school$_{1981}$	.362	.010	-.001	.004	.013
	(.070)	(.006)	(.004)	(.009)	(.011)
% bachelor's degree+$_{1981}$	.128	.020**	.010	.007	.027*
	(.044)	(.007)	(.009)	(.012)	(.012)
% female workers$_{1981}$	.382	.028**	.019**	.018	.019
	(.039)	(.010)	(.006)	(.012)	(.019)
% recent immigrants$_{1981}$	.018	-.036	.002	.049	-.010
	(.016)	(.043)	(.031)	(.044)	(.029)
% young (aged ≤ 16)$_{1981}$	.227	.016	.008	-.003	.027
	(.035)	(.016)	(.008)	(.030)	(.016)
% senior(aged ≥ 65)$_{1981}$	.091	-.010	-.011	-.014	-.003
	(.027)	(.013)	(.009)	(.025)	(.009)
Unemployment rate$_{1981}$	.048	-.033**	-.020**	-.019*	-.037**
	(.029)	(.007)	(.006)	(.009)	(.010)
Ln(total population)$_{1981}$	12.3	-.001*	-.001	.001	-.001
	(1.48)	(.001)	(.001)	(.001)	(.001)
Industry mix shares		Y	Y	Y	Y
rho			.402**		
			(.056)		
Constant		.076	.075	.219*	-.008
		(.085)	(.065)	(.100)	(.146)
No. of obs.	284	284	284	167	117
R-square		.717	.723	.749	.792

Notes: Heteroskedasticity robust standard errors are presented in parentheses. * indicates significance at the .10 level and ** at the .05 level. Based on the Lagrange Multiplier test, a spatial lag model was estimated.

Table 2. Pooled cross-sectional models, 1981 to 2011

	Weighted OLS	Weighted OLS	
		Rural	Urban
Gini	.071**	.015	.115**
	(.017)	(.040)	(.041)
Ln(median income)	-.030**	-.043**	-.028*
	(.010)	(.011)	(.011)
% less than high school	.003	-.020	.022
	(.011)	(.015)	(.024)
% bachelor's degree+	-.064	-.059**	-.096
	(.030)	(.014)	(.053)
% female workers	.091**	.041	.086*
	(.032)	(.023)	(.037)
% recent immigrants	-.088	.078	-.078
	(.046)	(.115)	(.041)
% young (aged ≤ 16)	-.006	.039	-.009
	(.033)	(.023)	(.043)
% senior(aged ≥ 65)	-.072**	-.029*	-.089*
	(.023)	(.012)	(.037)
Unemployment rate	-.033*	-.030*	-.029
	(.013)	(.013)	(.020)
Ln(total population)	.001	.001	.001
	(.001)	(.002)	(.001)
Industry mix shares	Y	Y	Y
Decade dummies	Y	Y	Y
Constant	-.837**	-.213	-1.67**
	(.220)	(.144)	(.474)
No. of obs.	852	501	351
R-square	.846	.776	.884

Notes: Heteroskedasticity robust standard errors are presented in parentheses.
* indicates significance at the .10 level and ** at the .05 level.

Table 3. Fixed-effects regression models, 10-year growth cycles

	FE	FE	
		Rural	Urban
Gini	-.067*	-.019	-.078**
	(.029)	(.023)	(.020)
Ln(median income)	.117**	.123**	.121**
	(.007)	(.014)	(.004)
% less than high school	.079**	.058**	.101**
	(.011)	(.022)	(.027)
% bachelor's degree+	.015	.008	-.017
	(.031)	(.033)	(.038)
% female workers	-.007	-.001	-.033
	(.045)	(.040)	(.061)
% recent immigrants	.094**	.313	.064*
	(.029)	(.211)	(.026)
% young (aged ≤ 16)	-.128	.021	-.151
	(.068)	(.041)	(.082)
% senior(aged ≥ 65)	.035	.189**	.019
	(.040)	(.047)	(.031)
Unemployment rate	-.015	.019	-.065
	(.029)	(.009)	(.040)
Ln(total population)	-.003	-.009	.001
	(.007)	(.010)	(.006)
Industry mix shares	Y	Y	Y
Decade dummies	Y	Y	Y
Constant	-.590**	-.791**	.037
	(.124)	(.173)	(.811)
No. of obs.	852	501	351
No. of groups	284	167	117
R-square	.395	.361	.539

Notes: Heteroskedasticity robust standard errors are presented in parentheses.
* indicates significance at the .10 level and ** at the .05 level.

Table 4. Sensitivity analysis

	Coef. on inequality	Standard error	Regions	Obs.	Growth period	Estimation method
Inequality indicators						
Gini coefficient	-.080**	(.029)	284	852	1981-2011	FE
Theil index	-.032**	(.010)	284	852	1981-2011	FE
Half squared CV (GE2)	-.002*	(.001)	284	852	1981-2011	FE
Income concept						
Median total income	-.080**	(.029)	284	852	1981-2011	FE
Median wages	-.145**	(.047)	284	852	1981-2011	FE
Average total income	-.149**	(.026)	284	852	1981-2011	FE
Average wages	-.174**	(.027)	284	852	1981-2011	FE
Income groups						
< $15,500	-.029	(.048)	75	275	1981-2011	FE
$15,500 to $19,500	-.092**	(.024)	125	375	1981-2011	FE
> $19,500	-.134**	(.049)	84	252	1981-2011	FE
Beale category						
Beale 0	-.216*	(.076)	6	18	1981-2011	FE
Beale 1	-.089*	(.009)	27	81	1981-2011	FE
Beale 2	-.148**	(.044)	24	72	1981-2011	FE
Beale 3	-.028	(.065)	60	180	1981-2011	FE
Beale 4	-.053	(.044)	60	180	1981-2011	FE
Beale 5	.017	(.058)	107	321	1981-2011	FE
Arellano-Bond GMM	-.069**	(.016)	284	1420	1986-2011	A&B

Notes: FE: fixed-effects, A&B: Arellano-Bond. Heteroskedasticity robust standard errors are presented in parentheses. * indicates significance at the .10 level and ** at the .05 level.

Appendix

Beale codes were originally developed for US counties in the 1970s to provide researchers with a more fine grained classification of regions that went beyond a simple urban-rural binary based on the degree of urbanization and metropolitan proximity of non-metropolitan counties. This classification, however, could also be re-aggregated to urban-rural labels. Beale codes continue to be maintained across US counties and are updated every 10 years by the US Department of Agriculture. Statistics Canada maintained a similar classification for CDs under its rural series program until the program was discontinued in 1996. Here, the census metropolitan agglomeration (CMA) and census agglomeration (CA) populations served as the defining units to classify CDs. For the purposes of this paper, we re-constructed the Canadian version of Beale codes based on their equivalent 2011 geography (see Table A1).

Table A1. Beale codes in Canada

Code	Name	Description	Congruent # of CDs
Metropolitan (urban) CDs			
0	Large metro	Central and most populous CD of a CMA with a population > than 1 million	6
1	Large metro fringe	Remaining CDs within or partially within a CMA > 1 million	27
2	Medium metro	CDs containing, within, or partially within a CMA with a population between 250,000 and 999,999	24
3	Small metro	CDs containing, within, or partially within a CMA with a population between 50,000 and 249,999	60
Non-metropolitan (rural) CDs			
4	Non metro-adjacent	CDs that share a boundary with a CMA/CA and the CMA/CA has a population > 50,000	60
5	Non metro-adjacent	CDs that do not share a boundary with a CMA/CA that has a population > 50,000	107