

Unpacking the geographical dimensions of income inequality in Canada

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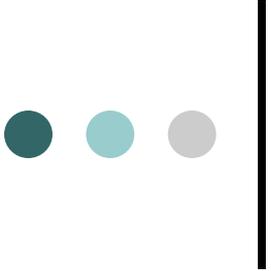
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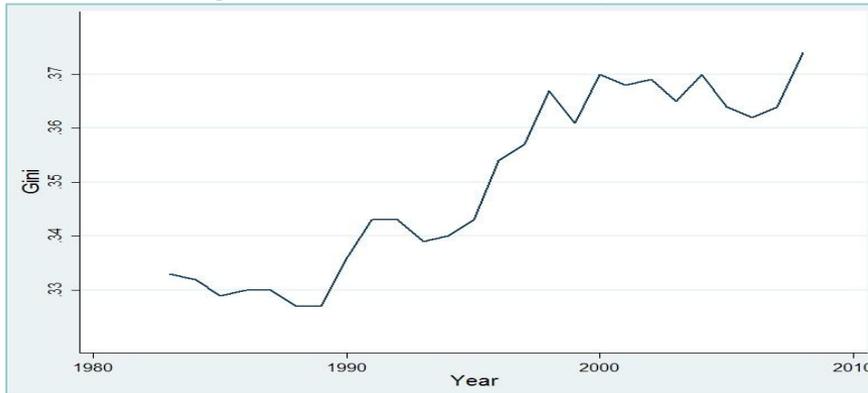


Outline

- Motivation and research questions
- Brief survey of the literature
- Data, methods and model specifications
- Peeling the layers of the onion: two vignettes!
 - The rising tide of inequality in Canada: A regional perspective
 - Changes in the distribution of earnings across Canadian cities
- Results (in press and in progress)
- Conclusion, future research directions

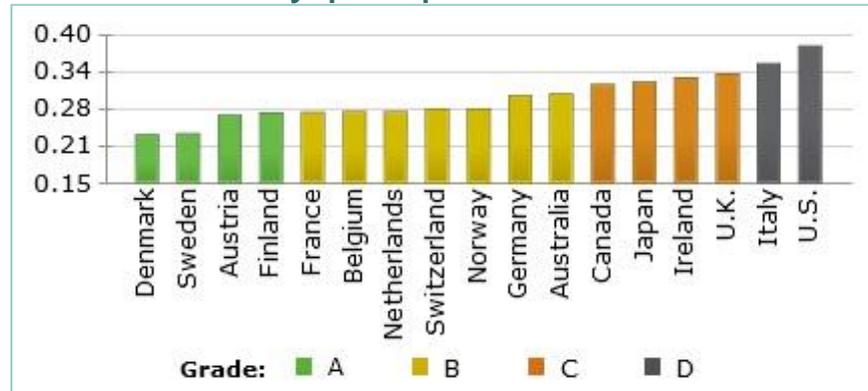
Motivation and research questions (1)

Increasing income inequality!



Source: Statistics Canada (2011)

Cross-country perspective, mid-2000s



Source: OECD (2008) and Conference Board of Canada (2011)

JEFFREY SIMPSON

Income inequality: deep, complex and growing

Canada's wage gap at record high:

OECD

THE GLOBE AND MAIL

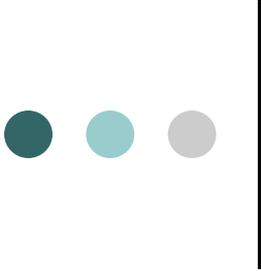
TAVIA GRANT



Occupy Montreal – Fall 2011



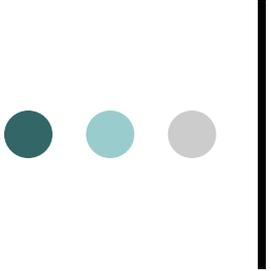
Source: Author's photograph.



Motivation and research questions (2)

○ Basic research questions:

- 1. How are incomes distributed across different geographical scales in Canada (i.e. regions, metropolitan areas) and how have these patterns changed over the 1996 to 2006 period?
- 2. How can differences observed in the distribution of incomes across these spatial units be explained?
- 3. Potential inter-scalar differences (*people-* vs. *place-*based policies)?



Overview of the literature

○ National-level studies: extensive literature

- Green and Kesselman (2006); Heisz (2007); Yalnizyan (2007); Osberg (2008); Frenette et al. (2009); Brzozowski et al. (2010)
- ‘Heavy lifting’ done by economists who tend to limit their analytical focus to national patterns (Myles 2003)

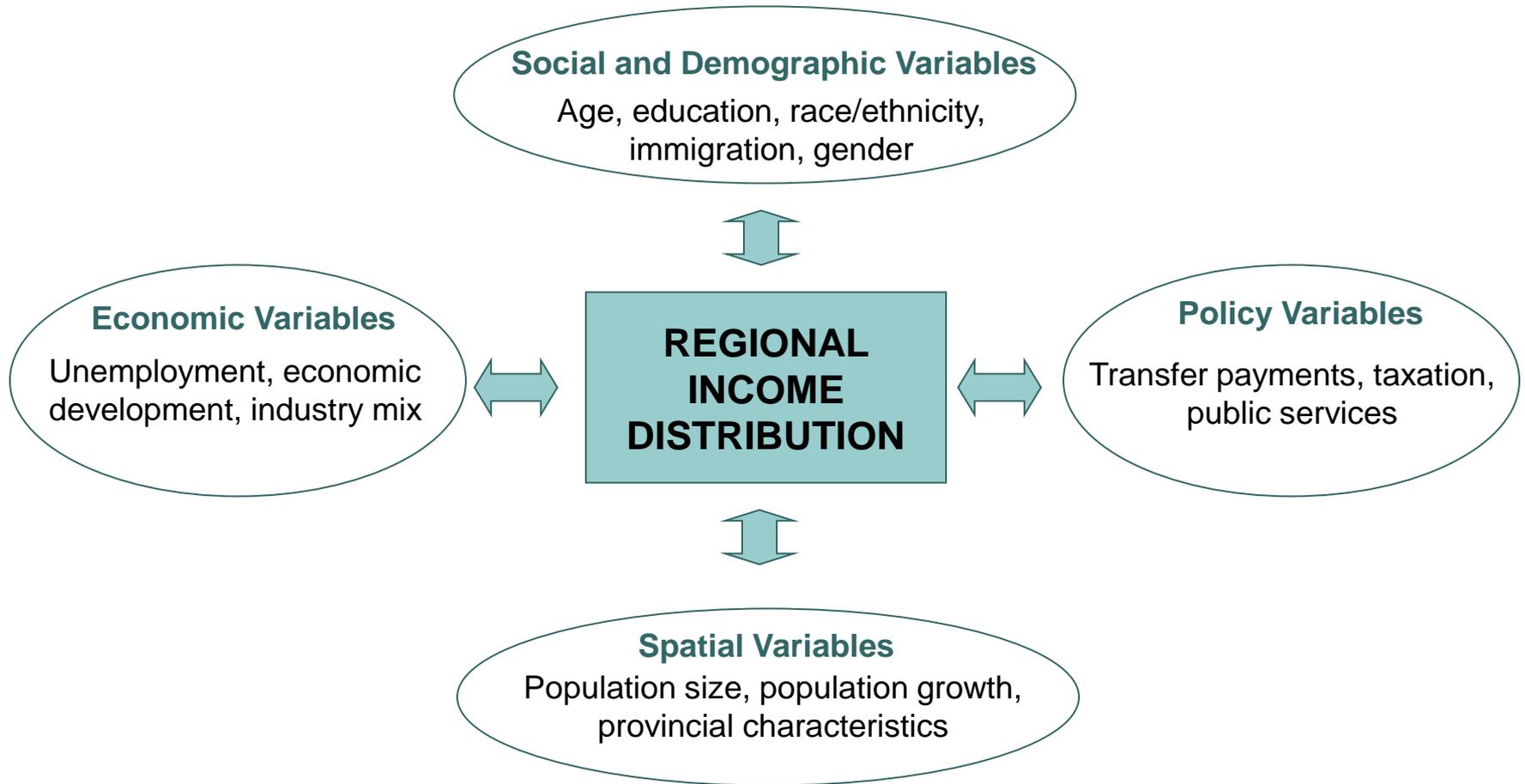
○ Few sub-national studies:

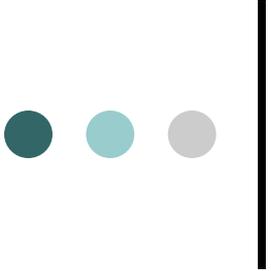
- Provincial-level: Finnie (2001); Gray et al. (2004); Breau (2007)
- Regional: MacPhail (2000)
- City-level: Bourne (1993); Mitchel and Soroka (1993); MacLachlan and Sawada (1997)

○ What’s missing?

- Up-to-date and comprehensive analysis of the determinants of income inequality across Canadian regions and cities

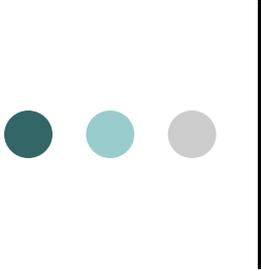
Analytical framework





Data (1)

- Census of Population (20% sample)
 - 1996, 2001, 2006
 - benefits: high response rate, large sample, stable and reliable over time, wage data not top-coded and detailed information on individuals workers (including place of residence)
- Establish correspondence in geographical boundaries across censuses
 - ArcGIS intersect tool used to aggregate 1996 and 2001 CDs and CMA / CAs according to 2006 CD or CMA / CA boundaries
 - In the end:
 - 287 consistent CDs across censuses
 - 87 consistent metropolitan areas



Data (2)

○ Focus on active labour force

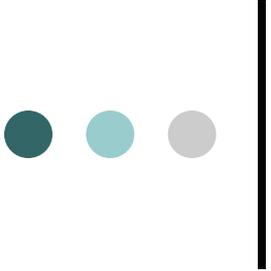
- Aged 25 to 65 who report > \$1,000 in annual total income
- Total income: employment earnings, government transfer payments and investment income (pre-tax)

○ Measures of inequality

- Gini coefficient (derived from the Lorenz curve)

$$G = \frac{1}{2n^2 \bar{y}} \sum_{i=1}^n \sum_{j=1}^n |y_i - y_j|$$

- Gini = 0: represents 'perfect equality'
- Gini = 1: represents 'complete inequality'
- Other measures: Theil, Mean Log Deviation

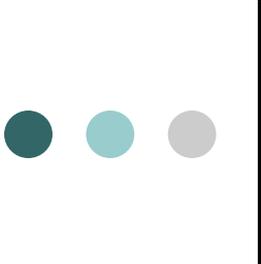


First layer

Viewing income inequality through the regional prism

Based on:

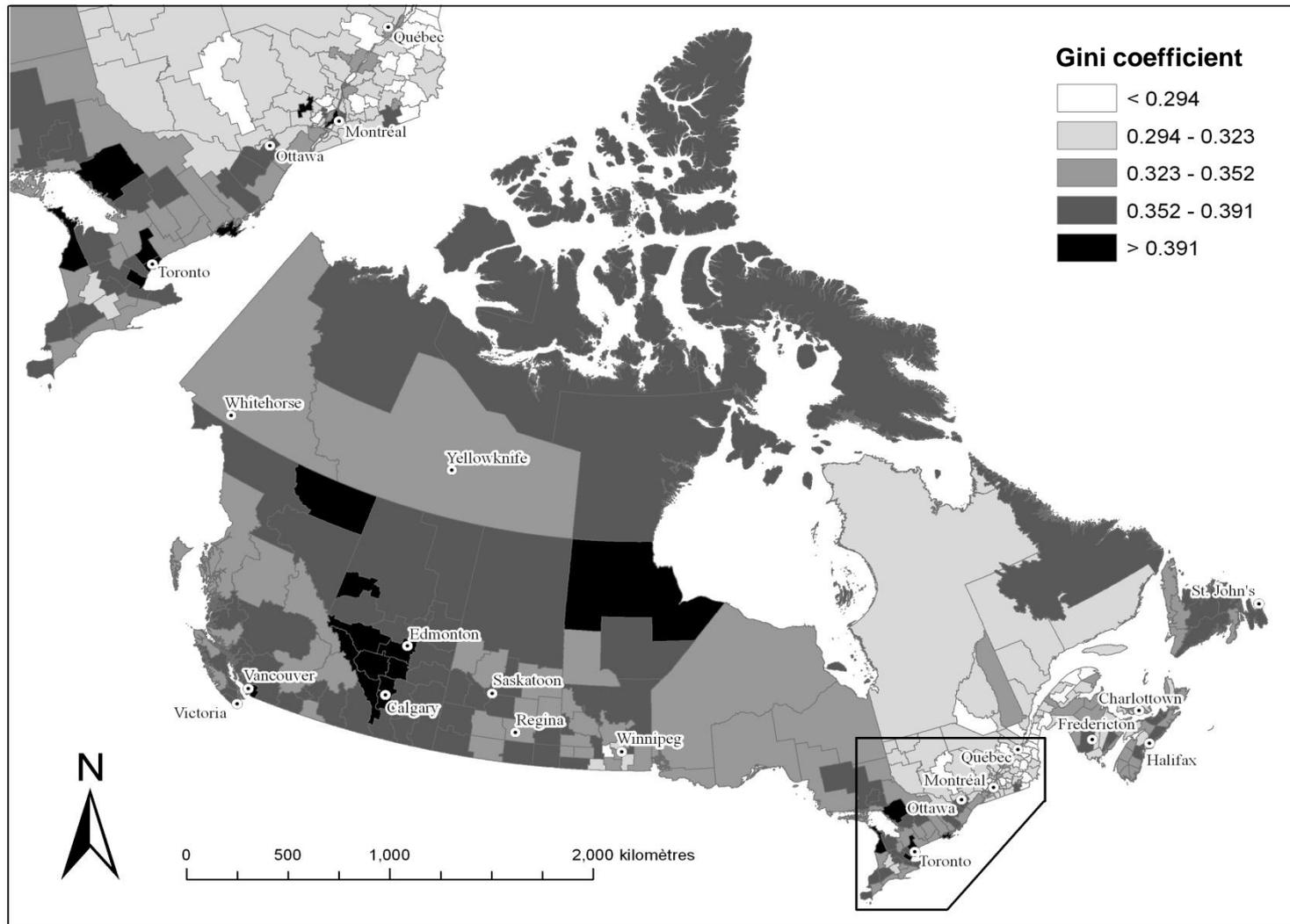
Breau, S. (à paraître) « Inégalités des revenus au Canada: Une analyse régionale », *Essais en l'honneur de Donald J. Savoie*, Presses de l'Université Laval.



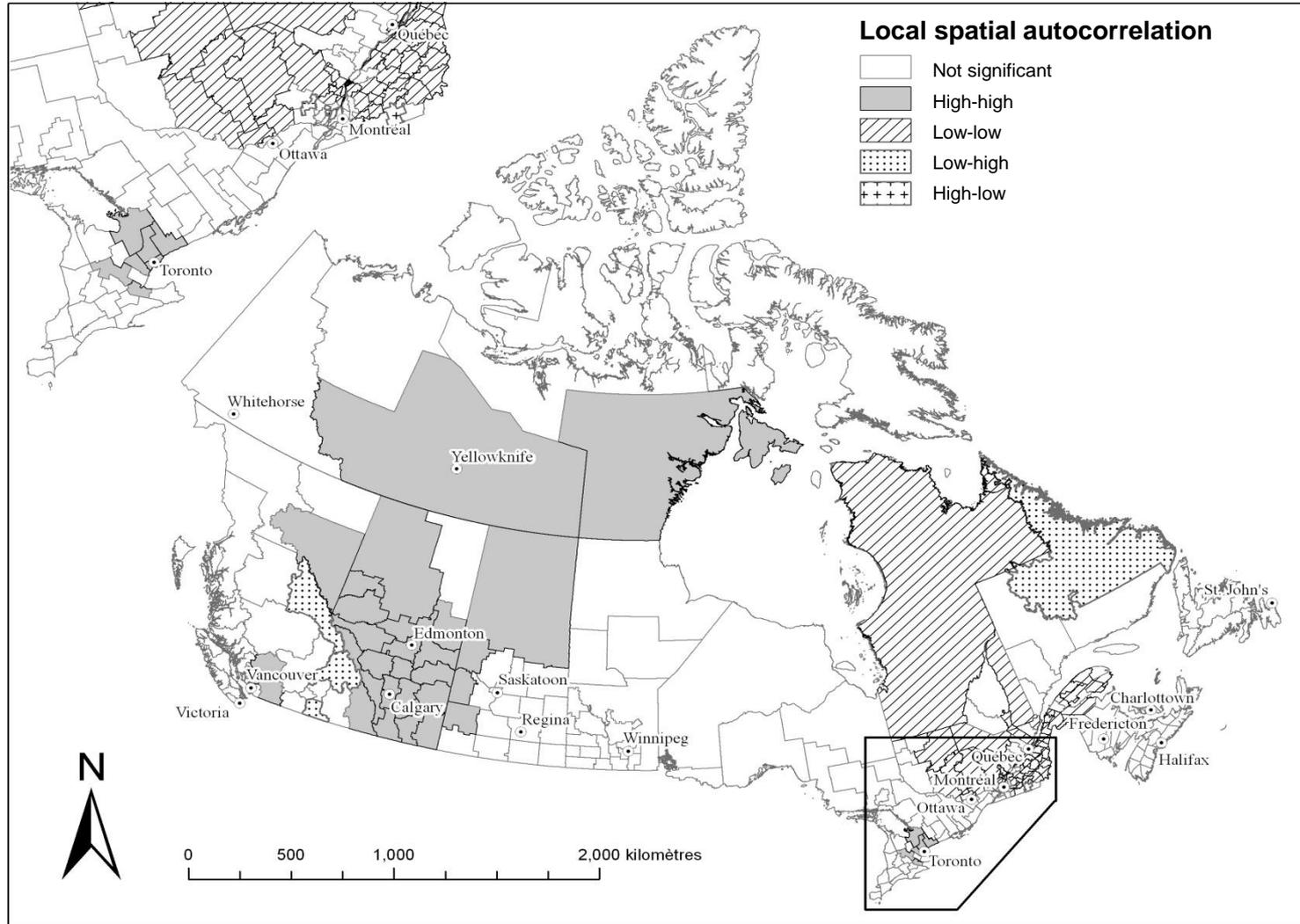
Broad regional patterns of income inequality in Canada, 1996-2006

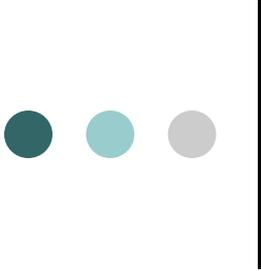
	Number of CDs	Gini coefficient			% change
		1996	2001	2006	
Canada	287	.347	.357	.373	7.5
Provinces					
Newfoundland & Labrador	10	.349	.351	.364	4.3
Prince Edward Island	3	.327	.328	.317	-3.1
Nova Scotia	18	.342	.353	.349	2.1
New Brunswick	15	.340	.341	.337	-0.9
Quebec	98	.331	.335	.339	2.4
Ontario	49	.348	.369	.386	10.9
Manitoba	23	.344	.342	.349	1.5
Saskatchewan	18	.352	.345	.353	0.3
Alberta	19	.376	.380	.422	12.2
British Columbia	28	.354	.360	.384	8.5
Urban Census Divisions	63	.351	.366	.387	10.3
Rural Census Divisions	224	.337	.336	.340	0.9
Range	287	.177	.147	.247	
Std. deviation	287	.024	.033	.049	
Coefficient of variation	287	.071	.094	.131	

Income inequality across census divisions, 2006



LISA map of income inequality across CDs, 2006





Modeling approach

○ Benchmark OLS model:

$$INEQ_{it} = \alpha + \beta INDMIX_{it} + \delta DEMOG_{it} + \varphi LABMKT_{it} + \varepsilon_{it}$$

where $INDMIX_{it}$: % manufacturing employment
 $DEMOG_{it}$: female participation rate, % visible minority, % aboriginal education ratio, % young and % senior
 $LABMKT_{it}$: unemployment rate, median wages (i.e. proxy for economic development), population size

○ Spatial lag model:

$$INEQ_{it} = \rho WINEQ_{it} + \beta X_{it} + \varepsilon_{it}$$

where W = spatial weights matrix and ρ = partial regression coefficient for the spatial lag.

○ Fixed-effects model:

$$INEQ_{it} = \beta X_{it} + \alpha_i + u_{it}$$

to study changes in the dependent variable while controlling for unobserved heterogeneity (i.e. omitted variables) across CDs.

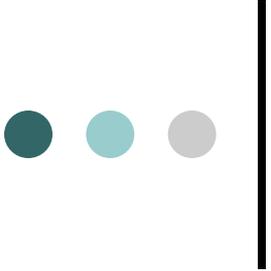
Table. OLS, spatial and panel regression model results, 1996-2006


Industrial mix

Demographic, social

Labor market, local

	1996		2006		1996 - 2006
	(1) OLS	(2) Spatial lag model (ML)	(3) OLS	(4) Spatial lag model (ML)	(5) Fixed-effects model
Manufacturing (%)	-.086** [-.326] (.015)	-.066** (.014)	-.189** [-.424] (.024)	-.140** (.021)	-.075** (.036)
Female participation rate	-.107* [-.130] (.058)	-.113** (.052)	-.083 [-.056] (.079)	-.106 (.068)	-.068 (.061)
Visible minority (%)	.202** [.328] (.043)	.161** (.039)	.174** [.269] (.040)	.108** (.036)	.408** (.059)
Aboriginal (%)	.049** [.234] (.021)	.046** (.019)	-.022 [-.080] (.028)	-.017 (.024)	.059 (0.40)
Education ratio	.075** [.162] (.032)	.072** (.029)	.087** [.147] (.042)	.0111** (.036)	.022 (.025)
Young (%)	-.003 [-.022] (.013)	-.009 (.012)	.035* [.165] (.018)	.016 (.015)	.032** (.015)
Senior (%)	.045** [.291] (.012)	.042** (.011)	.071** [.271] (.017)	.059** (.015)	.068** (.025)
Log (population size)	-.001 [-.028] (.002)	-.001 (.001)	.005** [.147] (.002)	-.004** (.002)	.010 (.011)
Economic development	-1.6e-07 [-.038] (4.1e-7)	-1.8e-07 (3.7e-07)	2.1e-06** [.346] (5.03e-07)	1.2e-06** (4.5e-06)	7.7e-07* (4.7e-07)
Unemployment rate	-.045 [-.106] (.030)	-.046* (.027)	.087* [.118] (.050)	.023 (.043)	.097** (.046)
Constant	.362** (.038)	.271** (.038)	.203** (.050)	.127** (.045)	.181 (0.123)
Spatial lag (ρ)		.287** (.057)		.357** (.052)	
R-squared	.370	.461	.504	.622	.328
F	16.2		28.1		11.5
N	287	287	287	287	861
Log likelihood	737.9	756.1	644.0	676.0	
Akaike info. criterion	-1453.8	-1444.3	-1266.0	-1284.2	



Second layer

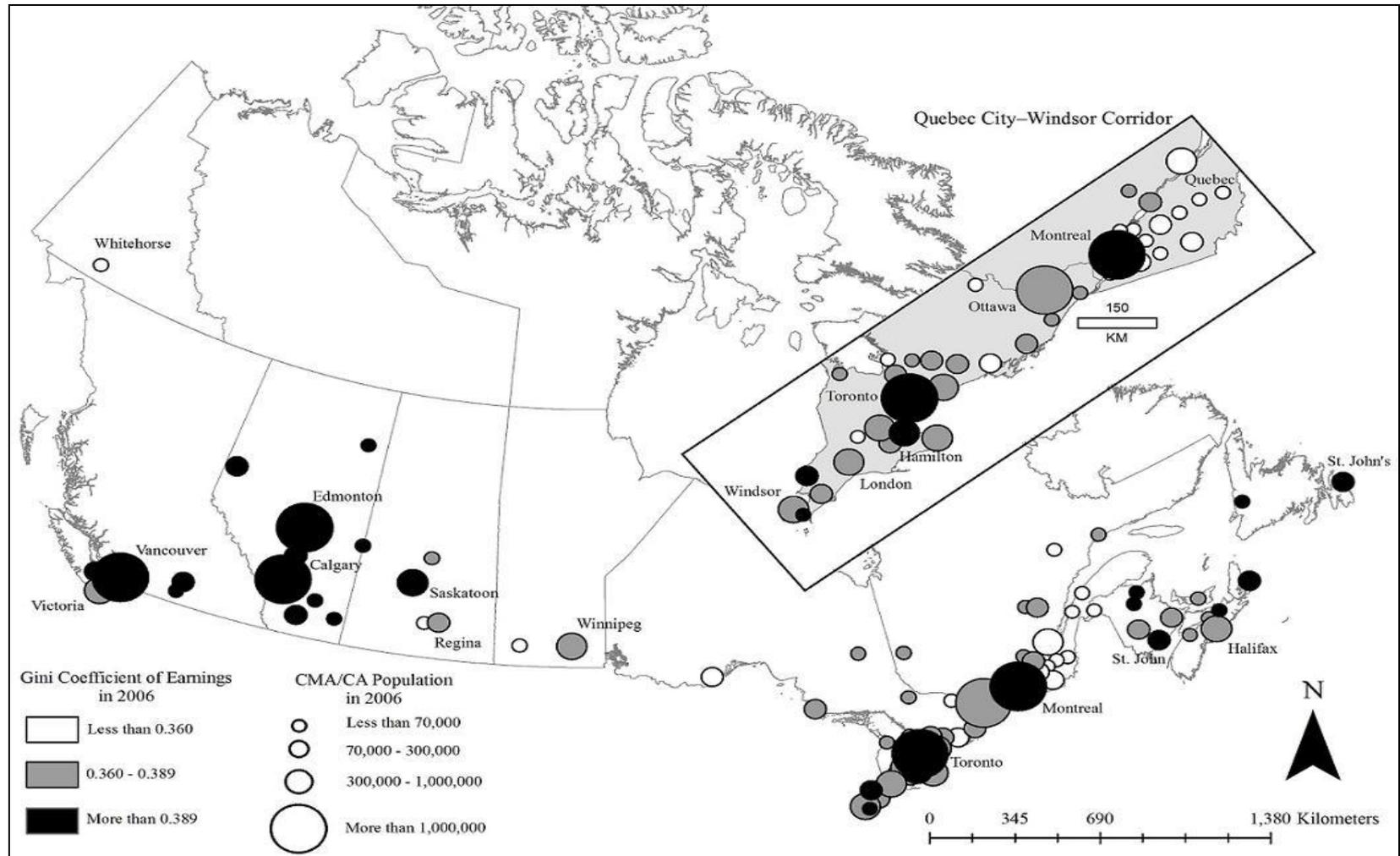
Inequality at the city-level

Based on:

Bolton, K. C. and S. Breau (2012) Growing unequal? Changes in the distribution of earnings across Canadian cities, *Urban Studies*.

Breau, S., D. Kogler and K. C. Bolton (In progress) Cities, innovation and inequality.

Earnings inequality across Canadian metropolitan areas, 2006





Inter-city dispersion and growth in Gini coefficients

Table. Inter-city dispersion and growth in Gini coefficients, 1996 – 2006

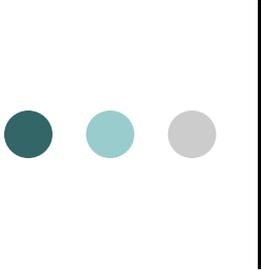
	1996	2001	2006	1996 – 2006 % change	
Mean Gini [§]	0.365	0.364	0.379	Range	(n*)
Min. / max.	0.330 / 0.412	0.320 / 0.422	0.330 / 0.491	> 7%	19
Std. deviation	0.019	0.022	0.027	3.5 – 7%	22
Coef. of variation	0.053	0.060	0.071	0 – 3.5%	28
				< 0%	18

Note: § The mean represents the average of all 87 metropolitan Gini values; * represents the number of cities that fall into the specified range.



Cities, innovation and inequality (1)

- The inequality-innovation link:
 - 1. Skills biased technological change: changes in the demand for skills (Acemoglu 2002; Autor et al. 2003; Breau 2007)
 - 2. Local productivity effect: stemming from reorganization of production activities within the firm (Svizzero and Tisdell 2003; Lee 2011)
 - 3. 'Sorting' of highly skilled and 'colocation' of personal services (Florida 2007; Lee 2011)
- The Canadian Patent Database (PATDAT, Kogler 2010)
 - Information on patents registered by Canadian inventors filed with US Patent and Trademark Office (USPTO)
 - Inventor's residential address geocoded and allocated to CMA / CA
- Measure of innovation: number of patents registered on a 100,000 person basis for each CMA / CA



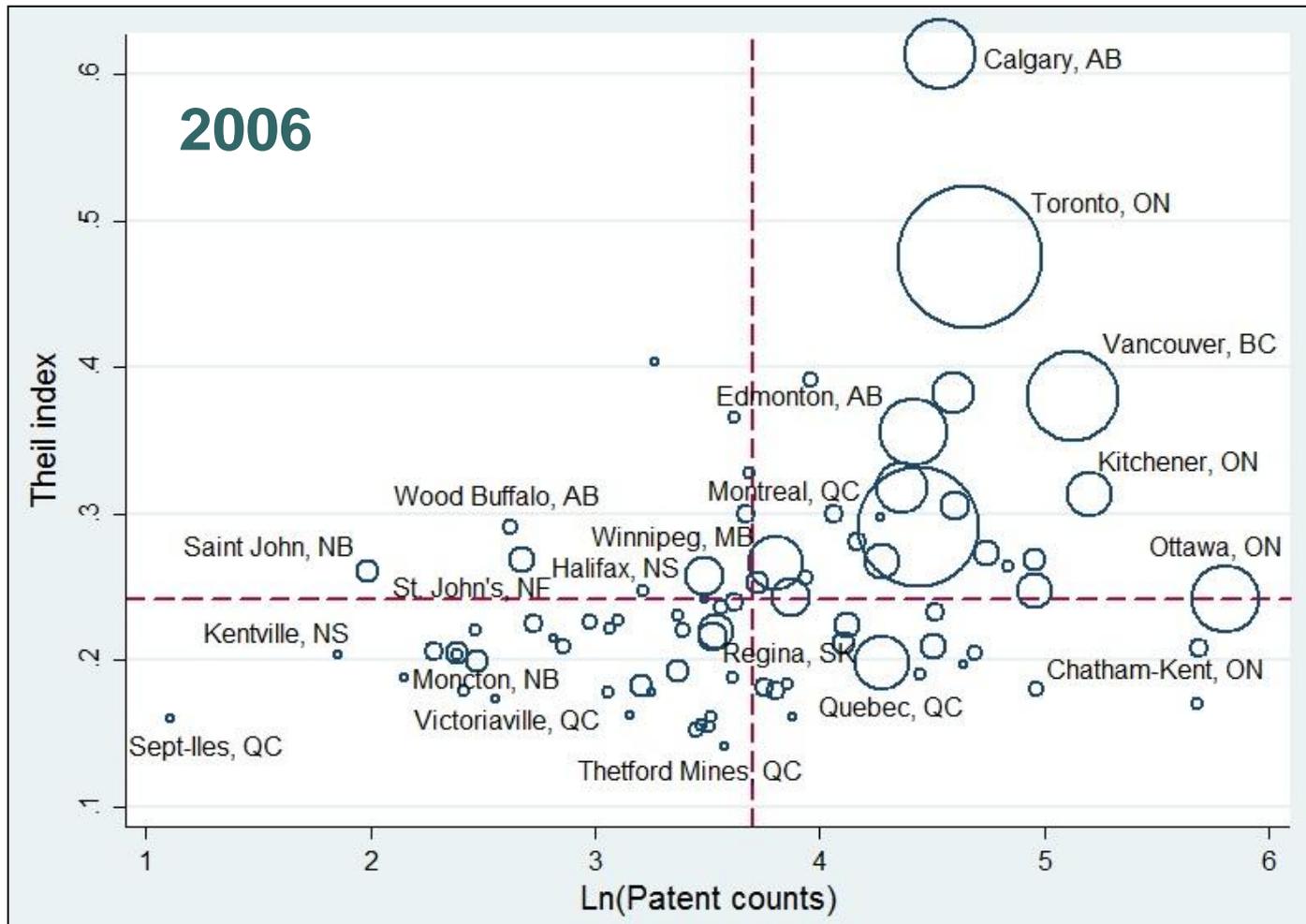
Cities, innovation and inequality (2)

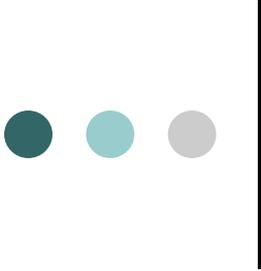
Table. Summary descriptive statistics for innovation

	1996	2001	2006	1996 – 2006 % change
<u>Standardized patent counts</u>				
Mean (<i>n</i>)	44.4 (86)	57.3 (86)	57.7 (86)	29.9
Large cities	78.2 (9)	125.1 (9)	118.4 (9)	51.4
Medium-large cities	64.6 (8)	98.3 (8)	88.8 (8)	37.5
Medium-small cities	47.3 (23)	64.1 (23)	58.8 (25)	24.3
Small cities	32.9 (46)	33.5 (46)	38.9 (44)	18.2
Min. / max.	0 / 264.8	0 / 258.4	0 / 332.0	
Coef. of variation	.965	.948	1.09	

Notes: Total population is used to define cities as large (500,000+ total population), medium-large (200,000 – 499,999), medium-small (75,000 – 199,999) and small (< 75,000).

Cities, innovation and inequality (3)





Modeling strategy

○ Fixed-effects model:

$$INEQ_{it} = \alpha + \beta_1 \ln INNOV_{it} + \beta_2 \ln SIZE_{it} + \eta ECON_{it} \\ + \phi SOCDEMOG_{it} + \delta INST_{it} + v_i + \varepsilon_{it}$$

where:

$ECON_{it}$ (% manufacturing employment, % public sector employment, UR)

$SOCDEMOG_{it}$ (female participation rate, % young and % senior, education ratio)

$INST_{it}$ (% union membership)

v_i : unobserved differences across cities

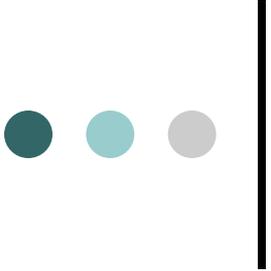
ε_{it} : idiosyncratic errors

○ Model estimated across cities clustered at the province-level

Table. Fixed-effects regression results

<i>Independent variables</i>	<i>Dependent variable: Theil index</i>			
	Model 1	Model 2	Model 3	Model 4
Innovation	.015** (.003)	.006* (.003)	.006* (.003)	.006* (.003)
City size		.243** (.017)	.209** (.029)	.143** (.047)
<i>Economic</i>				
Manufacturing (%)			-.219** (.084)	-.199** (.089)
Government (%)			-.109 (.162)	-.487* (.250)
Unemployment rate			.512 (.314)	.307 (.336)
<i>Socio-demographic</i>				
Female participation (%)				-.374 (.337)
Visible minority (%)				.890** (.303)
Young (%)				.024 (.155)
Senior (%)				.218 (.160)
Education ratio				.061 (.221)
<i>Institutional</i>				
Unionization (%)			-.008* (.004)	.001 (.005)
Constant	.167** (.010)	-2.36** (.178)	-1.72** (.352)	-1.26 (.829)
<i>N</i>	244	244	244	244
<i>R</i> ²	.011	.231	.301	.331

Notes: Heteroskedasticity-consistent standard errors also robust to possible clustering at the provincial-level are shown in parentheses; * and ** indicate significance at the .10 and .05 levels, respectively.



Conclusions (1)

- Key findings:

- Distribution of income in Canada increasingly unequal:
 - Growing geographical divides: urban vs. rural, western vs. eastern regions; large vs. small metropolitan areas
- Explanatory factors
 - 1. Deindustrialization, % visible minorities and economic development
 - 2. Population size increasingly influential
 - 3. Aging of population, educational inequality
 - 4. More innovative cities more unequal!

Conclusions (2)

Future research:

- Policy and institutional controls, trade-related factors
- Geographically weighted regression (GWR):
 - Tobler's law: "All places are related but nearby places are more related than distant places."
- Intra-metropolitan changes
- Inter-scalar differences
- A book on the spatial dimensions of inequality?



Source: www.cartoonstock.com