Essays on Causes and Consequences of Income Inequality in Natural Resource-Rich Countries:

Empirical Evidence from the Chilean Economy

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Motivation

"If income gaps are not reduced, the next crisis will happen as surely as autumn follows summer"

An interview with Michael Kumhof by Mikael Feldbaum, https://www.eurozine.com, 2012


WOM
Canon
"If income gaps are not reduced, the next crisis will happen as surely as autumn follows summer"

General Research problem

Income inequality could have a significant effect on social cohesion and instability, spreading its influence like a *disease*

(Brunori, Ferreira, & Peragine, 2013; R. Kanbur, 2005; S. M. R. Kanbur & Venables, 2005; Milanovic, 2016; Ocampo, 2004)

Essay 1:

Natural Resources: Curse or Blessing? Evidence on the Spatial Dimension of Income Inequality at the County Level in Chile

Research so far

- **Causes of income inequality** include **Globalization** (Milanovic, 2016), **Skill-biased technological change** (Tinbergen, 1975), investment in **human capital** (Murphy & Topel, 2016), **Institutions**, **redistributive policy** and **country-specific characteristics** (Acemoglu, 1995, 2002; Acemoglu et al., 2001a, 2001c)

The endowment of natural resources can influence inequality by:

- Determining its **initial levels** (Engerman & Sokoloff, 1994, 1997; Engerman, Sokoloff, Urquiola, & Acemoglu, 2002),
- Shaping the evolution of **institutions** (Acemoglu, 2002),
- Dumbing the **educational system** and moulding the **structure of economic activity** (Leamer, Maul, Rodriguez, & Schott, 1999)
- **Rent-seeking**, **delays in manufacturing and technology adoption** and **lower incentives for investment in physical and human capital** (Gylfason & Zoega, 2003).
- Impact on economic growth (**“Natural Resource Curse Hypothesis”**)

Research so far

Evidence for the Chilean economy has documented

- **High and persistent** levels of **income inequality**
- Significant **spatial dimension** (Aroca & Bosch, 2000; Paredes, Iturra, & Lufin, 2016)

About the relevance of the spatial dimension

- **Decomposing general indicators of inequality**. Evidence from countries including the US (Doran & Jordan, 2016), China (Akita, 2003; Gustafsson & Shi, 2002; Ye, Ma,Ye, Chen, & Xie, 2017; Yue, Zhang, Ye, Cheng, & Leipnik, 2014), Japan (Ohtake, 2008), South Africa (Leibbrandt, Finn, & Woolard, 2012) and Chile (Paredes et al., 2016).

- Using **spatial methods** to analyse the nature of the spatial effects:

    - **Spatial heterogeneity** (different relationships in distinct locations)

    - **Spatial dependence** (cross-sectional interactions such as spillover effects among units from distinct locations)

Research Questions

> How does the natural resource endowment influence the paths and structure of income inequality in natural resource-rich countries?

> Can the endowment of natural resources help to explain the persitently high levels of income inequality?

> What type of process describes the spatial dimension shown by income inequality?

Research Hypoteses

The Role of Natural Resources

> *H1:* A higher degree of dependence on natural resources is associated with higher levels of income inequality.

Nature and Relevance of the spatial dimension

> *H2:* Income inequality shows a significant process of spatial dependence, that is, a process of interaction among units from distinct locations

Data and Variables

- Merging of the following datasets:
  - Six waves of CASEN Survey for household data (years 2006-2009-2011-2013-2015-2017)
  - SINIM for information about municipalities
  - INE for population data
  - SII for data on employment and number of firms
- In total 1944 obsevations (324 municipalities in 6 years)

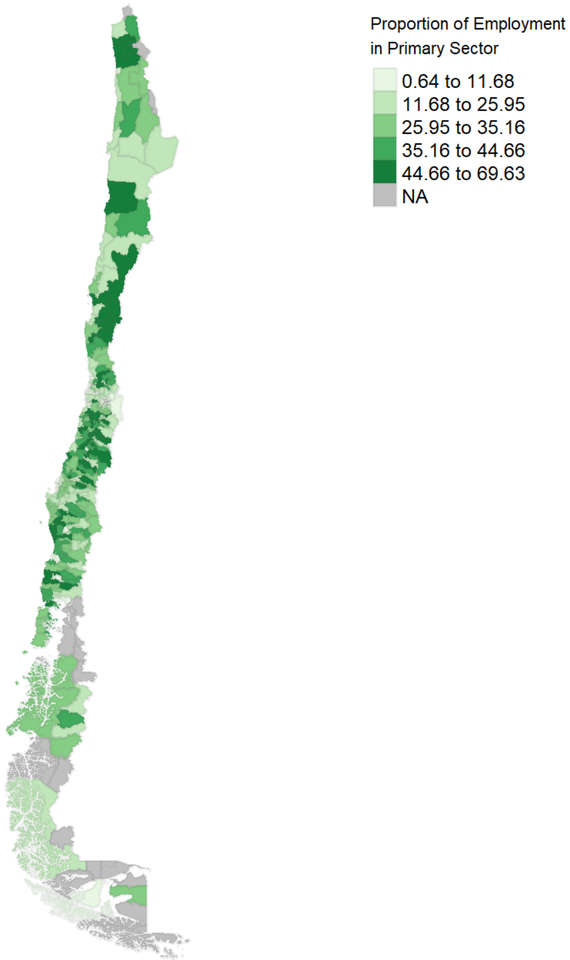
Dependent Variable

Gini coefficient of outonomous income (the sum of labour income and non-labour income such as rents, interests and pensions) for each county.

Independent Variable

Measure of natural resource dependence: Percentage of employment in the primary sector (mining, fishing, forestry and agriculture) in each county

Gini and NRD: Spatial distribution (average 2006-17)



Methods: "Spatial Approach"

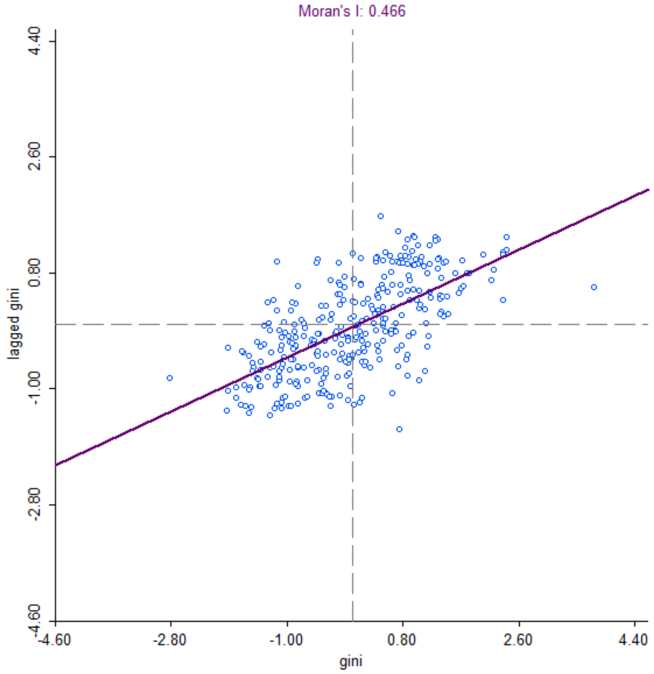
What do we mean by "spatial approach"?

- **Mapping** the spatial distribution of the variable
- **Defining** the relevant **neighborhood** for each county (matrix **W**).
- **Testing** the significance of the spatial patterns (**Spatial Autocorrelation**)
- Is the **clustering pattern** in inequality the result of a process of spatial dependence in the variable itself or it **can be explained by other variables?**
    - Run an **OLS regression** of Gini against NRD and controls
    - Test for **spatial autocorrelation** in the **OLS residuals**
- Using **spatial models** (cross-sectional and panel) to find the spatial structure that best fits the clustering process of income inequality after controlling for other variables

Results

Testing spatial correlation (Moran's I)

- H_0: Spatial randomness (I = 0)
- H_1: Spatial autocorrelation:
  - Positive (I > 0)
  - Netagive (I < 0)



Positive Spatial Autocorrelation:

> Counties with similar levels of inequality tend to be close each other

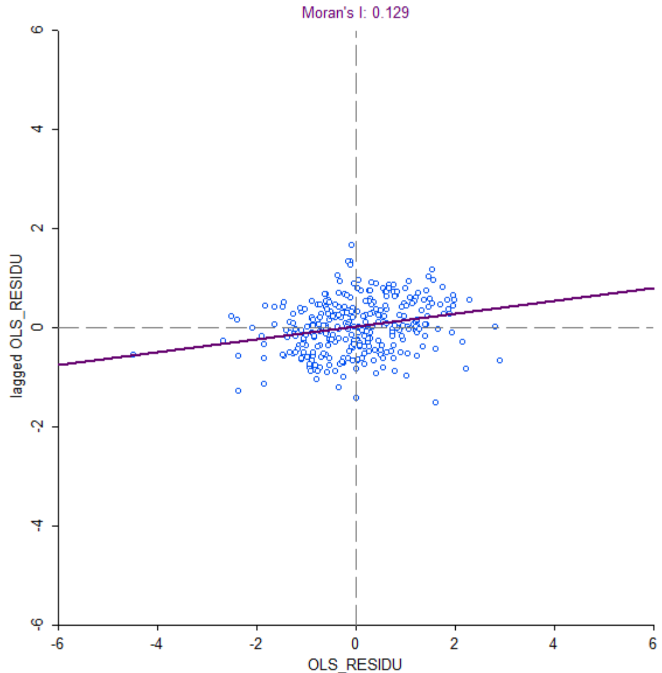
Analysis of OLS residuals

- We run the model:

$$gini_i = \beta_0 + \beta_1 pss\_casen + \beta_2 lnincome + \beta_3 poverty + \beta_4 unemployment + \beta_5 labour\_force + \beta_6 education + \beta_7 lndensity + \beta_8 rural + \beta_9 lnmuni\_expenditure + \beta_{10} north + \beta_{11} south$$

- We get the OLS residuals

- We test for spatial autocorrelation in OLS residuals



Spatial Model Specification (Cross-Sectional)

The model could be expressed as:

$$y = \lambda W y + X\beta + W X \gamma + u$$

where

$$u = \rho W u + \varepsilon$$

- W is our weight matrix that works as a NxN spatial lag operator (**Spatial Lag**: Weighted sum of the values observed at neighboring locations)
- Thus, the parameter:
  - λ capture the influence of the spatial lag for the dependent variable, Wy,
  - γ capture the influence of the spatial lag for the explanatory variables, WX,
  - ρ capture the influence of the spatial lag for the errors, Wu,
  - ϵ is a vector of idiosyncratic errors.

Cross-sectional Model Comparison (six-year average data)

	OLS	SLX	SAR	SEM	SARAR	SDM	SDEM	SARARX
pss_casen	-0.001^{***}	-0.002^{***}	-0.001^{***}	-0.001^{***}	-0.002^{***}	-0.002^{***}	-0.002^{***}	-0.002^{***}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnincome	0.163^{***}	0.171^{***}	0.154^{***}	0.171^{***}	0.172^{***}	0.176^{***}	0.177^{***}	0.177^{***}
	(0.014)	(0.016)	(0.014)	(0.014)	(0.015)	(0.015)	(0.014)	(0.015)
poverty	0.005^{***}	0.004^{***}	0.004^{***}	0.004^{***}	0.004^{***}	0.004^{***}	0.004^{***}	0.004^{***}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
unemployment	-0.000	-0.000	-0.000	0.000	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
labour_force	-0.002^{*}	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
education	-0.017^{***}	-0.021^{***}	-0.017^{***}	-0.020^{***}	-0.020^{***}	-0.023^{***}	-0.022^{***}	-0.023^{***}
	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
lndensity	-0.005^{***}	-0.004^{*}	-0.005^{***}	-0.005^{***}	-0.005^{***}	-0.004^{*}	-0.004^{*}	-0.004^{*}
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
rural	0.001^{***}	0.001^{***}	0.001^{***}	0.001^{***}	0.001^{***}	0.001^{***}	0.001^{***}	0.001^{***}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnmuni_expenditure	-0.019^{***}	-0.017^{***}	-0.018^{***}	-0.017^{***}	-0.017^{***}	-0.017^{***}	-0.018^{***}	-0.017^{***}
	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
north	0.012^{*}	0.026	0.010	0.015	0.015	0.030	0.033	0.030
	(0.006)	(0.027)	(0.006)	(0.008)	(0.008)	(0.025)	(0.024)	(0.025)
south	0.021^{***}	0.005	0.013^{**}	0.023^{***}	0.024^{**}	0.002	0.001	0.001
	(0.005)	(0.019)	(0.005)	(0.006)	(0.008)	(0.018)	(0.018)	(0.018)
lambda			0.200^{**}		-0.030	0.273^{***}		0.228
			(0.064)		(0.112)	(0.078)		(0.422)
rho				0.345^{***}	0.372^{***}		0.280^{***}	0.059
				(0.075)	(0.112)		(0.079)	(0.473)
Adj. R^2	0.630	0.652						
Num. obs.	324	324	324	324	324	324	324	324
Parameters			14	14	15	25	25	26
Log Likelihood			728.017	730.916	730.949	744.840	744.408	744.868

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

Panel Data Regressions (non-spatial)

	Dependent variable: Gini Coefficient Autonomous Income			
	Pooled	Pooled	Fixed Effects	Random Effects
pss_casen	-0.001^{***}	-0.001^{***}	-0.0003^{*}	-0.001^{***}
	(0.0001)	(0.0001)	(0.0002)	(0.0001)
lnincome		0.158^{***}	0.184^{***}	0.161^{***}
		(0.007)	(0.008)	(0.007)
poverty		0.002^{***}	0.0002	0.001^{***}
		(0.0002)	(0.0002)	(0.0002)
unemployment		0.003^{***}	0.003^{***}	0.003^{***}
		(0.0004)	(0.0004)	(0.0003)
labour_force		-0.002^{***}	-0.006^{*}	-0.003^{***}
		(0.0005)	(0.003)	(0.001)
education		-0.022^{***}	-0.022^{***}	-0.023^{***}
		(0.002)	(0.003)	(0.002)
lndensity		-0.003^{***}	0.011	-0.002^{**}
		(0.001)	(0.026)	(0.001)
rural		0.0004^{***}	-0.00004	0.0003^{***}
		(0.0001)	(0.0002)	(0.0001)
lnmuni_expenditure		-0.014^{***}	0.005	-0.013^{***}
		(0.003)	(0.007)	(0.004)
north	0.026^{***}	0.015^{***}		0.016^{**}
	(0.004)	(0.005)		(0.006)
south	0.054^{***}	0.035^{***}		0.041^{***}
	(0.003)	(0.003)		(0.004)
Constant	0.468^{***}	0.037		0.052
	(0.004)	(0.042)		(0.051)
Year Dummies?	*Yes*	*Yes*	*Yes*	*Yes*
Observations	1,944	1,944	1,944	1,944
Adjusted R^2	0.230	0.443	0.272	0.410
Note:				$^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Panel Data Regressions (Spatial)

ML Spatial SAR Models

Coefficients	Pooled	Pr(>|t|)	FE	Pr(>|t|)	RE	Pr(>|t|)
lambda	0.007	0.875	-0.002	0.949	0.001	0.700
pss_casen	-0.001	0.000	0.000	0.056	-0.001	0.000
lnincome	0.157	0.000	0.184	0.000	0.163	0.000
poverty	0.002	0.000	0.000	0.236	0.001	0.000
unemployment	0.003	0.000	0.003	0.000	0.003	0.000
labour_force	-0.002	0.000	-0.006	0.063	-0.003	0.000
education	-0.022	0.000	-0.022	0.000	-0.024	0.000
lndensity	-0.003	0.000	0.011	0.627	-0.002	0.079
rural	0.000	0.000	0.000	0.870	0.000	0.001
lnmuni_expenditure	-0.014	0.000	0.005	0.442	-0.012	0.002

ML Spatial SEM Models

Coefficients	Pooled	Pr(>|t|)	FE	Pr(>|t|)	RE	Pr(>|t|)
rho	0.097	0.009	0.061	0.098	0.076	0.047
pss_casen	-0.001	0.000	0.000	0.065	-0.001	0.000
lnincome	0.159	0.000	0.186	0.000	0.164	0.000
poverty	0.002	0.000	0.000	0.249	0.001	0.000
unemployment	0.003	0.000	0.003	0.000	0.003	0.000
labour_force	-0.002	0.000	-0.005	0.074	-0.003	0.000
education	-0.022	0.000	-0.022	0.000	-0.024	0.000
lndensity	-0.003	0.000	0.013	0.584	-0.002	0.085
rural	0.000	0.000	0.000	0.840	0.000	0.001
lnmuni_expenditure	-0.014	0.000	0.006	0.417	-0.012	0.002

GM Spatial Models

	SAR				SEM			
Coefficients	FE	Pr(>|t|)	RE	Pr(>|t|)	FE	Pr(>|t|)	RE	Pr(>|t|)
pss_casen	0.000	0.052	-0.001	0.000	0.000	0.065	-0.001	0.000
lnincome	0.183	0.000	0.161	0.000	0.185	0.000	0.163	0.000
poverty	0.000	0.270	0.001	0.000	0.000	0.250	0.001	0.000
unemployment	0.003	0.000	0.003	0.000	0.003	0.000	0.003	0.000
labour_force	-0.006	0.086	-0.003	0.000	-0.006	0.074	-0.003	0.000
education	-0.022	0.000	-0.024	0.000	-0.022	0.000	-0.024	0.000
lndensity	0.010	0.694	-0.002	0.063	0.013	0.588	-0.002	0.047
rural	0.000	0.900	0.000	0.000	0.000	0.843	0.000	0.000
lnmuni_expenditure	0.005	0.493	-0.013	0.000	0.005	0.421	-0.012	0.001

Discussion and Recomendations

- Contrary to our main hypothesis, **NRD shows a significant and negative association with income inequality**.
- This **result is robust** to the type of analysis (cross-sectional vs panel data), the approach (spatial vs nonspatial) and the inclusion of different controls.
- Implication: **The downward trend in the participation of the primary sector in terms of employment in the Chilean economy could be one of the reasons explaining the high persistence in the levels of income inequality**.
- **Policies** oriented to transform the structure of local economies to less dependent ones on natural resources will generate additional challenges for local and central governments in their attemps to reduce inequality
- **Education and municipal expenditure** seem to be **effective** policy tools aiming **to reduce inequality in Chile**.

Limitations and Future Research

Limitations

- Data availability at the county level
- Results do not allow us to make causal inferences about the effect of NRD on income inequality
- Results are sensitive to the specification of the spatial weights

Future Research

- "Innovative" ways to define "distance" and W.
- Incorporate measures of commuting and migration between counties.
- Using measures of NRD as instrument for income inequality in studies about its consequences.

Essay 2:

Assessing and Explaining Local Government Efficiency in Natural Resource-Rich Countries: The case of Chilean Municipalities

Research so far

- **Trade-off between efficiency and equity**:
  - Pursuing **equality can reduce efficiency** (see Okun 1975; Browning & Johnson 1984; Andersen & Maibom 2016)
  - But, equality **could also be an important ingredient in promoting and sustaining growth** (see Berg & Ostry 2011; kumhof, Rancière & Winant 2015)
- **Local Government Efficiency (LGE)** studies focus on:

Measuring LGE

- Single service vs overall efficiency
- Parametric (SFA) vs **non-parametric (DEA)** techniques
- Input oriented vs output oriented
- Selection of inputs and outputs

Explaining differences in LGE

- Discretionary factors (inputs and outputs)
- **Non-discretionary (contextual) factors**: Socio-economic, demographic, geographic, political, institutional, etc.

Research Question

> What role does income inequality play in explaining differences in municipal efficiency?

Research Hypoteses

About the relationship between LGE and income inequality

> H_1: Income inequality has a negative effect on municipal efficiency.

See Tandon ,2005; Jottier, Ashworth, & Heyndels, 2012; Ortega, Sanjuán, & Casquero, 2017

Why?; How?

About the level of inefficiency of Chilean municipalities

> H_2: Chilean municipalities show an average level of inefficiency of 30%.

See Pacheco, Sanchez & Villena, 2013

Data

First Stage (DEA): Inputs - Output used to measure LGE

- National System of Municipal Information, SINIM (2006-2017)
- Sample of 324 municipalities (3888 observations)

County-Level Data on Contextual Factors

- National Socioeconomic Characterization Survey, CASEN (2006 - 2009 - 2011 - 2013 - 2015 - 2017)
- SINIM
- "Servicio de Impuestos Internos", SII
- National Institute of statistics, INE
- in total 1944 observations

Methodology: Two Stage Approach

First Stage: DEA analysis

- Input oriented assuming variable returns to scale
- Result: A vector of **efficiency scores (ES)** for each municipality

Second Stage: Regression Analysis

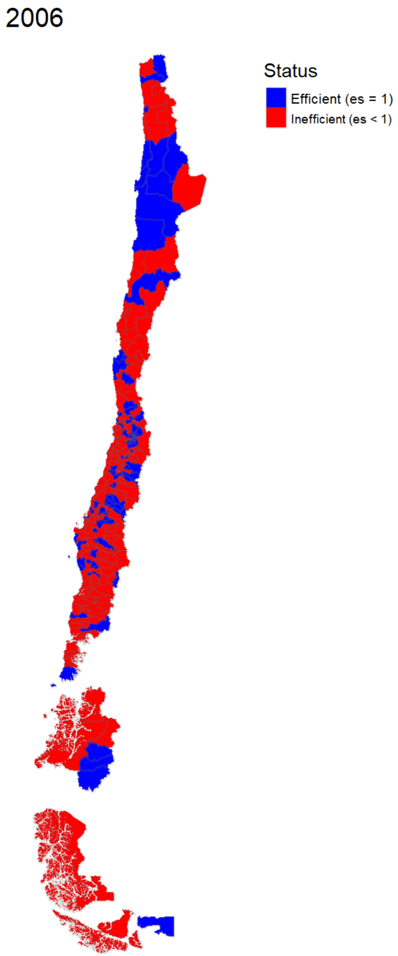
- **Dependent variable**: DEA efficiency scores
- **Independent variables**:
  - Measure of Income inequality + Remaining contextual factors
  - County (zone) specific + time effects
- **Estimation method**: Censored regression + Instrumental Variable (IV)
- **Proposed Instrument**: $pss\_firms = \frac{\text{Number of firms in primary sector}}{\text{Total number of firms}}$

First Stage: DEA Results

Evolution Efficiency Scores by Zone (Full Period)

Efficiency Scores by Zone and Region

Unit	n_counties	mean	median	sd	min	max
North	**41**	**0.83**	**0.86**	**0.19**	**0.26**	**1**
XV	3	0.88	1.00	0.22	0.27	1
I	6	0.73	0.80	0.28	0.26	1
II	8	0.98	1.00	0.07	0.70	1
III	9	0.79	0.79	0.14	0.53	1
IV	15	0.80	0.81	0.16	0.49	1
Centre_North	**121**	**0.88**	**0.94**	**0.14**	**0.32**	**1**
V	36	0.82	0.84	0.15	0.39	1
XIII	52	0.95	1.00	0.09	0.47	1
VI	33	0.81	0.82	0.15	0.32	1
Centre_South	**116**	**0.82**	**0.83**	**0.15**	**0.34**	**1**
VII	30	0.81	0.82	0.15	0.40	1
VIII	54	0.84	0.88	0.15	0.34	1
IX	32	0.77	0.77	0.16	0.40	1
South	**46**	**0.77**	**0.77**	**0.18**	**0.31**	**1**
XIV	12	0.74	0.74	0.13	0.46	1
X	25	0.74	0.75	0.19	0.31	1
XI	6	0.89	0.98	0.15	0.44	1
XII	3	0.85	0.91	0.17	0.52	1
Country	**324**	**0.83**	**0.86**	**0.16**	**0.26**	**1**



Second Stage

The model

To test our hypothesis, the empirical model is defined as:

$$\theta_{it} = \beta_1 gini_{it} + Z_{it}\beta + \delta_t + \alpha_i + \epsilon_{it}$$

Where:

- θ_{it} is the vector of efficiency scores from the DEA analysis,
- $gini_{it}$ is the Gini coefficient of each county,
- Z is a vector of controls.
- δ_t are year-specific effects,
- α_i are municipality-specific constants,
- ϵ_{it} is a vector of error terms and

Model Comparisons - Cross-sectional Censored Regressions

	Dependent variable: Efficiency Score (VRS)					
	2006	2009	2011	2013	2015	2017
gini	-0.228	-0.447^{**}	-0.393^{*}	-0.242	-0.189	-0.371^{*}
log(income)	0.119^{*}	0.249^{***}	0.208^{***}	0.164^{**}	0.221^{***}	0.257^{***}
agroland	-0.002^{***}	-0.003^{***}	-0.003^{***}	-0.001	-0.002^{***}	-0.001
log(density)	0.019^{**}	0.032^{***}	0.021^{***}	0.034^{***}	0.017^{**}	0.005
own	-0.002^{*}	-0.002	-0.003^{**}	-0.004^{***}	0.002^{*}	-0.002
education	-0.018	-0.038^{*}	-0.046^{**}	-0.026	-0.009	-0.020
IDD	-0.005^{**}	-0.006^{***}	-0.004^{*}	-0.001	-0.004^{*}	-0.006^{***}
professional	0.001	-0.0001	-0.0002	0.003^{**}	0.002	0.0003
mcf	0.002^{*}	0.002^{**}	0.002^{**}	0.0003	0.0004	0.0004
LEFT mayor	-0.016	0.012	0.008	0.003	0.020	-0.022
RIGHT mayor	0.007	-0.002	0.032	0.013	0.038	0.002
reg_cap	-0.039	-0.061	-0.043	-0.106^{*}	0.0004	-0.012
Centre South	0.068^{**}	0.126^{***}	0.050	0.028	0.054^{*}	0.040
North	-0.019	0.099^{**}	0.056	0.135^{***}	0.006	0.034
South	-0.051	0.044	0.015	-0.025	-0.019	-0.065^{*}
Observations	324	324	324	324	324	324
Log Likelihood	-14.778	12.330	-15.924	-24.773	-1.200	6.937
Akaike Inf. Crit.	63.555	9.339	65.848	83.546	36.400	20.127

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Panel Data Regressions : Dependent variable - Efficiency Score (VRS)						
			censored regression		*instrumental variable*	
	Pooled	RE	Pooled	RE	OLS IV	Tobit IV
	(1)	(2)	(3)	(4)	(5)	(6)
gini	−0.033	−0.049	-0.282^{***}	-0.189^{***}	-1.434^{***}	-1.196^{*}
	(0.082)	(0.068)	(0.081)	(0.073)	(0.432)	(0.538)
log(income)			0.184^{***}	0.106^{***}	0.258^{***}	0.292^{***}
			(0.026)	(0.025)	(0.054)	(0.069)
agroland			-0.002^{***}	-0.002^{***}	-0.002^{***}	-0.002^{***}
			(0.0003)	(0.0004)	(0.0003)	(0.0003)
log(density)			0.022^{***}	0.020^{***}	0.012^{***}	0.021^{***}
			(0.003)	(0.005)	(0.003)	(0.003)
own			-0.002^{***}	-0.001^{**}	-0.001^{***}	-0.001^{***}
			(0.001)	(0.001)	(0.0004)	(0.0005)
education			-0.022^{***}	−0.005	-0.034^{***}	-0.033^{**}
			(0.008)	(0.008)	(0.008)	(0.010)
IDD			-0.004^{***}	-0.005^{***}	-0.002^{**}	-0.003^{**}
			(0.001)	(0.001)	(0.001)	(0.001)
professional			0.001^{*}	−0.00004	0.0004	0.0008
			(0.0005)	(0.0005)	(0.0004)	(0.0005)
mcf			0.001^{***}	0.002^{***}	0.001^{***}	0.001^{**}
			(0.0003)	(0.0004)	(0.0003)	(0.0004)
LEFT mayor			−0.001	0.006	−0.007	−0.005
			(0.011)	(0.010)	(0.009)	(0.011)
RIGHT mayor			0.017	0.005	0.003	0.013
			(0.012)	(0.011)	(0.010)	(0.012)
reg_cap			-0.047^{**}	-0.069^{**}	0.024	−0.021
			(0.023)	(0.034)	(0.022)	(0.028)
Centre South	-0.089^{***}	-0.086^{***}	0.058^{***}	0.022	0.123^{***}	0.113^{**}
	(0.012)	(0.019)	(0.014)	(0.022)	(0.028)	(0.035)
North	-0.054^{***}	−0.045	0.050^{***}	0.059^{*}	0.030^{*}	0.061^{**}
	(0.016)	(0.033)	(0.019)	(0.032)	(0.016)	(0.020)
South	-0.142^{***}	-0.124^{***}	−0.019	−0.033	0.036	0.021
	(0.016)	(0.044)	(0.016)	(0.026)	(0.023)	(0.029)
Year Dummies?	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Note:				*p<0.1; **p<0.05; ***p<0.01		

Main results

- **DEA**
  - The **"production function"** of municipalities **shows variable returns to scale**.
  - The **average level of inefficiency is 17%**, with higher levels in the South area of the country.
  - Efficiency shows a **ciclical behaviour** and, on average, has remained stable in the period 2006 - 2017.
- **Regression analysis**
  - Empirical **evidence of a negative relationship between inequality and efficiency**.
  - A **reduction of income inequality** (or an increase in equality) **could have positive effects on economic efficiency**, at least at the **level of local governments**.

Limitations and Future Research

Limitations

- Results sensitive to the selection and number of inputs and outputs
- Associated with observational data and the interpretation of results as causal relationships.

Future research

- How to capture **quality** in the provision of public services
- Modelling spatial dependence-heterogeneity in LGE and use of alternatives IV´s.
- Program evaluation in Chilean municipalities
- Predictive analylitics (Machine Learning?) for the probability to get an eficient performance.
- Given the current situation: What about the issue of **reverse causality?**

Essay 3:

Does economic disadvantage diminish social cohesion? A study of the relationship between incivilities and income inequality at the municipal level in Chile

What are "Incivilities"?

> Incivilities are those visible disorders in the public space that violate respectful social norms and tend not to be treated as crimes by the criminal justice system

There two types of incivilities:

- **Social incivilities** include antisocial behaviours such as public drinking, noisy neighbours, fighting in public places and street drug sales.
- **Physical incivilities** include, among others, vandalism, graffiti, abandoned cars and garbage on the streets.

What is the problem?

Broken Window Theory

> Higher rates of incivilities are a signal of social disorganization which result in higher crime rates (Wilson & Kelling, 1982)

Research so far

> The negative impact of incivilities is not merely reflected in its **association with crime rates** (Skogan, 2015)

Incivilities have been associated with:

- **Health problems** (Branas et al., 2011; Cohenet al., 2000; Hill & Angel, 2005; Ross, 2011; Ross & Mirowsky, 2001)
- **Greater victimization** and **fear of crime** (Brunton-Smith, Jackson, & Sutherland, 2014; Mijanovich & Weitzman, 2003)
- Multiple negative **economic effects**:
    - Reduction in commercial activity, lower investment in real state and reduction in house prices (Skogan, 2015)
    - Population instability (Hipp, 2010).

Research so far

The "Incivilities Thesis"

> Incivilities are caused by inequality and the lack of informal mechanisms of social control. **The patterns of incivilities should mirror the patterns of inequality** (Taylor, 1999)

Chilean evidence:

- Focussed on crime and showing weak and ambiguous results
    - **Indicators of socio-economic disadvantage** would only have significant effects on property crime (Beyer & Vergara, 2006; Nuñez, Rivera, Villavicencio, & Molina, 2003; Rivera, Gutiérrez, & Núñez,2009).
    - **Crime deterrence variables**: The probability of being caught or the number of police resources (Beyer & Vergara, 2006; Rivera et al., 2009; Vergara, 2012).

Research Question

Do differences in the rate of incivilities mirror differences in income inequality between counties?

Research Hypoteses

> H_1: Incivilities will be higher in counties with high levels of inequality.

> H_2: Incivilities will be higher in counties with a high proportion of the young population.

> H_3: Incivilities will be higher in counties with a high proportion of foreign inhabitants.

> H_4: Incivilities will be lower in counties managed by municipalities more autonomous from central government transfers.

Data

- Data on the number of **incivilities** were obtained from the **“Centre of Studies and Analysis of Crime”** (Chilean government)

- Dependent variable:

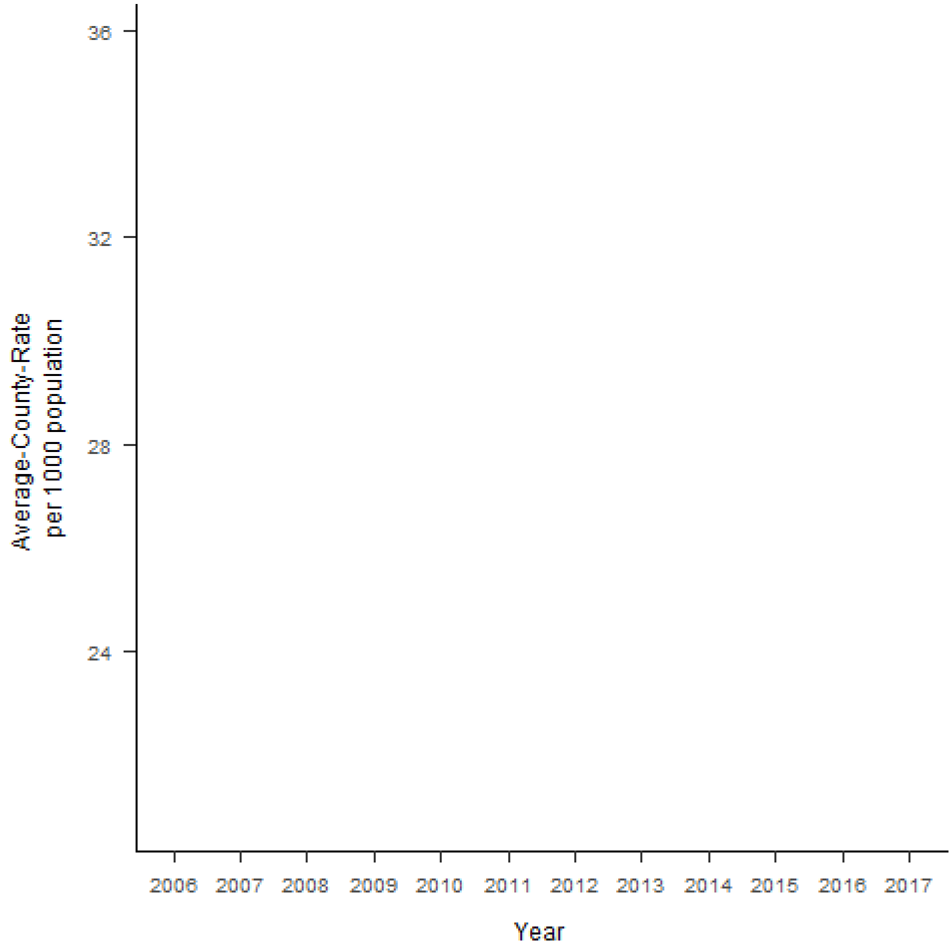
$$inciv\_rate = \frac{incivilities_{it}}{n_{it}} * 1000;$$

- Where $inciv\_rate$ is the incivilities rate, t is the year, i the county and n is the population of the county per year.

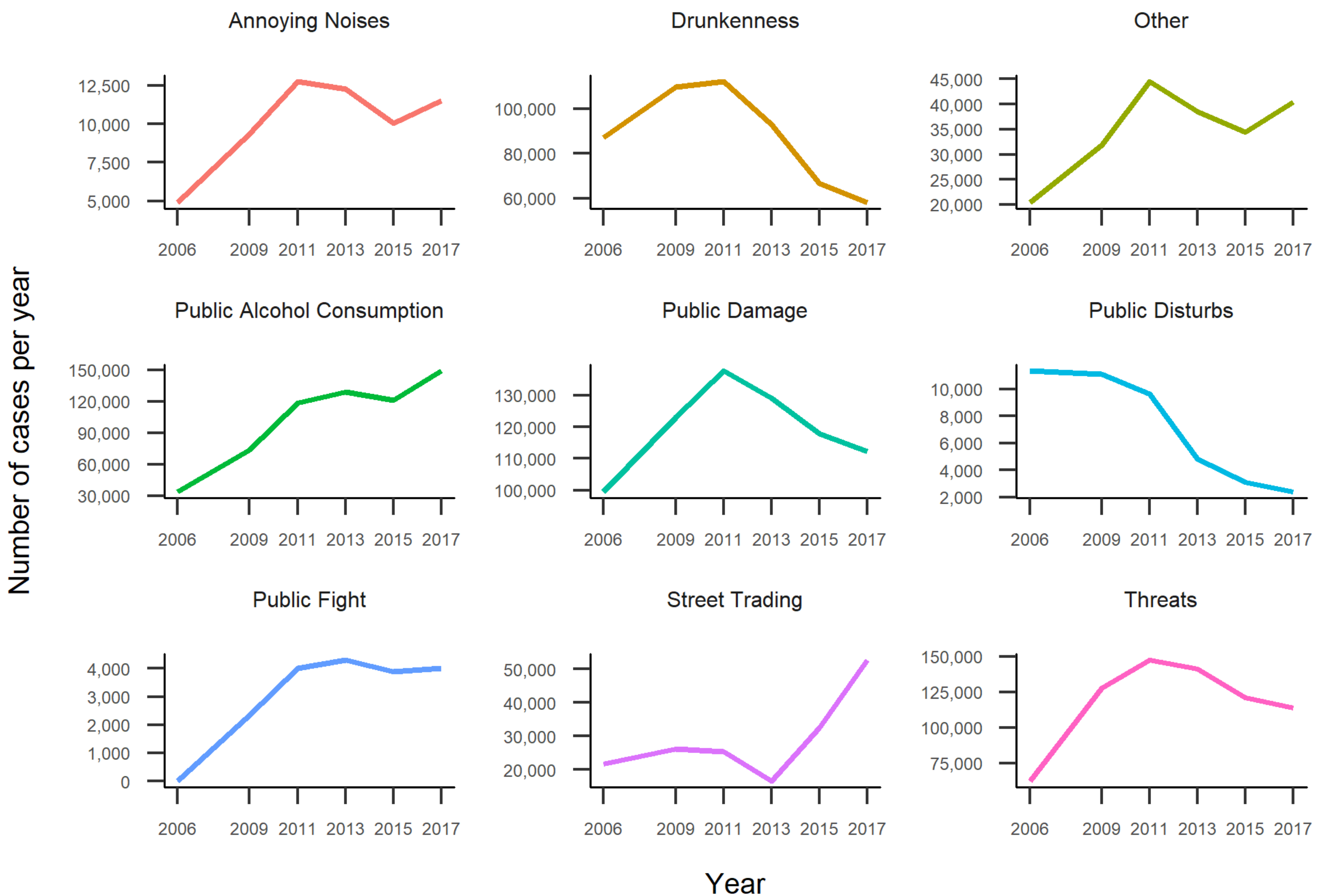
- Independent variable:

    - The **Gini coefficient** is calculated for each county and included through the variable *gini*.

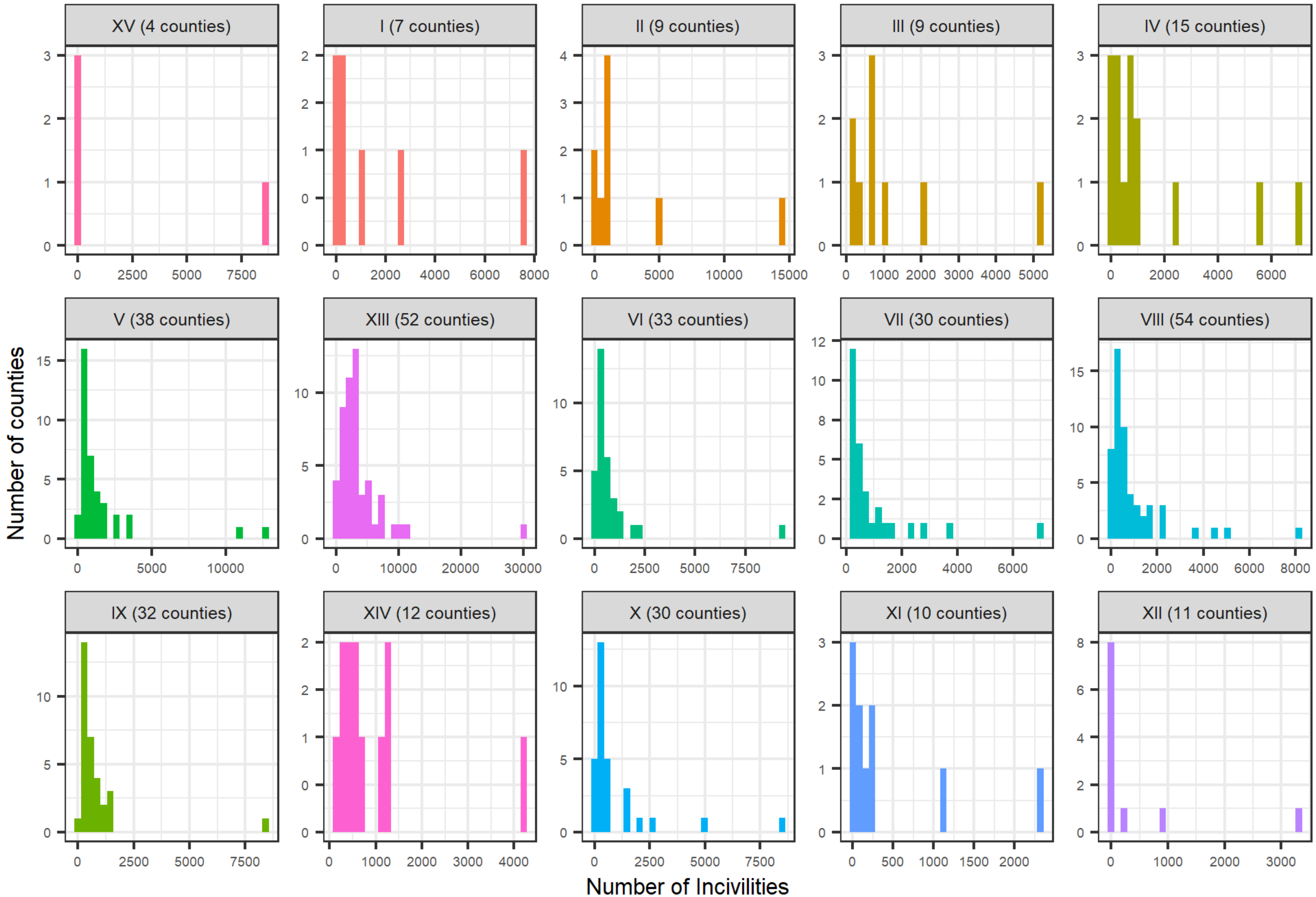
Evolution Average County Rate of Incivilities per 1000 inhabitants



Evolution Total Number of Incivilities by Category



Annual Average Number of Incivilities per County



Method: Panel Count Data models

- Considering as the response variable the count of incivilities:

$$\lambda_{it} = exp(\beta_0 + \beta_1 gini_{it} + X\gamma + \alpha_i + \theta_t)$$

- where
  - λ is the rate of incivilities,
  - X is our vector of controls,
  - $\alpha's$ are county-specific constants and
  - $\theta's$ are time-specific constants.

- To account for differences in county population, we have:

$$\frac{\lambda_{it}}{(\frac{population_{it}}{1000})} = exp(\beta_0 + \beta_1 gini_{it} + X\gamma + \alpha_i + \theta_t)$$

- The model estimated using Maximum Likelihood Estimation (MLE) is:

$$log(\lambda_{it}) = \beta_0 + \beta_1 gini_{it} + X\gamma + \alpha_i + \theta_t + log(\frac{population_{it}}{1000})$$

Results: Poisson Regression

	Dependent variable: Number of Incivilities								
	Pooled			Fixed Effects			Random Effects		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
gini	0.042***	−0.010***	−0.003**	0.039***	0.021***	0.022**	0.039***	0.021***	0.020***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
log(income)	0.395***	−0.317***	−0.186***	0.275***	0.100***	0.125***	0.277***	0.101***	0.112***
	(0.011)	(0.012)	(0.013)	(0.017)	(0.018)	(0.018)	(0.017)	(0.018)	(0.018)
poverty	−0.0004***	0.0003**	0.0001	−0.0003***	0.003***	0.001***	0.003***	0.003***	0.001***
	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0002)	(0.0002)
unemployment	−0.006***	0.003***	0.005***	0.006***	0.007***	0.008***	0.006***	0.007***	0.008***
	(0.0003)	(0.0002)	(0.0003)	(0.0003)	(0.0002)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
youth		−0.059***	−0.050***		−0.032***	−0.002		−0.031***	−0.010***
		(0.0004)	(0.0004)		(0.003)	(0.003)		(0.003)	(0.003)
foreign		0.119***	0.083***		0.028***	0.044***		0.028***	0.041***
		(0.0004)	(0.0005)		(0.0006)	(0.0007)		(0.0006)	(0.0007)
autonomy		0.004***	0.003***		−0.003***	−0.001***		−0.003***	−0.002***
		(0.00004)	(0.00004)		(0.0001)	(0.0001)		(0.0001)	(0.0001)
housing			−0.010***			−0.0003			−0.0002
			(0.0001)			(0.0002)			(0.0001)
log(density)			−0.009***			−0.469***			−0.268***
			(0.001)			(0.017)			(0.017)
women			−0.026***			0.033***			0.033***
			(0.0003)			(0.001)			(0.001)
community_org			0.002***			0.002***			0.002***
			(0.0001)			(0.0001)			(0.0001)
deterrence			0.007***			0.004***			0.005***
			(0.0001)			(0.00007)			(0.00007)
capitalYes			0.101***						0.409***
			(0.001)						(0.080)
mayorLEFT			0.010***			0.044***			0.041***
			(0.002)			(0.002)			(0.002)
mayorRIGHT			0.021***			0.034***			0.031***
			(0.002)			(0.002)			(0.002)
gini:log(income)	−0.006***	0.003***	0.001***	−0.007***	−0.004***	−0.004***	−0.007***	−0.004***	−0.004***
	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.0004)	(0.0004)	(0.0003)	(0.0004)	(0.0003)
Constant	0.380***	5.521***	6.737***				1.409***	3.208***	2.802***
	(0.062)	(0.067)	(0.071)				(0.105)	(0.127)	(0.185)
Year Dummies?	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Region Dummies?	*Yes*	*Yes*	*Yes*	*No*	*No*	*No*	*Yes*	*Yes*	*Yes*
Observations	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944
Log Likelihood	-285,168.100	-189,792.700	-167,855.800	-73,068.100	-71,772.252	-68,801.188	-75,895.29	-74,599.891	-71,802.581

Note: *p<0.1; **p<0.05; ***p<0.01

Results: Negative Binomial

	Dependent variable: Number of Incivilities								
	Pooled			Fixed Effects			Random Effects		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
gini	0.064***	0.037*	0.039*	0.005	0.002	0.006	0.017	0.008	0.011
	(0.021)	(0.020)	(0.020)	(0.016)	(0.017)	(0.014)	(0.016)	(0.016)	(0.014)
log(income)	0.733***	0.339*	0.450**	−0.275*	−0.289*	0.017	0.073	−0.002	0.115
	(0.191)	(0.186)	(0.187)	(0.157)	(0.159)	(0.145)	(0.148)	(0.147)	(0.139)
poverty	−0.003	−0.001	−0.001	0.005***	0.005***	0.001	0.003*	0.003*	−0.001
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
unemployment	0.001	0.002	0.004	0.000	0.002	0.002	0.001	0.002	0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)
youth		−0.015***	−0.015***		−0.077***	−0.009		−0.038***	−0.011
		(0.005)	(0.005)		(0.016)	(0.017)		(0.009)	(0.009)
foreign		0.128***	0.136***		0.026***	0.049***		0.036***	0.049***
		(0.012)	(0.013)		(0.008)	(0.011)		(0.007)	(0.008)
autonomy		0.002***	0.002***		−0.008***	−0.002*		−0.002**	0.000
		(0.001)	(0.001)		(0.001)	(0.001)		(0.001)	(0.001)
housing			0.002			0.002			0.001
			(0.002)			(0.001)			(0.001)
log(density)			−0.032***			−0.275***			−0.106***
			(0.007)			(0.017)			(0.016)
women			−0.007)*			0.014**			−0.006
			(0.004			(0.007)			(0.006)
community_org			−0.001			0.002**			−0.002
			(0.001)			(0.001)			(0.001)
deterrence			0.003***			0.001			0.003***
			(0.001)			(0.001)			(0.001)
capitalYes			0.077***			−1.168***			−0.279***
			(0.029)			(0.104)			(0.071)
mayorLEFT			0.045**			0.048**			0.032*
			(0.022)			(0.019)			(0.018)
mayorRIGHT			−0.001			0.038*			−0.017
			(0.025)			(0.022)			(0.020)
gini:log(income)	−0.012***	−0.007*	−0.008**	−0.000	0.001	−0.001	−0.003	−0.001	−0.002
	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
Constant	−0.929	1.331	1.114	−0.192	2.115**	−0.533	−2.068	−0.632	−1.509*
	(1.012)	(0.999)	(1.029)	(0.832)	(0.924)	(0.931)	(1.012)	(0.819)	(0.852)
Year Dummies?	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Region Dummies?	*Yes*	*Yes*	*Yes*	*No*	*No*	*No*	*Yes*	*Yes*	*Yes*
Observations	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944	1,944
Log Likelihood	-13,789.950	-13,712.540	-13,688.350	-10,761.609	-10,719.727	-10,493.015	-13,550.774	-13,529.049	-13,469.624

Note: *p<0.1; **p<0.05; ***p<0.01

Discussion and Recomendations

- We found strong evidence of a **significant and positive association between the rate of incivilities and income inequality**.
- Policies aimed at controlling the behaviour of **young people** do not have strong empirical support.
- The significant increase in the **foreign population** seems to be associated with a significant increase in the problem of incivilities.
- Efforts managed from the **municipalities** can be an important complement to those from the central government.
- Mayors supported by “LEFT” oriented political parties face higher challenges in terms of incivilities than those independent or RIGHT supported mayors.

Conclusions and Future Research

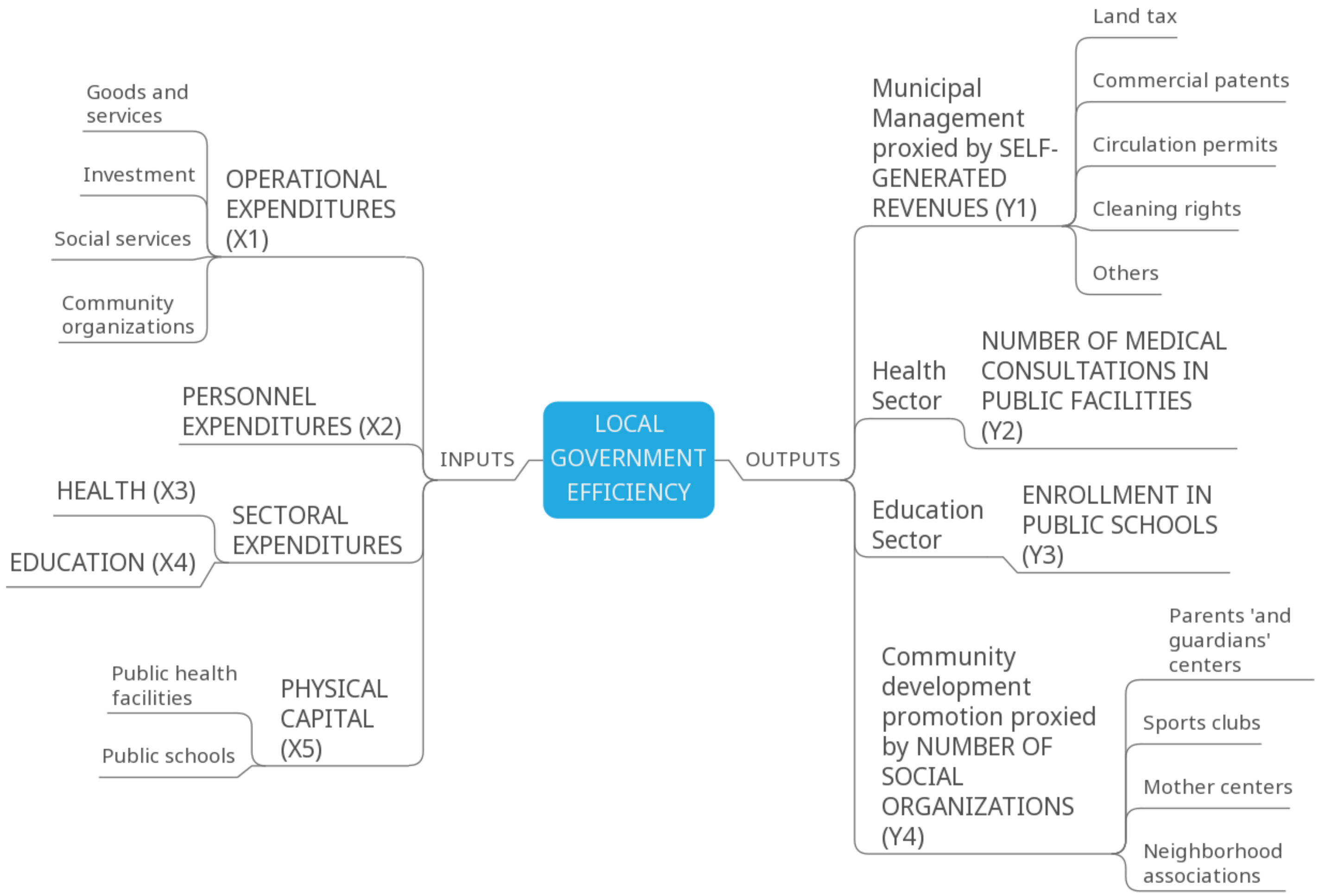
- Increasing income inequality or persistently high levels might be associated with the rise of antisocial behaviours in the form of incivilities.
- Future research should go further on the role of local authorities analysing the impact of specific programs in counties with similar characteristics.
- Program evaluation could help to elucidate the question of whether local interventions from the local governments have a causal effect on incivilities and crime rates.
- A deeper analysis of the impact that foreign migration is having on social cohesion in the Chilean society is an interesting avenue for future studies

Thanks

Thanks for Listening!

Questions?

Appendix 1


LOCAL GOVERNMENT EFFICIENCY
INPUTS
OPERATIONAL EXPENDITURES (X1)
Goods and services
Investment
Social services
Community organizations
PERSONNEL EXPENDITURES (X2)
SECTORAL EXPENDITURES
HEALTH (X3)
EDUCATION (X4)
PHYSICAL CAPITAL (X5)
Public health facilities
Public schools
OUTPUTS
Municipal Management proxied by SELF-GENERATED REVENUES (Y1)
Land tax
Commercial patents
Circulation permits
Cleaning rights
Others
Health Sector
NUMBER OF MEDICAL CONSULTATIONS IN PUBLIC FACILITIES (Y2)
Education Sector
ENROLLMENT IN PUBLIC SCHOOLS (Y3)
Community development promotion proxied by NUMBER OF SOCIAL ORGANIZATIONS (Y4)
Parents 'and guardians' centers
Sports clubs
Mother centers
Neighborhood associations

Appendix 2

Inputs and outputs used in DEA: Summary Statistics

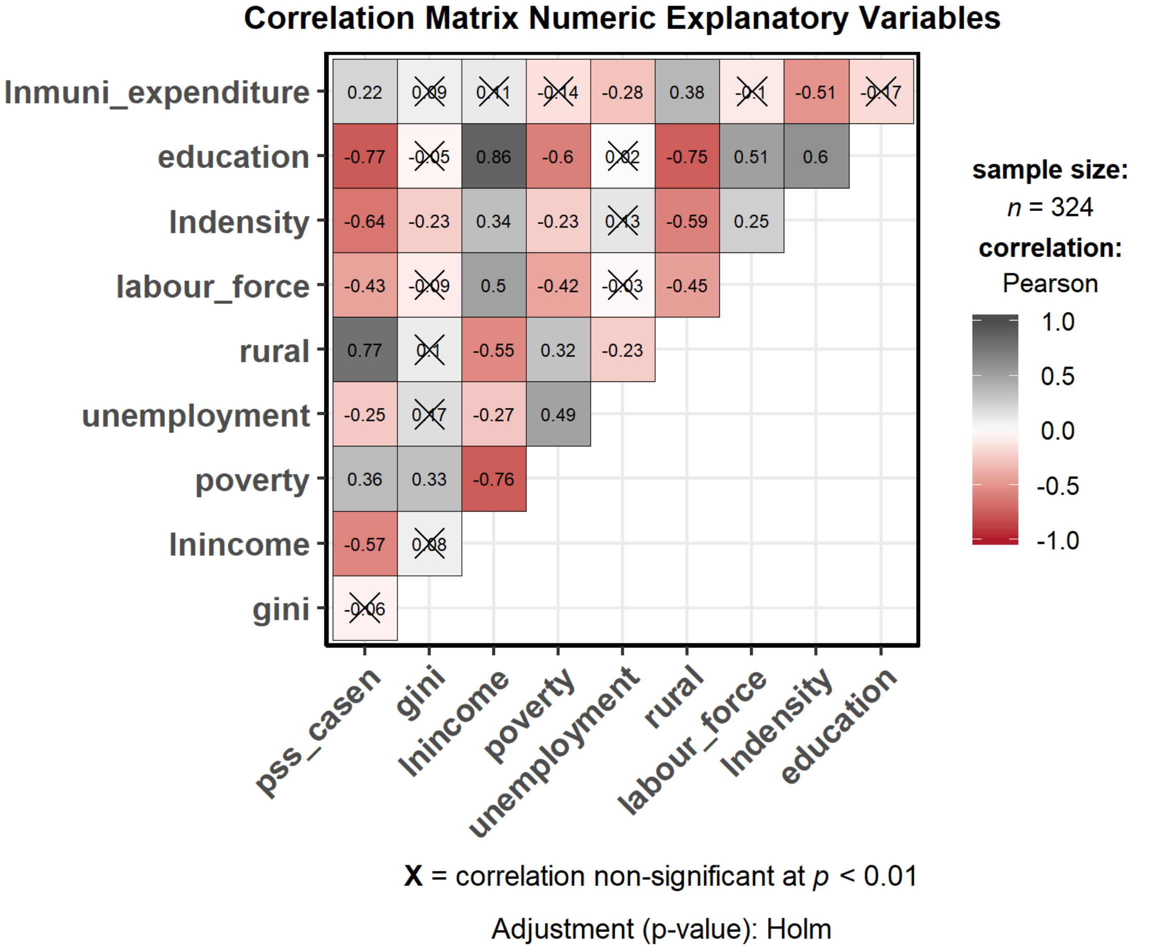
Statistic	Mean	St. Dev.	Min	Max
X1:Operational Expenditure	108.19	106.66	0.00	1,542.19
X2:Personnel Expenditure	47.94	40.67	7.66	629.25
X3:Education Expenditure	202.08	131.86	0.00	3,267.76
X4:Health Expenditure	68.36	46.41	0.00	415.80
X5:Municipal Facilities	0.001	0.001	0.00	0.02
Y1:Own Permanent Revenues	71.81	112.91	4	1,618
Y2:Enrollment Public Schools	0.61	0.26	0.03	2.08
Y3:Medical Consultations	1.83	1.16	0.00	27.88
Y4:Community Organizations	0.01	0.01	0.00	0.16

Appendix 3

Contextual Factors: Summary Statistics

Statistic	Mean	Median	St. Dev.	Min	Max
gini	0.45	0.45	0.07	0.22	0.83
income	202.28	176.59	123.12	71.88	1,623.62
agroland	31.05	29.62	24.87	0.00	88.55
density	987.30	31.05	2,994.48	0.20	17,566.86
own	67.84	68.75	9.72	0.00	96.77
education	9.36	9.24	1.38	5.21	15.88
IDD	58.95	58.76	6.90	22.69	97.37
professional	26.51	25.58	9.55	0.00	100.00
mcf	45.19	47.50	19.10	0.00	90.96

Appendix 4

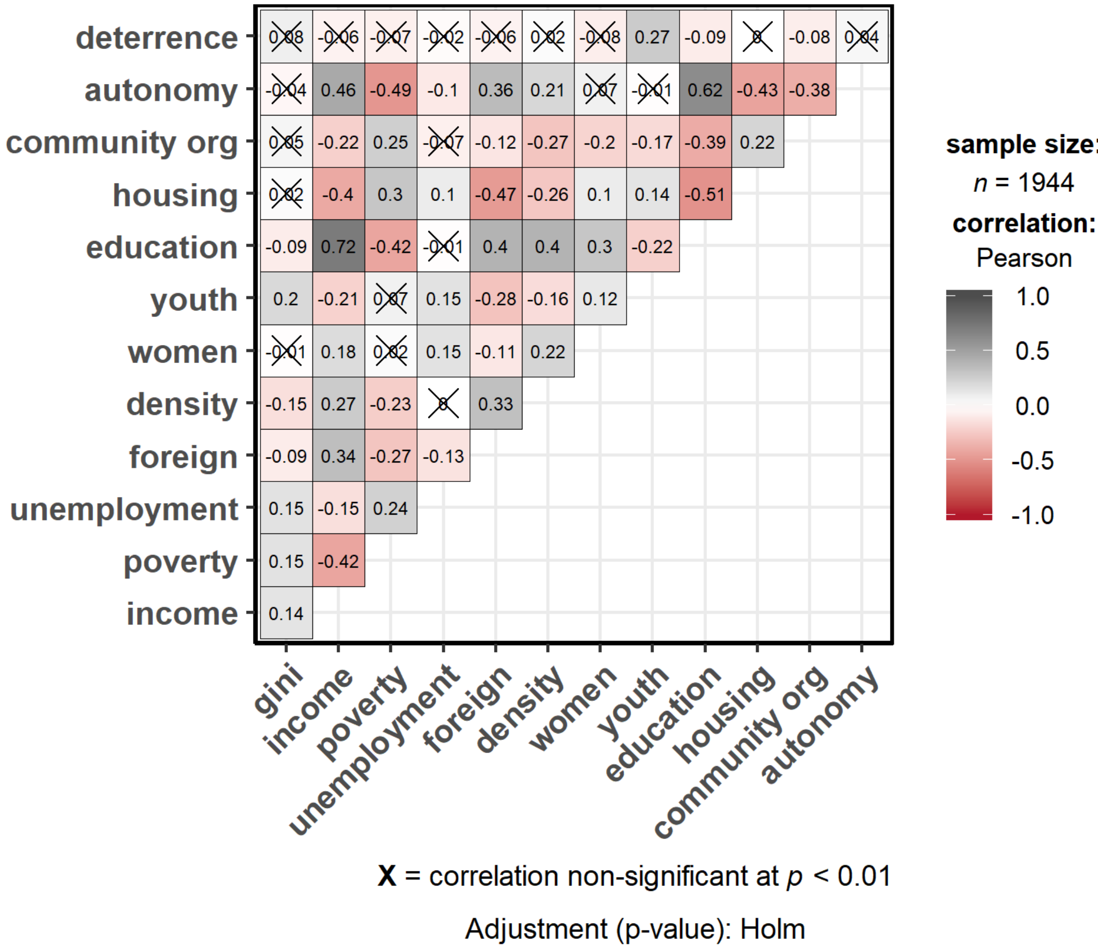


Correlation Matrix Numeric Explanatory Variables
lnmuni_expenditure
education
lndensity
labour_force
rural
unemployment
poverty
lnincome
gini
0.22
0.09
0.11
-0.14
-0.28
0.38
-0.1
-0.51
-0.17
-0.77
-0.05
0.86
-0.6
0.02
-0.75
0.51
0.6
-0.64
-0.23
0.34
-0.23
0.13
-0.59
0.25
-0.43
-0.09
0.5
-0.42
-0.03
-0.45
0.77
0.1
-0.55
0.32
-0.23
-0.25
0.17
-0.27
0.49
0.36
0.33
-0.76
-0.57
0.08
-0.06
pss_casen
gini
lnincome
poverty
unemployment
rural
labour_force
lndensity
education
sample size:
n = 324
correlation:
Pearson
1.0
0.5
0.0
-0.5
-1.0
X = correlation non-significant at p < 0.01
Adjustment (p-value): Holm

Appendix 5

rowname	income	density	gini	professional	own	IDD	mcf	agroland
income		.28	.13	.00	-.28	-.31	-.53	-.41
density			-.15	-.13	-.33	-.19	-.21	-.40
gini				-.01	.08	.05	.05	.17
professional					.06	.04	.09	.22
own						.34	.40	.36
IDD							.52	.54
mcf								.61
agroland								

Appendix 6



deterrence
autonomy
community org
housing
education
youth
women
density
foreign
unemployment
poverty
income
gini
sample size:
n = 1944
correlation:
Pearson
1.0
0.5
0.0
-0.5
-1.0
X = correlation non-significant at p < 0.01
Adjustment (p-value): Holm