ARCTIC MINING: THE SOCIOECONOMIC EFFECTS OF MINING IN THE SCANDINAVIAN ARCTIC

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WHEN MINING THE ARCTIC – SOMETHING WILL CHANGE?

▶ Resource extraction is often promoted as a way to enhance growth and prosperity in the Arctic region

▶ However, it is obvious that something will change when mines open up in the region. The question is **what**?

▶ The case of Greenland (large-scale mining in Isua close to Nuuk)

› This debate could have been better informed

› ... it was basically building on different political agendas

› ... and little empirical evidence

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WHAT DO WE KNOW?

▶ Macro literature

 › The resource curse (Sacks and Warner, 1995; Davis, 1995)
 › Corr (resource abundance, economic growth) < 0 (?)

▶ Micro literature

 › Extractive industries benefit local societies and, in particular, employment both in the Arctic and non-Arctic (AMAP, 2010; McMahon and Remy, 2001; Carrington, 1996; Aroca, 2001; Hajkowicz et al., 2011)

▶ We add to the micro literature by establishing the effects of mines on a broad set of socioeconomic indicators using Scandinavian data.

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WHY SCANDINAVIA?

▶ A representation in the Arctic and in the non-Arctic

▶ Many mines presently and historically

▶ Excellent data (at the municipality level) on may socioeconomic indicators

▶ Q1: What socioeconomic indicators change when mines open up in the area?

▶ Q2: Are there differences in these effects due to location (Arctic vs. non-Arctic)?

▶ Discussion: To what extent are our results informative about *what would happen* in other Arctic locations such as Greenland, Russia, Alaska and Canada if a mine is established?

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THE DATA

- Municipality-level data
- Norway, Sweden and Finland
- 34 mines (24 Arctic mines)
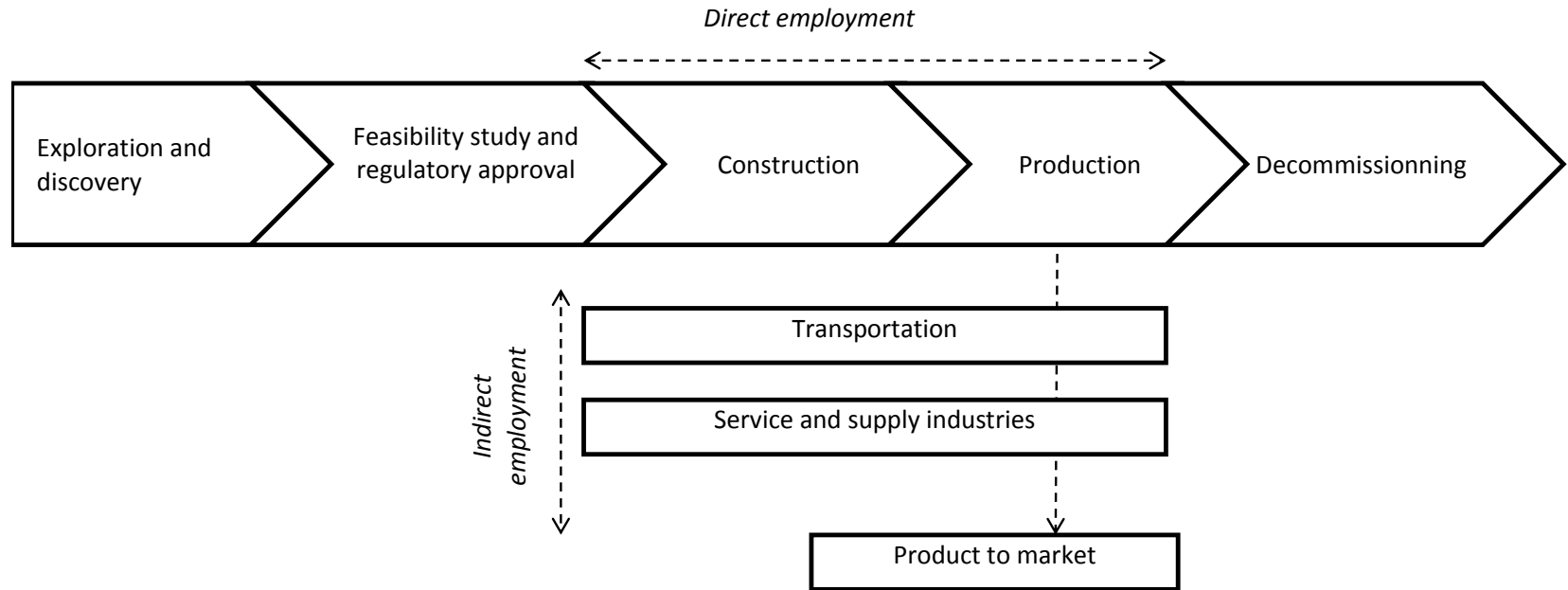
Table 2. Municipalities by country and location

	Number of municipalities	Municipality size: Population Mean (std. dev.)
All	1023	18,487 (45,206)
Arctic	174	9,288 (18,434)
Non-Arctic	849	20,367 (48,693)
Norway	422	10,794 (31,527)
Sweden	290	31,355 (60,139)
Finland	311	11,034 (21,237)

Note: We exclude the smallest municipalities from the analysis and thus focus on municipalities with 500+ inhabitants.
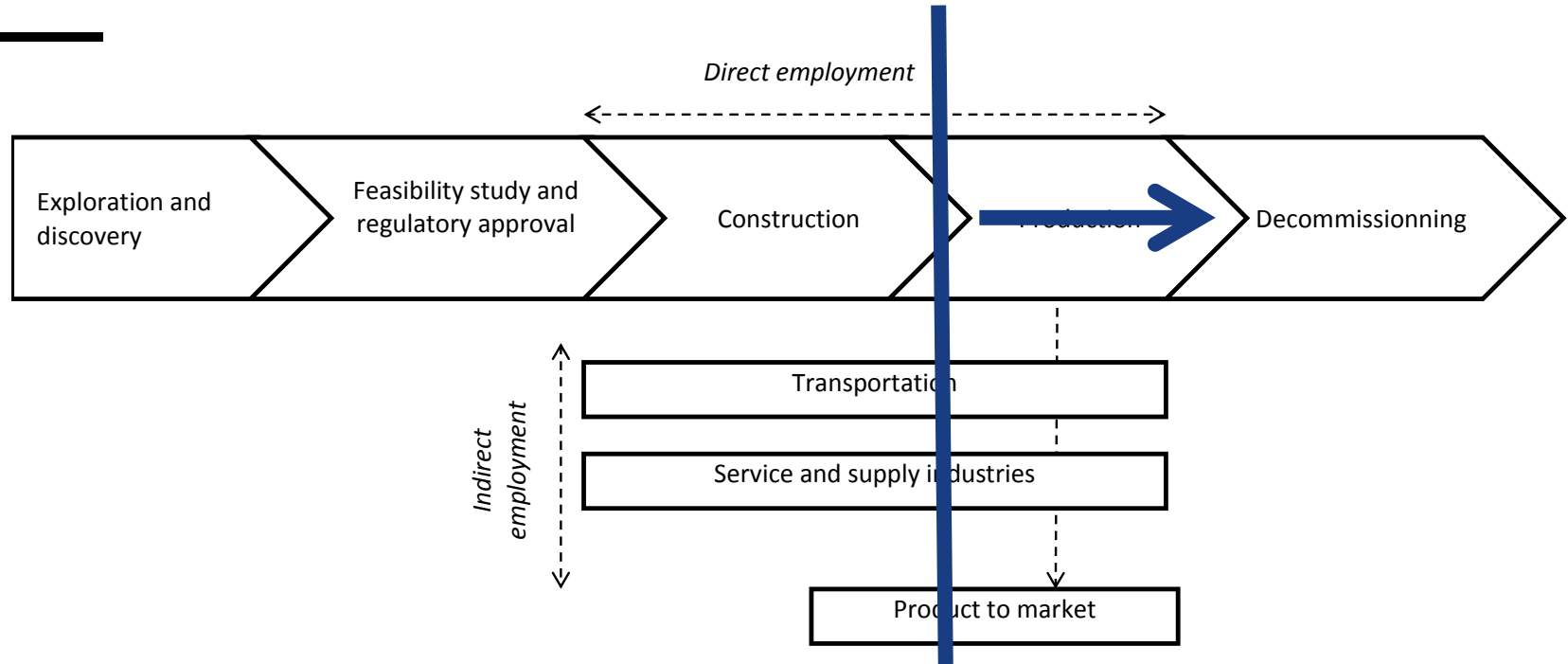
DEPENDENT VARIABLES

Dependent variable (all defined at the municipality level) :	Time period used in the empirical analysis
Population	1995-2012 or 1986-2013
Employment	1995-2012
Unemployment	1995-2012
Non-labor market	1995-2012
Employment shares by industry (8)	1995-2012
Age groups (5)	1986-2013
Women	1986-2013
Men	1986-2013
Female proportion	1986-2013
Child births	1986-2013
Education categories (5)	1987-2012
Crime	2007-2012

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A MINING PROJECT

Direct employment

| Exploration and discovery | Feasibility study and regulatory approval | Construction | Production | Decommissionning |

Indirect employment

Transportation

Service and supply industries

Product to market

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A MINING PROJECT – EMPIRICAL STRATEGY

Direct employment

| Exploration and discovery | Feasibility study and regulatory approval | Construction | Production | Decommissionning |

Indirect employment

Transportation

Service and supply industries
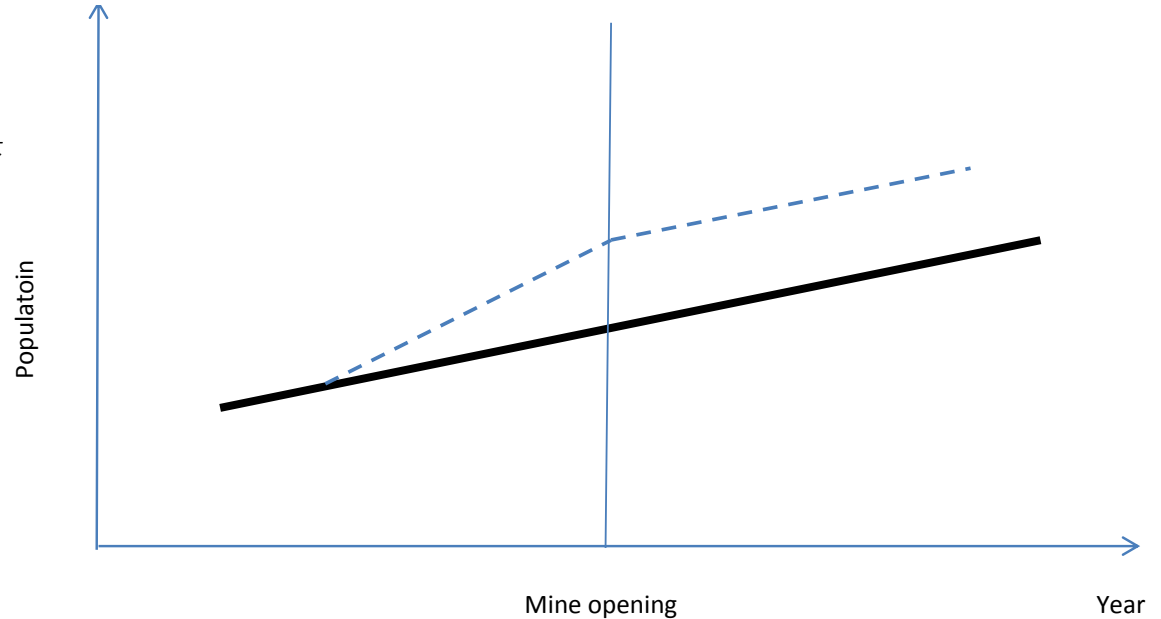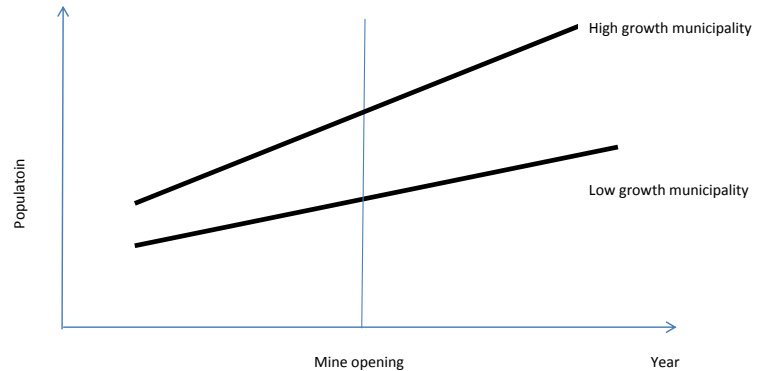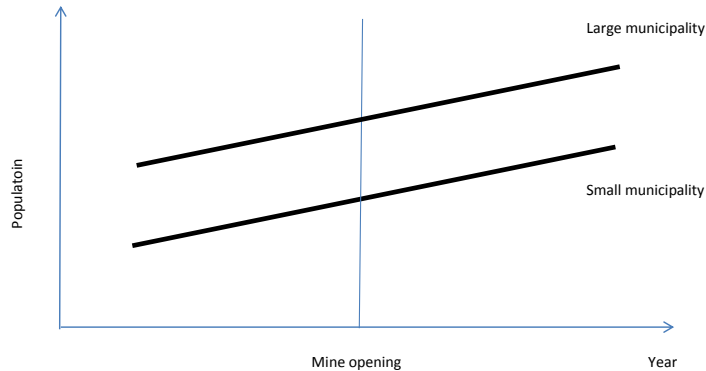
Product to market

EMPIRICAL STRATEGY (JACOBSON, LALONDE & SULLIVAN (1993)

$$y_{it} = \alpha + \gamma_t + \sum_{k=-m}^{m} D_{it}^k \delta_k + \varepsilon_{it}$$

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MORE FLEXIBLE SPECIFICATION

▶ $y_{it} = \alpha_i + \omega_i t + \gamma_t + \sum_{k=-m}^{m} D_{it}^k \delta_k + \varepsilon_{it}.$

▶ α_i: Municipality-specific fixed effect

▶ $\omega_i t$: Municipality-specific time trend

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FINAL SPECIFICATION

▶ $y_{it} = \alpha_i + \omega_i t + \gamma_t + \beta * Arctic_i + \sum_{k=-m}^{m} D_{it}^k \delta_k + Arctic_i * \sum_{k=-m}^{m} D_{it}^k \gamma_k + \varepsilon_{it},$

▶ All of the above in terms of flexibility

▶ + Arctic interactions

▶ Hence, we can identify:

1. The effects of mines (δ_k)
2. The extend to which these effects are different in the Arctic (γ_k)

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RESULTS

	Population	Employment	Unemployment	Non-labor market (*residual*)
Prior to opening				
t = -3	3.439	72.161	-8.912	-59.810
	(51.341)	(97.293)	(17.438)	(140.989)
t = -2	64.719	133.446	-29.289	-39.438
	(133.948)	(132.426)	(52.648)	(237.869)
t = -1	31.737	285.294*	-93.999*	-159.558
	(138.412)	(145.488)	(51.185)	(243.410)
Mine opening				
t = 0	2.176	364.115**	-137.978***	-223.961
	(144.274)	(158.136)	(45.961)	(251.636)
Post opening				
t = 1	27.405	367.208***	-131.018***	-208.786
	(125.537)	(108.563)	(39.608)	(197.446)
t = 2	12.924	374.967***	-108.974***	-253.069
	(107.709)	(101.832)	(39.189)	(185.068)
t = 3	49.324	436.195***	-70.124	-316.747**
	(102.875)	(113.873)	(55.533)	(148.554)

No significant differences between Arctic and non-Arctic municipalities

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INDUSTRY

	Primary sector	Mining	Manufacturing	Construction
Prior to opening				
t = -3	0.014	-0.0..	0.002	-0.004
	(0.009)	(0..)	(0.005)	(0.003)
t = -2	0.012	—	-0.004	-0.001
	(0.011)		(0.007)	(0.004)
t = -1	0.024***		-0.005	-0.005
	(0.007)		(0.007)	(0.005)
Mine opening				
t = 0	0.028***		-0.007	-0.004
	(0.009)		(0.007)	(0.006)
Post opening				
t = 1	0.023**	0.007	-0.007	-0.003
	(0.009)	(0.005)	(0.006)	(0.003)
t = 2	0.024***	0.004	-0.007	0.000
	(0.008)	(0.004)	(0.005)	(0.003)
t = 3	0.024***	0.001	-0.004	0.008**
	(0.006)	(0.002)	(0.004)	(0.003)
Arctic x Prior to opening				
t = -3	-0.014	-0.007	-0.003	0.006*
	(0.012)	(0.008)	(0.006)	(0.004)
t = -2	-0.009	-0.010	0.001	0.011*
	(0.015)	(0.008)	(0.009)	(0.006)
t = -1	-0.011	-0.004	-0.001	0.021***
	(0.013)	(0.008)	(0.009)	(0.008)
Arctic x Mine opening				
t = 0	-0.016	0.016**	-0.002	0.015**
	(0.013)	(0.007)	(0.009)	(0.007)
Arctic x Post opening				
t = 1	-0.010	0.017*	0.001	0.005
	(0.013)	(0.010)	(0.008)	(0.004)
t = 2	-0.008	0.024**	0.004	0.005
	(0.014)	(0.011)	(0.007)	(0.005)
t = 3	-0.005	0.031***	0.000	-0.004
	(0.013)	(0.012)	(0.009)	(0.004)
Municipality specific time trends	YES	YES	YES	YES
Observations	18,352	18,352	18,352	18,352
R-squared	0.579	0.555	0.710	0.647

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ADDITIONAL RESULTS

▶ Additional significant effects on:
  › People aged 20 to 39 (Arctic and non-Arctic)
  › Lower crime rates (Arctic and non-Arctic)

▶ No statistical effects on:
  › Number of women
  › Number of men
  › Female proportion
  › Number of child births
  › Education distribution

CONCLUSION

▶ Positive socioeconomic effects from mines (employment, unemployment and out-of-the-labour-force)

▶ Attractive for young people and lower crime rates

▶ Shifts in industry structure towards mining activities, construction and primary sector

▶ No effects on population, gender composition, child births or education distribution

▶ Issues not addressed: Environment, working conditions, indigenous people, etc.

▶ Can the results be extrapolated to other contexts?

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