Soviet Industrialization and American Skilled Labor: Transfer of Technologies and Productivity

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Motivation (1): Skilled Immigrants, Transfer of Technologies and Productivity

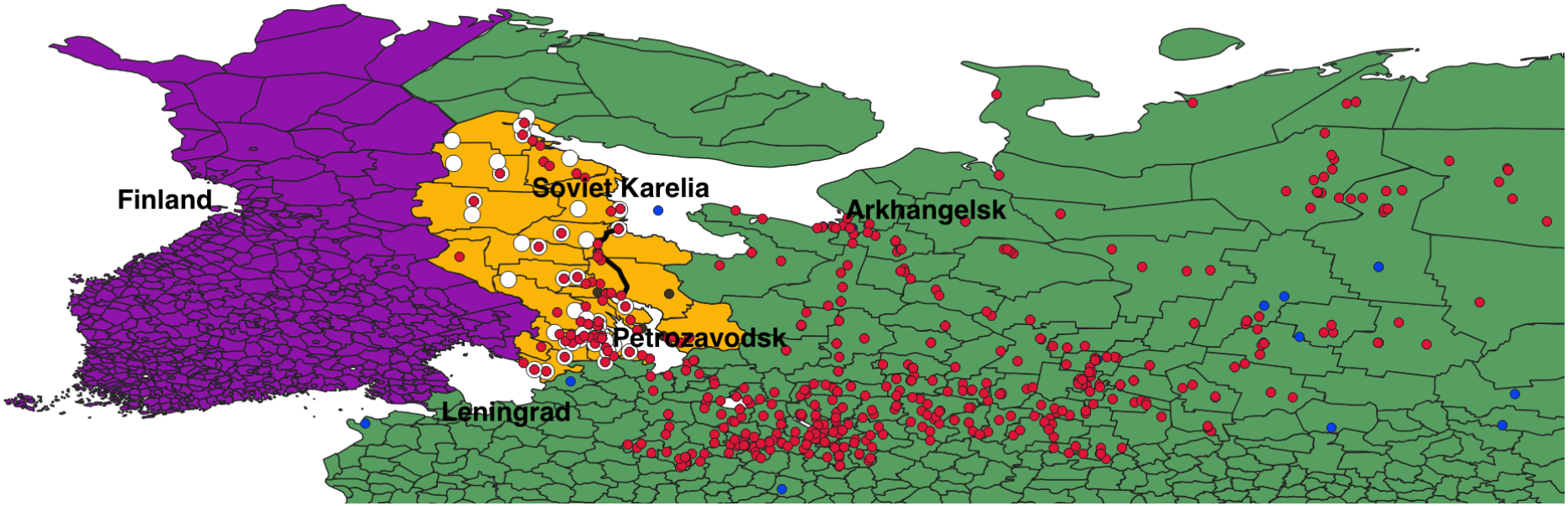
- High-skilled foreign immigrants can promote technology transfer and, thus, productivity (Hornung 2014, Natkhov and Vasilenok 2022, Boberg-Fazlic and Sharp 2024).
- Less is known about factors affecting successful adaptation of technologies brought by immigrants.
- To address this question, we consider the Soviet policy from the early 1930s to invite skilled labor from abroad to boost transfer of technologies and industrialization.

Motivation (2): Soviet Industrialization

- Import of technologies together with rapid capital accumulation and massive transfer of unskilled labor from farms to factories were key parts of Soviet industrialization in the 1930s.
- Controversial results: Soviet industry expanded under the first five-year plans but productivity did not increase and even decreased at the begining (Harrison, 1998; Chermukhin et al. 2017).
- Can the lack of skilled labor explain difficulties with the adaptation of modern technologies?
- We study the 1931-33 recruitment campaign of skilled workers with Finnish background from the US and Canada (or American Finns for brevity) to Soviet Karelia, a border region to Finland.

What We Do

- Explore the impact of the inflow of American Skilled Labor on Soviet Industrialization, using firm-level panel (1925-1938) for the Soviet Republic of Karelia (treated region) and the North region (control)



- White dots stand for the presence of American Finns.
- Red dots show the location of Soviet firms.
- Blue dots indicate forced labor Gulag camps location, black dots – special settlements with illegal Finnish migrants from Finland, black line – Belomor channel.

Preview of Main Findings

- The presence of American Finns in a settlement close to the location of a Soviet firm is associated with an increase in labor productivity.
- The effect is most pronounced in the wood and pulp industry.
- IV results imply more than a double increase in labor productivity for Wood&Pulp firms.
- First evidence on Soviet Industrialization based on firm-level disaggregated data
- Abilities of recipients – language barriers and literacy, i.e. literacy in Finnish in our case – are crucial for the transfer of knowledge.

Related Literature

- Skilled migration and expansion of knowledge and technology transfer (e.g. Akcigit et al. 2017, Boberg-Fazlic and Sharp 2024, Docquier 2020, Hornung 2014, Mitaritonna et al. 2017, Peri 2012)
- Slow adoptation of technologies (e.g. Juhasz et al. 2021)
- Soviet Economic History (e.g. Cheremukhin et al. 2017, Davies et al. 2018, Zhuravskaya et al. 2024)
- Transfer of technologies in planned economies (Giorcelli and Li, 2023, Glitz and Meyersson, 2020)
- History literature on American Finns: the case is very-well documented but no quantitative studies (e.g., Kero 1983, Lahti-Argutina 2004, Kangaspuro 2004, Golubev and Takala 2014).

Historical Background: Time frame

- 1917: Russian Revolution
- 1928: Start of the first five-year plan and Soviet industrialization
- 1930: 16th Party Congress decision to promote immigration of foreign skilled labor More details
- 1931-33: Arrival of 7K American Finns to Soviet Karelia (no other sizable groups of foreign skilled labor in Karelia and Russian North)
- 1935: Expulsion of the ”Red Finns” (exiles of the Finnish revolution of early 1918) from the Soviet Karelian government and an increase of return migration among American Finns
- 1937-38: The Great Terror: mass arrests of the remaining American Finns

Uniqueness of the American Finnish Migration

- No parallel episodes within the Soviet Union in terms of scale and geographical concentration. American Finnish skilled migrants were targeted because of language proximity and skill match:
  - Soviet Karelia is a border region to Finland with a large Fenno-Ugric (Karelian) minority and a small Finnish minority.
  - The Soviet Karelian government was under the leadership of Finnish socialist exiles who actively lobbied for the American Finnish recruitment policy.
  - Forestry related industries were a comparative advantage of Karelia.
  - North American was a global technological leader in logging and timber industry.
  - A large Finnish diaspora in the US and Canada (about 400K) with well known representation in timber industry (Washington, Michigan and Minnesota).

Occupations of Movers and All Am Finns (males, 16-64)

Occupational distribution of linked emigrants as reported in the US & Canadian census				US 1930 and Canadian 1931 100% Censuses pooled (Finnish origin)			
Occupation	Freq	% %	HIS CLASS	Occupation	Freq	% %	HIS CLASS
General worker	118	24.58	5	General worker	21,157	17.01	5
Farmer	79	16.46	3	Farmer	17,556	14.11	3
Carpenter	55	11.46	4	Farm worker	12,327	9.91	5
Miner	38	7.92	4	Miner	11,053	8.88	4
Farm worker	31	6.46	5	Carpenter	10,275	8.26	4
Forestry worker	24	5.00	5	Forestry worker	6,954	5.59	5
Other production worker	16	3.33	5	Production worker	5,257	4.23	5
Fisherman	13	2.71	5	Mechanic	4,079	3.28	4
Blacksmith	9	1.88	4	Manager	3,668	2.95	2
Manager	8	1.67	2	Driver	3,497	2.81	4
Total (top 10)	391	81.47		Total (top 10)	95,823	77.02	
Outside top 10	89	18.53		Outside top 10	28,584	22.98	
Total	**480**	**100.00**		**Total**	**124,407**	**100.00**	

Both ideological and economic motives likely drove American Finns' migration decisions

Why Did They Go?

Soviet Selective Recruitment

Immigration records from Karelian ASSR (1931-1934)				US 1930 and Canadian 1931 100% Censuses pooled (Finnish origin)			
Occupation	Freq	%	HIS CLASS	Occupation	Freq	%	HIS CLASS
Forestry worker	1,193	44.66	5	General worker	21,157	17.01	5
Carpenter	516	19.32	4	Farmer	17,556	14.11	3
General worker	234	8.76	5	Farm worker	12,327	9.91	5
Driver	176	6.59	4	Miner	11,053	8.88	4
Sawyer	92	3.44	4	Carpenter	10,275	8.26	4
Mechanic	83	3.11	4	Forestry worker	6,954	5.59	5
Metal worker	56	2.10	4	Production worker	5,257	4.23	5
Miner	50	1.87	4	Mechanic	4,079	3.28	4
Farm worker	48	1.80	5	Manager	3,668	2.95	2
Machinist	36	1.35	4	Driver	3,497	2.81	4
Total (top 10)	2,484	93.00		Total (top 10)	95,823	77.02	
Outside top 10	187	7.00		Outside top 10	28,584	22.98	
Total	**2,671**	**100.00**		**Total**	**124,407**	**100.00**	

Many of the recruited loggers did not work as loggers before moving to the Soviet Union

American Finns and Technology Transfer

- Transfer of technologies was the key economic motivation of Soviet recruitment campaign of American Finns. Focus on skilled labor but also American vehicles, tools and equipment.
- The Soviet government decided where to settle American Finns who had limited freedom to change work places
- "Karelian Technical Aid Committee" (with active support from the Central Forest Commisariate) promoted transfer of technologies:
  - Initially, ambulating logging teams of American Finns to teach the locals new techniques and organizational innovations.
  - Later, the model logging sites, saw mills and research unit of Matrosy took a lead in education of local forestry managers/foremen.
- Detailed manuals (in Finnish) on how to rationalize logging and wood processing:
  - How to use and sharpen a cross cut saw (needs frequent service)
  - How to load a sledge
  - How to organize logistics at a tree cutting and wood processing sites

Technology: American Cross Cut Saws



Technology: Canadian Axes



Technology: Hook



Technology: Two-horse-one-man sleighs (fin. pankkoreki)



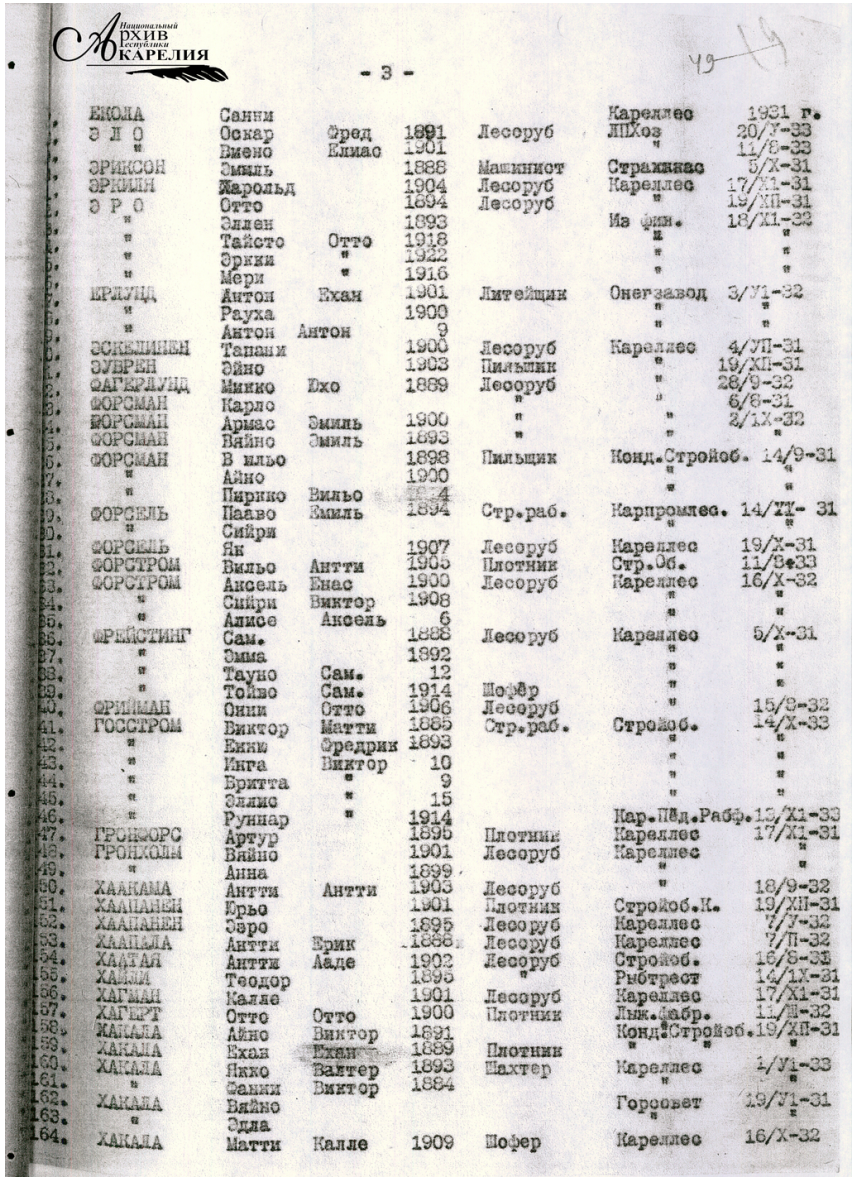
Organizational change: American felling area and hauling logistics



Individual-level Data

- Arguably, the most comprehensive individual-level dataset on American Finns in the Soviet Union: 6.7K with a coverage close to a 100%
  - Individuals are matched to US and Canadian censuses 1930 and 1931, respectively using ABE matching.
  - Manually geolocated at the settlement level
  - Geolocation success rate: about 40 %
- Use dummy variable to measure presence of American Finns in a settlement and continuous measure for robustness
  - Check against historical literature (Autio-Sarasmo, 2006; Takala, 2016) that we do not miss any settlement to which American Finns were assigned

Individual-level Data: Example



Национальный Архив Республики Карелия

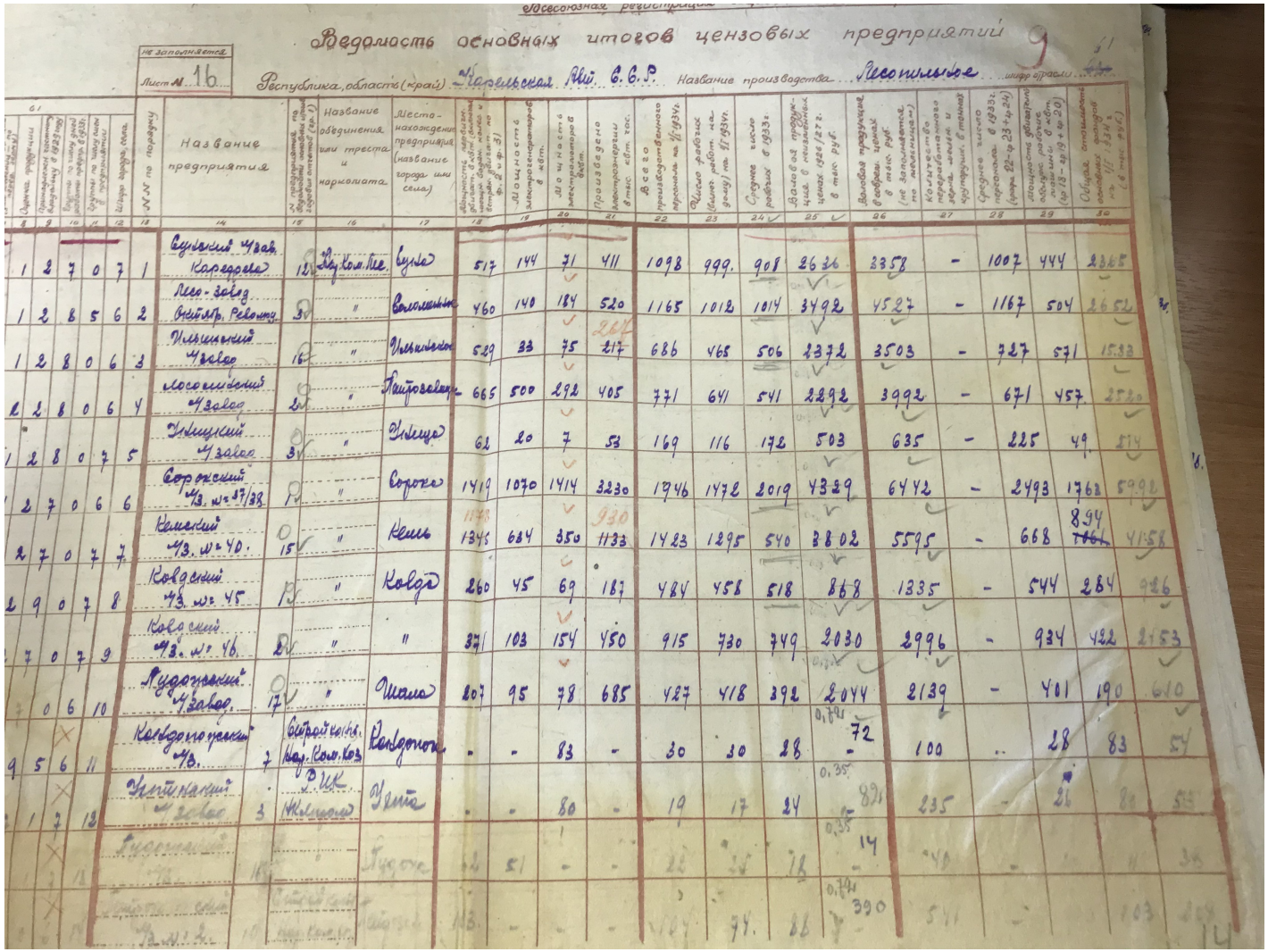
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ЕКОЛА	Санни				Кареллес	1931 г.	
Э Л О	Оскар	Фред	1891	Лесоруб	ЛПХоз	20/У-33	
"	Виено	Елиас	1901		"	11/8-33	
ЭРИКСОН	Эмиль		1888	Машинист	Стрелнас	5/X-31	
ЭРКИЛЯ	Жарольд		1904	Лесоруб	Карелдес	17/X1-31	
Э Р О	Отто		1894	Лесоруб	"	19/XП-31	
"	Эллен		1893		Из фин.	18/X1-32	
"	Тайсто	Отто	1918		"	"	
"	Эркки	"	1922		"	"	
"	Мери	"	1916		"	"	
ЕРЛУНД	Антон	Ехан	1901	Литейщик	Онегзавод	3/У1-32	
"	Рауха		1900		"	"	
"	Антон	Антон	9		"	"	
ЭСКЕЛИНЕН	Тапани		1900	Лесоруб	Карелдес	4/УП-31	
ЭУВРЕН	Эйно		1903	Пильщик	"	19/XП-31	
ФАГЕРЛУНД	Микко	Ихо	1889	Лесоруб	"	28/9-32	
ФОРСМАН	Карло			"	"	6/8-31	
ФОРСМАН	Армас	Эмиль	1900	"	"	2/1X-32	
ФОРСМАН	Вяйно	Эмиль	1893	"	"	"	
ФОРСМАН	В ильо		1898	Пильщик	Конд.Стройоб.	14/9-31	
"	Айно		1900		"	"	
"	Пирнко	Вильо	4		"	"	
ФОРСЕЛЬ	Паавo	Емиль	1894	Стр.раб.	Карпромлес.	14/XУ- 31	
"	Сийри				"		
ФОРСЕЛЬ	Як		1907	Лесоруб	Карелдес	19/X-31	
ФОРСТРОМ	Вильо	Антти	1905	Плотник	Стр.Об.	11/8-33	
ФОРСТРОМ	Аксель	Енас	1900	Лесоруб	Карелдес	16/X-32	
"	Сийри	Виктор	1908		"	"	
"	Алисе	Аксель	6		"	"	
ФРЕЙСТИНГ	Сам.		1888	Лесоруб	Карелдес	5/X-31	
"	Эмма		1892		"	"	
"	Тауно	Сам.	12		"	"	
"	Тойво	Сам.	1914	Шофёр	"	"	
ФРИЙМАН	Онни	Отто	1906	Лесоруб	"	15/8-32	
ГОССТРОМ	Виктор	Матти	1885	Стр.раб.	Стройоб.	14/X-33	
"	Вики	Фредрик	1893		"	"	
"	Инга	Виктор	10		"	"	
"	Бритта	"	9		"	"	
"	Эллис	"	15		"	"	
"	Руннар	"	1914		Кар.Пед.Раб.	12/X1-33	
ГРОНХОРС	Артур		1895	Плотник	Карелдес	17/X1-31	
ГРОНХОЛМ	Вяйно		1901	Лесоруб	Карелдес	"	
"	Анна		1899		"	"	
ХААКАМА	Антти	Антти	1903	Лесоруб	"	18/9-32	
ХААПАНЕН	Юрьо		1901	Плотник	Стройоб.К.	19/XП-31	
ХААПАНЕН	Эеро		1895	Лесоруб	Карелдес	7/У-32	
ХААПАЛА	Антти	Ерик	1888	Лесоруб	Карелдес	7/П-32	
ХААТАЯ	Антти	Аде	1902	Лесоруб	Стройоб.	16/8-33	
ХАЙМ	Теодор		1895		Рыбтрест	14/1X-31	
ХАГМАН	Калле		1901	Лесоруб	Карелдес	17/X1-31	
ХАГЕРТ	Отто	Отто	1900	Плотник	Лыж.фабр.	11/П-32	
ХАКАЛА	Айно	Виктор	1891		Конд.Стройоб.	19/XП-31	
ХАКАЛА	Ехан	Ехан	1889	Плотник	"	"	
ХАКАЛА	Якко	Вантер	1893	Шахтер	Карелдес	1/У1-33	
"	Санни	Виктор	1884		"	"	
ХАКАЛА	Вяйно				Горсовет	19/У1-31	
"	Эдла				"	"	
ХАКАЛА	Матти	Калле	1909	Шофер	Карелдес	16/X-32	

Soviet Firm-Level Data

- We are the first to use firm-level data for interwar Soviet Union.
  - Extracted from the Soviet Central Statistical Agency collection located in the Russian State Archive of Economy
  - Years: 1925/1926, 1926/1927, 1927/1928, 1932, 1934, 1938
    - Note: before 1930, the Soviets used "business years" lasted from October, 1 till September 30
  - All available records on firms in Karelia and the North region (modern Arkhangelsk, Komi and Vologda regions)
  - Data on output, capital and labor
- All in all 1.6K firm-year observations
- Observations are manually matched over time by firm name and geolocated at the settlement level

Soviet Firm-level Data: Example



Firm-Level Data (years 1925-1938)

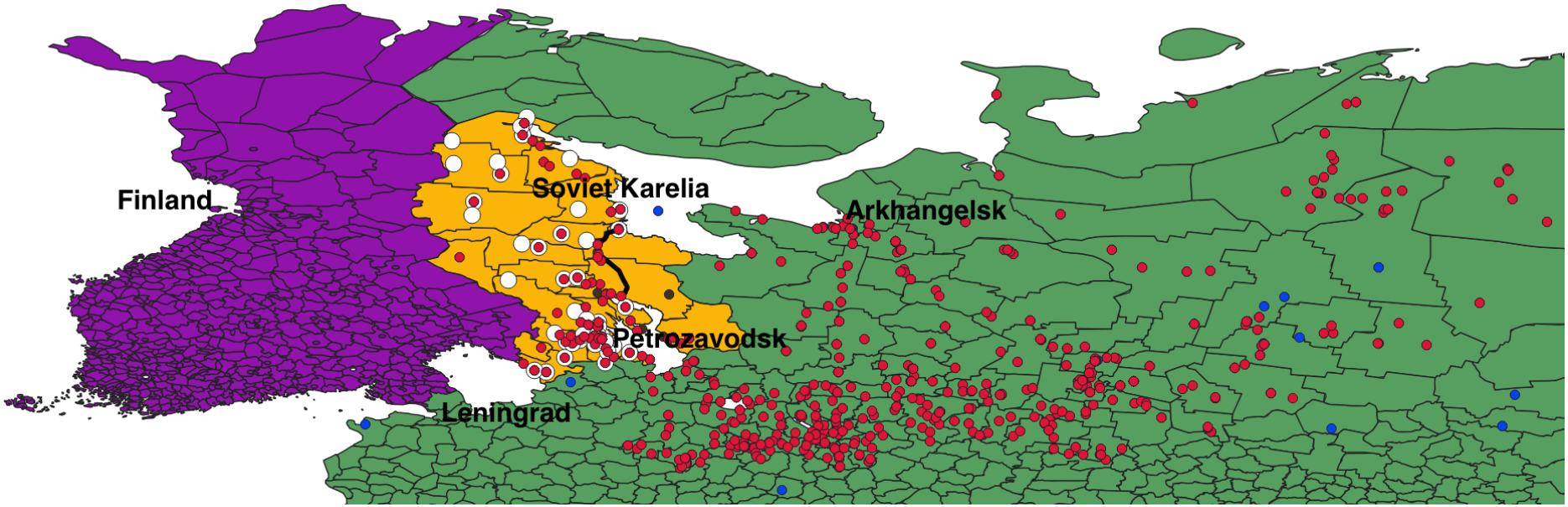
	Karelia	North region
Number of business years	331	1303
Share of business years affected by the presence of American Finns (< 15 km)	0.59	0
Number of of business years in Wood & Pulp Industry	158	543
Labor productivity per worker in 1913 rubles	2892	2814
Output in 1913 th. rubles	517	490
Number of employees	262	245
Capital in 1913 th. rubles	385	286

Karelia vs. North Region Initial Conditions

Coverage Quality

Additional Data

Soviet Firms and American Finns on the Map



- Karelia is in yellow.
- White dots stand for the presence of American Finns.
- Red dots show the location of Soviet firms.
- Blue dots indicate forced labor Gulag camps location, black dots – special settlements with illegal Finnish migrants from Finland, black line – Belomor channel.

Empirical Strategy (1)

We explore the effect of the presence of American Finns close by a Soviet firm on labor productivity in dif-in-dif setting:

$$y_i = \alpha_i + \gamma_t + \mathbf{X}'_{it}\eta + \beta \text{POST}_t \times D_i + \epsilon_{it} \quad (1)$$

- y stands for log output in 1913 rubles per worker.
- D_i is a dummy taking on value 1 if the settlement in which firm i is located (15 km radius of geolocation) received American Finns.
- POST_t is a dummy taking on value 1 if year>=1931 and 0 otherwise.
- $\mathbf{X}_{it}$ includes (A) An interaction of Karelia dummy with the post-1928 period to account for a difference in five-year plans for two regions and the decrease in the level of autonomy of the Karelian government after 1928. (B) distance to the presence of forced labor of different types – headquarters of operating Gulag forced labor camps, special settlements of illegal Finnish migrants from Finland, the Belomor channel – interacted with the relevant time periods and their squared terms. We also distinguish the Gulag forced labor effect before and after 1929 because of the change in Soviet penitentiary policy.
- α_i and γ_t stand for firm and year FEs.
- Standard errors are clustered at the firm level.

Empirical Strategy (2)

A useful variant of (1) accounts for possible difference in productivity before the arrival of American Finns in 1931-3:

$$y_i = \alpha_i + \gamma_t + \mathbf{X}_{it}\eta + \beta \text{POST}_t \times D_i + D_i \times d_{1928} + \epsilon_{it}, \tag{2}$$

To allow the effect to vary over time, we also consider a more flexible version of eq. (1) with year dummies interacted with the treated firms

$$y_i = \alpha_i + \gamma_t + \mathbf{X}_{it}\eta + \sum_{t \geq 1926} \beta_t D_i \times d_t + \epsilon_{it}. \tag{3}$$

Alternatively, we introduce a separate linear trend for treated firms after the arrival of American Finns

$$y_i = \alpha_i + \gamma_t + \mathbf{X}_{it}\eta + \beta \text{POSTTREND}_t \times D_i + \epsilon_{it}. \tag{4}$$

Effect on Labor Productivity: Full Sample (1926-1938)

	(1)	(2)	(3)	(4)	(5)
	Dep. var.: Log labor productivity per worker				
POST × D_i	-0.287	-0.254			
	(0.341)	(0.370)			
POSTTREND × D_i				0.162**	0.174**
				(0.0710)	(0.0712)
d_{1927} × D_i			-0.0462		
			(0.182)		
d_{1928} × D_i		0.108	0.0869		0.278*
		(0.184)	(0.171)		(0.149)
d_{1932} × D_i			-0.488		
			(0.375)		
d_{1934} × D_i			-0.0811		
			(0.364)		
d_{1938} × D_i			-0.165		
			(0.347)		
Karelia × First 5-y plan	0.0875	0.0912	0.0535	-0.319	-0.268
	(0.307)	(0.310)	(0.309)	(0.259)	(0.268)
Forced Labor Controls	Yes	Yes	Yes	Yes	Yes
Observations	1634	1634	1634	1634	1634

Effect on Labor Productivity (Wood and Pulp)

	(1)	(2)	(3)	(4)	(5)
	Dep. var.: Log labor productivity per worker				
POST × D_i	0.780**	0.911***			
	(0.304)	(0.337)			
POSTTREND × D_i				0.303***	0.314***
				(0.0783)	(0.0800)
d_{1927} × D_i			-0.158		
			(0.115)		
d_{1928} × D_i		0.256	0.176		0.147
		(0.202)	(0.187)		(0.164)
d_{1932} × D_i			0.595*		
			(0.354)		
d_{1934} × D_i			0.989***		
			(0.356)		
d_{1938} × D_i			1.015***		
			(0.303)		
Karelia × First 5-y plan	-0.628**	-0.631**	-0.679***	-0.543**	-0.513**
	(0.255)	(0.253)	(0.252)	(0.246)	(0.261)
Forced Labor Controls	Yes	Yes	Yes	Yes	Yes
Observations	701	701	701	701	701

American Finns and Increase of Labor Productivity in Wood and Pulp Industry

- Positive correlation arguably includes the effect of technology transfer due to of the presence of American Finns:
  - Too few American Finns to expect that the effect emerges only because of their own higher productivity
  - The effect is increasing over time that fits the argument of dissemination of technologies (and anecdotal evidence that local workers hesitated innovations)
  - The largest positive correlation is in 1938 when there were few American Finns in Soviet industry (either migrated back or were eliminated during the Great Terror).
- Did the central planner coordinate allocation of skilled labor and capital investments?

Effect on Capital Investments (Wood and Pulp)

	(1)	(2)	(3)	(4)	(5)
	Dep. var.: Log capital per worker				
POST × D_i	1.136***	1.678***			
	(0.391)	(0.499)			
POSTTREND × D_i				0.197*	0.249**
				(0.107)	(0.121)
d_{1927} × D_i			-0.245		
			(0.622)		
d_{1928} × D_i		1.075**	0.936***		0.670
		(0.460)	(0.211)		(0.414)
d_{1932} × D_i			1.497***		
			(0.361)		
d_{1934} × D_i			1.760***		
			(0.362)		
d_{1938} × D_i			1.402***		
			(0.403)		
Karelia × First 5-y plan	-0.418	-0.442	-0.475	0.0180	0.142
	(0.379)	(0.366)	(0.372)	(0.338)	(0.408)
Forced Labor Controls	Yes	Yes	Yes	Yes	Yes
Observations	675	675	675	675	675

American Skilled Labor and Allocation of Capital

- Allocation of American Finns to factories was correlated with capital investments in Soviet wood and pulp industries: the central planner arguably sought to explore complementary of capital and skilled labor
  - Massive investments started in the late 1920s and American Finns were assigned to this plants after arrival that likely explains positive correlation for 1928 year.
  - Once the American Finns disappeared from Soviet Karelia, the correlation becomes weaker (1938) that likely implies that new capital investments did not take into account the past presence of American Finns.
- When controlling for capital, the effect of American Finns on labor productivity holds.
- We also employ IV strategy to rule out the concerns on potential other omitted variables.

Controlling for Capital per Worker (Wood&Pulp)

	(1)	(2)	(3)	(4)	(5)
	Dep. var.: Log labor productivity per worker				
POST × D_i	0.585**	0.630*			
	(0.290)	(0.340)			
POSTTREND × D_i				0.266***	0.270***
				(0.0747)	(0.0776)
d_{1927} × D_i			-0.223*		
			(0.133)		
d_{1928} × D_i		0.0831	-0.0290		0.0401
		(0.219)	(0.195)		(0.178)
d_{1932} × D_i			0.301		
			(0.348)		
d_{1934} × D_i			0.642*		
			(0.354)		
d_{1938} × D_i			0.734**		
			(0.299)		
Capital per worker	0.210***	0.207***	0.204***	0.210***	0.210***
	(0.0687)	(0.0701)	(0.0682)	(0.0660)	(0.0665)
Karelia × First 5-y plan	-0.485**	-0.487**	-0.533**	-0.470**	-0.462*
	(0.211)	(0.210)	(0.209)	(0.229)	(0.239)
Forced Labor Controls	Yes	Yes	Yes	Yes	Yes
Observations	672	672	672	672	672

Secrete Police and Geography of Settlements of American Finns

- The Soviet Secret Police was always sceptical about the initiative of the ”Red Finns” to invite American Finns to settle in Soviet Karelia.
- Security issues at the Soviet-Finnish border was the major consideration $->$ distance to the border IV (Soviet-Finnish economic relations at neglectable level before WWII: in 1932 import was only 6% of 1913)
- Soviet secret police initiative (January 1932) to prohibit certain districts for settlements of American Finns. Not supported by Moscow but we know the districts (Takala, 2002 p. 28) $->$ prohibition dummy IV
- ”American Finns” was the Karelian government project, i.e. no American Finns outside this region $->$ interact IVs with the Karelian dummy (and the post-arrival period)

Labor Productivity and American Finns: IV estimates (Wood&Pulp)

	(1)	(2)	(3)
Panel A: Second-stage regressions			
	Dependent variable: Log of labor productivity per worker		
POST × D_i	1.081**	1.088***	1.085**
	(0.545)	(0.416)	(0.422)
Karelia × First 5-y plan	-0.807**	-0.811**	-0.810**
	(0.351)	(0.357)	(0.334)
Forced Labor Controls	Yes	Yes	Yes
Panel B: First-stage regressions			
	Dependent variable: POST × D_i		
POST × Settlement prohibition	-0.827***		-0.586***
	(0.199)		(0.147)
POST × Distance to border		84.19***	69.53***
		(23.61)	(19.35)
Kleinbergen-Paap F-statistic	17.24	12.72	19.83
N	701	701	701

OLS vs. IV Estimates

- IV estimates are slightly larger than OLS, arguably due to measurement error in geolocation of American Finns.
- Ambiguous theoretical predictions about the direction of bias in OLS estimates due to strategic placement of American Finns
- Under assumption of valid instruments, IV results imply causal effect of American Finns who more than doubled labor productivity: not unrealistic!
  - The American Finn lumberjack teams were three times as productive as local (Bekrenev, Nik., Kanadalaiset metsätöissä Neuvosto-Karjalassa. Petroskoi 1932).
  - Kero's (1983): American Finns were two to three times more productive. Based on careful measurement (e.g., to produce one m^3 of timber, a local team needs btw 89-94 minutes and a Canadian team needs 45-47 minutes)

Robustness Checks

- Intensive margin: account for the number of American Finns closeby a firm. Caveat only 40% of American Finns are geolocated. Table
- Different benchmarks for the distance between the location of Soviet firms and the closest settlement with American Finns present
- Restrictions on the control region: exclude firms located on territories of the modern regions other than Arkhangelsk region
- Restrictions on the type of the firm: 'large firms' only
- Other functional forms: e.g. estimate the OLS effect on TFP (do not have enough instruments to estimate IV)

Mechanism: Finnish Language and Human Capital

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. var.: Labor productivity per worker					
POST × D_i	0.189	-0.428	0.0129	-2.472	-0.590	1.126
	(0.323)	(1.336)	(2.881)	(1.946)	(1.842)	(1.791)
Karelia × First 5-y plan	-0.657**	-0.658***	-0.658**	-0.670***	-0.676***	-0.663***
	(0.258)	(0.250)	(0.263)	(0.253)	(0.258)	(0.256)
POST × D_i × Finnish speakers pc	33.33*		31.44			
	(19.61)		(27.96)			
POST × D_i × Karelian speakers pc	0.360		0.437			
	(0.305)		(1.098)			
POST × D_i × Literacy pc		2.073	0.323	4.969	1.301	-0.986
		(2.417)	(5.274)	(3.260)	(3.090)	(2.953)
POST × D_i × Finnish and Karelian				1.499**	-1.978	-4.928**
speakers pc				(0.630)	(1.676)	(2.118)
POST × D_i × Adult literacy in Finnish					10.35**	
					(5.160)	
POST × D_i × Adult literacy among						7.389***
Finns and Karels						(2.575)
Forced Labor Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	701	701	701	701	701	701

Note: Finish, Karelian speakers and literacy are measured in subdistricts in 1926; adult literacy in Finnish and adult literacy among Karels and Finns are measured in districts for cohorts between 8 and 49 years old.

- The Red Finns benefited from the Soviet indigenization policy but promoted Finnish rather than Karelian language arguing that such policy would contribute to faster cultural development of the region (e.g., no Karelian written language, no national literature etc.).
- The Red Finns promoted education in Finnish language (education was also available in Russian in Russian districts)

Discussion: Abilities of Recipients and Adaptation of Technologies (1)

- Abilities of recipients (not only of senders) to get and process information are crucial for adaptation of technologies
  - Fits historical facts that American Finns wrote technical manuals how to use new technologies in Finnish $->$ need a translator able to read Finnish
  - In line with the argument of the earlier studies on the importance of information and communication channel (Natkhov and Vasilenok 2022, Boberg- Fazlic and Sharp 2024) coefficients
  - But also reveal the constraints associated with the human capital of the locals: literacy in Finnish rather than language drives the effect

Other Results

- Loyalty/Regime capacity pathway: party members (in 1927) per capita
- Media/Propaganda pathway: number of copies of media outlets (in 1927 and 1928) per capita
- No difference in the effect driven by migrants from the US or Canada

Conclusion

- Transfers of technologies worked in the planned economy context: the presence of the American Finns increase labor productivity in Soviet wood and pulp firms
- Abilities of receivers to get and proceed information were important for successful transfer of technologies.
- Contribution to the debate on the limits of the Soviet industrialization: highlight skilled labor constraint
- The central planner allocated capital and skilled labor to the same industrial cites, i.e. likely understood the constraint well.

Soviet Industrialization and Foreign Skilled Labor

- Soviet Industrialization started from a low level:
  - Agriculture produced about half of GDP in 1928.
  - Labor productivity in industry was at about 30% of the US in that time.
  - Skilled labor was one of constraints: literacy in the age above ten was 69.3% only in 1926 (for Russia).
- Shortage of skilled labor was well understood by the Soviet government
- 16th Party Congress (1930): invite "foreign engineers, foremen and skilled workers" in order to exploit "their experience and knowledge inside Soviet plants"
  - Records are poor but up to 80K (including family members) came from the US, Germany etc.
  - Before, only about 5K foreign workers (1930).
  - The Soivet government allocated arrived migrants to major industrial cites, i.e., not to the remote regions like Karelia or the North region Table

Back: Time Frame

Karelia vs. North Region on the Eve of Soviet Industrialization (1926)

	Karelia	North region
Territory sq. km	146045	1165178
Population	269734	3104260
Population Density (per sq. km)	1.85	2.66
Number of urban settlements	14	46
Share of urban population	0.23	0.09
Share of Russians	0.57	0.93
Share of Karels	0.41	0.004
Share of Finns	0.01	0
Share of literatre	0.49	0.47
Number of large firms in 1925/26	30	91
Industrial output in 1925/26 in th. rubles, current prices	17855	55597
Agicultural output per hectar in 1928 (tons)	1.03	0.84

- The North region was set up in 1929 and its admin borders were changing in the 1930s.
- For the 1926 census, North region is defined as Arkhangelsk, Cherepovetz, Vologda provinces and Komi republic.

Back: Firm-level Data

Why Did They Go? Left Political Preferences and Propaganda

- The median migrant was likely left minded but not a party member
- For Soviet visa, immigrants needed (two) recommendations from trusted comrades in the US
- The US communist party was reluctant to let own members go because it competed for these activists

Economic consideration

Back: Emigrating American Finns

Why Did They Go? Economic consideration

- Great Depression heavilyheated forestry and wood industry in the US

TABLE 1—Gross Income, Net Profits, Production, and Prices in the Lumber Industry 1920–1935

Year	Gross Income [a] (000 omitted)	Net Profits [b] (000 omitted)	Production [c] (000,000 omitted) (In board feet)	Wholesale Prices [d]	
				Douglas Fir No. 1 Common (Per 1000 ft.)	Index Numbers 1926=100
1920	$3,312,000	.....	35,000	$29.917	.....
1921	1,847,000	.....	29,000	11.833	.....
1922	2,402,000	$167,494	35,250	15.250	.....
1923	2,975,000	278,766	41,000	19.417	111.8
1924	2,835,000	132,344	39,500	17.250	99.3
1925	2,968,000	159,639	41,000	17.250	100.6
1926	3,069,000	116,810	39,750	16.483	100.0
1927	2,805,000	43,379	37,250	16.285	92.5
1928	2,842,000	81,958	36,750	16.758	90.5
1929	2,795,000	78,018	36,900	18.293	93.8
1930	1,988,000	109,576 [e]	26,100	14.702	85.8
1931	1,348,000	177,752 [e]	16,500	11.648	69.5
1932	854,000	202,266 [e]	10,100	9.415	58.5
1933	994,000	68,876 [e]	12,596	14.118	70.7
1934	.....	.....	12,827	17.631	84.5
1935	.....	.....	17,778	16.000	81.1

Back: Emigrating American Finns

Soviet Firm-level Dataset: Coverage

- Unbalanced dataset because of construction of new plants and multiple administrative reorganizations
- For the 1920s, one firm report = one archival package $->$ missings are possible; for the 1930s, table format where each firm is a row
- But coverage is high, somewhere above eighty percent
- E.g., the 1932 official statistical book reports 30 and 37 large firms (under the Soviet definition) for Karelia in 1925/6 and 1930, and our dataset has output data for 26 and 53 firms in 1925/6 and 1932.

Back: Firm-level Data

Quality of Soviet Firm-level Data

- Internal (non-public) records
- Officials used them for policy decisions
- Labor is measured in the number of blue collar workers (hard to manipulate)
- Prices are non-market but the same within industry: firm-level FEs account for that

Back: Firm-level Data

Additional Data

- Gulag camps location dataset from Kapelko and Markevich (2014)
- Location of special settlements with illegal migrants from Finland: Takala (2002)
- 1926 Census sub-district level data from Markevich, Naumenko, and Qian (2024) and original census volumes
- 1926 and 1934 administrative borders maps from Markevich, Naumenko, and Qian (2024)
- 1933 Karelian census volume and other regional Karelian volumes: district-level data

Back: Firm-level Data

Intensive Margin: Continuous DID Model with Wood and Pulp Sample

	(1)	(2)	(3)	(4)	(5)
POST × n_i	0.0534*	0.0569			
	(0.0312)	(0.0352)			
POSTTREND × n_i				0.0157**	0.0161**
				(0.00670)	(0.00728)
d_{1927} × n_i			-0.0149		
			(0.0191)		
d_{1928} × n_i		0.0182	0.0142		0.00844
		(0.0255)	(0.0209)		(0.0176)
d_{1932} × n_i			0.0455		
			(0.0339)		
d_{1934} × n_i			0.0547*		
			(0.0294)		
d_{1938} × n_i			0.0558*		
			(0.0286)		
Karelia × First 5-y plan	-0.377*	-0.383*	-0.387*	-0.286	-0.286
	(0.206)	(0.206)	(0.207)	(0.225)	(0.226)
Observations	701	701	701	701	701

Back