Economic growth spurred by diversity: Central Europe at the turn of the 20th century

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Motivation

One of the principal questions of economics:
Why are some places more successful and prosperous than others?

Various robust explanations have been proposed:

- related to traditional "neo-classical" factors
- concerning many "fundamental" causes of development

However, very little is known about

- whether cultural and societal factors might affect economic development
- and if they do, through what channels and under which circumstances

This research project

Specifically, my research looks at the relationship between cultural diversity and economic growth at the local level, using a new historical dataset of Hungarian townships from the turn of the 20th century.

The project has several novel features:

- makes effective use of the historical approach for identification purposes
- finds a strong and positive causal link between diversity and economic growth
- offers an explanation as to how diversity translates into growth

Outline:

1. Brief literature review and historical background
2. Data and measurement issues
3. Main regression results
4. Identification strategy and IV estimations
5. Proposed mechanism

Very brief literature review

Economic theory of diversity focuses on trade-offs between inefficiencies and productive varieties (Alesina and La Ferrara, 2004)

Empirical literature looks at which effect dominates....and finds puzzling results

- mostly negative association on the country level (Easterly and Levine,1997)
- mixed results for city-level studies in the US
  - earlier studies focus on race and identify a negative relationship (Poterba, 1997; Glaeser et al., 1995; Rappaport, 1999)
  - more recent studies with a broader focus on immigration find a positive link (Ottaviano and Peri, 2005, 2006; Sparber 2009, 2010; Florida, 2002)
- mostly positive results for firm-level studies

Main issues:

- diversity is endogenous to economic development
- hard to go beyond the reduced-form relationship to understand the mechanisms

How can the historical approach help?

Historical approach allows sidestepping many potential issues that plague contemporary city-level studies

- low levels of social and geographical mobility - helps alleviating reverse causality concerns
- local economies and segmented markets - mitigate the effect of systemic or global factors
- lack of regulation and bureaucratic command - lets local market forces prevail
- extensive period of peace and political status quo - allows for taking a long-term perspective

The question is only whether there is a country with high levels of social diversity and good-quality local-level data at the same time. Yes, there is!

The Austro-Hungarian Monarchy (1867-1918)

- *'...not a state, but a wildly centripetal agglutination of bewilderingly heterogeneous elements'* (Evans, 1984)
- by far the most diverse country formation in modern Europe
- strong national antagonism identified as main reason for its dissolution (Jaszi, 1929; Taylor, 1990)

Data

Empirical analysis covers Hungary, the more diverse constituent of the Austro-Hungarian Monarchy

I have compiled the township-level data from official statistical sources:

- decennial population censuses between 1869 and 1910
  - containing the demographic and industry profiles of each township
- periodical publications for additional controls
  - e.g. access to transportation infrastructure, natural resources
- occasional reports on townships' financial situation (1880, 1910)

The collected sample covers

- all townships with at least 2000 inhabitants in the first census (1869)
- altogether 1689 localities in 517 administrative districts in 72 counties
- more than 50% of total population and 10% of all townships

Measurement

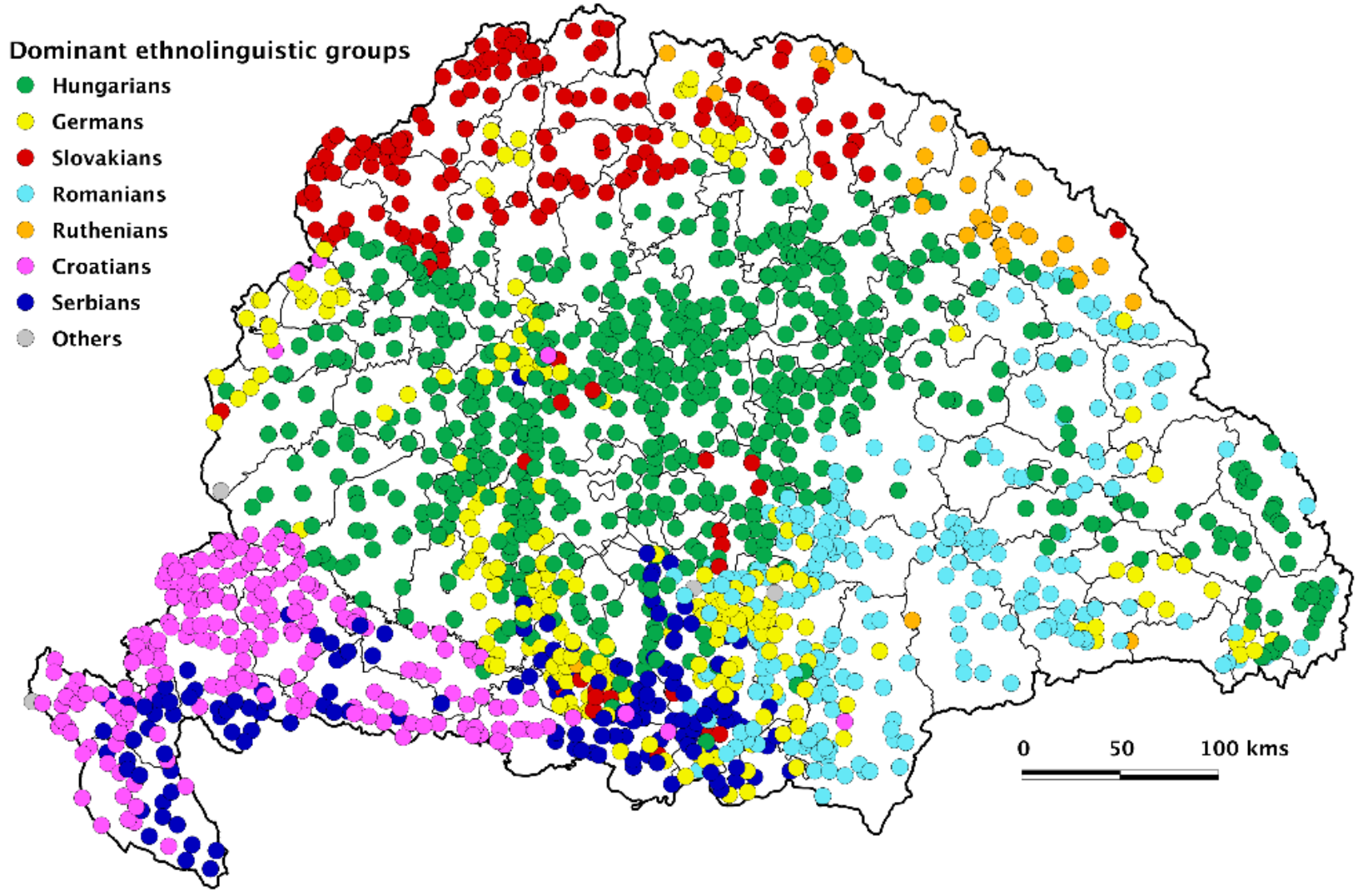
Social diversity is

- defined separately along ethnolinguistic and religious lines
- measured in the usual way, by a type of Herfindahl-index as $1 - \sum_q s_q^2$

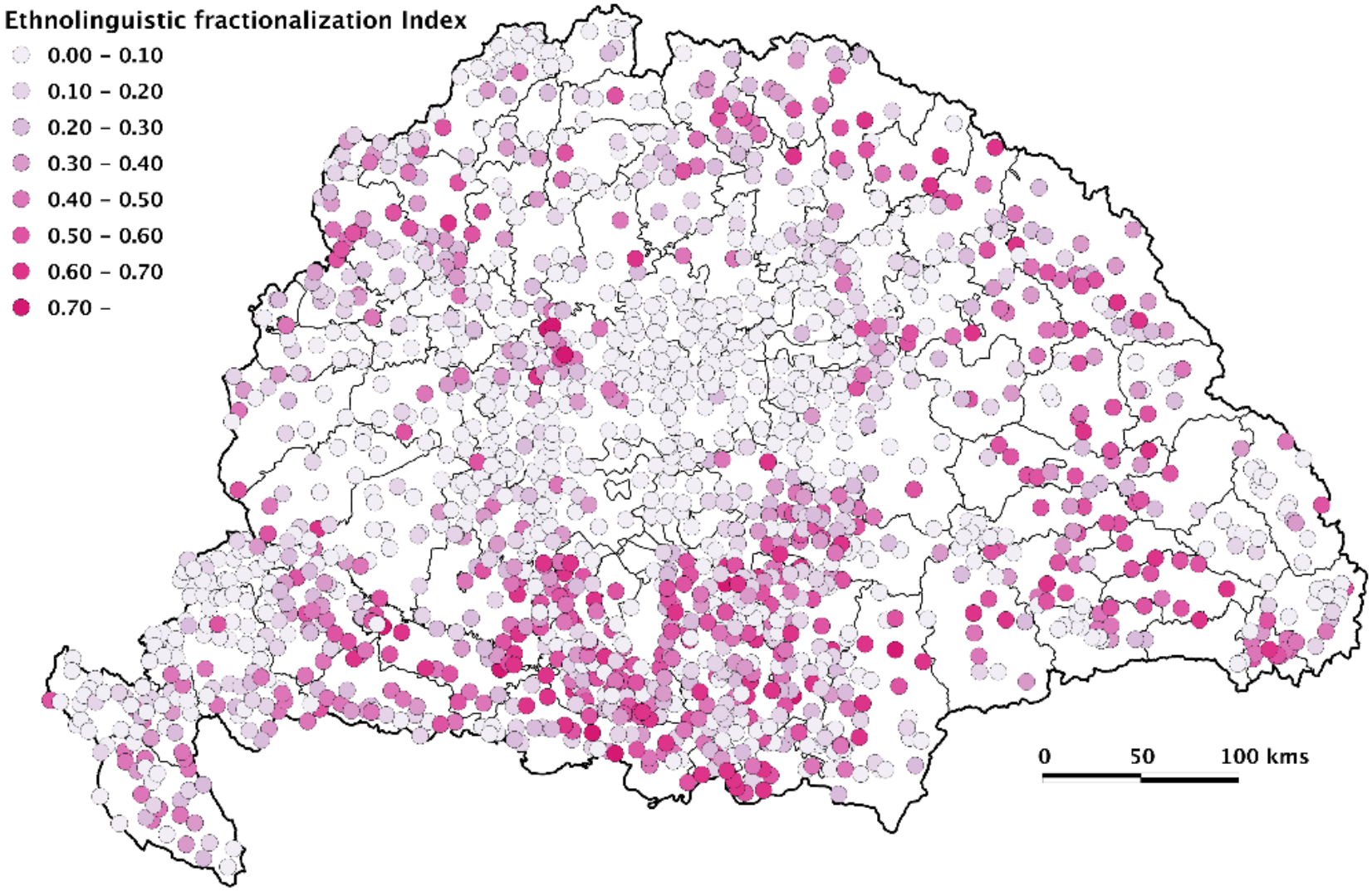
Economic development is

- measured by townships' direct tax base
  - the sum of direct taxes levied by the state and paid to the central government
  - comprises land and property taxes, income and capital gains taxes as well as corporate taxes
  - gives an accurate and comprehensive view of townships' economic activity

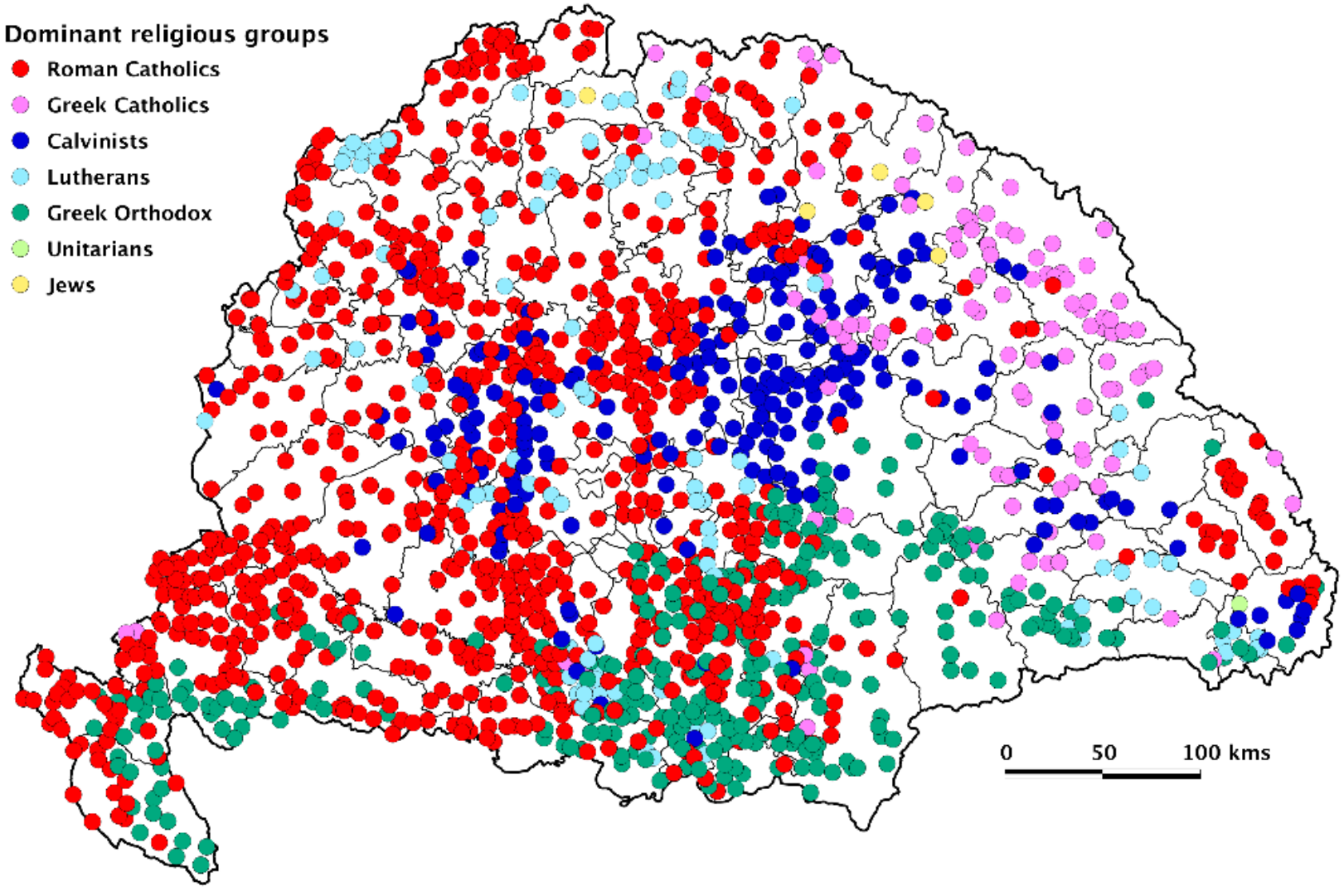
Ethnic diversity between townships in 1880



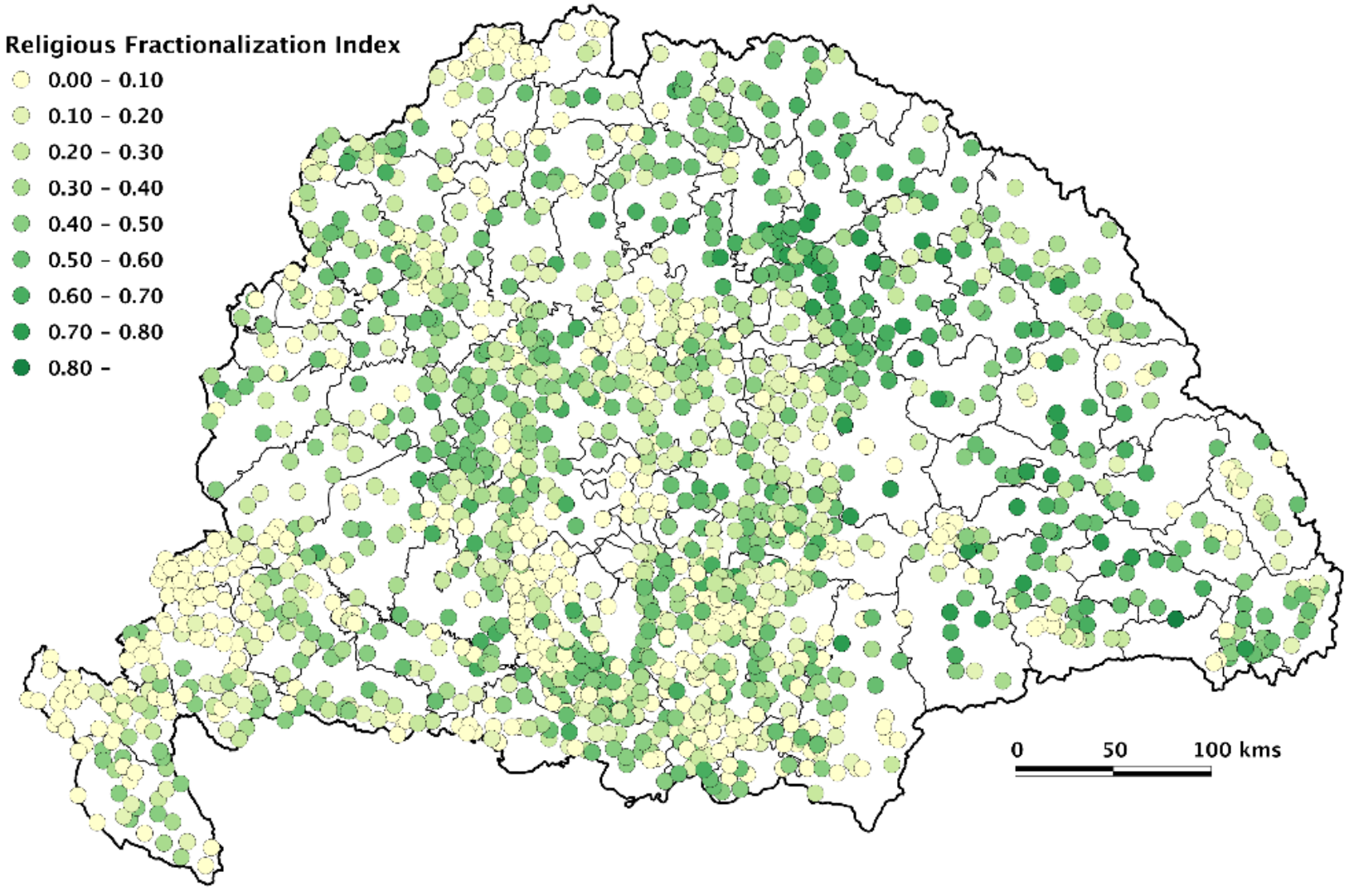
Ethnic diversity within townships in 1880



Religious diversity between townships in 1880

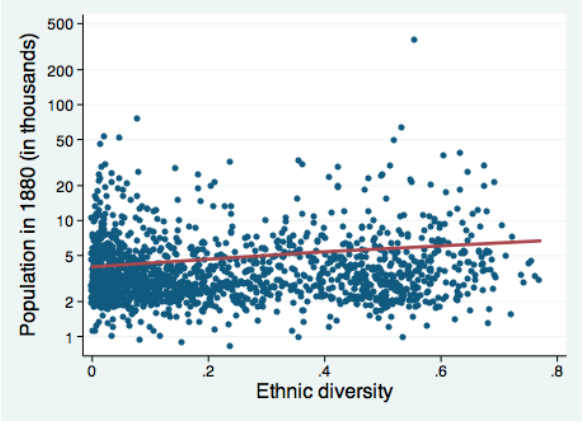


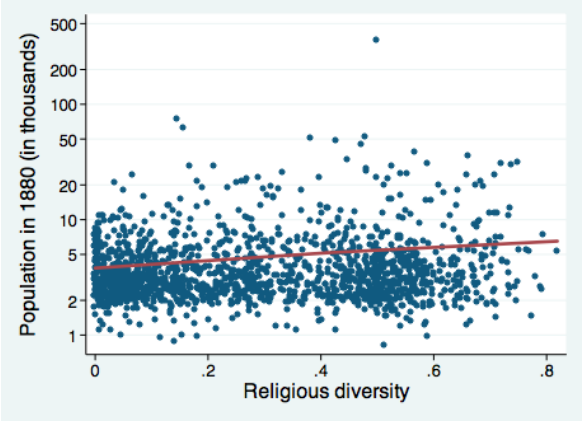
Religious diversity within townships in 1880



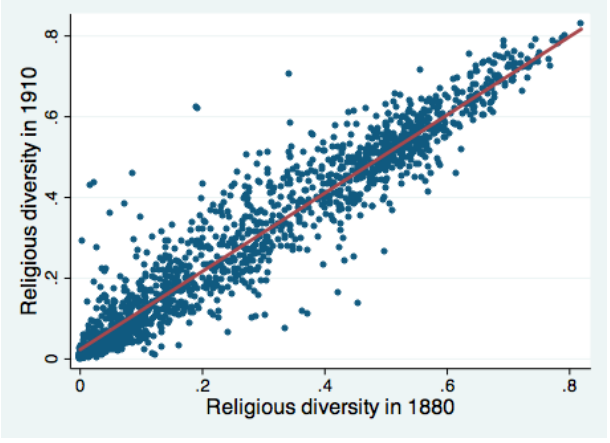
Key aspects of diversity

1. Diversity is not specifically related to urban or economic development

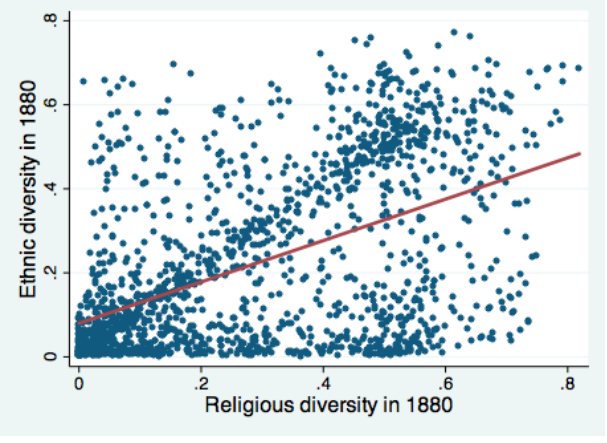




2. Diversity is highly persistent over time



3. Two aspects of diversity are largely independent from one another



Empirical strategy

The empirical analysis focuses on growth differentials across townships in the period during the 1880-1910 period.

Baseline regressions set out to explain 1910 economic outcomes by settlement characteristics as of 1880:

$$y_{i,1910} = \alpha + \beta \text{Diversity}_{i,1880} + X'_{i,1880}\delta + \gamma y_{i,1880} + \epsilon_i$$

where

- subscript i denotes townships
- $y_{i,1880}$ and $y_{i,1910}$ measure economic development in 1880 and 1910, respectively
- $\text{Diversity}_{i,1880}$ stands for ethnic or religious diversity in 1880
- $X_{i,1880}$ is a vector of control variables as of 1880

Preferred interpretation: a generalized diff-in-diff equation with diversity as the continuous treatment variable

Main regression results

	Township level tax base			Per capita tax base		
	(1)	(2)	(3)	(4)	(5)	(6)
A. Ethnic dimension						
Ethnic diversity	**.257*** **	**.331*** **	**.337*** **	**.255*** **	**.247*** **	**.207*** **
	(.068)	**(.063)**	**(.066)**	**(.062)**	**(.064)**	**(.065)**
1880 tax base	1.051***	.540***	.514***	.864***	.597**	.492**
	(.020)	(.045)	(.050)	(.042)	(.046)	(.046)
Literacy share		.602***	.546***		.808***	.710***
		(.080)	(.087)		(.081)	(.085)
Population size		.515***	.516***		.041*	.019
		(.052)	(.056)		(.022)	(.025)
R squared	.831	.897	.913	.552	.691	.760
B. Religious dimension						
Religious diversity	**.463*** **	**.251*** **	**.343*** **	**.367*** **	**.110** **	**.313*** **
	(.065)	**(.054)**	**(.062)**	**(.061)**	**(.056)**	**(.060)**
1880 tax base	1.040***	.561***	.497***	.857***	.616**	.471**
	(.019)	(.044)	(.050)	(.041)	(.044)	(.046)
Literacy share		.517***	.457***		.761***	.639***
		(.078)	(.085)		(.080)	(.084)
Population size		.505***	.537***		.047**	.022
		(.052)	(.056)		(.023)	(.024)
R squared	.837	.896	.914	.561	.691	.760
Additional control variables	No	Yes	Yes	No	Yes	Yes
County dummies	No	No	Yes	No	No	Yes
Nr. of observations	1008	1008	1008	1008	1008	1008

Robustness of results - alternative specifications

These findings are robust to

- including a quadratic term for the diversity index
- using population growth, townships' budget or the employment share in non-agriculture as the dependent variable
- restricting the sample to below-median localities in terms of population size or initial level of development
- including population shares of specific ethnic or religious groups in the regression model
- accounting for land endowment and land quality
- running a pairwise analysis focusing on growth differentials between neighboring townships only

Identification strategy based on past exposure to warfare

To exploit exogenous variation in diversity, I propose a novel IV strategy based on the historical importance of warfare.

Historical evidence suggests that warfare

- has been a prime cause of both short-term and long-term migration in Europe (Tilly, 1978; Tallett, 1992),
- led to the complete transformation of Hungary's ethnic and religious make-up during the 15-17th centuries (Acs, 1984; Romsics, 2011)

Warfare in 16-17th century Europe was most destructive from society's point of view (Howard, 2009), creating three potential channels for population mixing

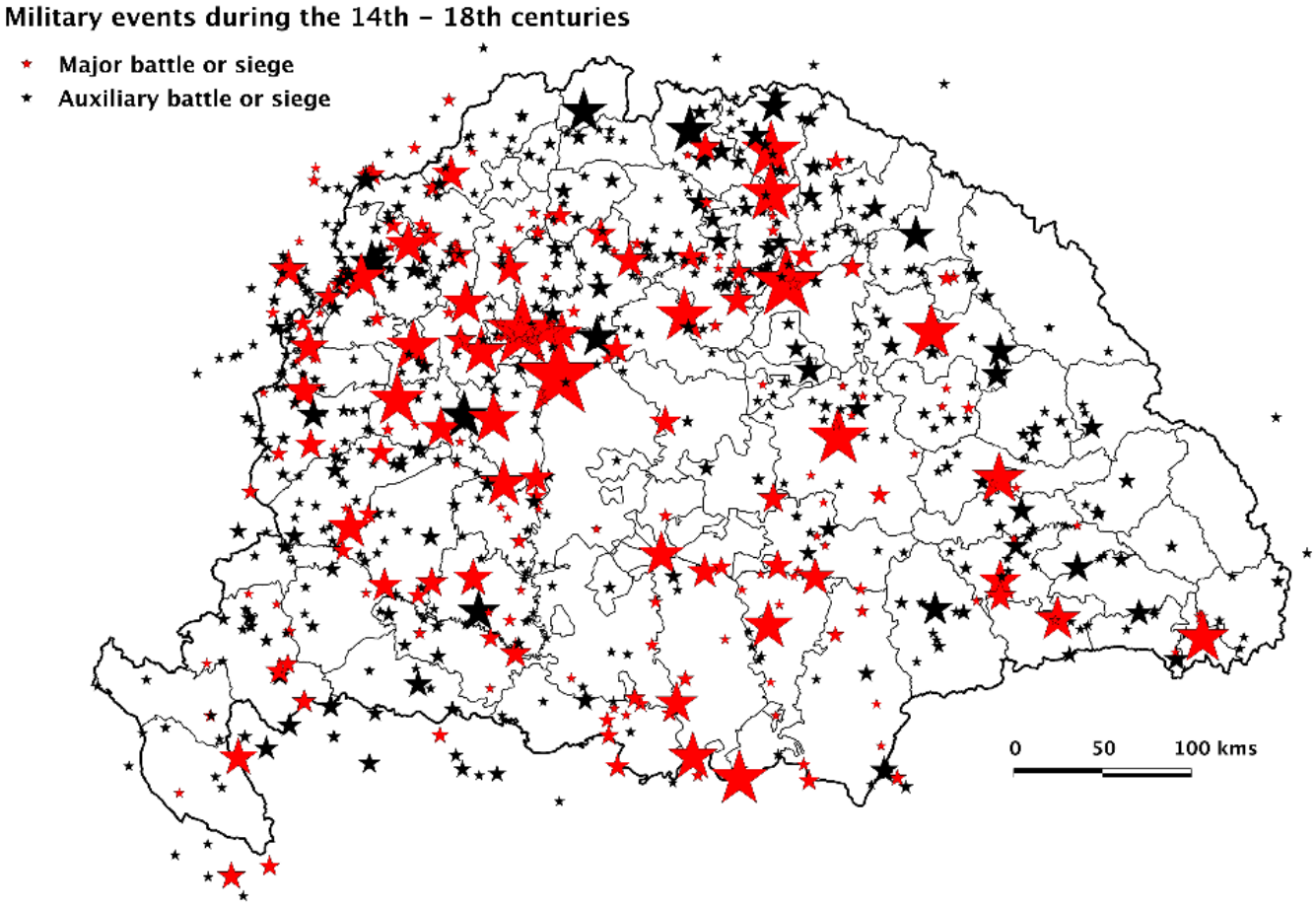
- intense interactions between the local populace and multi-ethnic troops
- short-term migration of directly affected civilians
- long-run demographic effects of spatially distorted economic incentives

No clear pattern of social mixing identified, but most action should be centered around battlefields.

Armed military conflicts on Hungarian territories (1391-1718)

I collected all documented military events in an around Hungary

- between the first Ottoman raid (1391) and the Habsburg restoration (1718)
- using the 24-volume "Military history of the Hungarian nation" (Banlaky, 1928)
- creating a final sample of 2218 military events in total, 364 classified as major

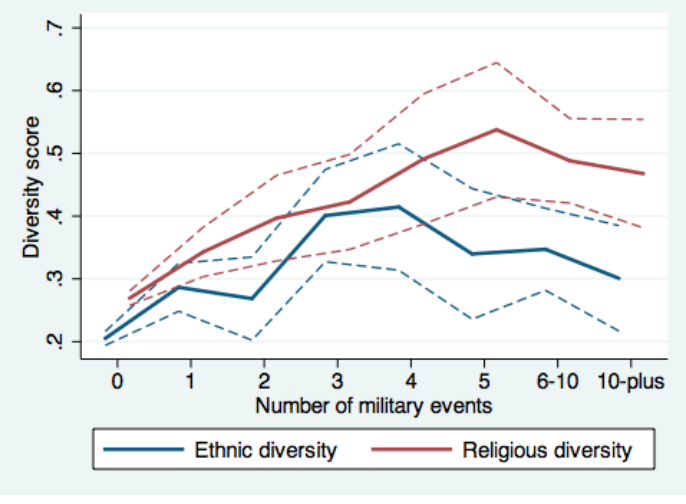


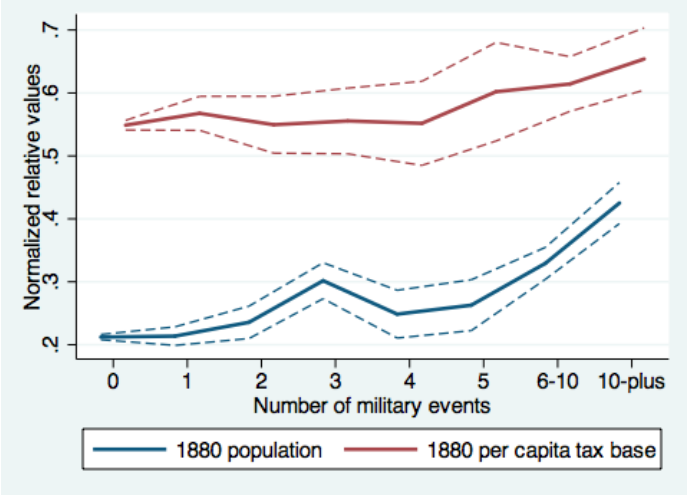
Instrument validity and relevance

Using the number of military events in (and around) townships as an IV requires that

1. previous war exposure is closely related to ethnic and religious diversity (*instrument relevance*)
2. war locations are exogenous (*instrument validity*)
3. wars have no direct effect on subsequent growth (*exclusion restriction*)

Both historical evidence (Tallett, 1992) and data at hand attest to it:





Main IV results

IV analysis uses only the part of variation in diversity explained by war

- instrument set contains indicator variables for each level of war exposure
- 2SLS estimates with per capita tax base as the dependent variable

	Without county dummies			With county dummies		
	In-town	Within 5 kms	Within 10 kms	In-town	Within 5 kms	Within 10 kms
A. Ethnic dimension						
Diversity estimate	.800***	.208	-.389	.836**	.237	.009
	(.292)	(.252)	(.387)	(.314)	(.254)	(.356)
First-stage R-squared	.236	.249	.234	.358	.372	.358
First-stage partial R-squared	.029	.045	.026	.026	.046	.024
First-stage F-statistics	6.21***	21.97***	187.48***	2.58***	5.58***	9.52***
B. Religious dimension						
Diversity estimate	.662**	.611**	.591**	.909**	.926***	.740***
	(.300)	(.258)	(.247)	(.441)	(.343)	(.261)
First-stage R-squared	.198	.210	.220	.385	.390	.398
First-stage partial R-squared	.025	.041	.052	.013	.020	.034
First-stage F-statistics	3.50***	22.74***	35.84***	1.72**	1.71**	6.40***

- IV estimates are mostly significant, larger than OLS ones, and robust across specs
- Relevant issues: weak instruments, LATE (IV) vs. ATE (OLS)

Understanding the mechanism

To understand the linkages between social diversity and growth, I will focus on

- the association between diversity and productive varieties in skills
- how these latter translate into economic complexity and growth

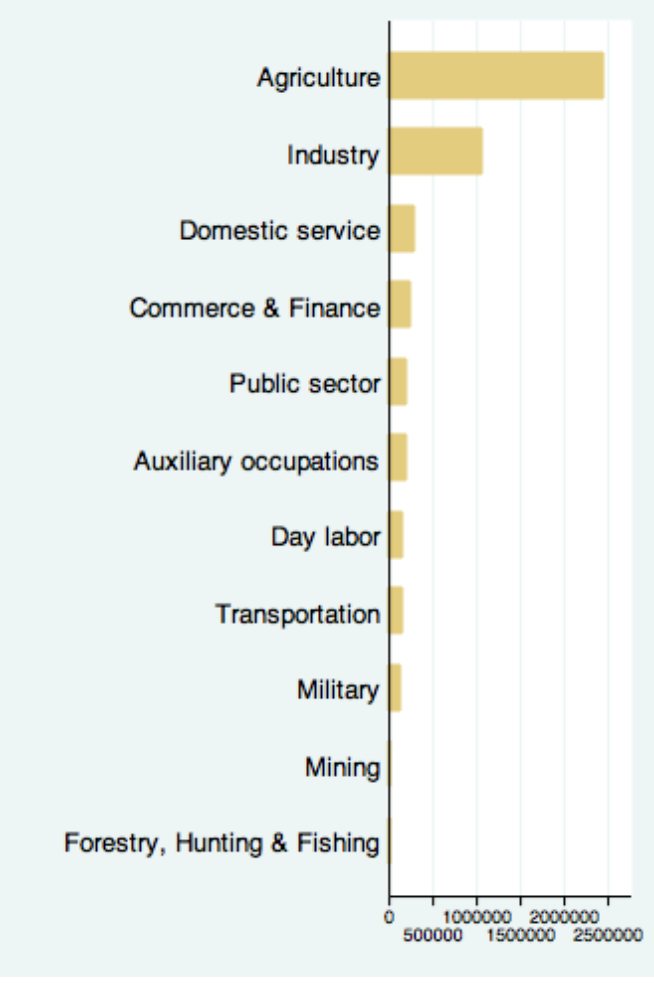
Historical and ethnographic evidence suggests considerable occupational sorting along ethnic and religious lines (Acs, 1984)

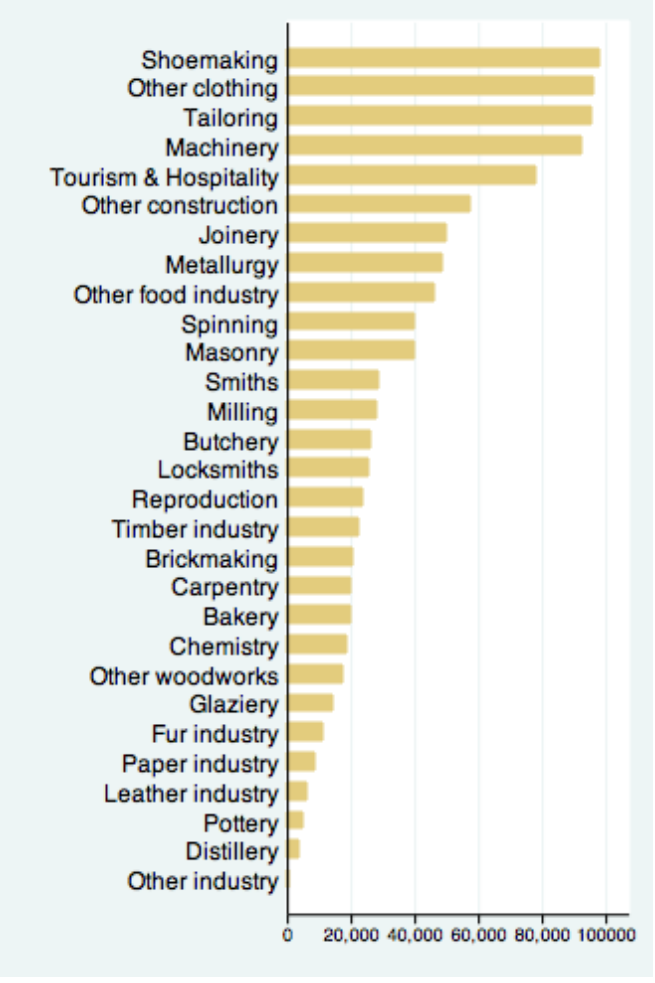
- across sectors
  (e.g. Ruthenians in agriculture, Germans in industry, Jews in public sector)
- across industries
  (e.g. Slovakian glass workers, German brickmakers, Gypsy nail cutters)

My proposed testable hypothesis:

Data on industry and occupational structure

The 1900 and 1910 censuses contain the distribution of the local populace across 11 sectors and 29 industry classes for all townships.





Stylized fact #1: Occupation sorting along ethnic and religious lines

The joint distribution of social and economic status of individuals is not known, but it is possible to compare township pairs.

Specifically, the **index of dissimilarity** for any township pair is calculated as

$$ID_{ij} = \sum_k \frac{(s_{ik} - s_{jk})^2}{2}$$

- where s_{ik} and s_{jk} denote the share of (active) population with a specific social background or economic activity k in townships i and j, respectively

Focusing on within-county variation, two different approaches are investigated:

1. correlation between social and economic dissimilarity
2. economic dissimilarity in townships pairs with different/same dominant social groups

	SECTORAL ANALYSIS		INDUSTRY ANALYSIS	
	Ethnic	Religious	Ethnic	Religious
A. Average correlation between social and economic dissimilarity				
All townships	.276	.158	.194	.143
B. Average economic dissimilarity between townships with different/same dominant groups				
All townships	.352/.288	.321/.292	.496/.451	.477/.459

Stylized fact #2: Diverse localities have more complex economies

Occupational sorting implies that diversity is associated with more complex (diverse) local economies.

Empirical test concerns the regression of economic complexity on diversity in the 1910 cross-section, controlling for contemporaneous level of development

$$\text{Complexity}_{i,1910} = \alpha + \beta \text{Diversity}_{i,1910} + \delta X_{i,1910} + \gamma y_{i,1910} + \epsilon_i$$

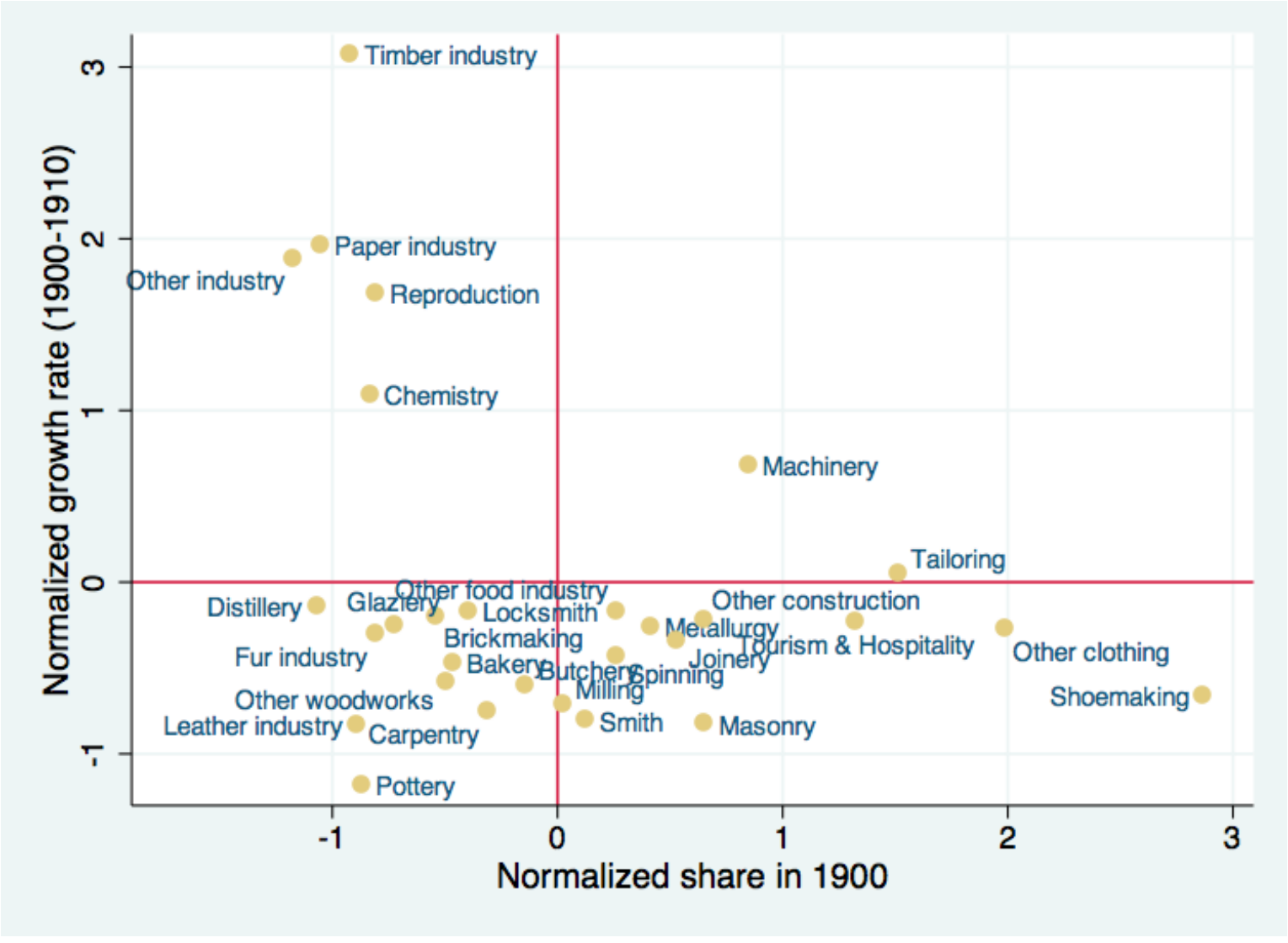
- where complexity is measured by the number of sectors or industries present in a township

	Ethnic dimension		Religious dimension	
	No county FE	County FE	No county FE	County FE
A. Sectoral analysis				
Diversity	.651***	.893***	.892***	.708***
	(.115)	(.132)	(.113)	(.129)
R-squared	.339	.778	.354	.994
B. Industry analysis				
Diversity	5.289***	4.745***	4.129***	4.009***
	(.426)	(.496)	(.419)	(.471)
R-squared	.754	.980	.743	.980

Number of observations is 1314 for all specifications. Robust standard errors in parenthesis. One, two and three stars denote significance at 10, 5 and 1% probability levels, respectively.

Stylized fact #3: Emergence of "high-tech" industries in diverse townships

Industries can be ranked in terms of their "commonness" and "expansion"



Stylized fact #3 (cont.)

One may consider industries with below-average "commonness" and above-average growth as "high-tech".

Regressing the number of such high-tech industries on economic complexity, social diversity and standard controls in the 1910 cross-section reveals

	Ethnic dimension		Religious dimension	
	No county FE	County FE	No county FE	County FE
Number of industries present	.139***	.144***	.142***	.148***
	(.008)	(.008)	(.008)	(.008)
Diversity	.149	.202	.002	-.068
	(.117)	(.127)	(.106)	(.126)
Per capita tax base	-.166***	-.057	-.153***	-.042
	(.057)	(.060)	(.054)	(.060)
R-squared	.731	.870	.731	.870

Number of observations is 1315 for all specifications. Robust standard errors in parenthesis.

- Importantly, diversity does not seem to matter once industrial complexity is accounted for.

Outline of a simple model of city growth

I propose a simple micro-founded model of city growth,
in the spirit of Dittmar (2010) and Fiszbein (2015)

Setup

- overlapping generations living in a given number of established localities
- each generation decides in the first period which which trade to learn and which township to migrate to; individuals stay put and keep working in subsequent periods

Production

- production takes place in vertically integrated local economies characterized by a (less productive) agriculture sector, low-tech and (more productive) high-tech industry sectors
- all trades produce consumer goods, while agriculture and low-tech industries also provide intermediate inputs to respective downstream industries in optimal quantities
- in a given trade and town, production technology is Cobb-Douglas in labour and (sector-specific physical) capital with a stochastic productivity variable and constant returns to scale

Drivers of city growth

- for newborns, learning a trade and choosing a location different from that of their parents is costly
- these costs are assumed heterogeneous with respect to social background

Implications of the model

The presented model

1. is able to reproduce the stylized facts observed in the data
   - and implies the increasing returns to diversity over time
   - social diversity leads to higher economic complexity,
   - higher economic complexity among low-tech industries leads to the faster emergence of high-tech industries
   - the emergence of high-tech industries generates increasing returns to diversity over time
2. offers a tool to identify circumstances under which social diversity has economic relevance
   - economic gains to diversity completely disappear in absence of occupational sorting
   - economic divergence due to diversity is reduced with increased geographical mobility or trade

Thank you for your attention!