Natural Experiments of History and Credit Institutions

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May 2012

Introduction

- Controlled and replicated laboratory experiments are the hallmark of the scientific methodology. Unfortunately, they are impossible to perform in many fields.

- An alternative technique to establish chains of cause and effects is the natural experiments.

- Question: Is the quality of local credit institutions persistent? Does it causes economic development?

Pascali (2012)

- **Research Question**: What are the effects of local credit institutions on economic development?

- **Natural Experiment**: Jewish demography 5 centuries is a source of variation in today's local banks that is exogenous with respect to current economic development.

- **Presentation**:
  - Why should local banking development matter in Italy?
  - Why is Jewish demography in 1450?
  - Where do the data come from?
  - Results?

The Italian banking system
Why Italy?

- **"Bank-based" financial system**

- **Considerable spatial diversity in the degree of banking development**

    - Restrictions on lending and branching across provinces until late 90s
    - 1936-1985 +87% branches (+1228% branches in US)

- **Difficult to borrow in a market other than the local one**

    - Distance matter in the provision of funds (Petersen and Rajan, 2002; Bofondi and Gobbi, 2004; Lerner 1995)
    - "Never lend to a client located more than 3 miles away from your office" (in Guiso et al., 2004)

Instrumental variable approach

Why is Jewish demography a good instrument?

- **2sls estimation:**

  STAGE 2

  $$\log Y_i = \alpha \widehat{\log F_i} + X_i' \beta_Y + \upsilon_{1i}^*$$

  STAGE 1

  $$\log F_i = \pi_1 J_i + X_i' \pi_2 + \epsilon_{2i}$$

- **Identifying assumptions:**

  1. $Cov(J_i; F_i) \neq 0$
  2. $Cov(J_i; \upsilon_{1i}^*) = 0$

Instrumental variable approach: correlation

Why is Jewish demography a good instrument?

- **During the 14th century, Jews in Italy became money lenders.**
  - 1215: the Lateran Council allowed the Jews to lend for a "moderate" profit
  - 1260-1340: large expansion of merchant and craft guilds
  - In the Middle Ages, the Jews in Central Italy had accumulated sizeable wealth

- **Jewish communities fostered banking development during the Renaissance**
  - Jews were allowed to lend for a profit
  - Franciscan reaction: "Monti di Pieta'"

- **The "Monti di Pieta'" evolved into today's Italian banks**
  - Ex. Banco di Napoli, Banca di Roma, Monte dei Paschi di Siena, Banca San Paolo

Instrumental variable approach: correlation

Why Jewish demography is a good instrument?

Instrumental variable approach: correlation

Why Jewish demography is a good instrument?

ITALIAN PROVINCES

Instrumental variable approach: correlation

Why is Jewish demography a good instrument?

ITALIAN PROVINCES

Instrumental variable approach: correlation

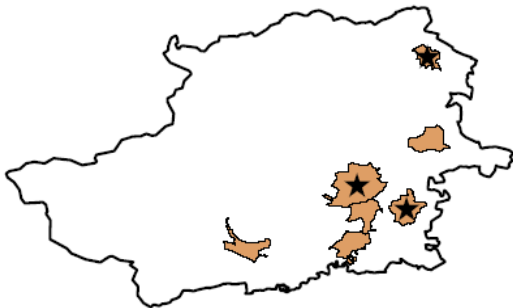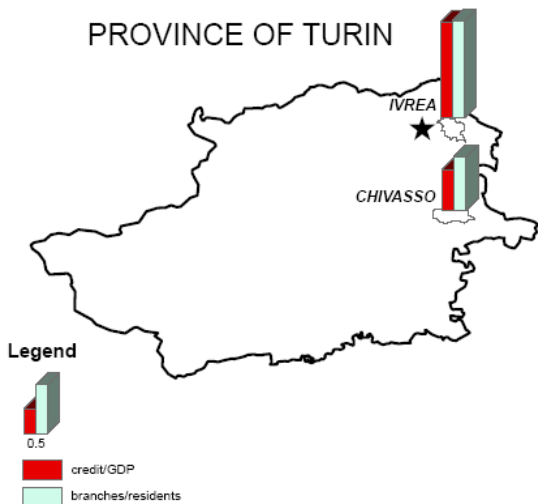## Why is Jewish demography a good instrument?

PROVINCE OF TURIN

Instrumental variable approach: correlation

Why is Jewish demography a good instrument?

Instrumental variable approach: correlation

Why Jewish demography is a good instrument?

Instrumental variable approach: exogeneity

Why is Jewish demography a good instrument?

- **Exclusion restriction**

$$Cov(J_i; v_{1i}) = 0$$

- **Let's decompose v_{1i} into 3 parts:**

$$v_{1i} = \zeta_{[-\infty;1450],i} + \zeta_{[1450,2000],i} + \epsilon_i$$

$\zeta_{[-\infty;1450],i}$: unobserved features of city i between $-\infty$ and $1450A.D.$ that affect current economic development:

$\zeta_{[1450,2000],i}$: unobserved features of city i after $1450A.D.$ that affect current economic development:

1. $Cov(J_i; \zeta_{[-\infty;1450],i}) = 0$

    1.1 Geo-morphological characteristics of the city
    1.2 Institutions before 1450
    1.3 Culture before 1450
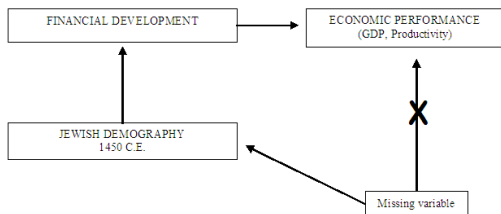   1.4 Economic development before 1450

2. $Cov(J_i; \zeta_{[1450,2000],i}) = 0$

    2.1 Human capital after 1450
    2.2 Institutions after 1450
    2.3 Culture after 1450

Instrumental variable approach: exogeneity PART 1
Why is Jewish demography a good instrument?

Let me argue that: $Cov(J_i; \zeta_{[-\infty;1450],i}) = 0$

Instrumental variable approach: exogeneity PART 1

Why is Jewish demography a good instrument?

1. **Indirect effect on economic development: culture, human capital, institutions**

- Between 1503 and 1541, Jews were expelled from the Italian regions under the Spanish crown
- Divide Italian cities across 2 dimensions

| | | Jewish community in 1450 A.D. | |
		No	Yes
Region under Spanish crown	Yes	GDP_{00}	GDP_{01}
(Expulsion beginning 16th cent.)	No	GDP_{10}	GDP_{11}

- Difference in difference analysis:

$$Y_i = \alpha_0 S_i + \alpha_1 J_i + \alpha_2 J_i * S_i + \beta X_i + \epsilon_i$$

Instrumental variable approach: exogeneity PART 2

Let me argue that: $Cov(J_i; \zeta_{[1450;2000],i}) = 0$
or:
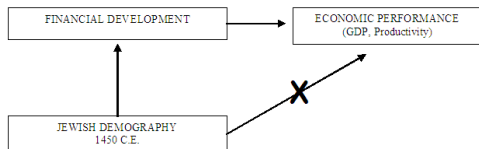
Instrumental variable approach: exogeneity PART 2
Why is Jewish demography a good instrument?

2 **Indirect effect on economic development: culture, human capital, institutions**

- Jewish demography totally changed in the 18-19th century
    - Expulsions and persecutions during the 18th century
    - Statuto albertino
    - "Manifesto della Razza"
    - Nazi persecutions in North of Italy
    - Jewish population declined steadily

- Jews lived segregated from the rest of the population until 1848
    - Derived their livelihood mainly from lending
    - Excluded from all professions and from academia
    - Few contacts with Catholics

DATA

What data do we have on ancient Jewish demography?

- **Historical Data:**
    - Jewish communities in 1130, 1450 (Milano, 1963; Bonfil, 1991)
    - Historical population (Malanima, 2004)

- **City-level data:**
    - Geographical data (Istituto Geografico De Agostini)
    - Economic indicators (ISTAT)
    - Banking and other financial data (Bank of Italy)
    - Other data

- **Firm-level data:**
    - Amadeus dataset (1996-2005)

Jewish settlements and GDP

Framework

$$Y_i = \alpha_0 S_i + \alpha_1 J_i + \alpha_2 J_i * S_i + \sum_{p=1}^{107} D_p + \beta X_i + \epsilon_i$$

- where:
  Y_i is income per capita
  J_i is a dummy for Jewish settlement in 1450
  S_i is a dummy for regions not under Spanish crown
  D_p province dummies
  X_i city covariates

Financial development and GDP

Validating the instruments

	GDP	GDP	GDP	GDP	GDP
JEW	0.304	-0.573*	-0.975	-0.322	-0.695**
	(0.325)	(0.308)	(1.04)	(0.328)	(0.318)
JEW*STAY	2.18***	1.17**	4.21***	1.32**	1.82***
	(0.519)	(0.486)	(1.16)	(0.530)	(0.490)
STAY	1.97*	1.58	0.704	2.15*	2.77***
	(1.12)	(1.04)	(1.08)	(1.10)	(1.06)
PROVINCE CAP.		0.395***			
		(0.312)			
POP1300				0.0822***	
				(0.0250)	
POP1400				-0.0130	
				(0.0461)	
POP1500				0.00619	
				(0.0163)	
EDUC					0.180***
					(0.172)
GEO. CHARACT.	YES	YES	YES	YES	YES
PROVINCE DUM.	YES	YES	YES	YES	YES
r2_a	0.700	0.745	0.576	0.723	0.735
N	1185	1185	249	1185	1185
SAMPLE	All	All	Central Italy	All	All

Banking development and GDP

- Two stages least square
  STAGE 2

$$\log Y_i = \alpha \widehat{\log F}_i + X_i' \beta_Y + \sum_{p=1}^{57} D_p + v_i$$

STAGE 1

$$\log F_i = \xi_1 J_i^S + \xi_2 J_i^M + \xi_3 J_i^L + X_i' \delta + \sum_{p=1}^{57} D_p + \epsilon_i$$

- where:
  Y_i is GDP per capita
  F_i is credit/GDP; branch density
  D_p province dummies
  X_i city covariates
  J_i^S, J_i^M and J_i^L are dummies for small, medium and large Jewish settlements in 1450

Banking development and GDP
2STLS

PANEL A (2nd stage)	LGDP(OLS)	LGDP	LGDP	LGDP	LGDP	LGDP	LGDP
LCRED (loans/GDP)	0.101***	0.253***	0.259***	0.268***	0.256***	0.212***	0.209*
	(0.0138)	(0.0443)	(0.0437)	(0.0423)	(0.0519)	(0.0559)	(0.112)
AREA					0.0494	0.00261	0.0618
					(0.0910)	(0.0829)	(0.0836)
REGION CAPITAL						0.124**	
						(0.0503)	
PROVINCE CAPITAL							0.0291
							(0.0617)
GEOGR. CHARAC.	NO	NO	NO	YES	YES	YES	YES
PROVINCE DUM.	NO	NO	YES	YES	YES	YES	YES
sarganp		0.0807	0.250	0.478	0.493	0.780	0.497
N	510	510	510	510	510	510	510
SAMPLE				Cities not under Aragon crown in 1500 A.D.			

PANEL B (1st stage)		LCRED	LCRED	LCRED	LCRED	LCRED	LCRED
JEWsmall		0.144**	0.245***	0.267***	0.279***	0.261***	0.193***
		(0.0596)	(0.0549)	(0.0567)	(0.0558)	(0.0556)	(0.0533)
JEWmedium		0.441***	0.554***	0.575***	0.503***	0.473***	0.205***
		(0.0775)	(0.0694)	(0.0683)	(0.0694)	(0.0694)	(0.0748)
JEWlarge		0.704***	0.748***	0.728***	0.596***	0.482***	0.106
		(0.0998)	(0.0911)	(0.0888)	(0.0932)	(0.0993)	(0.106)
R_2		0.0812	0.5523	0.5967	0.6101	0.6192	0.6200
F (excluded instr.)		22.87	34.78	36.91	24.52	18.77	5.27

Banking development and GDP

2STLS - Robustness checks

PANEL A (second stage)	LGDP	LGDP	LGDP	LGDP	LGDP	LGDP
LCREDIT (loans/GDP)	0.485***	0.460***	0.369*	0.174***	0.177***	0.179*
	(0.148)	(0.163)	(0.192)	(0.0651)	(0.0650)	(0.0997)
AREA	-0.270	-0.287	-0.119	0.0216	-0.00869	0.00569
	(0.192)	(0.185)	(0.53)	(0.0881)	(0.0890)	(0.0858)
REGION CAP.		0.0632			0.0894*	
		(0.107)			(0.0496)	
PROVINCE CAP.			-0.0235			0.0152
			(0.0999)			(0.0467)
POP (1300, 1400, 1500)	NO	NO	NO	YES	YES	YES
GEO. CHARACT.	YES	YES	YES	YES	YES	YES
PROVINCE DUM.	YES	YES	YES	YES	YES	YES
YEAR DUM.	YES	YES	YES	YES	YES	YES
sarganp	0.154	0.0850	0.0255	0.925	0.892	0.756
N	210	210	210	510	510	510
SAMPLE	Not under Aragon in Central Italy			Cities not under Aragon crown		

PANEL B (first stage)	LCREDIT	LCREDIT	LCREDIT	LCREDIT	LCREDIT	LCREDIT
JEWsmall	0.246***	0.243***	0.212***	0.205***	0.209***	0.160***
	(0.0863)	(0.0867)	(0.0785)	(0.0592)	(0.0599)	(0.0570)
JEWmedium	0.223*	0.222*	0.00244	0.429***	0.429***	0.206***
	(0.114)	(0.114)	(0.109)	(0.0686)	(0.0687)	(0.0742)
JEW_large	0.546***	0.507***	0.00263	0.249**	0.249**	-0.0680
	(0.140)	(0.156)	(0.153)	(0.119)	(0.120)	(0.124)
r2_a	0.655	0.654	0.716	0.646	0.645	0.676
F (excluded instr.)	5.76	4.45	3.08	13.39	13.41	6.31

Banking development and GDP

2STLS - Robustness checks

PANEL A (second stage)	LGDP	LGDP	LGDP	LGDP	LGDP	LGDP
LCREDIT (branch density)	0.713***	1.336***	1.341***	1.360***	1.166***	1.523
	(0.143)	(0.284)	(0.293)	(0.403)	(0.405)	(1.021)
AREA				-0.0137	-0.0462	-0.0199
				(0.159)	(0.140)	(0.190)
REGION CAPITAL					0.119*	
					(0.0715)	
PROVINCE CAPITAL						-0.0292
						(0.117)
GEO. CHARACTERISTICS	NO	NO	YES	YES	YES	YES
PROVINCE DUMMIES	NO	YES	YES	YES	YES	YES
YEAR DUMMIES	YES	YES	YES	YES	YES	YES
sarganp	0.0354	0.764	0.829	0.835	0.825	0.857
N	519	519	519	519	519	519
SAMPLE	Cities not under Aragon crown in 1500 A.D.					

PANEL B (first stage)	LCREDIT	LCREDIT	LCREDIT	LCREDIT	LCREDIT	LCREDIT
JEWsmall	0.0525	0.0631**	0.0595**	0.0584**	0.0565**	0.0396
	(0.0321)	(0.0246)	(0.0252)	(0.0250)	(0.0251)	(0.0253)
JEWmedium	0.190***	0.117***	0.116***	0.0941***	0.0897***	0.0294
	(0.0420)	(0.0316)	(0.0319)	(0.0328)	(0.0332)	(0.0374)
JEWlarge	0.228***	0.180***	0.169***	0.127***	0.110**	0.0205
	(0.0541)	(0.0415)	(0.0411)	(0.0442)	(0.0474)	(0.0534)
R_2	0.0506	0.670	0.679	0.683	0.683	0.690
F (excluded instr.)	10.70	8.71	8.12	4.45	3.51	0.84

Banking development and TFP

- Compute firms' TFP

$$\log Y_{fit} = \varepsilon_L^j \log L_{fit} + \varepsilon_K^j \log K_{fit} + \varepsilon_M^j \log M_{fit} + \delta_{it} + \eta_{jt} + \alpha_f + \omega_{fit}$$

- Compute a measure of aggregate technology:

$$T_{i,t} \equiv \sum_{f \in i} t_{ft} w_{ft}$$

where $w_{ft} \equiv VA_{ft} / \sum_{f \in i} VA_{ft}$

- Run 2SLS

$$\log T_{i,t} = \alpha \log F_i + X_i' \beta_T + \sum_{p=1}^{57} D_p + v_{j,i}$$

- Sample: 14004 firms, 368 Italian cities, year 2004

Banking development and TFP

2STLS; city-level regressions

	(1) LTFP (OLS)	(2) LTFP	(3) LTFP	(4) LTFP	(5) LTFP	(6) LTFP
LCREDIT (loans/GDP)	0.00725	0.114***	0.112***	0.112***	0.108	0.135***
	(0.0132)	(0.0328)	(0.0336)	(0.0392)	(0.0679)	(0.0513)
REGION CAPITAL				-0.0115		
				(0.0499)		
PROVINCE CAPITAL					-0.00506	
					(0.0488)	
POP1300						-0.000519
						(0.00199)
POP1400						0.00238
						(0.00342)
POP1500						-0.00177
						(0.00137)
GEO. CHARACTERISTICS	NO	NO	YES	YES	YES	YES
PROVINCE DUMMIES	YES	YES	YES	YES	YES	YES
N	381	381	381	381	381	381
sarganp		0.574	0.373	0.343	0.317	0.444
SAMPLE	Cities not under Aragon crown in 1500 A.D.					

Banking development and TFP

2STLS; city-level regressions

	(1)	(2)	(3)	(4)	(5)
	LTFP	LTFP	LTFP	LTFP	LTFP
LCREDIT (branch density)	0.523***	0.524***	0.511**	0.614	0.556**
	(0.190)	(0.191)	(0.208)	(0.415)	(0.250)
REGION CAPITAL			0.0109		
			(0.0574)		
PROVINCE CAPITAL				-0.0206	
				(0.0647)	
POP1300					0.00266
					(0.00228)
POP1400					-0.000991
					(0.00408)
POP1500					-0.00228
					(0.00186)
GEO. CHARACTERISTICS	NO	YES	YES	YES	YES
PROVINCE DUMMIES	YES	YES	YES	YES	YES
N	381	381	381	381	381
sarganp	0.922	0.880	0.880	0.911	0.925
SAMPLE	Cities not under Aragon crown in 1500 A.D.				

Banking development and TFP

- Olley and Pakes (1996):

$$\log T_{i,t} = \sum_{f \in i} \Delta \log t_{fit} \Delta w_{fit} + \overline{\log t_{it}} \tag{1}$$

where:

$$\Delta \log t_{fit} \equiv \log t_{fit} - \overline{\log t_{fit}} \quad \text{and} \quad \Delta w_{fit} \equiv w_{fit} - \overline{w_{it}}$$

and:

$$\overline{\log t_{it}} \equiv \sum_{f \in i} \log t_{fit} \quad \text{and} \quad \overline{w_{it}} \equiv \sum_{f \in i} w_{fit}$$

Banking development and TFP

2STLS; city-level regressions

	(1) ave LTFP	(2) ave LTFP	(3) ave LTFP	(4) ave LTFP	(5) ave LTFP	(6) ave LTFP
LCRED (loans/GDP)	0.0397	0.0434	0.0468			
	(0.0283)	(0.0293)	(0.0421)			
LCRED (branch density)				0.191	0.212	0.231
				(0.133)	(0.137)	(0.177)
POP1300			0.000853			0.00195
			(0.00165)			(0.00162)
POP1400			-0.000524			-0.00168
			(0.00285)			(0.00289)
POP1500			-0.000786			-0.00107
			(0.00112)			(0.00126)
GEOGR. CHARAC.	NO	YES	YES	NO	YES	YES
PROVINCE DUM.	YES	YES	YES	YES	YES	YES
N	381	381	381	381	381	381
sarganp	0.806	0.667	0.580	0.956	0.885	0.868
SAMPLE	Cities not under Aragon crown in 1500 A.D.					

Banking development and TFP

2STLS; city-level regressions

	(1) REAL TFP	(2) REAL TFP	(3) REAL TFP	(4) REAL TFP	(5) REAL TFP	(6) REAL TFP
LCRED(loans/GDP)	0.651**	0.548**	0.540			
	(0.279)	(0.266)	(0.378)			
LCRED(branch density)				1.893*	1.750*	1.284
				(1.079)	(1.019)	(1.244)
POP1300			0.00711			0.0138
			(0.0136)			(0.0141)
POP1400			-0.0159			-0.0218
			(0.0248)			(0.0254)
POP1500			0.00211			0.00279
			(0.00874)			(0.00942)
GEOGR. CHARAC.	NO	YES	YES	NO	YES	YES
PROVINCE DUM.	YES	YES	YES	YES	YES	YES
N	242	242	242	242	242	242
sarganp	0.242	0.558	0.472	0.126	0.396	0.318
SAMPLE	Cities not under Aragon crown in 1500 A.D.					

Conclusions

- The expulsion of the Jews from the Aragon kingdom was responsible for a relevant portion of the gap in income per capita between the North and the South of Italy.

- Banking development has substantial effects on GDP per capita. Most of this effect is due to the ability of banks to reallocate resources toward more productive firms.

- Additional results (not presented) document the persistence of local banking development across Italian municipalities.
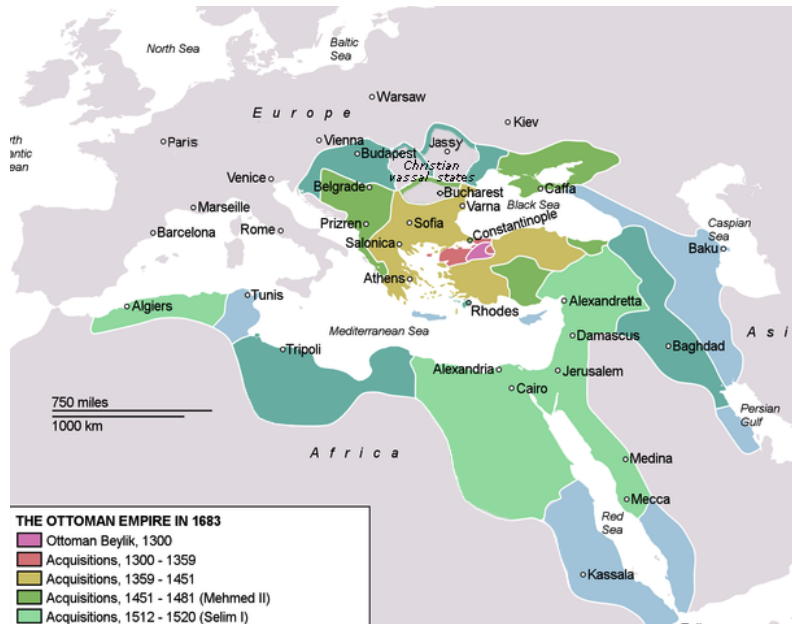
Grosjean (2011)

- **Research Question**: Is local financial development persistent?

- **Natural Experiment**: Changes in the exposure to the Ottoman Empire gave raise to a variation in the development of the local banking system.

- **Presentation:**
  - Why the Ottoman Empire?
  - Where do the data come from?
  - Results?

Why the Ottoman Empire?

- Interest lending was forbidden under the Islamic Law
- Inalcik (1973): Political authority was merely a means for the application of the Sharia
- Successor state's borders do not coincide with the borders of the former Empire

Why the Ottoman Empire?

THE OTTOMAN EMPIRE IN 1683
- Ottoman Beylik, 1300
- Acquisitions, 1300 - 1359
- Acquisitions, 1359 - 1451
- Acquisitions, 1451 - 1481 (Mehmed II)
- Acquisitions, 1512 - 1520 (Selim I)

DATA

- Historical data
    - Empire evolution across time (Euratlas, 2008)
- Regional data
    - Bank penetration (LITS)
    - household income (LITS)
    - industrial index (LITS)
    - age of entrepreneurs (LITS)
    - regional GDP (Eurostat)

Ottoman Empire and current credit

$$Y_{ic} = \alpha E_i + \beta X_i + \sum_{p=1}^{6} D_c + \epsilon_i$$

where
E_i is the exposure to the Ottoman Empire
D_c country dummies
X_i covariates

Ottoman Empire and current credit

	LCREDIT	LCREDIT	INDUSTRY	LINDUSTRY	LAGE ENTR.	LAGE ENT
	(1)	(2)	(3)	(4)	(5)	(6)
Ottoman	-0.011**	-0.008***	-0.002	-0.02	-0.021	-0.014
	(0.002)	(0.002)	(0.004)	(0.003)	(0.062)	(0.061)
GEO./ECON. CONTROLS	NO	YES	NO	YES	NO	YES
COUNTRY DUMMIES	YES	YES	YES	YES	YES	YES
r2_a	0.528	0.738	0.046	0.131	0.092	0.244
N	300	300	298	298	161	161
SAMPLE		6 countries: Croatia, Hungary, Montenegro, Romania, Serbia, Ukraine.				

Ottoman Empire and current credit

- Every 25 additional years of Ottoman rule are associated with a reduction of bank penetration by about 0.1%.
- Ottoman rule does is not associated with systematic differences in economic activity or entrepreneurship measures
- A puzzle?

Ottoman Empire, Jews and current credit

	LCREDIT	LCREDIT
	(1)	(2)
Ottoman	-0.008***	-0.008***
	(0.002)	(0.002)
Greeks, Armenians, Jews	0.323	-1.745*
	(0.675)	(0.841)
Greeks, Armenians, Jews*Ottoman		0.104**
		(0.039)
GEO./ECON. CONTROLS	YES	YES
COUNTRY DUMMIES	YES	YES
r2_a	0.771	0.772
N	1000	1000
SAMPLE	20 countries	

Conclusions

- Natural experiments in history can be used to assess the emergence, persistence and long-term effects of institutions.
- Using two natural experiments:
  - Local credit Institutions are exceptionally persistent over time
  - Local credit Institutions exert large economic effects today
  - Clear policy implications.