Forbidden Fruits: The Political Economy of Science, Religion and Growth

Roland Bénabou
Princeton University
NBER & CIFAR

Davide Ticchi
IMT Lucca

Andrea Vindigni
IMT Lucca & Collegio Carlo Alberto

NBER SI - July 2014
Introduction

**Aim:** study interplay of religion, innovation [growth] and politics
Introduction

- **Aim:** study interplay of religion, innovation [growth] and politics
- Throughout history and to this day, periodic clashes between science and organized religion. Political power arbitrates
  - Sacred texts, doctrines, tied to fixed “world view”. Scientific discoveries recurrently contradict, falsify important aspects
Introduction

- **Aim:** study interplay of religion, innovation [growth] and politics

- Throughout history and to this day, periodic clashes between science and organized religion. Political power arbitrates
  
  - Sacred texts, doctrines, tied to fixed “world view”. Scientific discoveries recurrently contradict, falsify important aspects


   - Rediscovered in 12th century ⇒ declared heretical, **banned under penalty of excommunication** from 1210 to 1325
Introduction

- **Aim:** study interplay of religion, innovation [growth] and politics
- Throughout history and to this day, periodic clashes between science and organized religion. Political power arbitrates
  - Sacred texts, doctrines, tied to fixed “world view”. Scientific discoveries recurrently contradict, falsify important aspects

1. Aristotle’s lost treatises: Physics, On the Soul, On Generation & Corruption, Metaphysics, Meteorology, On the Heavens...
   - Rediscovered in 12th century ⇒ declared heretical, banned under penalty of excommunication from 1210 to 1325

   - “Medieval synthesis” of reason and faith, became official doctrine
3.  Scientific revolution: heliocentrism, atomism, infinitesimals, empiricism
Completely upended Aquinian synthesis ⇒ banned, severely repressed
by Roman Church (Jesuits, Inquisition)

- Copernicus (1453), Bruno (1600), Galileo (1610), Cavalieri
  (1598-1647), Toricelli (1608-1647), Newton (1687)
Introduction

3. Scientific revolution: heliocentrism, atomism, infinitesimals, empiricism
   Completely upended Aquinian synthesis ⇒ banned, severely repressed by Roman Church (Jesuits, Inquisition)
   ▶ Copernicus (1453), Bruno (1600), Galileo (1610), Cavalieri (1598-1647), Toricelli (1608-1647), Newton (1687)

4. Islamic world: following “golden age”, deep and prolonged decline of science and knowledge-seeking, from 11th century until present
   ▶ Printing press (1436): Ottoman Empire forbade it in 1483, under penalty of death, until 1727; de facto no printing until 19th century
Introduction

3. Scientific revolution: heliocentrism, atomism, infinitesimals, empiricism
Completely upended Aquinian synthesis ⇒ banned, severely repressed
by Roman Church (Jesuits, Inquisition)
   ▶ Copernicus (1453), Bruno (1600), Galileo (1610), Cavalieri (1598-1647), Toricelli (1608-1647), Newton (1687)

4. Islamic world: following “golden age”, deep and prolonged decline of
science and knowledge-seeking, from 11\textsuperscript{th} century until present
   ▶ Printing press (1436): Ottoman Empire forbade it in 1483, under
penalty of death, until 1727; de facto no printing until 19th century
   ▶ In 2007: top 46 Muslim countries produced 1.17% of world scientific
literature, vs. .48% for Spain. Books translated into Arabic: 330 / year
Introduction

3. Scientific revolution: heliocentrism, atomism, infinitesimals, empiricism
   Completely upended Aquinian synthesis ⇒ banned, severely repressed
   by Roman Church (Jesuits, Inquisition)
   ▶ Copernicus (1453), Bruno (1600), Galileo (1610), Cavalieri
     (1598-1647), Toricelli (1608-1647), Newton (1687)

4. Islamic world: following “golden age”, deep and prolonged decline of
   science and knowledge-seeking, from 11th century until present
   ▶ Printing press (1436): Ottoman Empire forbade it in 1483, under
     penalty of death, until 1727; de facto no printing until 19th century
   ▶ In 2007: top 46 Muslim countries produced 1.17% of world scientific
     literature, vs. .48% for Spain. Books translated into Arabic: 330 / year

5. United States: origins of Earth, evolution of life, stem cell research
   ban, climate change… in perpetual flux / debate
Outline

1. Historical and contemporary examples
2. New empirical facts
Outline

1. Historical and contemporary examples
2. New empirical facts
3. Model
   1. Scientific discoveries: if widely diffused and implemented, yield productivity gains but sometimes also erode religious beliefs

Remarks:
I. State variables: stocks of knowledge and religious capital
I. Scientific progress
Outline

1. Historical and contemporary examples
2. New empirical facts
3. Model

   1. Scientific discoveries: if widely diffused and implemented, yield productivity gains but sometimes also erode religious beliefs
   2. Government in power can allow these ideas to spread, or spend resources to prevent and impede their diffusion
      - Subsequently, chooses taxes + mix of secular / religious public goods: spending, exemptions, laws
Outline

1. Historical and contemporary examples
2. New empirical facts
3. Model

1. Scientific discoveries: if widely diffused and implemented, yield productivity gains but sometimes also erode religious beliefs
2. Government in power can allow these ideas to spread, or spend resources to prevent and impede their diffusion
   - Subsequently, chooses taxes + mix of secular / religious public goods: spending, exemptions, laws
3. Religious sector (e.g., Church) may undertake adaptation of doctrine, making it more compatible with new knowledge
Outline

1. Historical and contemporary examples
2. New empirical facts
3. Model
   1. Scientific discoveries: if widely diffused and implemented, yield productivity gains but sometimes also erode religious beliefs
   2. Government in power can allow these ideas to spread, or spend resources to prevent and impede their diffusion
      - Subsequently, chooses taxes + mix of secular / religious public goods: spending, exemptions, laws
   3. Religious sector (e.g., Church) may undertake adaptation of doctrine, making it more compatible with new knowledge

Remarks:
- State variables: stocks of knowledge and religious capital
- Scientific progress $\rightarrow$ religious beliefs $\rightarrow$ coalition gaining power (religious or secular led) $\rightarrow$ pace of scientific progress
I - Innovation and Religiosity Across Countries

Figure 1

Figure 3
<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dep. var.</strong></td>
<td><strong>Patents per capita (log)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Religiosity</td>
<td>-3.584</td>
<td>-2.23</td>
<td>-2.079</td>
<td>-1.478</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.314)***</td>
<td>(0.424)***</td>
<td>(0.449)***</td>
<td>(0.589)**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belief in God</td>
<td>-3.853</td>
<td>-2.444</td>
<td>-2.302</td>
<td>-1.581</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.235)***</td>
<td>(0.56)***</td>
<td>(0.566)***</td>
<td>(0.66)**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Religious freedom</td>
<td>0.024</td>
<td>0.028</td>
<td>0.021</td>
<td>0.015</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.007)***</td>
<td>(0.006)***</td>
<td>(0.007)***</td>
<td>(0.008)*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP per capita (log)</td>
<td>1.074</td>
<td>1.199</td>
<td>0.928</td>
<td>0.909</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.1)***</td>
<td>(0.107)***</td>
<td>(0.106)***</td>
<td>(0.133)***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population (log)</td>
<td>-0.135</td>
<td>-0.09</td>
<td>-0.141</td>
<td>-0.144</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.062)**</td>
<td>(0.071)</td>
<td>(0.059)**</td>
<td>(0.061)**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection intellectual property</td>
<td>-0.013</td>
<td>-0.11</td>
<td>0.116</td>
<td>0.102</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.095)</td>
<td>(0.109)</td>
<td>(0.104)</td>
<td>(0.103)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tertiary education (years)</td>
<td>0.791</td>
<td>0.873</td>
<td>0.985</td>
<td>1.013</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.25)***</td>
<td>(0.277)***</td>
<td>(0.253)***</td>
<td>(0.28)***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign direct investment</td>
<td>-0.056</td>
<td>-0.041</td>
<td>-0.043</td>
<td>-0.039</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.016)***</td>
<td>(0.02)**</td>
<td>(0.022)**</td>
<td>(0.017)**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years fixed effects</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Predominant religion</td>
<td>YES</td>
<td>YES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>146</td>
<td>151</td>
<td>115</td>
<td>116</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-squared</td>
<td>0.184</td>
<td>0.165</td>
<td>0.815</td>
<td>0.834</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes**: Standard errors are clustered by country. Predominant religion includes the following religions: Protestant, Catholic, Muslim, Orthodox. *Significant at 10%; **significant at 5%; ***significant at 1%.
II - Innovation and Religiosity Across U.S. States

Figure 5
Controls: GSP per capita, Population, Fraction with at least Bachelor’s Degree, Foreign Direct Investment,
## Table 2: Religiosity and Innovation in the US: Cross-State Estimates (OLS)

<table>
<thead>
<tr>
<th>Dep. var.: Patents per capita (log)</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Importance of religion</td>
<td>-3.245</td>
<td>-2.803</td>
<td>-3.922</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.064)***</td>
<td>(0.947)***</td>
<td>(0.737)***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belief in God</td>
<td></td>
<td>-10.324</td>
<td>-7.766</td>
<td>-11.238</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.289)***</td>
<td>(3.861)**</td>
<td>(3.275)***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GSP per capita (log)</td>
<td>-1.112</td>
<td>-1.104</td>
<td>-0.503</td>
<td>-0.561</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.607)*</td>
<td>(0.64)*</td>
<td>(0.513)</td>
<td>(0.62)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population (log)</td>
<td>0.23</td>
<td>0.21</td>
<td>0.185</td>
<td>0.166</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.078)***</td>
<td>(0.079)**</td>
<td>(0.079)</td>
<td>(0.083)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tertiary education</td>
<td>0.071</td>
<td>0.072</td>
<td>0.028</td>
<td>0.031</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.027)**</td>
<td>(0.032)**</td>
<td>(0.021)</td>
<td>(0.03)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign direct investment</td>
<td></td>
<td></td>
<td>-29.877</td>
<td>-26.677</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(5.73)***</td>
<td>(6.716)***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>51</td>
<td>51</td>
<td>51</td>
<td>51</td>
<td>51</td>
<td>51</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.222</td>
<td>0.203</td>
<td>0.475</td>
<td>0.43</td>
<td>0.597</td>
<td>0.523</td>
</tr>
</tbody>
</table>

**Notes:** Robust standard errors in parentheses. *Significant at 10%; **significant at 5%; ***significant at 1%.
III - The Model: Agents

- Non-overlapping generations: youth \((t \text{ even})\), old age \((t + 1 \text{ odd})\):

\[
U_t^i = \mathbb{E}_t\left[ c_t^i + (c_{t+1}^i + \nu T_{t+1} + \beta^i b_{t+1} G_{t+1})(a_{t+1}/a_t) \right]
\]

- All magnitudes measured relative to current TFP \((a_t, a_{t+1})\)
- \(\nu T_{t+1}\): utility from standard (secular) public goods, transfers
- \(\beta^i b_{t+1} G_{t+1}\): utility from (organized) religion

- Beliefs \(b_{t+1}\) complementary to “religious public goods” \(G_{t+1}\): sanctuaries (churches, temples, mosques), priests, rituals
III - The Model: Agents

- Non-overlapping generations: youth \((t\ \text{even})\), old age \((t + 1\ \text{odd})\):

\[
U_t^i = \mathbb{E}_t [c_t^i + (c_{t+1}^i + \nu T_{t+1} + \beta^i b_{t+1} G_{t+1})(a_{t+1}/a_t)]
\]

- All magnitudes measured relative to current TFP \((a_t, a_{t+1})\)
- \(\nu T_{t+1}\): utility from standard (secular) public goods, transfers
- \(\beta^i b_{t+1} G_{t+1}\): utility from (organized) religion

- Beliefs \(b_{t+1}\) complementary to “religious public goods” \(G_{t+1}\): sanctuaries (churches, temples, mosques), priests, rituals

- Majority \(r > 1/2\) of religious agents, \(\beta^i = 1\), rest secular, \(\beta^i = 0\)
  - Types fixed, but intensity of religious beliefs \((b_t, b_{t+1})\) endogenous
III - The Model: Agents

- Non-overlapping generations: youth \( t \) even), old age \( t + 1 \) odd:

\[
U_t^i = \mathbb{E}_t[c_t^i + (c_{t+1}^i + \nu T_{t+1} + \beta^i b_{t+1} G_{t+1}) (a_{t+1}/a_t)]
\]

- All magnitudes measured relative to current TFP \( (a_t, a_{t+1}) \)
- \( \nu T_{t+1} \): utility from standard (secular) public goods, transfers
- \( \beta^i b_{t+1} G_{t+1} \): utility from (organized) religion

- Beliefs \( b_{t+1} \) complementary to “religious public goods” \( G_{t+1} \): sanctuaries (churches, temples, mosques), priests, rituals

- Majority \( r > 1/2 \) of religious agents, \( \beta^i = 1 \), rest secular, \( \beta^i = 0 \)
  - Types fixed, but intensity of religious beliefs \( (b_t, b_{t+1}) \) endogenous

- Income \( \theta^i \) in both periods \( \Rightarrow c_s^i = (1 - \tau_s)\theta^i, \forall s \)
  - Part I: no income differences, \( \theta^i \equiv 1, \forall i \Rightarrow \) religious majority rules
  - Part II: rich and poor, \( \theta_L < 1 < \theta_H \Rightarrow \) coalitions among four groups
Public Policies in Second Subperiod (t+1)

- Linear income tax $\tau \Rightarrow$ revenue $R(\tau)$, per unit of TFP
  - $R(\cdot) \sim$, revenue-maximizing tax rate $\hat{\tau}$

...
Public Policies in Second Subperiod \((t+1)\)

- Linear income tax \(\tau \Rightarrow \text{revenue } R(\tau)\), per unit of TFP
  - \(R(\cdot) \sim\), revenue-maximizing tax rate \(\hat{\tau}\)

- Standard public goods and services \(T_{t+1}\): infrastructure, safety, education. Valued equally at \(\nu T_{t+1}\) by those with \(\beta^i = 0, 1\)
  - Can also correspond to pure transfers

- Religious public goods \(G_{t+1}\): provided directly (state religion) or via tax exemptions, subsidies, advantages conceded to religious sector
Public Policies in Second Subperiod \((t+1)\)

- Linear income tax \(\tau \Rightarrow \text{revenue} \, \mathcal{R}(\tau)\), per unit of TFP
  - \(\mathcal{R}(\cdot) \sim \), revenue-maximizing tax rate \(\hat{\tau}\)

- Standard public goods and services \(T_{t+1}\) : infrastructure, safety, education. Valued equally at \(\nu T_{t+1}\) by those with \(\beta^i = 0, 1\)
  - Can also correspond to pure transfers

- Religious public goods \(G_{t+1}\) : provided directly (state religion) or via tax exemptions, subsidies, advantages conceded to religious sector

\(\Rightarrow\) Gvt’s budget constraint at \(t + 1\) :

\[
T_{t+1} + G_{t+1} \leq \mathcal{R}(\tau_{t+1}).
\]
Public Policies in Second Subperiod (t+1)

- Linear income tax $\tau \Rightarrow$ revenue $R(\tau)$, per unit of TFP
  - $R(\cdot) \curvearrowright$, revenue-maximizing tax rate $\hat{\tau}$

- Standard public goods and services $T_{t+1}$: infrastructure, safety, education. Valued equally at $\nu T_{t+1}$ by those with $\beta^i = 0, 1$
  - Can also correspond to pure transfers

- Religious public goods $G_{t+1}$: provided directly (state religion) or via tax exemptions, subsidies, advantages conceded to religious sector

$\Rightarrow$ Gvt’s budget constraint at $t + 1$:

$$T_{t+1} + G_{t+1} \leq R(\tau_{t+1}) .$$

- Alternative $G$: legislation on school prayer, abortion, women’s role...
  - Key is that provides different (dis)utility to different groups
Public Policies in First Subperiod (t)

- Policy decision is whether to invest resources in a control and repression apparatus designed to block diffusion of ideas deemed heretical, dangerous to the faith.
  - Religious police, Inquisition tribunals, censorship of school lessons, textbooks. Banning printing press. Subsidizing official or parallel doctrine-friendly “science” (creationism, climate change denial, etc.)
Public Policies in First Subperiod (t)

- Policy decision is whether to invest resources in a control and repression apparatus designed to block diffusion of ideas deemed heretical, dangerous to the faith.
  - Religious police, Inquisition tribunals, censorship of school lessons, textbooks. Banning printing press. Subsidizing official or parallel doctrine-friendly “science” (creationism, climate change denial, etc.)

- **Set-up cost**, normalized by TFP, is $\varphi(a_t)$ with society’s level of knowledge and technology $\Rightarrow$ Gvt’s budget constraint at $t$:

$$\chi_t \varphi(a_t) \leq R(\tau_t), \quad \chi_t = 0, 1.$$
Public Policies in First Subperiod (t)

- Policy decision is whether to invest resources in a **control and repression apparatus** designed to block diffusion of ideas deemed heretical, dangerous to the faith.
  - Religious police, Inquisition tribunals, censorship of school lessons, textbooks. Banning printing press. Subsidizing official or parallel doctrine-friendly “science” (creationism, climate change denial, etc.)
- **Set-up cost**, normalized by TFP, is \( \varphi(a_t) \) with society’s level of knowledge and technology \( \Rightarrow \) Gvt’s budget constraint at \( t \):
  \[
  \chi_t \varphi(a_t) \leq R(\tau_t), \quad \chi_t = 0, 1.
  \]
- Censoring “dangerous ideas” emanating from scientific inquiry, methodology entail:
  - **Ex ante**: cost \( \varphi(a_t) \) of setting up repressive apparatus
  - **Ex-post**: foregone TFP gains that could be reaped from applications
Discoveries: Productivity, Beliefs, and Blocking

- **Scientific discoveries**: Poisson arrival rate $\lambda$, during the youth of each generation. Exogenous (domestic or from abroad), could endogenize

- If allowed to diffuse $\Rightarrow$ advances in practical knowledge & technology

$$
\Rightarrow a_{t+1} = (1 + \gamma) a_t
$$
Discoveries: Productivity, Beliefs, and Blocking

- **Scientific discoveries**: Poisson arrival rate $\lambda$, during the youth of each generation. Exogenous (domestic or from abroad), could endogenize
- If allowed to diffuse $\Rightarrow$ advances in practical knowledge & technology
  \[ a_{t+1} = (1 + \gamma)a_t \]
- May also contradict doctrine, sacred texts’ statements about natural or social world $\Rightarrow$ shake and weaken the faith:
  - Fraction $p_R = 1 - p_N$ are belief-eroding ($BR$): if diffuse in population, erode religious capital $\Rightarrow b_{t+1} = (1 - \delta)b_t$
  - Fraction $p_N$ are belief-neutral ($BN$): no impact on $b_t$
  - Later on, allow for (exogenous) belief-enhancing ($BE$) shocks
Discoveries: Productivity, Beliefs, and Blocking

- **Scientific discoveries**: Poisson arrival rate $\lambda$, during the youth of each generation. Exogenous (domestic or from abroad), could endogenize

- If allowed to diffuse $\Rightarrow$ advances in practical knowledge & technology

  $$\Rightarrow a_{t+1} = (1 + \gamma) a_t$$

- May also contradict doctrine, sacred texts’ statements about natural or social world $\Rightarrow$ shake and weaken the faith:
  - Fraction $p_R = 1 - p_N$ are belief-eroding ($BR$): if diffuse in population, erode religious capital $\Rightarrow b_{t+1} = (1 - \delta) b_t$
  - Fraction $p_N$ are belief-neutral ($BN$): no impact on $b_t$
  - Later on, allow for (exogenous) belief-enhancing ($BE$) shocks

- **Blocking**: religious majority or coalition may want to censor, deny, restrict access to, the new knowledge
  - Blocking can be targeted at $BR$ innovations, is fully effective

  $$\Rightarrow b_{t+1} = b_t, \text{ but also } a_{t+1} = a_t$$
Timeline

Date $t$ (even): youth

- Political Competition
- Taxes levied
- Probability $\lambda$: new discovery
- BN: $p_N = 1 - p_R$
- BR: $p_R$
- Government in power chooses:
  - Blocked
  - Science policy
  - Not blocked

Date $t+1$ (odd): old age

- Political Competition
- Taxes levied
- Public spending on $G_z$ or $T_z$
- Consumption
- Government in power chooses:
  - Fiscal policy
  - $T_{t+1} + G_{t+1} = R(t_{t+1})$
The Church / Religious Sector

- Small (zero-measure) set of agents, drawn among the religious
- Whenever a $BR$ scientific discovery occurs and diffuses through society, can attempt to “repair” the damage done to the faith:
  - Doctrinal adaptation through internal reform, e.g. working out reinterpretation of sacred texts, more compatible with scientific facts.
  - Can also take form of conflictual Reformation, schism or creation of new sects by competing faith entrepreneurs
The Church / Religious Sector

- Small (zero-measure) set of agents, drawn among the religious
- Whenever a BR scientific discovery occurs and diffuses through society, can attempt to “repair” the damage done to the faith:
  - Doctrinal adaptation through internal reform, e.g. working out reinterpretation of sacred texts, more compatible with scientific facts.
  - Can also take form of conflictual Reformation, schism or creation of new sects by competing faith entrepreneurs
- Treat here organized religion as a single actor, with preferences

\[
\Gamma^i_t = E_t \left[ b_{t+1} G_{t+1} - \rho_t \eta b_t \right], \quad \rho_t \in \{0, 1\},
\]

- Internalizes the religious utility \( b_{t+1} G_{t+1} \) of the faithful.
  - Partially benevolent, or just capturing rents
Doctrinal Adaptation - Repairing Beliefs

\[ \Gamma^i_t = \mathbb{E}_t [b_{t+1} G_{t+1} - \rho_t \eta b_t], \quad \rho_t \in \{0, 1\}, \]

- Incurs effort costs \( \eta b_t \) if, following the diffusion of a BR innovation, it undertakes the work required to prevent \( b_t \) from eroding

- Succeeds with probability \( q \Rightarrow b_{t+1} = b_t \)
  Fails with probability \( 1 - q \Rightarrow b_{t+1} = (1 - \delta) b_t \)
  - In either case: \( a_{t+1} = (1 + \gamma) a_t \), as idea has diffused

- Empirical counterparts of \( \eta \): key determinant is religious freedom:
  - Ease with which heterodox interpretations, new sects or cults are allowed to develop, and people to switch affiliation
  - State religion vs. competitive sector
  - Also: doctrine-specific features making adaptation easy/hard
Timeline

Date $t$ (even): youth

$$\chi_t \varphi(a_t) = R(\tau_t)$$

Political Competition
Science / tolerance policy put in place
Government in power chooses:

Taxes levied

Date $t + 1$ (odd): old age

$$T_{t+1} + G_{t+1} = R(\tau_{t+1})$$

$$\begin{pmatrix} a_{t+2} \\ b_{t+2} \end{pmatrix} = \begin{pmatrix} a_{t+1} \\ b_{t+1} \end{pmatrix}$$

Political Competition
Government in power chooses:
Public spending on $G_t$ or $T_t$
Consumption

Probability $\lambda$: new discovery
Church attempts repair, or not

BN: $\rho_N = 1 - \rho_R$
BR: $\rho_R$

Science policy

Blocked

Not blocked

$$\begin{pmatrix} (1+\gamma)a_t \\ (1-\delta)b_t \end{pmatrix}$$

Fiscal policy
Timeline

Date $t$ (even): youth

$\lambda_t \varphi(a_t) = R(\tau_t)$

$\rho_t \in \{0, 1\}$

$T_{t+1} + G_{t+1} = R(\tau_{t+1})$

Political Competition

Taxes levied

Science / tolerance policy put in place

Government in power chooses:

$BN: \rho_N = 1 - \rho_R$

$BR: \rho_R$

Probability $\lambda$: new discovery

Church attempts repair, or not

$T_{t+1}$

$G_{t+1}$

$R(\tau_{t+1})$

$\begin{pmatrix} a_{t+1} \\ b_{t+1} \end{pmatrix}$

$\begin{pmatrix} a_{t+2} \\ b_{t+2} \end{pmatrix} = \begin{pmatrix} a_{t+1} \\ b_{t+1} \end{pmatrix}$

Political Competition

Taxes levied

Public spending on $G_t$ or $T_t$

Consumption

Government in power chooses:

$\begin{pmatrix} a_t \\ b_t \end{pmatrix}$

Fiscal policy

Blocked

Science policy

Not blocked

No repair, or fails:

$$(1 + \gamma)a_t$$

$$(1 - \delta)b_t$$

Repair successful:

$$(1 + \gamma)a_t$$

$$(1 - \delta)b_t$$
Equilibrium Fiscal Policy (date t+1)

- No income differences $\Rightarrow$ religious majority rules

$$\max_{\tau, G} \{1 - \tau + \nu [R(\tau) - G] + bG \mid 0 \leq G \leq R(\tau)\} \Rightarrow$$

$$\forall x, \text{ let } \tau^*(x) \text{ solve FOC: } xR'(\tau^*) = 1$$

**Proposition**

1. With religiosity $b$, tax rate in old age is:

2. Spending on $G$ is then $G(b; \nu) = 0$ if $b < \nu$, $= R(\tau^*(b))$ if $b \geq \nu$
Church’s Doctrinal Adaptation - Belief-Repairing

- Church cares about \( bG(b; \nu) \Rightarrow \) beliefs worth more when strongly affect choice of \( G \Rightarrow \pi \sim \) in \( b \)

- Working to repair the damage done to \( b \) by a \( BR \) innovation costs \( \eta b \), succeeds with probability \( q \Rightarrow \) Church attempts iff

\[
\pi (b, \nu) \equiv G(b; \nu) - (1 - \delta) G((1 - \delta)b; \nu) \geq \eta / q.
\]

Proposition (repairing range)

(1) There exist unique \( b \) and \( \bar{b} \), such that the Church attempts repair after a belief-eroding innovation (not blocked by the state) iff \( b \) lies in \( [b, \bar{b}] \).

(2) \( \nu \leq b < \nu / (1 - \delta) < \bar{b} \)
State Policy Toward Science (date t)

- Decision at $t$: whether to invest in blocking potential $BR$ discoveries.
  - Tradeoff: option value of preserving religious capital vs. foregone TFP gains + setup cost of repressive apparatus
State Policy Toward Science (date t)

- Decision at $t$: whether to invest in blocking potential $BR$ discoveries. Tradeoff: option value of preserving religious capital vs. foregone TFP gains + setup cost of repressive apparatus

- Two clear cases in which clearly no point in blocking:
  - When $b < \nu$: religious agents themselves prefer secular public goods to religious ones, $\Rightarrow$ set $G(b, \nu) = 0$, derive no utility from organized religion. If $b$ falls to $(1 - \delta) b$, no change
  - When $b \in [b, \bar{b}]$: Church will attempt repair of unblocked $BR$ innovations $\Rightarrow$ if sufficient likelihood $q \geq 1 / (1 + \gamma)$ that will succeed, government prefers to “take a pass”, let Church do the work
State Policy Toward Science (date t)

- Decision at t: whether to invest in blocking potential BR discoveries. Tradeoff: option value of preserving religious capital vs. foregone TFP gains + setup cost of repressive apparatus

- Two clear cases in which clearly no point in blocking:
  - When $b < \nu$: religious agents themselves prefer secular public goods to religious ones, $\Rightarrow$ set $G(b, \nu) = 0$, derive no utility from organized religion. If $b$ falls to $(1 - \delta)b$, no change
  - When $b \in [b, \bar{b}]$: Church will attempt repair of unblocked BR innovations $\Rightarrow$ if sufficient likelihood $q \geq 1/(1 + \gamma)$ that will succeed, government prefers to “take a pass”, let Church do the work

- Outside these two regions:
  - Net expected value of blocking $V_B - V^{NB} \uparrow$ in $b$
  - Cost of blocking $\varphi(a) \uparrow$ in $a$ $\Rightarrow$
Proposition (state policy toward science)

Let $b \notin [0, \nu] \cup [b, \bar{b}]$. 
Proposition (state policy toward science)

Let $b \not\in [0, \nu] \cup [b, \bar{b}]$. Blocking occurs when $b \geq B(a)$, with $B' > 0$, i.e. when society is sufficiently religious, relative to its state of scientific and technical development.
Dynamics of Scientific Progress and Religiosity

- Within-generation: done. Between, simplest case is where young inherit final stocks of knowledge and religiosity of the old: \((a_{t+2}, b_{t+2}) = (a_{t+1}, b_{t+1})\)
Dynamics of Scientific Progress and Religiosity

- Religiosity-enhancing shocks: plague, earthquake, flood, war; cultural change, immigration. No link to science: $a_{t+2} = a_{t+1}$, $b_{t+2} = (1 + \mu) b_{t+1}$ [prob. $p_E$] or $= b_{t+1}$
Average Trajectories in Each Regime

1. Non-blocking, non-repair “secularization” region: Western Europe, United States when \( b_t / a_t \) is low:

\[
\mathbb{E}_t \left( \frac{a_{t+1}}{a_t} \right) = 1 + \lambda \gamma,
\]

\[
\mathbb{E}_t \left( \frac{b_{t+1}}{b_t} \right) = \left( 1 - \lambda p_R \delta \right) \left( 1 + p_E \mu \right)
\]

2. Non-blocking with repair region: United States for \( b_t / a_t \) moderately high, Singapore

\[
\mathbb{E}_t \left( \frac{a_{t+1}}{a_t} \right) = 1 + \lambda \gamma,
\]

\[
\mathbb{E}_t \left( \frac{b_{t+1}}{b_t} \right) = \left[ 1 - \lambda p_R (1 - q) \delta \right] \left( 1 + p_E \mu \right)
\]

3. Blocking region: theocratic regimes (Medieval Europe, Ottoman Empire, Ancient China, Pakistan), United States for \( b_t / a_t \) high:

\[
\mathbb{E}_t \left( \frac{a_{t+1}}{a_t} \right) = 1 + \lambda (1 - p_R) \gamma,
\]

\[
\mathbb{E}_t \left( \frac{b_{t+1}}{b_t} \right) = 1 + p_E \mu
\]
Implications: Growth With and Without Secularization

- “Western Europe” and “United States” grow at the same rate $1 + \lambda \gamma$ (neither blocks), but
  - In WE, there is a downward trend in religiosity (with periodic upward shocks preventing degenerate long-distribution)
  - In US, can be mostly offset by adaptive response of the religious sector
    $\Rightarrow$ trendless fluctuations or slow-moving shifts in religiosity
Implications: Growth With and Without Secularization

- “Western Europe” and “United States” grow at the same rate $1 + \lambda \gamma$ (neither blocks), but
  - In WE, there is a downward trend in religiosity (with periodic upward shocks preventing degenerate long-distribution)
  - In US, can be mostly offset by adaptive response of the religious sector
    \[ \Rightarrow \text{trendless fluctuations or slow-moving shifts in religiosity} \]

- Provided a society is not excessively religious ($b < \bar{b}$), economic growth can thus occur both with and without secularization, as a result of endogenously different responses of religious sector (also $\eta$)

- In the “theocratic” region $b > \bar{b}$, religiosity trends up while knowledge and TFP stagnate, particularly if $\lambda_R \approx 1$. 
IV - Inequality, Religion and the Politics of Science

- In each generation, \( n < 1/2 \) of rich agents, majority of poor.
- Pretax incomes \( \theta_H \) or \( \theta_L \) in both youth and old age,
  \[
  \theta_L < \nu < \theta_H \quad \text{and} \quad \theta_H + (1-n)\theta_L \equiv 1
  \]
  - \( T \) never worth it for the rich \( \Rightarrow \) can also interpret as pure transfers

- Income and religiosity distributed independently \( \Rightarrow \) four groups:
  - Secular Poor, \( SP = (1-n)(1-r) \), Secular Rich, \( SR = n(1-r) \), Religious Poor, \( RP = (1-n)r \), Religious Rich, \( RR = nr \)
IV - Inequality, Religion and the Politics of Science

In each generation, \( n < 1/2 \) of rich agents, majority of poor.

Pretax incomes \( \theta_H \) or \( \theta_L \) in both youth and old age,

\[
\theta_L < \nu < \theta_H \quad \text{and} \quad \theta_H + (1-n)\theta_L \equiv 1
\]

- \( T \) never worth it for the rich \( \Rightarrow \) can also interpret as pure transfers

Income and religiosity distributed independently \( \Rightarrow \) four groups:

- Secular Poor, \( SP = (1-n)(1-r) \), Secular Rich, \( SR = n(1-r) \), Religious Poor, \( RP = (1-n)r \), Religious Rich, \( RR = nr \)

- Assumption: Group’s sizes (or power) ranked as:

\[
SR < SP < SR + SP < RR < RP < 1/2 < 1-n < r
\]

- Thus no group constitutes a majority on its own, but religious agents together, as well as poor agents together, do
Timeline

Date $t$ (even): youth

- $\chi_t \phi(a_t) = R(T_t)$
- $\rho_t \in \{0, 1\}$
- $T_{t+1} + G_{t+1} = R(T_{t+1})$

Political competition
Taxes levied
Science / tolerance policy put in place
Government in power chooses:

Politics policy

Timeline

Date $t+1$ (odd): old age

- $\chi_{t+1} \phi(a_{t+1}) = R(T_{t+1})$
- $\rho_{t+1} \in \{0, 1\}$
- $T_{t+2} + G_{t+2} = R(T_{t+2})$

Political competition
Taxes levied
Public spending on $G_t$ or $T_t$
Consumption

Government in power chooses:

Fiscal policy

Blocked

Not blocked

No repair, or fails: $\begin{pmatrix} (1+\gamma)a_t \\ (1-\delta)b_t \end{pmatrix}$

Repair successful: $\begin{pmatrix} (1+\gamma)a_t \\ b_t \end{pmatrix}$
The Political Process

- Four groups ⇒ forming coalitions required to gain power. Also, policy at $t + 1$ is \textit{two-dimensional}: level and mix of public spending
The Political Process

- Four groups ⇒ **forming coalitions** required to gain power. Also, policy at $t + 1$ is **two-dimensional**: level and mix of public spending.

- Political competition – voting or open conflict – unfolds at $t$ and $t + 1$ according to variant of “citizen-candidate” model + PCPNE.
The Political Process

- Four groups ⇒ forming coalitions required to gain power. Also, policy at \( t + 1 \) is two-dimensional: level and mix of public spending

- Political competition – voting or open conflict – unfolds at \( t \) and \( t + 1 \) according to variant of “citizen-candidate” model + PCPNE (Osborne-Slivinsky 1996, Besley-Coate 1997 + Bernheim et al. 1987)

1. In each social group, a randomly chosen member is selected as leader. Each then decides whether to make a bid for power or stay out
   - Fully strategic and forward-looking

2. Citizens (small) sincerely choose which active contender to support
The Political Process

- Four groups ⇒ forming coalitions required to gain power. Also, policy at $t + 1$ is two-dimensional: level and mix of public spending.

- Political competition – voting or open conflict – unfolds at $t$ and $t + 1$ according to variant of “citizen-candidate” model + PCPNE

(Osborne-Slivinsky 1996, Besley-Coate 1997 + Bernheim et al. 1987)

1. In each social group, a randomly chosen member is selected as leader. Each then decides whether to make a bid for power or stay out.
   - Fully strategic and forward-looking

2. Citizens (small) sincerely choose which active contender to support.

3. If a leader gains support from 50%, he wins.
   - If not, runoff round or battle between the two with most support.
The Political Process

- Four groups ⇒ forming coalitions required to gain power. Also, policy at $t + 1$ is two-dimensional: level and mix of public spending.

- Political competition – voting or open conflict – unfolds at $t$ and $t + 1$ according to variant of “citizen-candidate” model + PCPNE (Osborne-Slivinsky 1996, Besley-Coate 1997 + Bernheim et al. 1987).

1. In each social group, a randomly chosen member is selected as leader. Each then decides whether to make a bid for power or stay out.
   - Fully strategic and forward-looking.

2. Citizens (small) sincerely choose which active contender to support.

3. If a leader gains support from 50%, he wins.
   - If not, runoff round or battle between the two with most support.

4. Victorious leader implements his preferred policy.
   - No credible commitment to do otherwise.
Whom Do the Religious Poor Side With?

- When / if in power at $t + 1$, the secular poor provide a lot of $T$ and no $G$, the religious rich no $T$ and a positive $G$, but (due to their distaste for taxes) at a level less than what the religious poor desire

  - $T$ has value $\nu$ per unit, whereas $G$ is complement to beliefs $b$ ⇒
Whom Do the Religious Poor Side With?

- When / if in power at $t + 1$, the secular poor provide a lot of $T$ and no $G$, the religious rich no $T$ and a positive $G$, but (due to their distaste for taxes) at a level less than what the religious poor desire.
  
  - $T$ has value $\nu$ per unit, whereas $G$ is complement to beliefs $b$.

### Proposition (CPNE at $t + 1$)

*The unique equilibrium outcome is characterized by belief threshold $b^*(\nu)$:*

1. If $b < b^*(\nu)$, the RP back the SP, who thus come to power and implement their ideal policy $\tau^*(\nu/\theta_L)$, with all revenue spent on $T$.

2. If $b \geq b^*(\nu)$, the RP back the RR, who thus come to power and implement their ideal policy $\tau^*(b/\theta_H)$, with all revenue spent on $G$.

3. $b^*(\nu)$ is increasing in $\nu$, as well in $\theta_H - \theta_L$. 

Whom Do the Religious Poor Side With?

Religiosity and equilibrium tax rate

\[ \tau_L(v) \]

\[ \hat{\tau} \]

\[ \tau_H(b) \]

Religiosity and equilibrium tax rate
Key Implications

1. Religion as a “wedge” issue

- In countries with low religiosity, secular governments come to power, implement welfare-state policies that (mostly) benefit the poor.

- Such countries tax more and have a larger public sector than somewhat more religious ones, such as the US, which provide not only a different set of public goods but also at a lower level.

- In latter countries, religion splits the usual pro-redistribution coalition of the poor. Decisive class is then not only more religious, but also richer.
Key Implications

1 Religion as a “wedge” issue
   - In countries with low religiosity, secular governments come to power, implement welfare-state policies that (mostly) benefit the poor
   - Such countries tax more and have a larger public sector than somewhat more religious ones, such as the US, which provide not only a different set of public goods but also at a lower level
   - In latter countries, religion splits the usual pro-redistribution coalition of the poor. Decisive class is then not only more religious, but also richer

2 Fiscal effects of greater income inequality:
   - Higher taxes and government spending in low-religiosity countries (WE)
   - Lower levels of both (and different mix) in more religious ones (US)
Effect of Increased Inequality Depends on Religiosity

Mean-preserving spread in incomes: \( nd\theta_H + (1 - n)d\theta_L = 0 \)
Church: Doctrinal Adaptation

- Same basic intuition as before: expected return highest when $b$ would have large effect on $G \Rightarrow \pi(b)$ is single-peaked.
- Even sharper now: at $b^*(\nu)$, power switches from $RR$ to $SP \Rightarrow G \downarrow 0$

Proposition (Church policy and income inequality)

1. There exist a unique $b$ and $\bar{b}$, such that the Church attempts repair of a belief-eroding innovation (not blocked by the state) iff $b \in [b, \bar{b}]$.
2. Both $b$ and $\bar{b}$ rise with income inequality (m.p.s. in $\theta$)
Church: Doctrinal Adaptation

- Same basic intuition as before: expected return highest when $b$ would have large effect on $G \Rightarrow \pi(b)$ is single-peaked
- Even sharper now: at $b^*(\nu)$, power switches from $RR$ to $SP \Rightarrow G \downarrow 0$

Proposition (Church policy and income inequality)

1. There exist a unique $b$ and $\bar{b}$, such that the Church attempts repair of a belief-eroding innovation (not blocked by the state) iff $b \in [b, \bar{b}]$.

2. Both $b$ and $\bar{b}$ rise with income inequality (m.p.s. in $\theta$)

State: Blocking Ideas

- Costs same as before (taxes at $t$ to finance repressive apparatus, foregone TFP at $t+1$), but incidence is different for rich and poor
- Benefits now differ not only between secular and religious but also by income, as erosion of beliefs can trigger reallocation of power from (religious) rich to (secular) poor at $t+1$
Equilibrium Blocking Policy (date t)

- Study, compare the four groups’ blocking prefs. ⇒ show that:
  1. The SP never want to block; nor do the SR, if \( \gamma \) is large enough
  2. No point in blocking when expect no fiscal policy conflict, \( b < b^*(\nu) \), or that Church will repair, \( b \in [\underline{b}, \overline{b}] \)
Equilibrium Blocking Policy (date $t$)

- Study, compare the four groups’ blocking prefs. $\Rightarrow$ show that:
  1. The $SP$ never want to block; nor do the $SR$, if $\gamma$ is large enough
  2. No point in blocking when expect no fiscal policy conflict, $b < b^*(\nu)$, or that Church will repair, $b \in [b, \bar{b}]$
  3. Whenever the $RR$ want to block, then so do the $RP$

$\Rightarrow$ The $RR$ are always pivotal in the date-$t$ political competition
Equilibrium Blocking Policy (date t)

- Study, compare the four groups’ blocking prefs. \( \Rightarrow \) show that:
  1. The SP never want to block; nor do the SR, if \( \gamma \) is large enough
  2. No point in blocking when expect no fiscal policy conflict, \( b < b^*(\nu) \), or that Church will repair, \( b \in [b, \bar{b}] \)
  3. Whenever the RR want to block, then so do the RP

\( \Rightarrow \) The RR are always pivotal in the date-\( t \) political competition

---

### Proposition (PCPNE)

1. **The unique Perfectly Coalition-Proof Nash Equilibrium of the two-period game always implements the preferred science and knowledge policy of the religious rich.**

2. **The corresponding blocking boundary is an upward-sloping line**
   
   \[ b = B(a) \text{ in the state space} \]
Phase Diagram with Inequality

The diagram illustrates the relationship between different parameters and their outcomes.

1. The vertical axis represents $b$, with levels $b \geq \bar{b}$.
2. The horizontal axis represents $a$.
3. The diagram shows various regions:
   - Blocking & no-repairing
   - No-blocking & no-repairing
   - No-blocking & repairing

The boundaries $B^1(a)$ and $B^2(a)$ divide the diagram into different regions, indicating transitions between conditions.
Mean-preserving spread in incomes: \( nd\theta_H + (1 - n)d\theta_L = 0 \)
Proposition (Inequality and the politics of science)

(1) In the “American” regime (intermediate $b/a$), greater income inequality $\Rightarrow$ more blocking of “threatening” scientific findings, and to (weakly) greater doctrinal rigidity (less adaptation) of the religious sector.
Proposition (Inequality and the politics of science)

(1) In the “American” regime (intermediate \( b/a \)), greater *income inequality* \( \Rightarrow \) *more blocking* of “threatening” scientific findings, and to (weakly) *greater doctrinal rigidity* (less adaptation) of the religious sector.

(2) At high enough levels of religiosity, corresponding to “theocratic” regimes, it has the opposite (“Arab Spring”) effects.
Proposition (Inequality and the politics of science)

(1) In the “American” regime (intermediate $b/a$), greater income inequality $\Rightarrow$ more blocking of “threatening” scientific findings, and to (weakly) greater doctrinal rigidity (less adaptation) of the religious sector.

(2) At high enough levels of religiosity, corresponding to “theocratic” regimes, it has the opposite (“Arab Spring”) effects.

- Inequality $\rightsquigarrow$ emergence of Religious-Right alliance
Proposition (Inequality and the politics of science)

(1) In the “American” regime (intermediate $b/a$), greater income inequality $\Rightarrow$ more blocking of “threatening” scientific findings, and to (weakly) greater doctrinal rigidity (less adaptation) of the religious sector.

(2) At high enough levels of religiosity, corresponding to “theocratic” regimes, it has the opposite (‘‘Arab Spring’’) effects.

- Inequality $\leadsto$ emergence of Religious-Right alliance
  - At $t+1$, $RP$ will support $RR$ and their low-tax policy against own class interest (represented by $SP$) only if sufficiently religious
Proposition (Inequality and the politics of science)

(1) In the “American” regime (intermediate $b/a$), greater income inequality $\Rightarrow$ more blocking of “threatening” scientific findings, and to (weakly) greater doctrinal rigidity (less adaptation) of the religious sector.

(2) At high enough levels of religiosity, corresponding to “theocratic” regimes, it has the opposite (“Arab Spring”) effects.

- Inequality $\leadsto$ emergence of Religious-Right alliance
  1. At $t+1$, $RP$ will support $RR$ and their low-tax policy against own class interest (represented by $SP$) only if sufficiently religious $\Rightarrow$
  2. At $t$, $RP$ have forward-looking incentive to “keep them religious” $\Rightarrow$ may want to block belief-eroding ideas, even though doing so is more costly to the rich (tax burden & foregone TFP)
(1) In the “American” regime (intermediate $b/a$), greater \textit{income inequality} $\Rightarrow$ \textit{more blocking} of “threatening” scientific findings, and to (weakly) \textit{greater doctrinal rigidity} (less adaptation) of the religious sector.

(2) At high enough levels of religiosity, corresponding to “theocratic” regimes, it has the opposite (“Arab Spring”) effects.

- Inequality $\rightsquigarrow$ emergence of Religious-Right alliance

1. At $t + 1$, $RP$ will support $RR$ and their low-tax policy \textit{against own class interest} (represented by $SP$) only if sufficiently religious

2. At $t$, $RP$ have forward-looking incentive to “\textit{keep them religious}” $\Rightarrow$ may want to block belief-eroding ideas, even though doing so is more costly to the rich (tax burden & foregone TFP)

3. This incentive is stronger, the more redistribution would occur at $t + 1$ if the $RP$ (lacking faith) allied themselves with the $SP$ instead – hence, the greater is income \textit{inequality} $\theta_H - \theta_L$
Summary of Main Results

1. “Secularization” (Western Europe): declining religiosity, no repairing of beliefs, unimpeded knowledge, TFP
   - High taxes, public spending / policies tilted to secular, redistribution

2. “Theocracy” (Iran, Pakistan): very high religiosity, doctrinal rigidity, blocking of knowledge, TFP stagnation.
   - High taxes, public spending / policies tilted to religious

3. “Coexistence” (US): medium-high religiosity, adaptation of beliefs, usually unimpeded knowledge, TFP
   - Low taxes, …scal or other policies tilted to religious

4. Inequality & Religious Right: rising inequality can lead to strategic coalition between (religious) rich and religious poor:
   - Former block science that would erode the beliefs of the latter
   - Latter then prefer low taxes + religion-tilted policies to high redistribution, favored by secular poor
Summary of Main Results

1. “Secularization” (Western Europe): declining religiosity, no repairing of beliefs, unimpeded knowledge, TFP
   - High taxes, public spending / policies tilted to secular, redistribution

2. “Theocracy” (Iran, Pakistan): very high religiosity, doctrinal rigidity, blocking of knowledge, TFP stagnation.
   - High taxes, public spending / policies tilted to religious
Summary of Main Results

1 “Secularization” (Western Europe): declining religiosity, no repairing of beliefs, unimpeded knowledge, TFP
   - High taxes, public spending / policies tilted to secular, redistribution

2 “Theocracy” (Iran, Pakistan): very high religiosity, doctrinal rigidity, blocking of knowledge, TFP stagnation.
   - High taxes, public spending / policies tilted to religious

3 “Coexistence” (US): medium-high religiosity, adaptation of beliefs, usually unimpeded knowledge, TFP
   - Low taxes, fiscal or other policies tilted to religious

4 Inequality & Religious Right: rising inequality can lead to strategic coalition between (religious) rich and religious poor:
Summary of Main Results

1. “Secularization” (Western Europe): declining religiosity, no repairing of beliefs, unimpeded knowledge, TFP
   - High taxes, public spending / policies tilted to secular, redistribution

2. “Theocracy” (Iran, Pakistan): very high religiosity, doctrinal rigidity, blocking of knowledge, TFP stagnation.
   - High taxes, public spending / policies tilted to religious

3. “Coexistence” (US): medium-high religiosity, adaptation of beliefs, usually unimpeded knowledge, TFP
   - Low taxes, fiscal or other policies tilted to religious

4. Inequality & Religious Right: rising inequality can lead to strategic coalition between (religious) rich and religious poor:
   - Former block science that would erode the beliefs of the latter
   - Latter then prefer low taxes + religion-tilted policies to high redistribution, favored by secular poor
Remarks

- Leading examples of “forbidden fruits” discussed involved the hard sciences on the one hand, religion stricto sensu on the other.

- Clear from the model that both concepts should be taken in a much more general sense:
  1. Lysenkoism (official science in Soviet Union, 1935 to 1964)
  2. Modern contraception (religions & states proscribed, then “adapted”)
  3. Other examples, e.g. from social sciences, economics (China)
Remarks

- Leading examples of “forbidden fruits” discussed involved the hard sciences on the one hand, religion stricto sensu on the other

- Clear from the model that both concepts should be taken in a much more general sense:
  1. Lysenkoism (official science in Soviet Union, 1935 to 1964)
  2. Modern contraception (religions & states proscribed, then “adapted”)
  3. Other examples, e.g. from social sciences, economics (China)

- It is largely the scientific method itself, with its emphasis on systematic doubt, contradictory debate and empirical falsifiability, that inevitably runs afoul of preestablished dogmas
Remarks

- Leading examples of “forbidden fruits” discussed involved the hard sciences on the one hand, religion stricto sensu on the other.

- Clear from the model that both concepts should be taken in a much more general sense:
  1. Lysenkoism (official science in Soviet Union, 1935 to 1964)
  2. Modern contraception (religions & states proscribed, then “adapted”)
  3. Other examples, e.g. from social sciences, economics (China)

- It is largely the scientific method itself, with its emphasis on systematic doubt, contradictory debate and empirical falsifiability, that inevitably runs afoul of preestablished dogmas.

- Could use model to study interactions between:
  - Other types of radically new ideas: (social, political)
  - Threatened beliefs & interests (cultural, ideological, corporate)
Directions for Further Research

- Besides being source of utility for some, religiosity may also
  - Promote certain forms of human capital accumulation
  - Induce greater trust and trustworthiness among individuals
  - Legitimize authority of ruler or state ⇒ reduce agency problems

Tradeoff with allowing belief-eroding ideas to diffuse would remain
⇒ likely hill-shaped relationship between religiosity and growth
Directions for Further Research

- Besides being source of utility for some, religiosity may also
  - Promote certain forms of human capital accumulation
  - Induce greater trust and trustworthiness among individuals
  - Legitimize authority of ruler or state \(\Rightarrow\) reduce agency problems

Tradeoff with allowing belief-eroding ideas to diffuse would remain
\(\Rightarrow\) likely hill-shaped relationship between religiosity and growth

- Interstate conflict: strong religiosity, state-church links, can be
  - Valuable assets in short to medium run: increase people’s willingness to fight and die for the cause
  - In long run, a drag on scientific knowledge and technological innovation, leads to military backwardness (Ottoman Empire)
Directions for Further Research

- Besides being source of utility for some, religiosity may also
  - Promote certain forms of human capital accumulation
  - Induce greater trust and trustworthiness among individuals
  - Legitimize authority of ruler or state ⇒ reduce agency problems

Tradeoff with allowing belief-eroding ideas to diffuse would remain ⇒ likely hill-shaped relationship between religiosity and growth

- Interstate conflict: strong religiosity, state-church links, can be
  - Valuable assets in short to medium run: increase people’s willingness to fight and die for the cause
  - In long run, a drag on scientific knowledge and technological innovation, leads to military backwardness (Ottoman Empire)

- Empirics: inverse relationship between religiosity and innovation, found across countries & US states, deserves further investigation.
Rep. Paul Broun (R-Ga.) also an M.D., June 2012

“All that stuff I was taught about evolution and embryology and the big bang theory, all that is lies straight from the pit of Hell... It’s lies to try to keep me and all the folks who were taught that from understanding that they need a savior...

You see, there are a lot of scientific data that I’ve found out as a scientist that actually show that this is really a young Earth. I don’t believe that the earth is about 9,000 years old. I believe it was created in six days as we know them. That’s what the Bible says.”

Rep. Broun sits on U.S. House Committee on Science, Space & Technology

I

Favorite for 2014 race to fill vacant U.S. Senate seat from Georgia
The United States

- Rep. Paul Broun (R-Ga.) also an M.D., June 2012
Rep. Paul Broun (R-Ga.) also an M.D., June 2012

“All that stuff I was taught about evolution and embryology and the big bang theory, all that is lies straight from the pit of Hell...
The United States

- Rep. Paul Broun (R-Ga.) also an M.D., June 2012

“All that stuff I was taught about evolution and embryology and the big bang theory, all that is lies straight from the pit of Hell...

It’s lies to try to keep me and all the folks who were taught that from understanding that they need a savior...
"All that stuff I was taught about evolution and embryology and the big bang theory, all that is lies straight from the pit of Hell...

It’s lies to try to keep me and all the folks who were taught that from understanding that they need a savior...

You see, there are a lot of scientific data that I’ve found out as a scientist that actually show that this is really a young Earth. I don’t believe that the earth’s but about 9,000 years old. I believe it was created in six days as we know them. That’s what the Bible says."
"All that stuff I was taught about evolution and embryology and the big bang theory, all that is lies straight from the pit of Hell...

It's lies to try to keep me and all the folks who were taught that from understanding that they need a savior...

You see, there are a lot of scientific data that I've found out as a scientist that actually show that this is really a young Earth. I don't believe that the earth's but about 9,000 years old. I believe it was created in six days as we know them. That's what the Bible says."

Rep. Broun sits on U.S. House Committee on Science, Space & Technology
Rep. Paul Broun (R-Ga.) also an M.D., June 2012

“All that stuff I was taught about evolution and embryology and the big bang theory, all that is lies straight from the pit of Hell...

It’s lies to try to keep me and all the folks who were taught that from understanding that they need a savior...

You see, there are a lot of scientific data that I’ve found out as a scientist that actually show that this is really a young Earth. I don’t believe that the earth’s but about 9,000 years old. I believe it was created in six days as we know them. That’s what the Bible says.”

Rep. Broun sits on U.S. House Committee on Science, Space & Technology

- Favorite for 2014 race to fill vacant U.S. Senate seat from Georgia
To keep ourselves right in all things, we ought to hold fast to this principle: What I see as white I will believe to be black if the hierarchical church thus determines it.”

(Ignatius de Loyola, founder of Jesuit order – Spiritual Exercises (1522-1524), 13th Rule).
Education vs. Innovation: the Jesuits

- To keep ourselves right in all things, we ought to hold fast to this principle: “What I see as white I will believe to be black if the hierarchical church thus determines it.”

  (Ignatius de Loyola, founder of Jesuit order – Spiritual Exercises (1522-1524), 13th Rule).

- One should not be drawn to new opinions, that is, those that one has discovered,… [but instead] adhere to the old and generally accepted opinions… and follow the true and sound doctrine”.

  (Benito Pereira, Jesuit theologian and member of the Collegio Romano, 1564)
Education vs. Innovation: the Jesuits

- To keep ourselves right in all things, we ought to hold fast to this principle: What I see as white I will believe to be black if the hierarchical church thus determines it.”

(Ignatius de Loyola, founder of Jesuit order – Spiritual Exercises (1522-1524), 13th Rule).

- One should not be drawn to new opinions, that is, those that one has discovered,... [but instead] adhere to the old and generally accepted opinions... and follow the true and sound doctrine”.

(Benito Pereira, Jesuit theologian and member of the Collegio Romano, 1564)

- “We consider this proposition [that a line is composed of indivisible, infinitesimal points] to be not only repugnant to the common doctrine of Aristotle, but that it is by itself improbable, and... is disapproved and forbidden in our Society”

(Revisors General of the Collegio Romano, in numerous rulings)
To keep ourselves right in all things, we ought to hold fast to this principle: What I see as white I will believe to be black if the hierarchical church thus determines it.”

(Ignatius de Loyola, founder of Jesuit order – Spiritual Exercises (1522-1524), 13th Rule).

One should not be drawn to new opinions, that is, those that one has discovered,... [but instead] adhere to the old and generally accepted opinions... and follow the true and sound doctrine”.

(Benito Pereira, Jesuit theologian and member of the Collegio Romano, 1564)

“We consider this proposition [that a line is composed of indivisible, infinitesimal points] to be not only repugnant to the common doctrine of Aristotle, but that it is by itself improbable, and... is disapproved and forbidden in our Society”

(Revisors General of the Collegio Romano, in numerous rulings)

Education vs. Innovation: the Jesuits

Claudio Aquaviva, fifth general of the Jesuits (1580-1615) and promulgator of the Ratio Studiorum (1586):

One should have as the primary goal in teaching to strengthen the faith and to develop piety. Therefore, no one shall teach anything not in conformity with the Church and received traditions, or that can diminish the vigor of the faith or the ardor of a solid piety."

"Let us try, even when there is nothing to fear for faith and piety, to avoid having anyone suspect us of wanting to create something new or teaching a new doctrine. Therefore no one shall defend any opinion that goes against the axioms received in philosophy or in theology, or against that which the majority of competent men would judge is the common sentiment of the theological schools."
Education vs. Innovation: the Jesuits

Claudio Aquaviva, fifth general of the Jesuits (1580-1615) and promulgator of the Ratio Studiorum (1586):

- *One should have as the primary goal in teaching to strengthen the faith and to develop piety. Therefore, no one shall teach anything not in conformity with the Church and received traditions, or that can diminish the vigor of the faith or the ardor of a solid piety.*”
Education vs. Innovation: the Jesuits

Claudio Aquaviva, fifth general of the Jesuits (1580-1615) and promulgator of the Ratio Studiorum (1586):

- One should have as the primary goal in teaching to strengthen the faith and to develop piety. Therefore, no one shall teach anything not in conformity with the Church and received traditions, or that can diminish the vigor of the faith or the ardor of a solid piety.”

“Let us try, even when there is nothing to fear for faith and piety, to avoid having anyone suspect us of wanting to create something new or teaching a new doctrine.
Education vs. Innovation: the Jesuits

Claudio Aquaviva, fifth general of the Jesuits (1580-1615) and promulgator of the Ratio Studiorum (1586):

- One should have as the primary goal in teaching to strengthen the faith and to develop piety. Therefore, no one shall teach anything not in conformity with the Church and received traditions, or that can diminish the vigor of the faith or the ardor of a solid piety."

“Let us try, even when there is nothing to fear for faith and piety, to avoid having anyone suspect us of wanting to create something new or teaching a new doctrine.

Therefore no one shall defend any opinion that goes against the axioms received in philosophy or in theology, or against that which the majority of competent men would judge is the common sentiment of the theological schools.