The Evolution of Human Civilization

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The Environment of the Individual

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External factors define a stochastic optimization problem

Evolution solves the problem by adaptation through natural selection

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External factors define a stochastic optimization problem

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The Environment of the Individual

Internal factors define a stochastic optimization problem competing with other concious actors = game theoretical problem

Individuals solve the problem by concious social behaviour, within the norms of society

But who sets the norms ?

The Environment of the Group

Other groups of the same species pose a competition

The strongest groups are selected by historical evolution

The Environment of the Group

Groups are different by their social norms, which determines their strength

Historical evolution = Evolution of social norms

Evolutionary Game Theory Example

Subgroups with different behaviour coexist, interact, and receive payouts which determine their rate of reproduction.

Solution
(Evolutionarily Stable Strategy)
by „Replicator Dynamics"

Doves and hawks coexist in the population.

Classical and Evolutionary Game Theory

Actions with different probabilities

Mixed Strategy

Subpopulations with different sizes

Examples of Social Innovations

Technology

- **Obviously beneficial**
- **Does not alter the *structure* of society**
- **Spreads fast**
- **Assumed given in model**

Examples of Social Innovations

Trade

- **Beneficial for cooperative**
- **Does alter the *structure* of society**

Examples of Social Innovations

Criminal Law

- **Punishes defector**
- **Does alter the *structure* of society**

Examples of Social Innovations

Civil Law

- **Beneficial for cooperative**
- **Does alter the *structure* of society**

Examples of Social Innovations

Ethics

- **Beneficial for cooperative, punishes defector**
- **Does alter the *structure* of society**
- **Depends on the type**

Two Different Types of Social Innovations

Law

	Dove cooperative	Hawk defector
Dove cooperative	1	0
Hawk defector	2	-1

Depends on interaction

Ethics

	Dove cooperative	Hawk defector
Dove cooperative	1	0
Hawk defector	2	-1

Depends on the type

Two Different Types of Social Innovations

Law

	Dove cooperative	Hawk defector
Dove cooperative	1	0
Hawk defector	2 ↓	-1

Depends on action

Ethics

	Dove cooperative	Hawk defector
Dove cooperative	1 ↑	0 ↑
Hawk defector	2 ↓	-1 ↓

Does not depend on action

Two Different Types of Social Innovations

Law

Ethics

Models true interaction

Equivalent to external factors

Two Different Types of Social Innovations

Law

	Dove *cooperative*	Hawk *defector*
Dove *cooperative*	1	0
Hawk *defector*	2 ↓	-1

Your actions are good or bad

Ethics

	Dove *cooperative*	Hawk *defector*
Dove *cooperative*	1 ↑	0 ↑
Hawk *defector*	2 ↓	-1 ↓

You are good or bad

Two Different Types of Social Innovations

Law

Your actions are good or bad
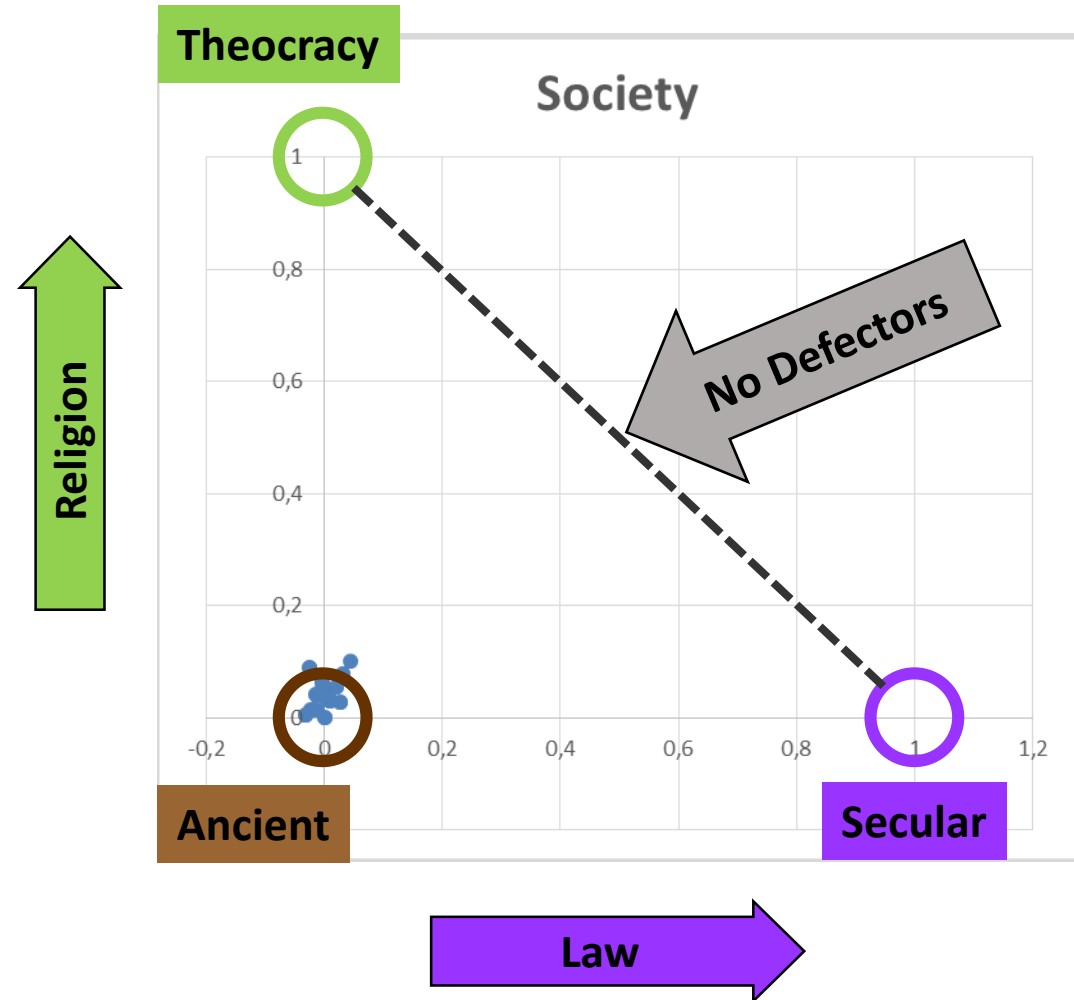
Religion

You are good or bad

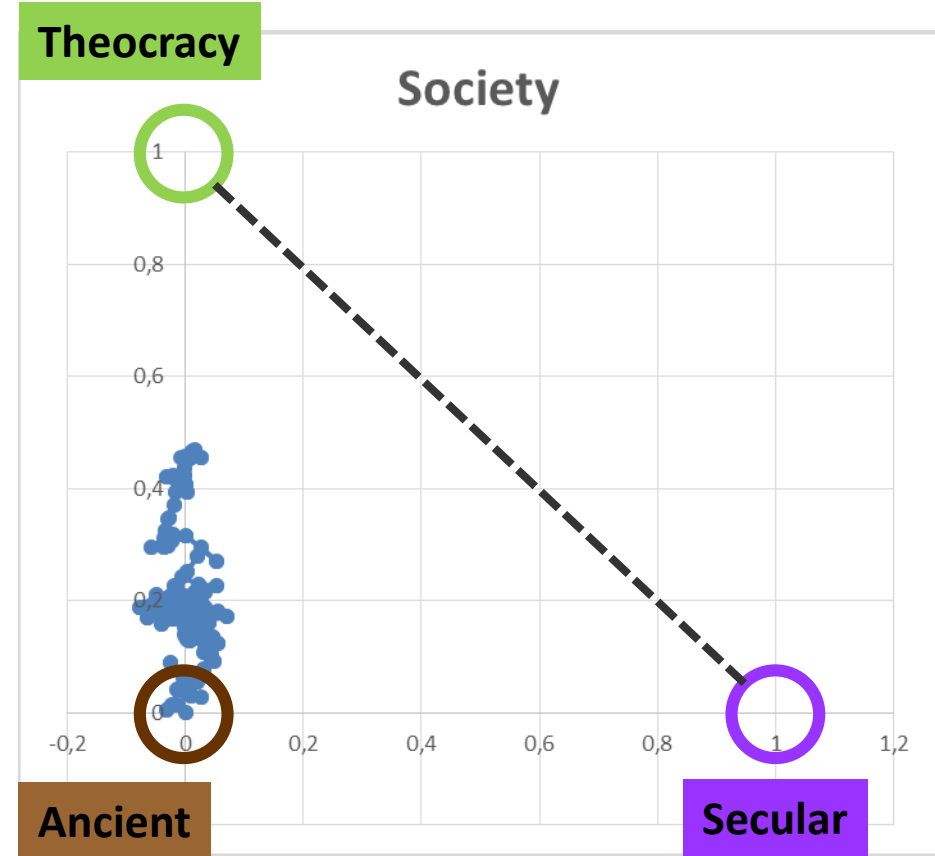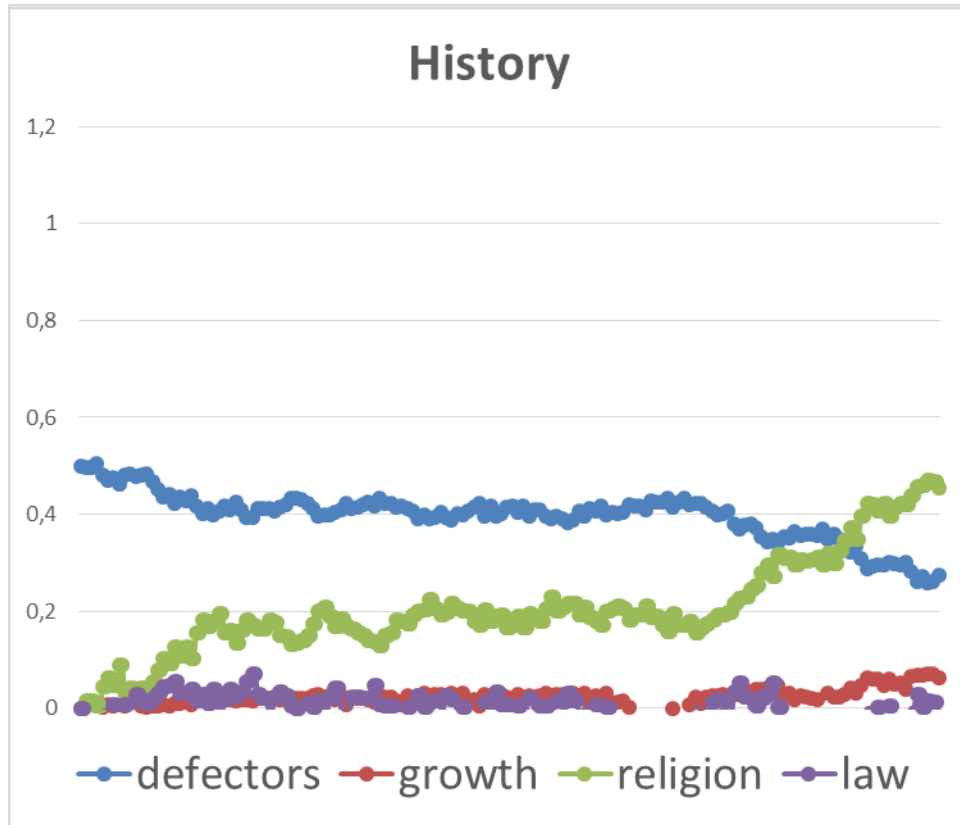# The Model for the Evolution of Human Civilization
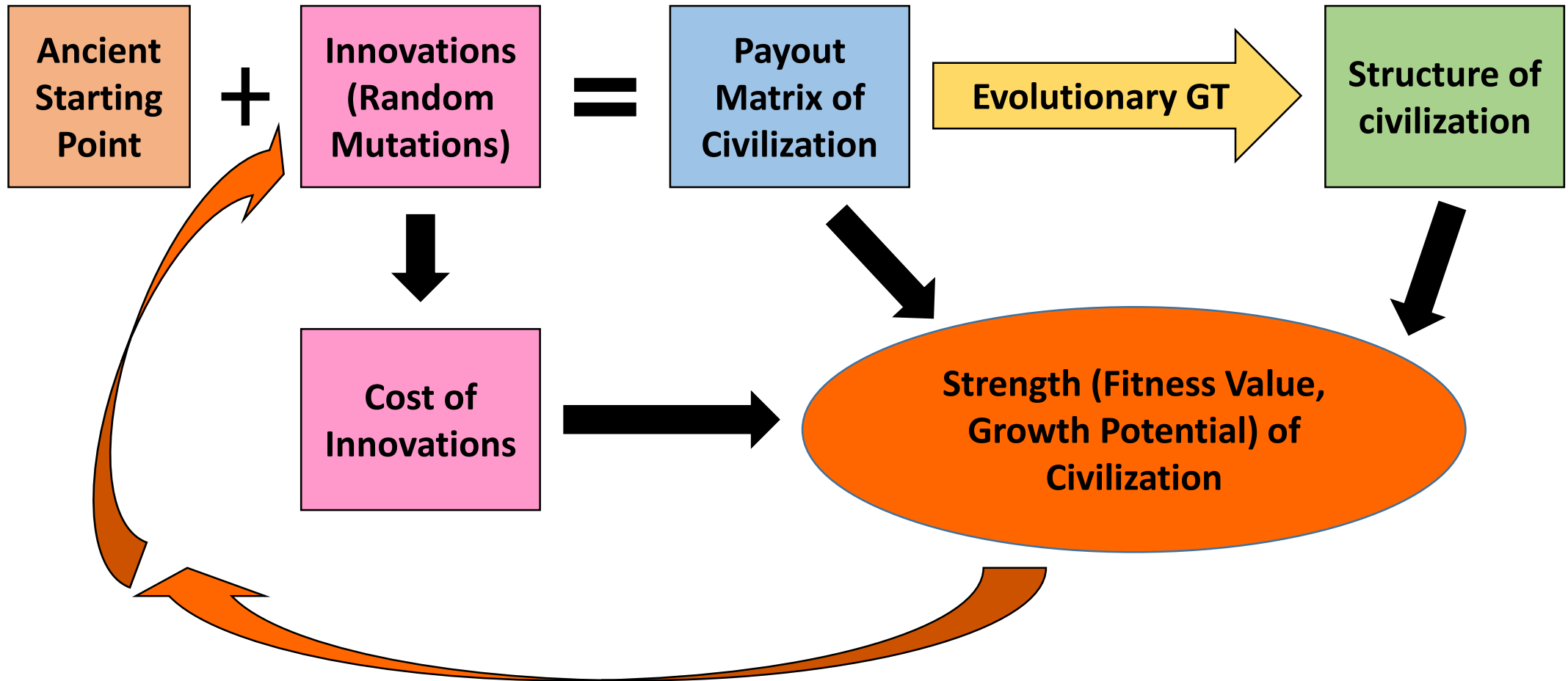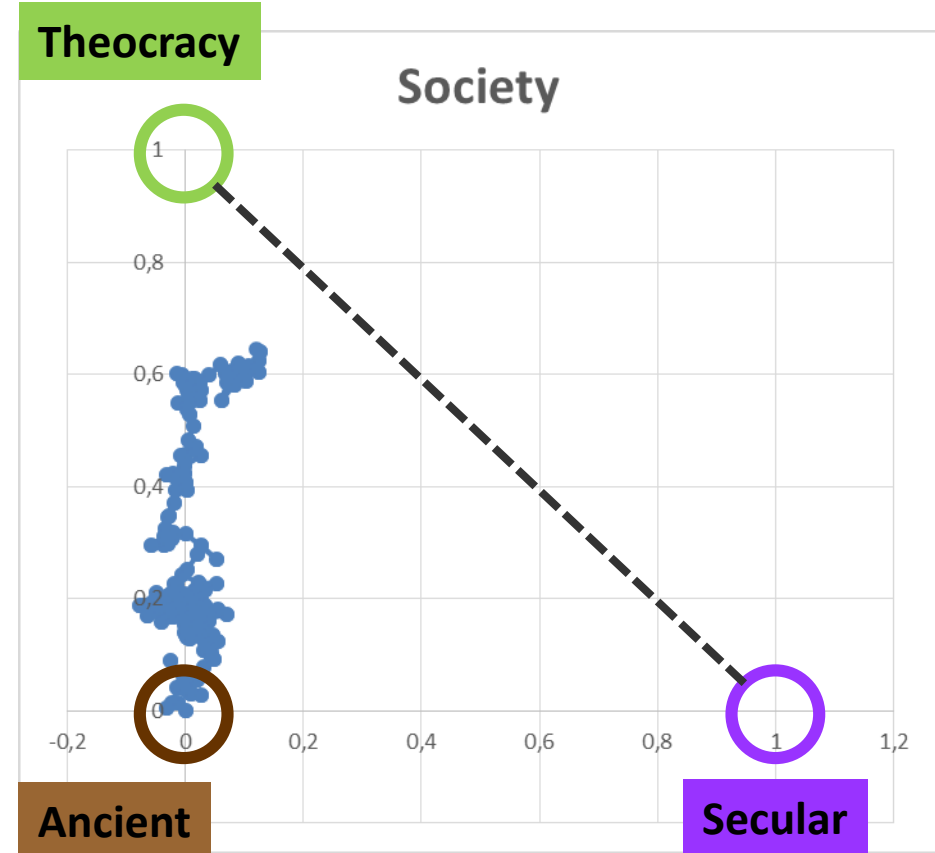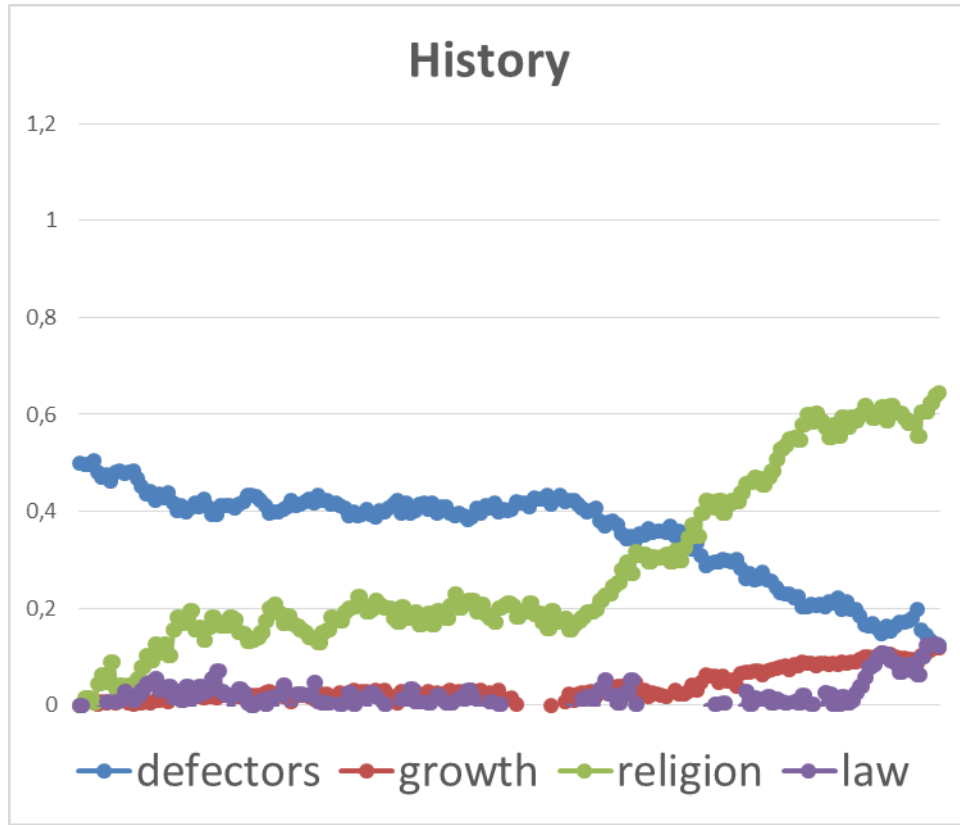
Coordinate System of Possible Societies
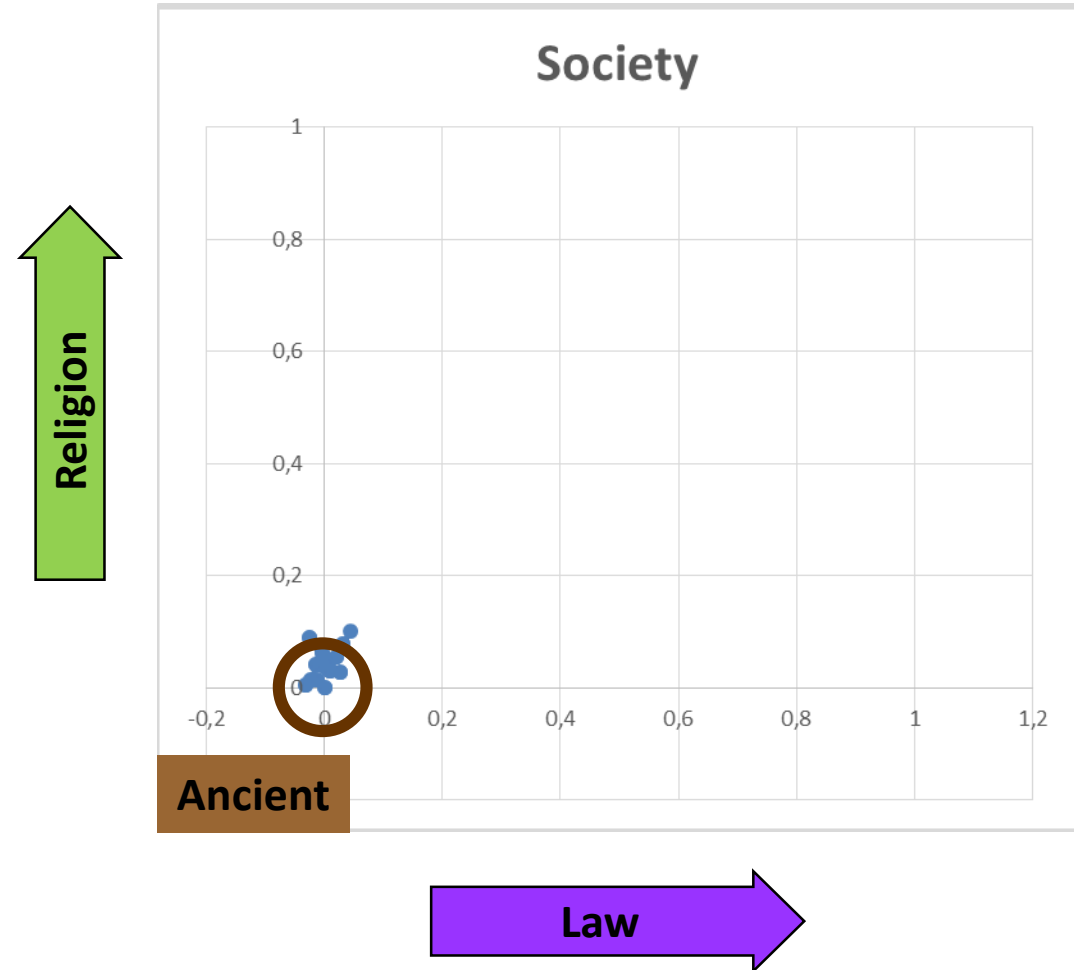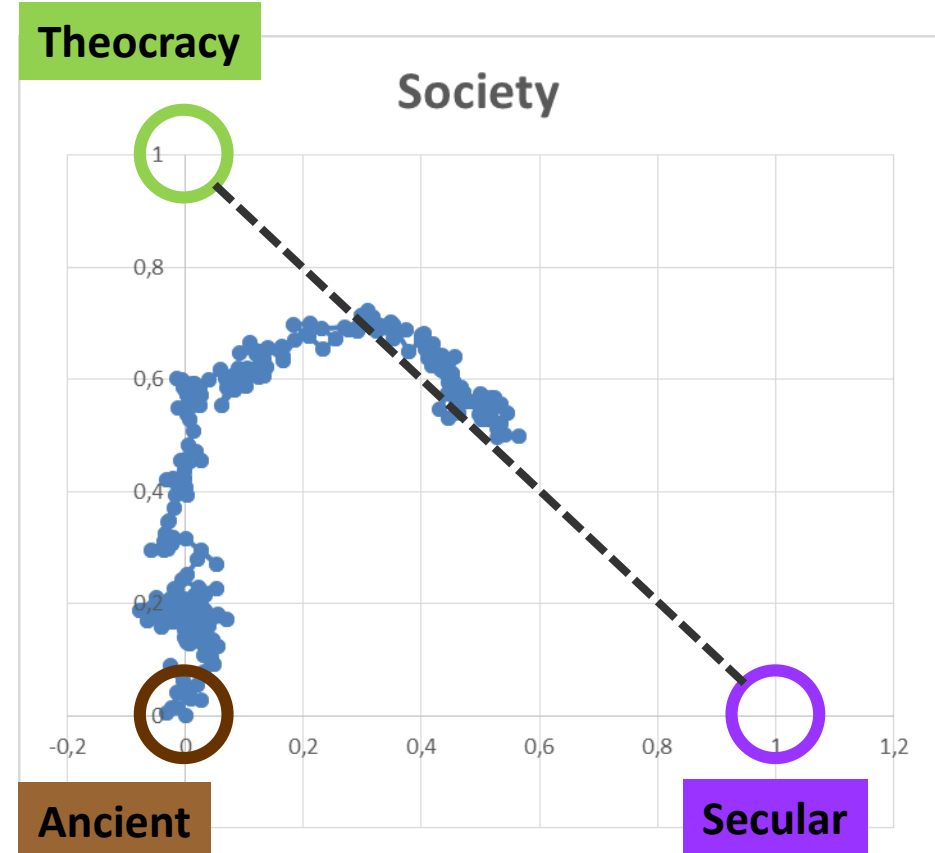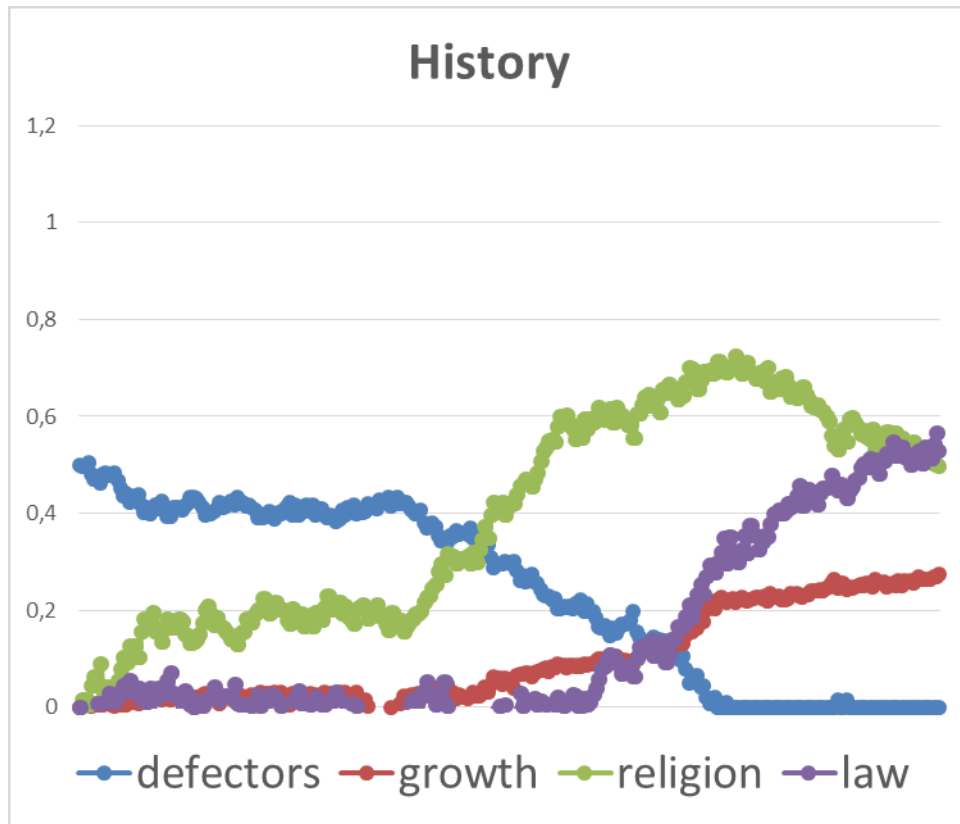
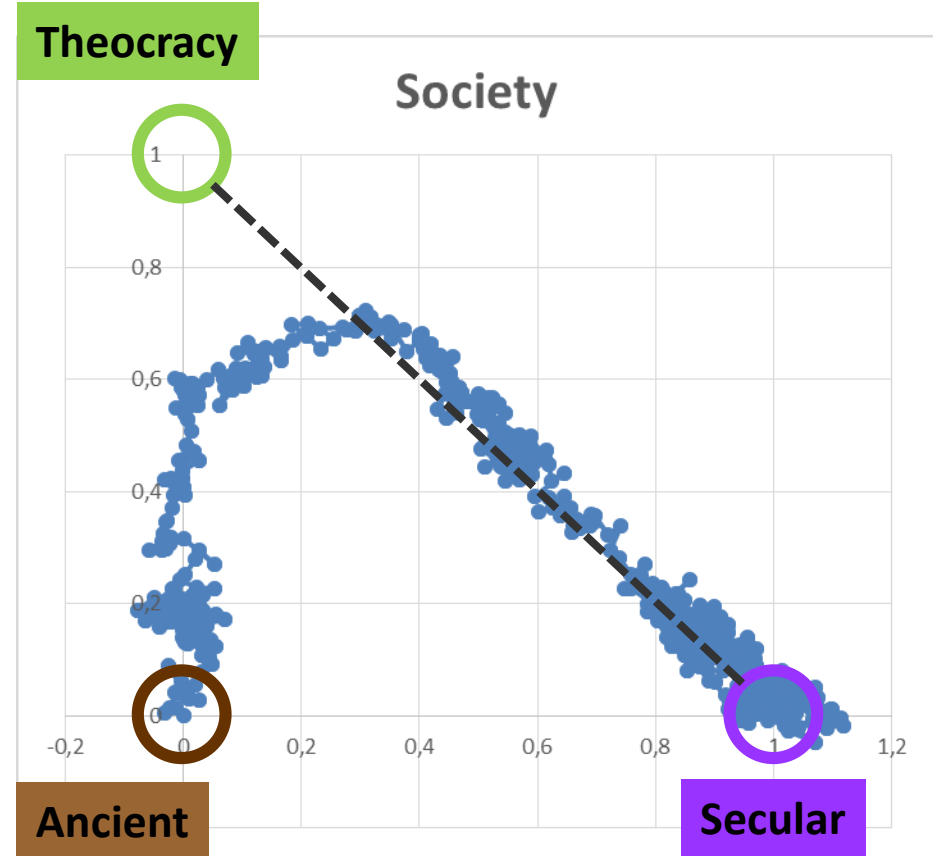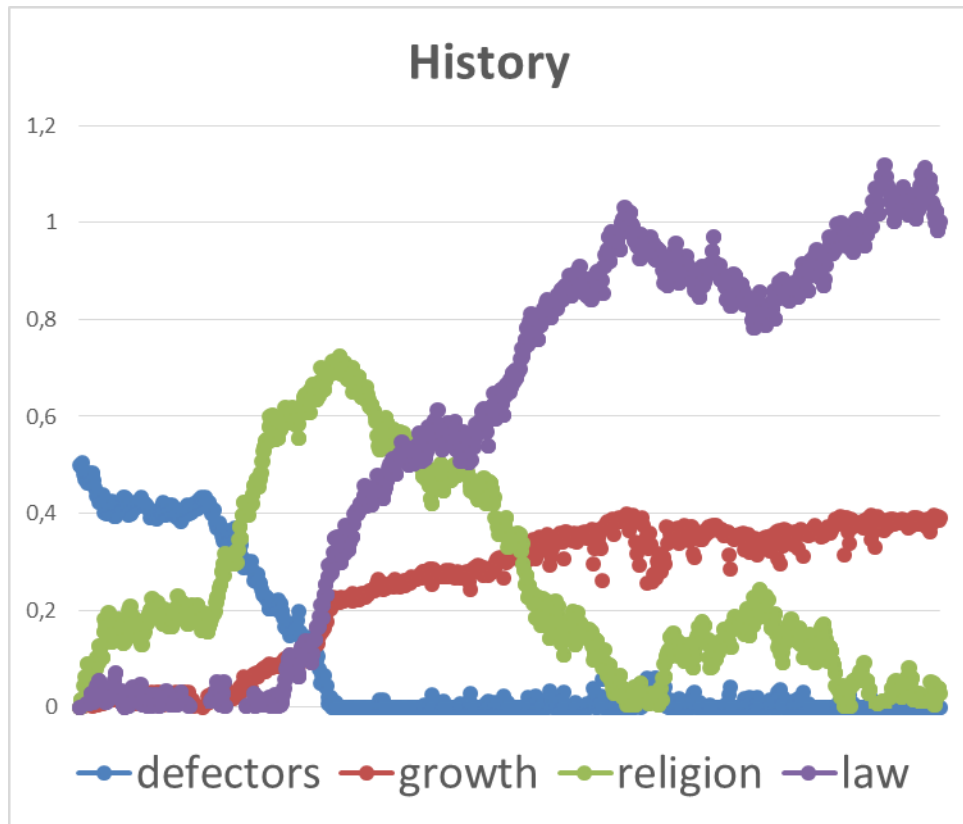# Coordinate System of Possible Societies

One Specific Example of History

One Specific Example of History

One Specific Example of History

One Specific Example of History

History

Society

Theocracy

Ancient

Secular

And thus we arrived at The End of History,

and I arrived at the end of this talk.

Thank you for your attention.