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Chinese Dynasties Learning Lab II.

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Good Governance in a Complex World

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Abstract

This paper models an economy of farmers, bandits and soldiers. In addition to the economic factors affecting the economy studied by Saeed and Pavlov (2008), and the effects of two psychological factors broadly categorized as exposure to violence and group identity studied by (Saeed, Pavlov, Skorinko, Smith†), we have added to the model, the ability to review the impact of the phenomenon of collusion between soldiers and bandits, and the effects in the policies of population dynamics and policies related to changing the parameters representing the productivities and behavioral scaling factors in the economy, which has often been observed both in history and in some developing countries, and we have adding control checks for limiting collusion. We have also developed a storytelling to explain step by step, how the model was created and enriched, also we have developed an interactive presentation of the history, in iBook format for iPad and Mac, and we have created Chinese Dynasties learning lab II, that can be accessed from the web, allowing users to run the simulation easily, especially to review the impact of their decisions and to avoid as far as possible, the unintended consequences of any change, before they can be implemented in real level.

Keywords: system dynamics, political economy, human behavior, iPad, collusion, simulation, psychology, and public policy.

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Introduction

Over the four millennia of Chinese history, at least thirty three distinct political regimes, or dynasties, ruled the country (Rodzinski, 1984: 437). A regime succession was usually accompanied by a decline in economic well-being of the country and general lack of order. The succeeding dynasty would typically improve the economic situation and restore order but eventually follow its predecessor's path of decline. Historians of China have dubbed the country's fluctuations in political and economic conditions a dynastic cycle.

When history is written with one foot pointing visualizing the future, as in the case of this Chinese Dynasties Learning Lab II, is impressive learning obtained and this can be extended and implemented for the good of the a variety of organizations, including political economies, educational institutions, markets and firms. Above all, these ways allow us to discover new routes to address peace agendas and sustainable development.

Generic structure of resource allocation.

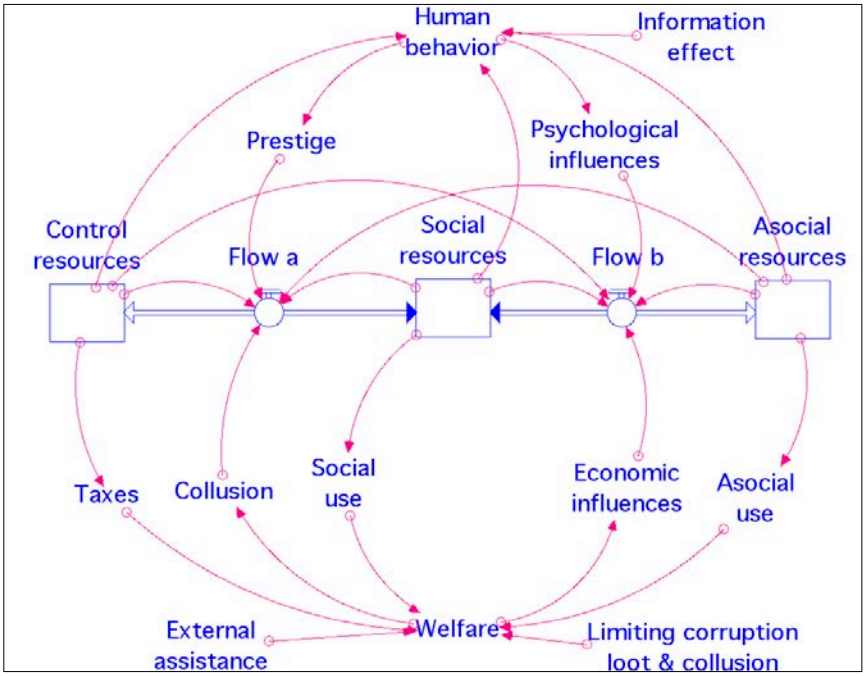
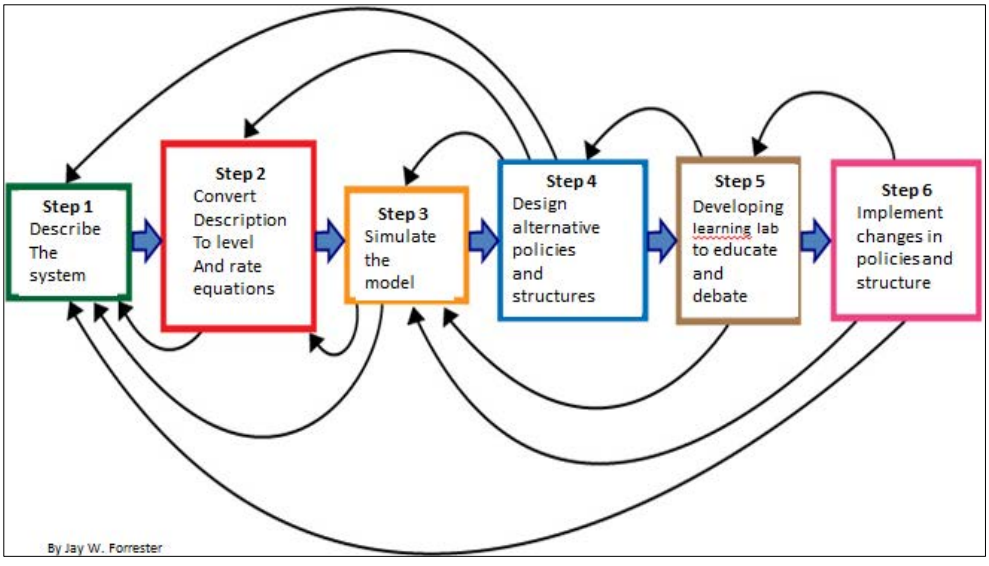


Figure 1: Chinese dynasties learning lab II, with collusion, human behavior, governance and control checks. (Adapted from Saeed and Pavlov (2008))

Our contribution to the model.

1. We have enriched the logic that shares resources among farmers, soldiers and bandits.
2. We've improved the standardization of formulas used by the original model, to expand the scope of their calculations.
3. We have added to the model, the ability to review the impact of the phenomenon of collusion between soldiers and bandits, in the policies of population dynamics and policies related to the sensitivity analysis of parameters, which has often been observed both in history and in some developing countries (Economist, 2005).
4. We have developed a storytelling to explain step by step, how the model was created and enriched, and especially to show easily, the underlying structure of the model, and the mathematics of their calculations.
5. We have developed an interactive presentation of the history, in iBook format, for iPad and Mac.
6. We created Chinese Dynasties learning lab, that can be accessed from the web, allowing users to run the simulation easily, especially to review the impact of their decisions and to avoid as far as possible, the unintended consequences of any change, before they can be implemented in real level.

Steps for developing the learning lab.



Complete model

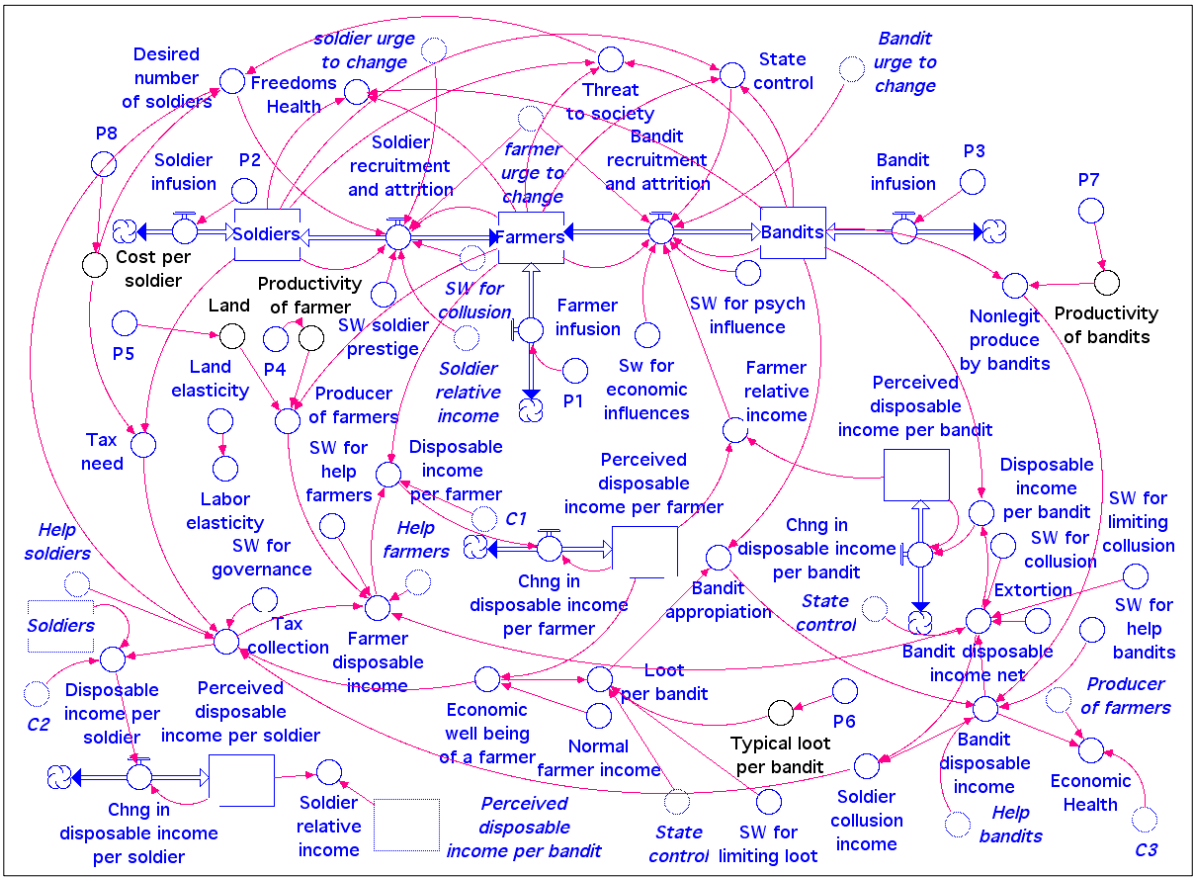


Figure 2: Full model- include collusion, governance, economic & behavioral influences, and control checks for limiting loot, corruption & collusion. (Adapted from Saeed and Pavlov (2008))

Steady state - normalization constants in detail.

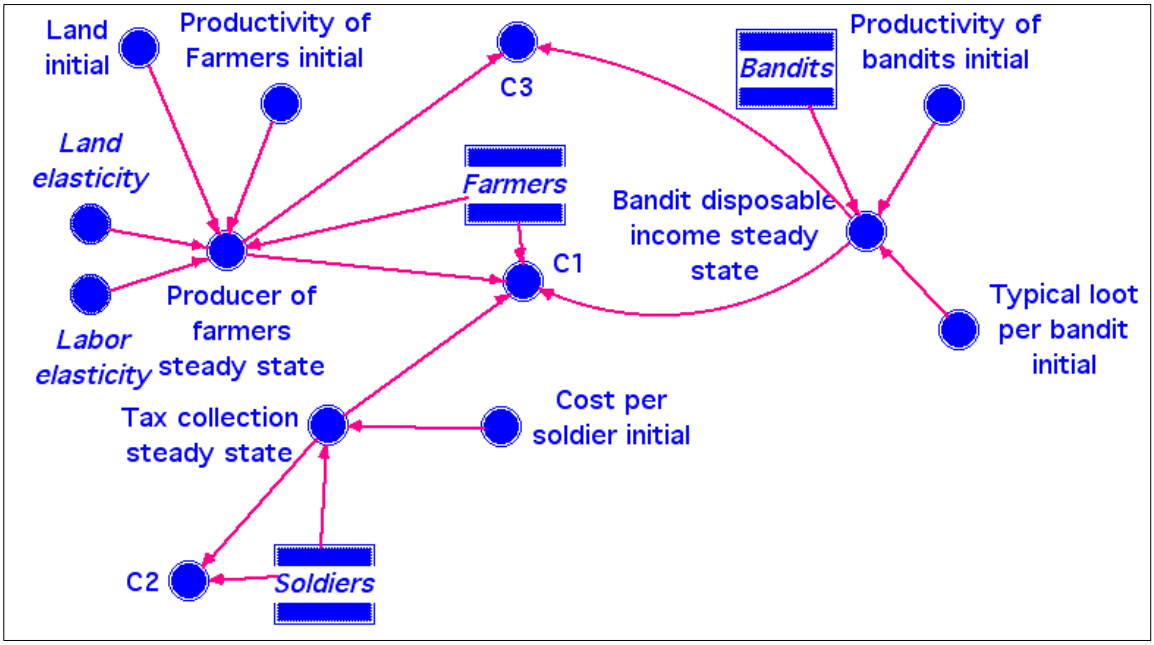


Figure 3: Normalization constants (C1, C2 & C3), ensures that the index is equal one in the steady state..

Governance & control checks for limiting loot, corruption and collusion.

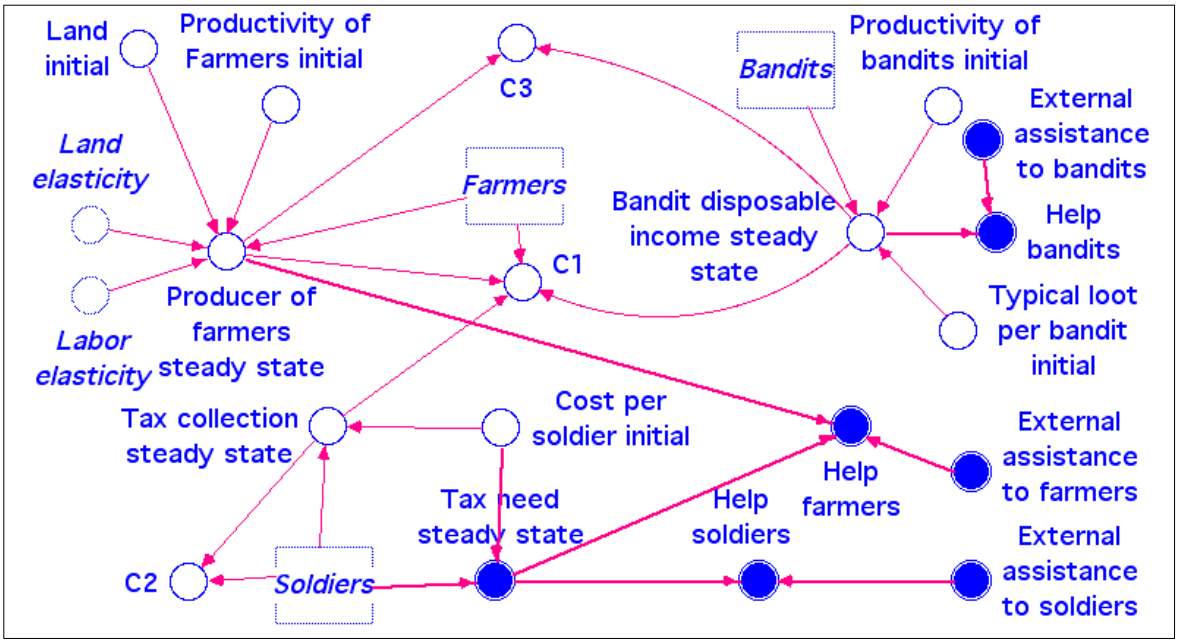


Figure 4: How to calculate help to farmers, bandits & governance, external assistance to actors to limiting loot, corruption & collusion.

Behavioral influences sector.

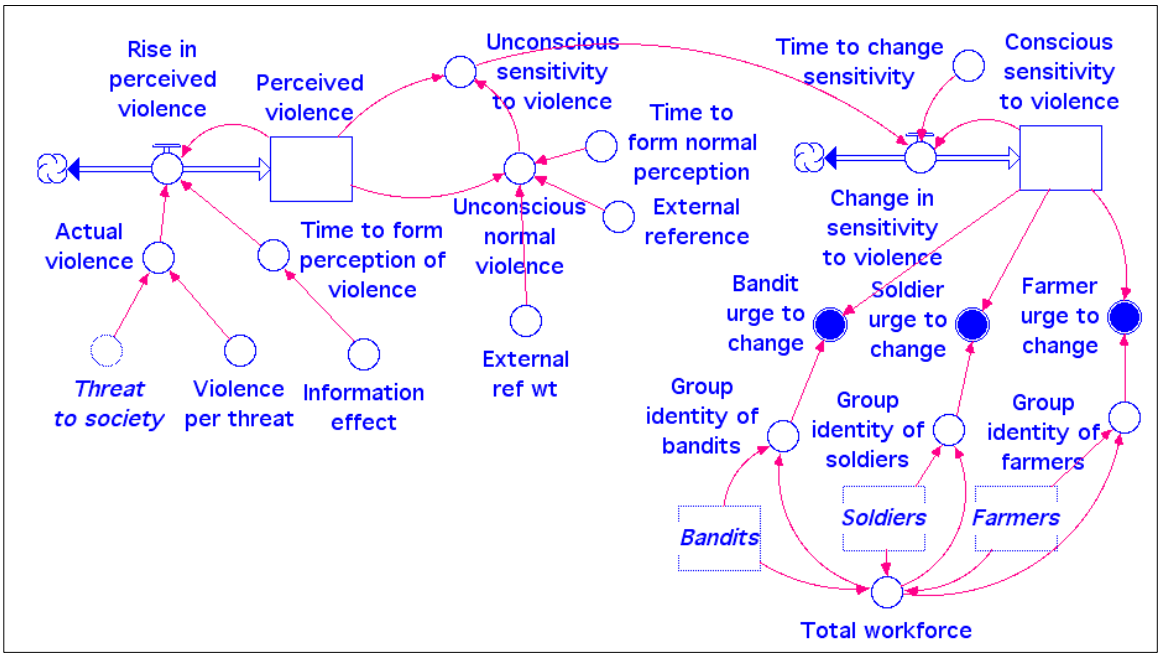


Figure 5: Human behavior, psychologic influences, and soldier prestige. (Saeed, Pavlov, Skorinko, Smith), **(Saeed et. al 2013)**

The behavioral influences sector captures the psychological effects of violence and group identity. The behavioral sector feeds into the political economy sector and collusion by affecting agents' desires to change their status.

Redesigning the mathematical calculation of all policies

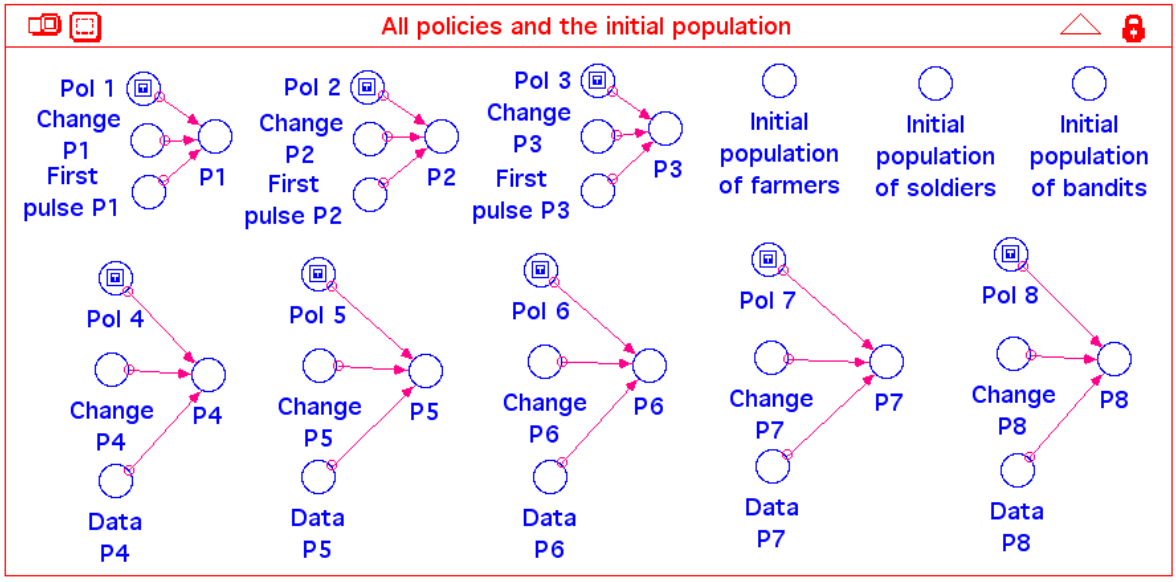


Figure 6: All policies sector and initial population of agents, the mathematical calculation of all policies.

Note: See detailed equations in Appendix A

Graphical representation of indicators of freedom and economic health

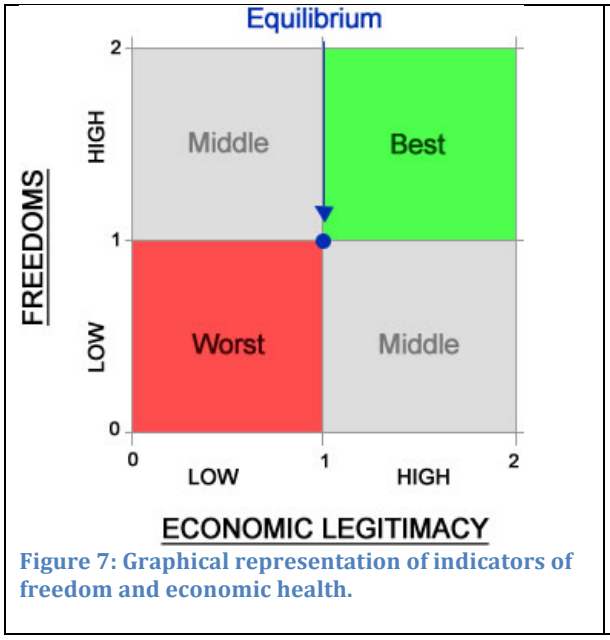


Figure 7: Graphical representation of indicators of freedom and economic health.

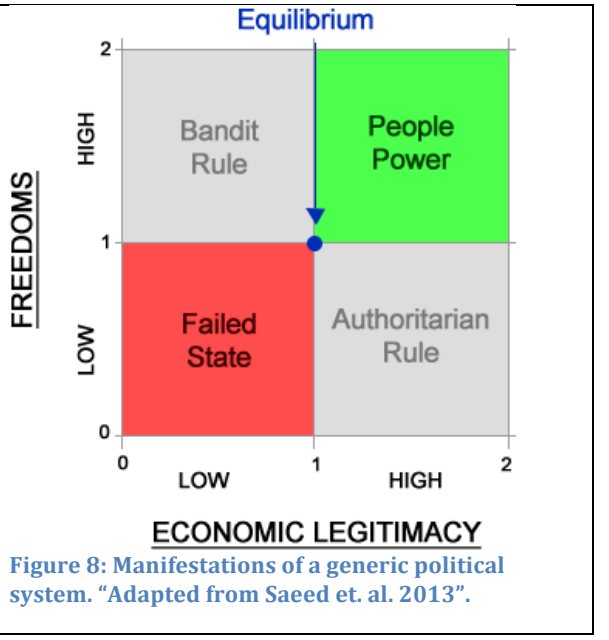
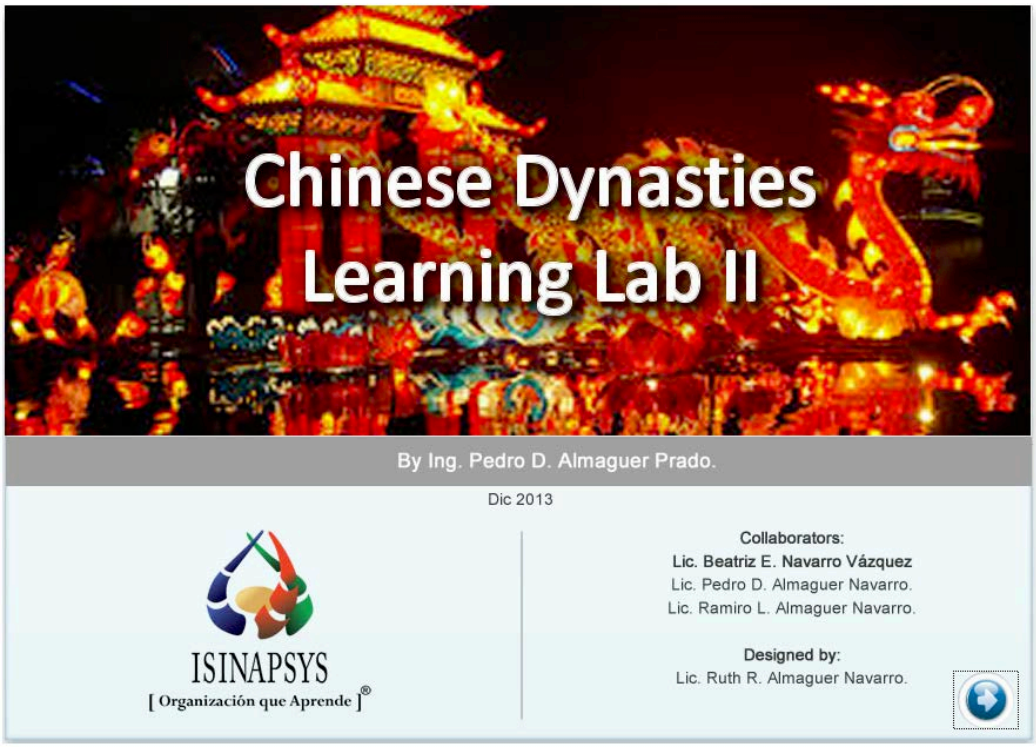


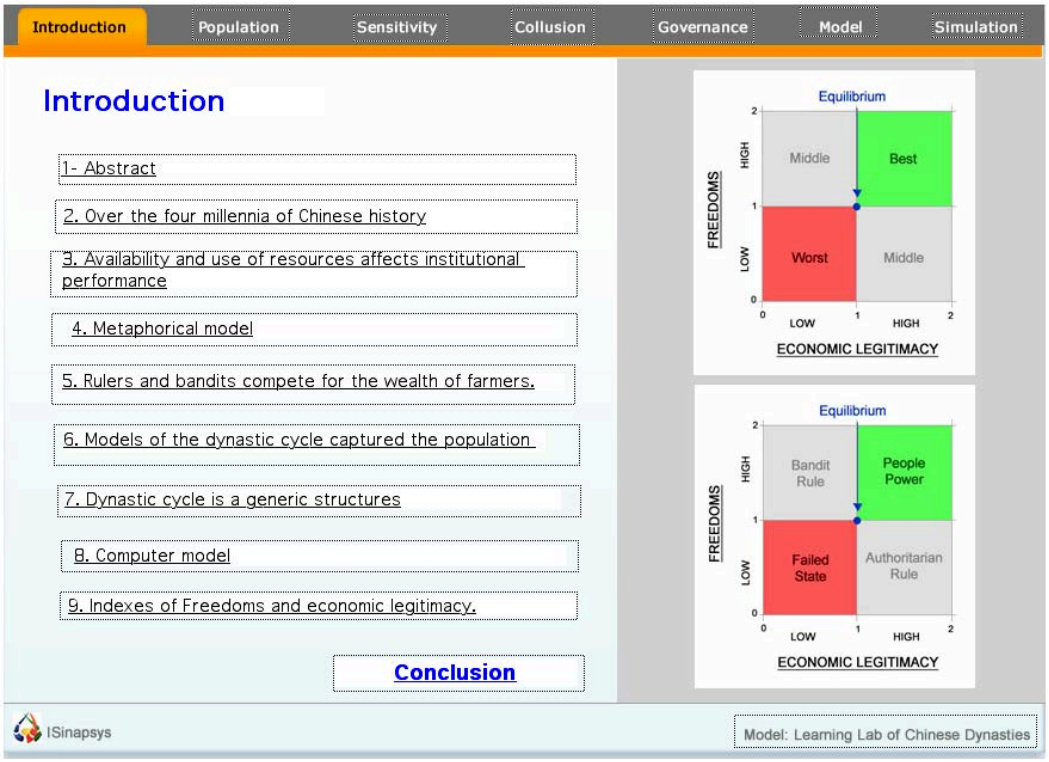
Figure 8: Manifestations of a generic political system. "Adapted from Saeed et. al. 2013".

Chinese dynasties learning lab II

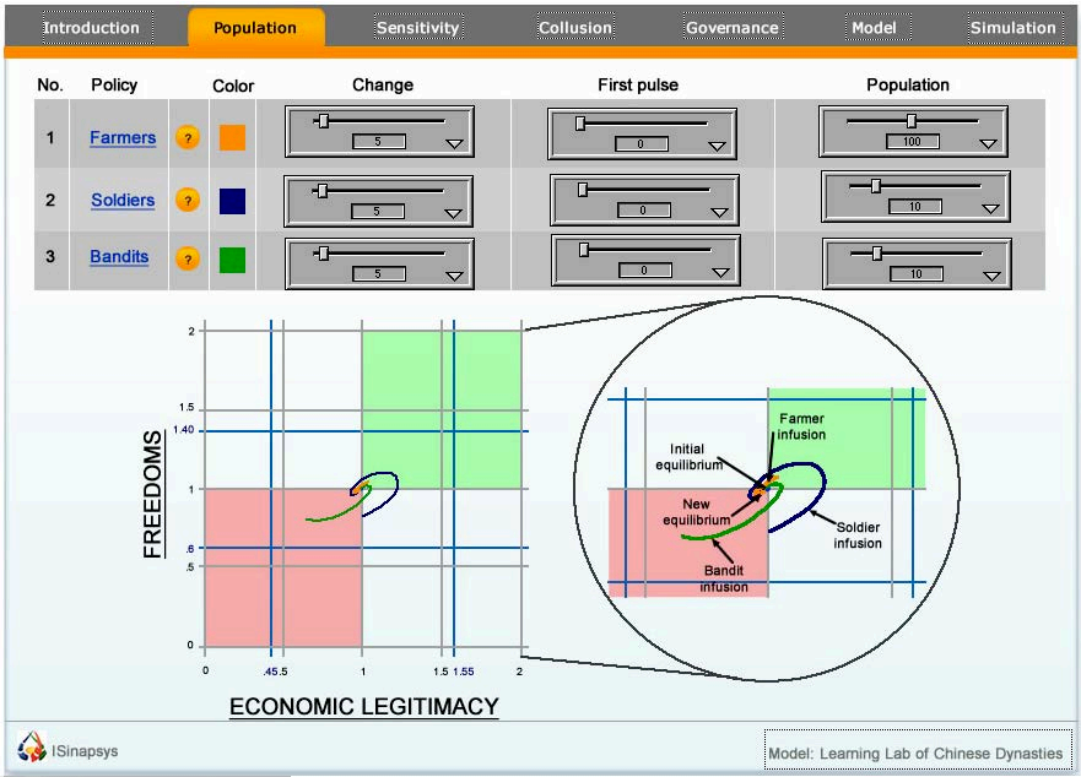
Learning lab



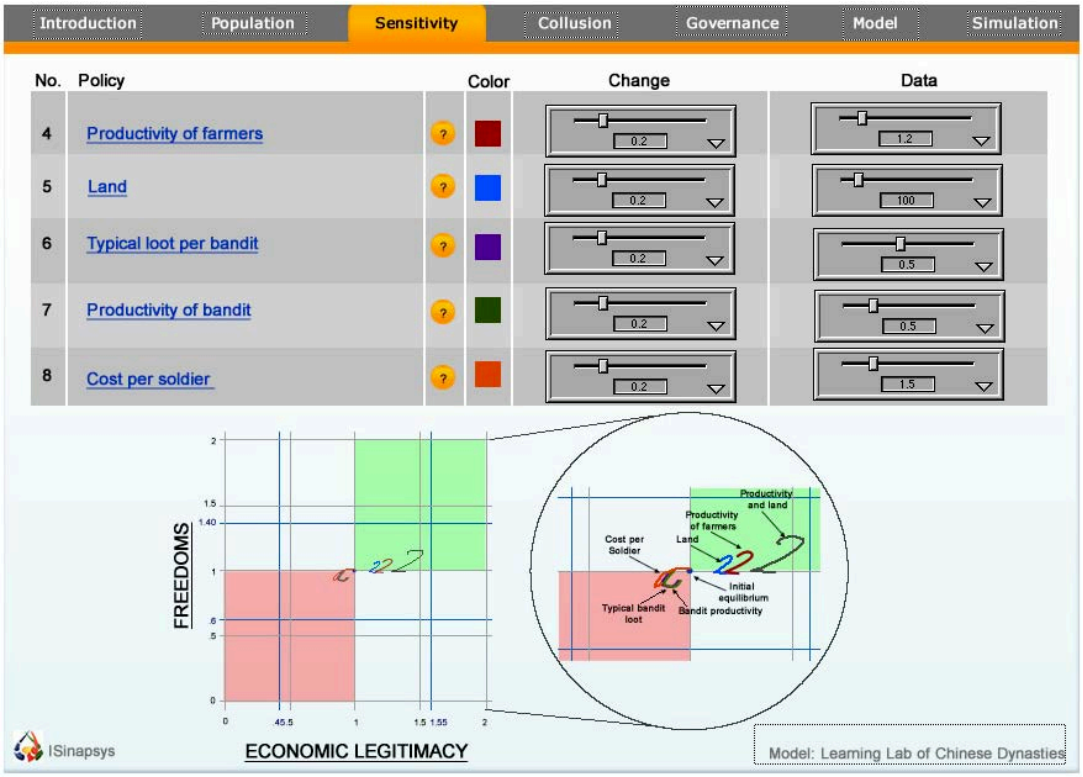
Introduction



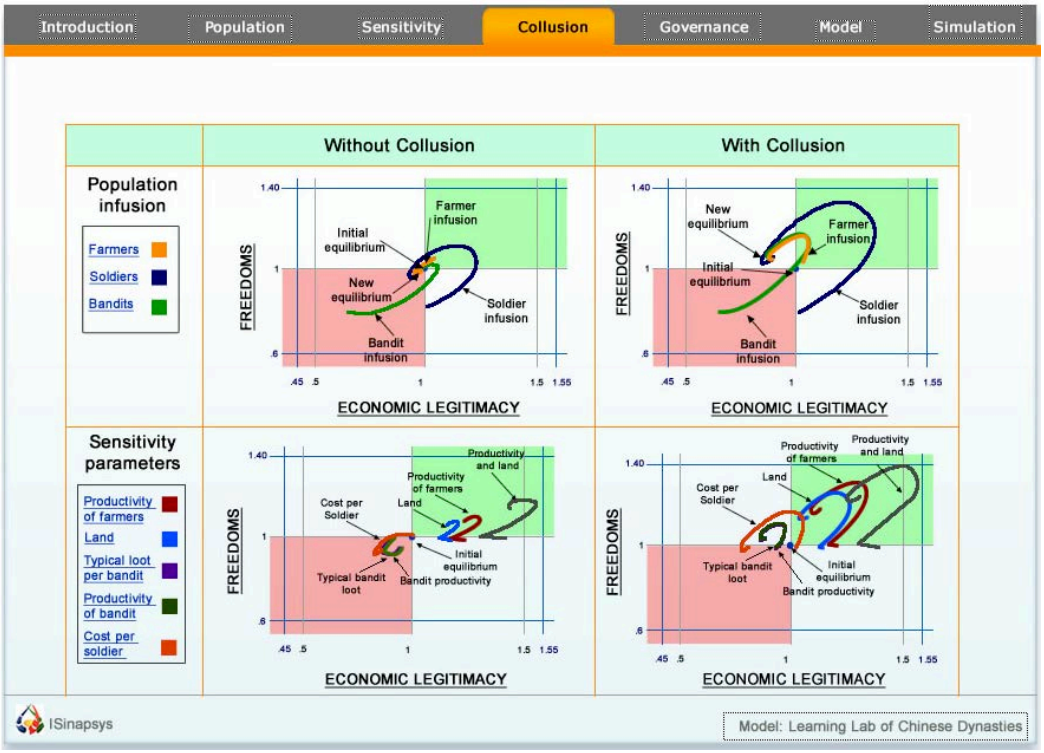
Population



Sensitivity parameters.



Collusion between soldiers and bandits.



We have extended the model presented by Saeed and Pavlov l 2006, adding the phenomenon of collusion between soldiers and bandits, in general, regardless of the policy implemented, it is observed that the phenomenon of collusion affects a decreased in economic performance, although improving freedoms of citizens. The latter result seems counterintuitive, perhaps due to the type of education given to the soldiers, with outstanding learning values such as loyalty, discipline, honesty, civic behavior and other, perhaps when detected the phenomenon of collusion among his colleagues, some resign from their position and pass to the side of the farmers, this leads eventually to a smaller number of soldiers and greater perceived freedom.

Summary of results

Policies applied to population infusion

Thus another lesson to be learn is that expansion beyond the state afforded by resources will always lead to a suboptimal condition, no matter what path of growth is adopted.

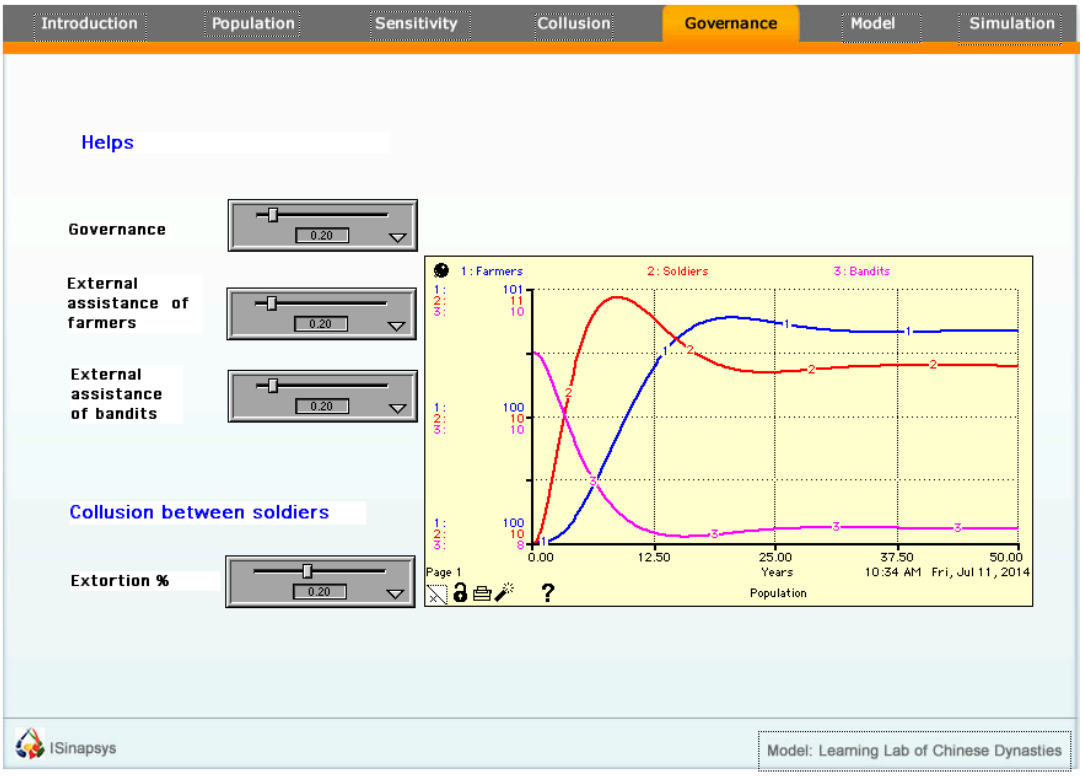
Policies applied for soldier & bandits

The policies applied to soldiers or bandits, will always lead to a suboptimal condition, no matter what path of growth is adopted.

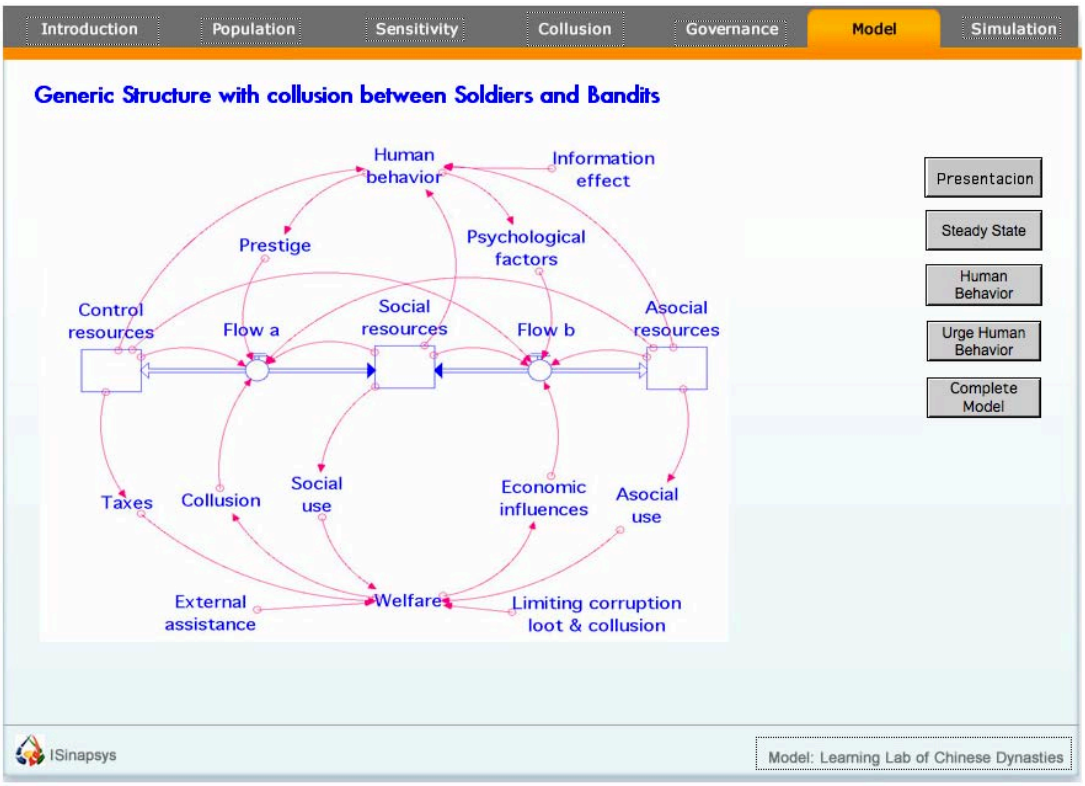
Policies applied for farmers

The new homeostasis depends, of course, on the degree of technological growth achieved or the volume of additional resources acquired for farmers, or grows both simultaneously. The system comes to a new balance at a higher level of legitimacy and freedoms than the initial level.

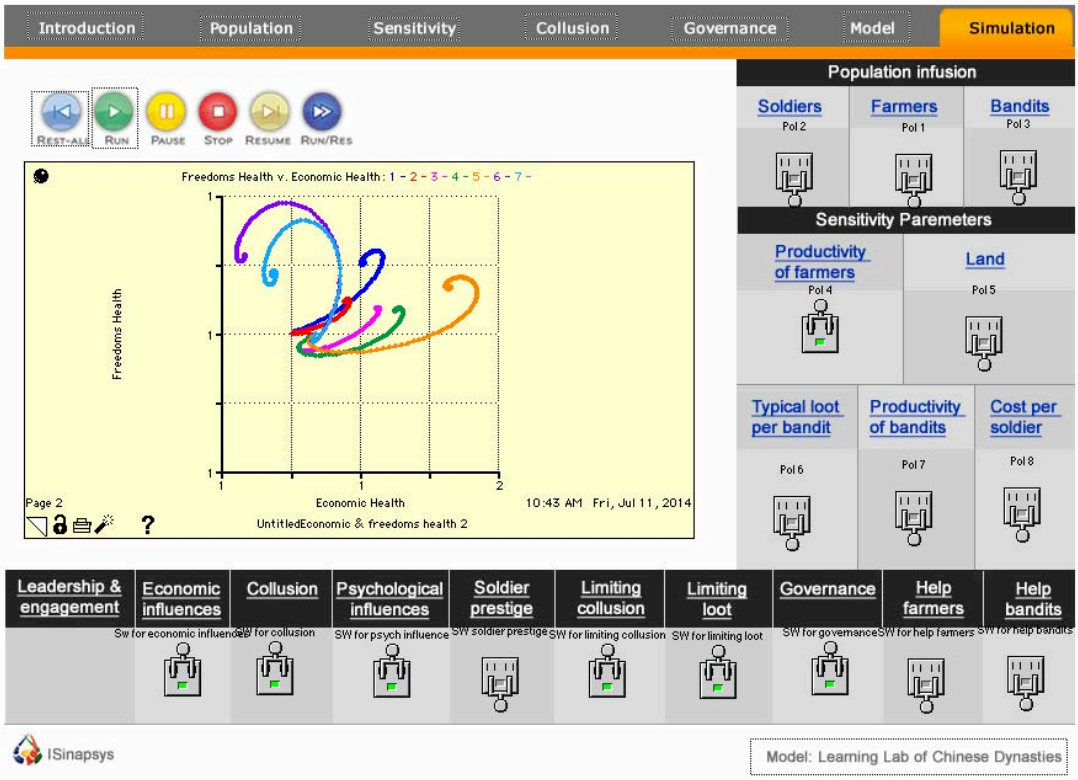
Governance



Model & Storytelling



Dashboard



Experiments with the model

I. The model is initialized in equilibrium which is disturbed in two ways for simulation experiments:

a) by infusing a fixed number of additional members into the various population stocks.

b) by changing the parameters representing the various productivities and scaling factors.

II. and activating progressively the assumptions about of:

1. Engagement – connecting to leadership (Future development)
2. Economic influences - rational economic behavior
3. Collusion between soldiers and bandits.
4. Psychological influences – human behavior. Specifically, exposure to violence, sense of belonging and group identity affect people's decisions regarding the role they select for themselves.
5. Soldier prestige – The prestige of being a soldier is embodied in the "farmer urge to change "that encourages soldier recruitment and "soldier urge to change", which discourages soldier attrition.
6. Limiting collusion – control checks for limiting collusion.
7. Limiting loot – control checks for limiting corruption and loot.
8. Governance - the writ of government. External assistance to soldiers, for strengthen law and order institutions.
9. Help farmers – external assistance to farmers.
10. Help bandits – external assistance to bandits.

While the first set of experiments is primarily aimed at understanding the internal dynamics of the resource allocation system, the later sets provide insights into the key entry points for change. All sets can, however, be interpreted in terms of the related policy interventions.

Graphical results - Raise farmer productivity & effective policy sets for addressing peace agendas and sustainability.

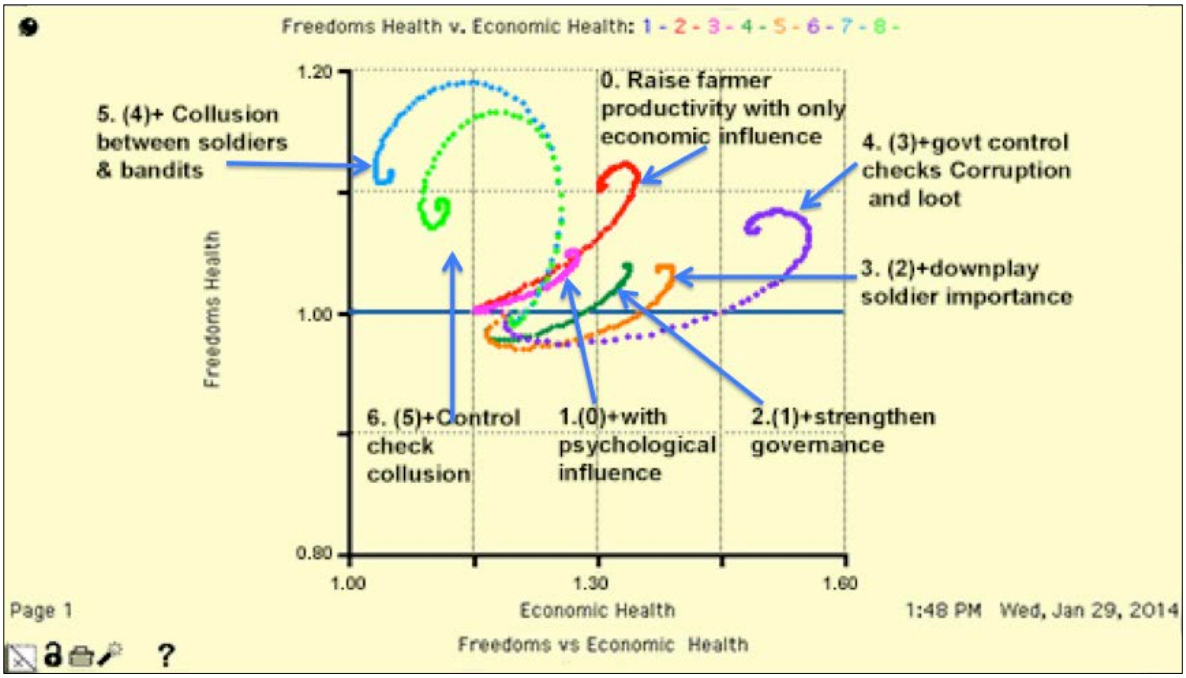


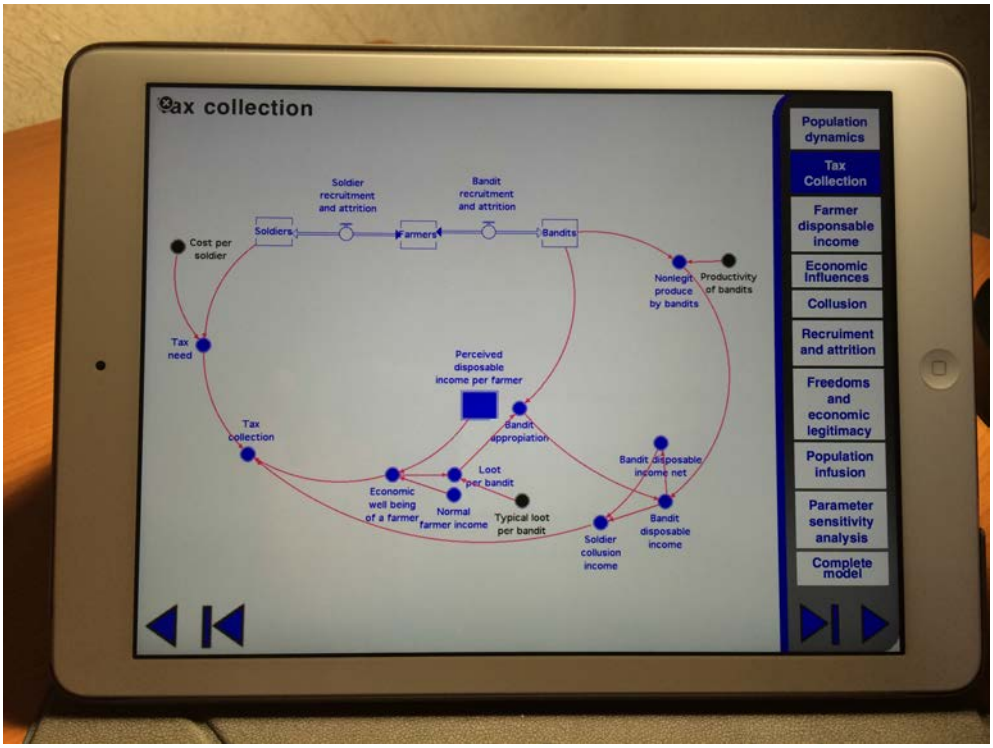
Figure 9: Raise farmer productivity and effective policy sets for addressing peace agendas and sustainability.

Raise farmer productivity and effective policy sets in detail.

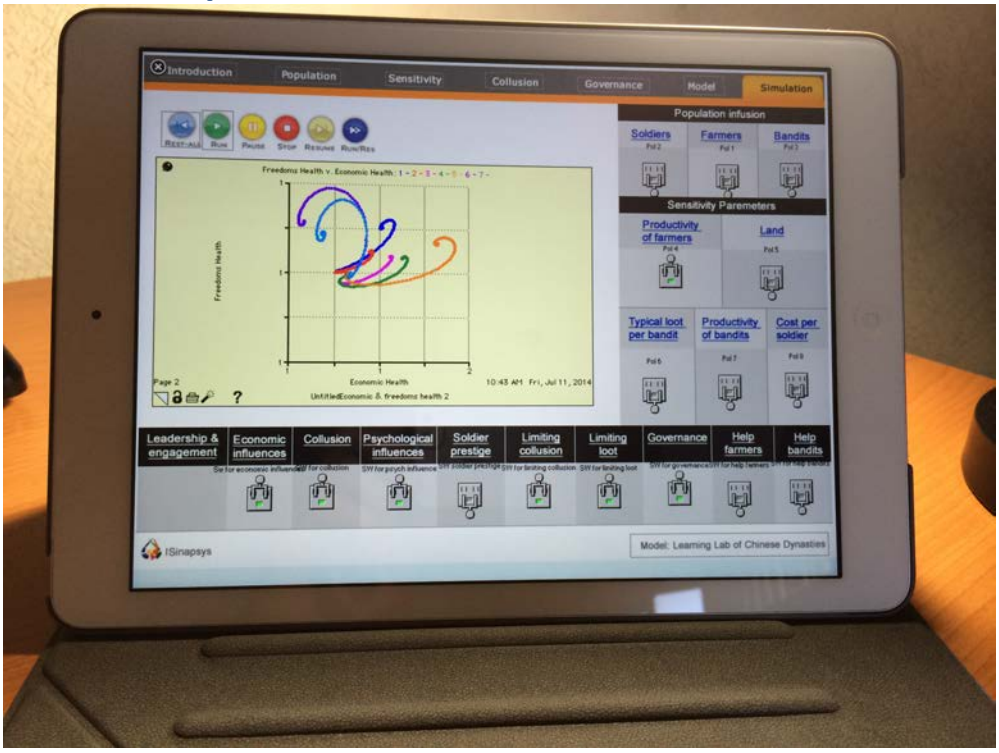
No	Leadership & engagement	Economic influences	Collusion	Psychological influences	Soldier prestige	Limiting collusion	Limiting loot	Governance	Help farmers	Help bandits
0		✔								
1		✔		✔						
2		✔		✔	✔			✔		
3		✔		✔				✔		
4		✔		✔			✔	✔		
5		✔	✔	✔			✔	✔		
6		✔	✔	✔		✔	✔	✔		

Figure 10: Raise farmer productivity and effective policy sets in detail. The best marked in yellow.

Storytelling



Interactive presentation in iBook format for iPad.



Conclusion

When history is written with one foot pointing visualizing the future, as in the case of this learning laboratory of Chinese Dynasties, is impressive learning obtained and this can be extended and implemented for the good of the a variety of organizations, including political economies, educational institutions, markets and firms.

The distinctive feature of our model is the presence of three resources framed as metaphorical populations of farmers, bandits and soldiers. These three classifications of people are present now and in the future, and are unavoidable, as they are part of human nature. Our model, formalizes systems in which some resources are used for productive activities, some resources are engaged in parasitic/ asocial activities and then some resources are allocated to attempts to limit the parasitic/ asocial activity. We must learn to work with these three species together, it is not possible to eliminate its effect, and we can only learn how to control their operation.

We have extended the model presented by (Saeed, Pavlov, Skorinko, Smith[†]), we have added to the model, the ability to review the impact of the phenomenon of collusion between soldiers and bandits, and the effects in the policies of population dynamics and policies related to changing the parameters representing the productivities and behavioral scaling factors in the economy, which has often been observed both in history and in some developing countries, and we have also adding control checks for limiting collusion.

The collusion, in general, regardless of the policy implemented, it is observed that affects a decreased in economic performance, although improving freedoms of citizens. The latter result seems counterintuitive, perhaps due to the type of education given to the soldiers, with outstanding learning values such as loyalty, discipline, honesty, civic behavior and other, perhaps when detected the phenomenon of collusion among his colleagues, some resign from their position and pass to the side of

the farmers, this leads eventually to a decrease in the number of soldiers and greater perceived freedom.

Future vision: Chinese dynasties learning lab III.

The impacts of leadership and engagement of the working groups.

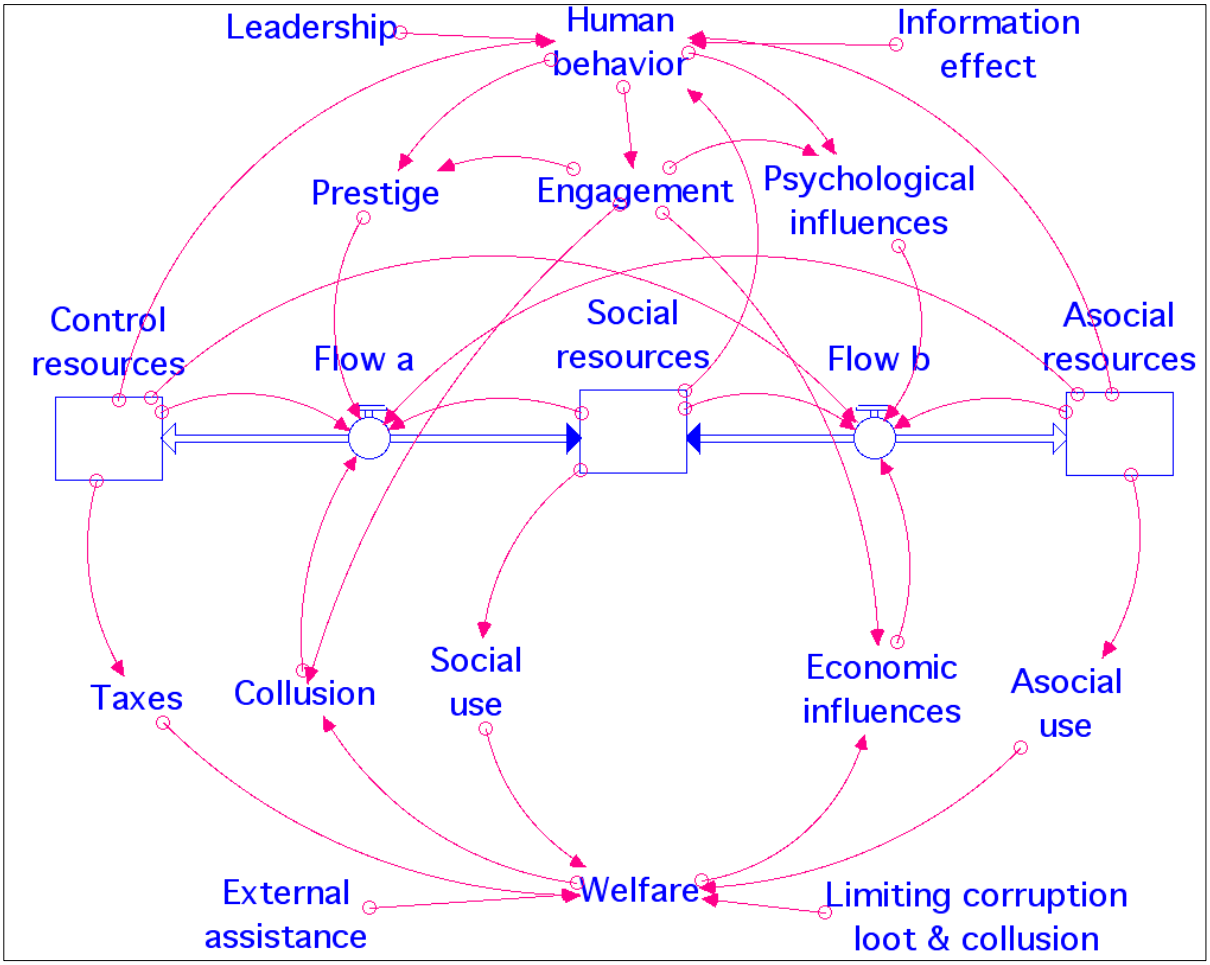


Figure 11: Future visión - Chinese Dynasties Learning Lab III. Our next article.

Special Thanks

I want to thank significantly, to Pål I. Davidsen, Professor of Department of Geography, University of Bergen, Norway. For his guidance, advice and feedback on how to write this article.

Apendix A: Model equations.

All policies and the initial population

Change_P1 = 5
Change_P2 = 5
Change_P3 = 5
Change_P4 = 0.2
Change_P5 = 0.2
Change_P6 = 0.2
Change_P7 = 0.2
Change_P8 = 0.2
Data_P4 = 1.2
Data_P5 = 100
Data_P6 = 0.5
Data_P7 = 0.5
Data_P8 = 1.5
First_pulse_P1 = 0
First_pulse_P2 = 0
First_pulse_P3 = 0
Initial_population_of_bandits = 10
Initial_population_of_farmers = 100
Initial_population_of_soldiers = 10
P1 = if Pol_1=1 then pulse(Change_P1,First_pulse_P1,1000) else 0
P2 = if Pol_2=1 then pulse(Change_P2,First_pulse_P2,1000) else 0
P3 = if Pol_3=1 then pulse(Change_P3,First_pulse_P3,1000) else 0
P4 = Data_P4*(1+(if Pol_4=1 then Change_P4 else 0))
P5 = Data_P5*(1+(if Pol_5=1 then Change_P5 else 0))
P6 = Data_P6*(1+(if Pol_6=1 then Change_P6 else 0))
P7 = Data_P7*(1+(if Pol_7=1 then Change_P7 else 0))
P8 = Data_P8*(1+(if Pol_8=1 then Change_P8 else 0))
Pol_1 = 0
Pol_2 = 0
Pol_3 = 0
Pol_4 = 0
Pol_5 = 0
Pol_6 = 0
Pol_7 = 0
Pol_8 = 0

Behavioral influences

Conscious_sensitivity_to_violence(t) = Conscious_sensitivity_to_violence(t - dt) + (Change_in_sensitivity_to_violence) * dt
INIT Conscious_sensitivity_to_violence = 1
INFLOWS:
Change_in_sensitivity_to_violence = (Unconscious_sensitivity_to_violence-Conscious_sensitivity_to_violence)/Time_to_change_sensitivity
Perceived_violence(t) = Perceived_violence(t - dt) + (Rise_in_perceived_violence) * dt
INIT Perceived_violence = 1
INFLOWS:
Rise_in_perceived_violence = (Actual_violence-Perceived_violence)/Time_to_form_perception_of_violence
Actual_violence = Threat_to_society*Violence_per_threat
Bandit_urge_to_change = Conscious_sensitivity_to_violence/Group_identity_of_bandits
External_reference = 1
External_ref_wt = 1
Farmer_urge_to_change = Conscious_sensitivity_to_violence/Group_identity_of_farmers
Group_identity_of_bandits = 1/((Bandits/Total_workforce)/(INIT(Bandits)/INIT(Total_workforce)))
Group_identity_of_farmers = 1/((Farmers/Total_workforce)/(INIT(Farmers)/INIT(Total_workforce)))
Group_identity_of_soldiers = 1/((Soldiers/Total_workforce)/(INIT(Soldiers)/INIT(Total_workforce)))
Information_effect = 1
Soldier_urge_to_change = Conscious_sensitivity_to_violence/Group_identity_of_soldiers
Time_to_form_normal_perception = 5
Time_to_change_sensitivity = 2
Time_to_form_perception_of_violence = 1/Information_effect
Total_workforce = Farmers+Soldiers+Bandits
Unconscious_normal_violence = SMTH3(((1-External_ref_wt)*Perceived_violence+External_ref_wt*External_reference),Time_to_form_normal_perception)
Unconscious_sensitivity_to_violence = Perceived_violence/Unconscious_normal_violence
Violence_per_threat = 1

Political economy

Bandits(t) = Bandits(t - dt) + (Bandit_recruitment_and_attrition + Bandit_infusion) * dt
INIT Bandits = Initial_population_of_bandits
INFLOWS:
Bandit_recruitment_and_attrition = ((1/init(Farmers))*(Farmers*(if SW_for_psych_influence=1 then Farmer_urge_to_change else 1)/((if Sw_for_economic_influences=1 then Farmer_relative_income else 1)*State_control)))-((1/init(Bandits))*(Bandits*(if SW_for_psych_influence=1 then Bandit_urge_to_change else 1)*(if Sw_for_economic_influences=1 then Farmer_relative_income else 1)*State_control))
Bandit_infusion = P3
Farmers(t) = Farmers(t - dt) + (Farmer_infusion - Bandit_recruitment_and_attrition - Soldier_recruitment_and_attrition) * dt
INIT Farmers = Initial_population_of_farmers
INFLOWS:
Farmer_infusion = P1
OUTFLOWS:
Bandit_recruitment_and_attrition = ((1/init(Farmers))*(Farmers*(if SW_for_psych_influence=1 then Farmer_urge_to_change else 1)/((if Sw_for_economic_influences=1 then Farmer_relative_income else 1)*State_control)))-((1/init(Bandits))*(Bandits*(if SW_for_psych_influence=1 then Bandit_urge_to_change else 1)*(if Sw_for_economic_influences=1 then Farmer_relative_income else 1)*State_control))
Soldier_recruitment_and_attrition = ((1/init(Farmers))*Farmers*(if SW_soldier_prestige=1 then Farmer_urge_to_change else 1)*(1/(Soldiers/Desired_number_of_soldiers))*(if SW_for_collusion=1 then 1/Soldier_relative_income else 1))-((1/init(Soldiers))*Soldiers*(if SW_soldier_prestige=1 then Soldier_urge_to_change else 1) *(Soldiers/Desired_number_of_soldiers)* (if SW_for_collusion=1 then Soldier_relative_income else 1))
Perceived_disposable_income_per_bandit(t) = Perceived_disposable_income_per_bandit(t - dt) + (Chng_in_disposable_income_per_bandit) * dt
INIT Perceived_disposable_income_per_bandit = 1
INFLOWS:
Chng_in_disposable_income_per_bandit = (Disposable_income_per_bandit-Perceived_disposable_income_per_bandit)/2
Perceived_disposable_income_per_farmer(t) = Perceived_disposable_income_per_farmer(t - dt) + (Chng_in_disposable_income_per_farmer) * dt
INIT Perceived_disposable_income_per_farmer = 1
INFLOWS:
Chng_in_disposable_income_per_farmer = (Disposable_income__per_farmer-Perceived_disposable_income_per_farmer)/2

Perceived_disposable_income_per_soldier(t) =
Perceived_disposable_income_per_soldier(t - dt) +
(Chng_in_disposable_income_per_soldier) * dt
INIT Perceived_disposable_income_per_soldier = 1
INFLOWS:
Chng_in_disposable_income_per_soldier = (Disposable_income_per_soldier-
Perceived_disposable_income_per_soldier)/2
Soldiers(t) = Soldiers(t - dt) + (Soldier_infusion + Soldier_recruitment_and_attrition) *
dt
INIT Soldiers = Initial_population_of_soldiers
INFLOWS:
Soldier_infusion = P2
Soldier_recruitment_and_attrition = ((1/init(Farmers))*Farmers*(if
SW_soldier_prestige=1 then Farmer_urge_to_change else
1)*(1/(Soldiers/Desired_number_of_soldiers))*(if SW_for_collusion=1 then
1/Soldier_relative_income else 1))-((1/init(Soldiers))*Soldiers*(if
SW_soldier_prestige=1 then Soldier_urge_to_change else 1)
(Soldiers/Desired_number_of_soldiers) (if SW_for_collusion=1 then
Soldier_relative_income else 1))
Bandit_appropiation = Loot_per_bandit*Bandits
Bandit_disposable_income = (Bandit_appropiation+ Nonlegit_produce_by_bandits)+
(if SW_for_help_bandits=1 then Help_bandits else 0)
Bandit_disposable_income_net = if SW_for_collusion=1 then
Bandit_disposable_income*(1- Extortion)/(if SW_for_limiting_collusion=1 then
State_control else 1) else Bandit_disposable_income
Cost_per_soldier = P8
Desired_number_of_soldiers = Threat_to_society*(Tax_collection/ Cost_per_soldier)
Disposable_income_per_bandit = Bandit_disposable_income_net/Bandits
Disposable_income__per_farmer = ({100/95}C1)*(Farmer_disposable_income/
Farmers)
Disposable_income_per_soldier = ({10/15}C2)*(Tax_collection/Soldiers)
Economic_Health = ({10/120}C3)*(Producer_of_farmers/ Bandit_disposable_income)
Economic_well_being_of_a_farmer = Perceived_disposable_income_per_farmer/
Normal_farmer_income
Extortion = 0.2
Farmer_disposable_income = (Producer_of_farmers - Tax_collection -
Bandit_disposable_income_net)+(if SW_for_help_farmers=1 then Help_farmers else 0)
Farmer_relative_income = Perceived_disposable_income_per_farmer/
Perceived_disposable_income_per_bandit
Freedoms_Health = ((init(Soldiers)+init(Bandits))/init(Farmers))*
(Farmers/(Soldiers+Bandits))
Labor_elasticity = 1-Land_elasticity
Land = P5
Land_elasticity = 0.7
Loot_per_bandit = (Economic_well_being_of_a_farmer*Typical_loot_per_bandit)/ (if
SW_for_limiting_loot=1 then State_control else 1)

Nonlegit_produce_by_bandits = Bandits*Productivity_of_bandits
Normal_farmer_income = 1
Producer_of_farmers = Productivity_of_farmer*(Land^Land_elasticity)*
(Farmers^Labor_elasticity)
Productivity_of_bandits = P7
Productivity_of_farmer = P4
Soldier_collusion_income = Bandit_disposable_income-Bandit_disposable_income_net
Soldier_relative_income = Perceived_disposable_income_per_soldier/
Perceived_disposable_income_per_bandit
State_control = ((init(Farmers)+init(Bandits))/init(Soldiers))*Soldiers/
(Farmers+Bandits)
SW_for_collusion = 0
Sw_for_economic_influences = 1
SW_for_governance = 0
SW_for_help_bandits = 0
SW_for_help_farmers = 0
SW_for_limiting_collusion = 0
SW_for_limiting_loot = 0
SW_for_psych_influence = 1
SW_soldier_prestige = 0
Tax_collection = (Tax_need*Economic_well_being_of_a_farmer+
Soldier_collusion_income)+ (if SW_for_governance=1 then Help_soldiers else 0)
Tax_need = Soldiers*Cost_per_soldier
Threat_to_society = ((init(Farmers)+init(Soldiers))/init(Bandits))*Bandits/
(Farmers+Soldiers)
Typical_loot_per_bandit = P6

Steady state

Bandit_disposable_income_steady_state = init(Bandits)*
(Typical_loot_per_bandit_initial+ Productivity_of_bandits_initial)
C1 = init(Farmers)/(Producer_of_farmers_steady_state-Tax_collection_steady_state-
Bandit_disposable_income_steady_state){100/95}
C2 = (init(Soldiers)/Tax_collection_steady_state){10/15}
C3 = Bandit_disposable_income_steady_state/Producer_of_farmers_steady_state
{10/120}
Cost_per_soldier_initial = 1.5
External_assistance_to_bandits = 0.2
External_assistance_to_farmers = 0.2
External_assistance_to_soldiers = 0.2
Help_bandits =
Bandit_disposable_income_steady_state*External_assistance_to_bandits
Help_farmers = (Producer_of_farmers_steady_state-Tax_need_steady_state-
Bandit_disposable_income_steady_state)*External_assistance_to_farmers
Help_soldiers = External_assistance_to_soldiers*Tax_need_steady_state
Land_initial = 100
Producer_of_farmers_steady_state = Productivity_of_Farmers_initial*
(Land_initial^Land_elasticity)*(init(Farmers)^Labor_elasticity)
Productivity_of_bandits_initial = 0.5
Productivity_of_Farmers_initial = 1.2
Tax_collection_steady_state = init(Soldiers)*Cost_per_soldier_initial
Tax_need_steady_state = init(Soldiers)*Cost_per_soldier_initial
Typical_loot_per_bandit_initial = 0.5

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Author and collaborators.

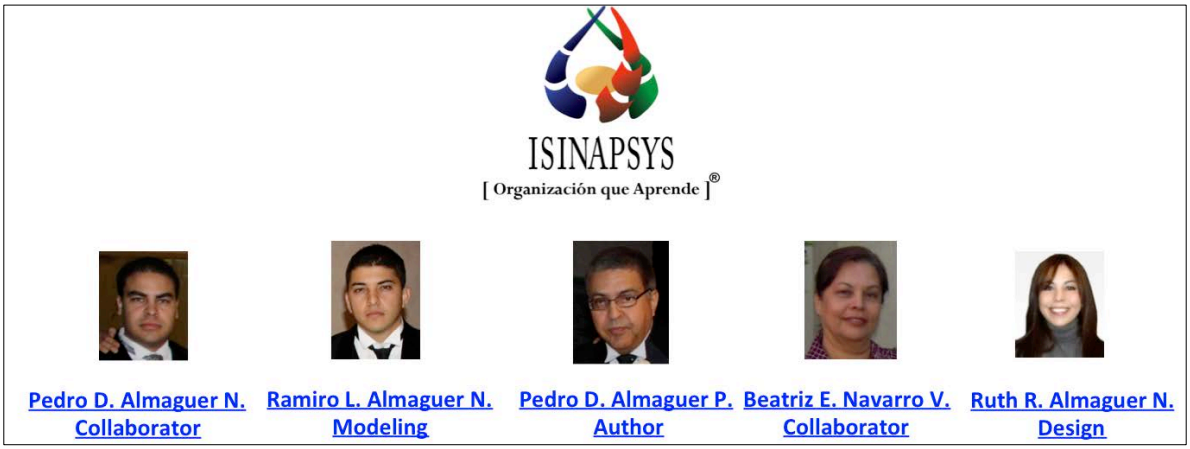

Figure 12: Author and collaborators.