Combining political and economic models: An evolutionary Computable General Political Economy Equilibrium Model (CGPE)

Christian Henning and Eva Krampe

Department of Agricultural Economics, University of Kiel, Germany

CGPE - A model for policy evaluation

**Task:** Understand why suboptimal policies are chosen/persist

**Aim:** Identify political knowledge and incentive gaps and propose strategies that reduce existing gaps

**Method:** The Computable General Political Economy Equilibrium Model (CGPE)

**Advantage:** Modeling of political decision-making and policy learning processes with endogenous policy preferences and beliefs
Background information

- Idea to combine political and economic models is not new but no one has derived a CGPE for empirical application yet (see Binswanger and Deiniger (1997)).
- Idea has already been applied to analyze agricultural policy-making in the EU (see work published by Henning, Pappi and Struve).
- Workshop on evaluating and modelling CAADP-policies in 2011 organized by IFPRI, University of Kiel and PEGnet.
Outline of presentation

1. Model layout
2. Empirical application
3. Expected research outputs
4. Final remarks
Model layout: The static CGPE

Economic system

Status of economic system

determines

Welfare of socio-economic groups

determines

Welfare of voters

Computable general equilibrium model (CGE)
Model layout: The static CGPE

Political system

- Political agents
  - lobby
  - support
  - Political behavior of voter

Economic system

- Status of economic system
  - determines
  - Welfare of socio-economic groups
    - determines
    - Welfare of voters

Motivation Model layout Empirical application Research outputs Conclusion

An evolutionary Computable General Political Economy Equilibrium Model
Model layout: The static CGPE

Political system

- Political agents
  - vote collectively

- Interest groups
  - lobby

- Political behavior of voter
  - support

Economic system

- Status of economic system

- Welfare of socio-economic groups
  - determines

- Welfare of voters
  - determines

An evolutionary Computable General Political Economy Equilibrium Model
Model layout: The static CGPE

Political system
- Political agents
  - vote collectively
  - lobby
- Interest groups
  - support

Economic system
- Status of economic system
  - determines
  - Welfare of socio-economic groups
  - determines
- Welfare of voters

Legislative decision-making

Formation of voter interests

An evolutionary Computable General Political Economy Equilibrium Model
Legislative bargaining module: General overview

- Final policy choice ($\gamma^*$) determined by
  - Rules of political games ($\varphi$)
  - Political agents’ policy positions ($U_g(\gamma)$)

- Models the final policy decision as the result of a political bargaining process using:
  $$\gamma^* = \Gamma(U_g(\gamma), \varphi).$$

- Cooperative mean-voter rule developed by Henning and Pappi
Legislative bargaining module: Policy preferences

- Political support maximization

\[ U_g(\gamma) = \text{Max} \{ S_g(z) \mid T(z, \gamma) \equiv 0 \} \]

- Voter behaviour, i.e. \( S_g(z) \)
Deriving policy positions of political actors: Voter response module

- Understanding the determinants of the voting decision
- Voter behavior:
  - Ideological (e.g., ethnicity based voting),
  - Retrospective and
  - Policy-oriented.
- Result: Political support function which is similar to a social welfare function
Data on voter behavior

C17. When you consider voting for a certain candidate, which of the following things are important for your choice. *(Do not read out the don’t know option)*

<table>
<thead>
<tr>
<th></th>
<th>Very unimportant</th>
<th>Unimportant</th>
<th>Important</th>
<th>Very important</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Character</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Outer Appearance</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Ethnic origin</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Regional origin</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Political knowledge</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Party affiliation</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Past political performance</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Election campaign</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Other (________________)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
Deriving policy positions of political actors: Belief formation module

- No perfect information/knowledge about the political technology $T(z, \gamma)$
- Belief formation about the political technology $T(z, \gamma)$
- See, for example, Jonathan’s analysis of the Self-/Other-Perception of different coalitions.
The evolutionary CGPE

CGPE period t

Political beliefs

CGPE period t+1

Political belief up-dating
Belief up-dating and policy learning module I

1. Communication learning in networks

- Each actor forms his policy beliefs via taking weighted averages of his neighbour’s and his own beliefs. (see Friedkin and Johnson (1991))
Belief up-dating and policy learning module I

1. Communication learning in networks

- Each actor forms his policy beliefs via taking weighted averages of his neighbour’s and his own beliefs. (see Friedkin and Johnson (1991))
Data on communication networks

**Question 5. Expert information**

Stakeholder organizations, research institutes or political actors can frequently provide expert information to other organizations, especially when consequences of complex policies have to be evaluated. Such kind of expert information comprises the knowledge of the effects of different policy instruments on the welfare of different social groups. Therefore expert information is very important for political organizations as well as for other interest groups when designing and influencing agricultural policy programmes.

**Question 5.01 Expert information: Sender**

*Using the list of organizations again, please check all organizations to which your organization provides expert information on agricultural policies.*

**Question 5.02 Expert information: Receiver**

*Using the list of organizations again, please check all organizations from which your organization receives expert information on agricultural policies.*

**Question 5.03 Value of provided information**

*Please check further those organizations from which your organization receives extremely valuable information.*
Belief up-dating and policy learning module II

II. Observational learning using mental models

- Observe policy and policy outcome
- Take the difference between what you observe and what you expected given the specific policy choice
- Form a new belief about the relation between a specific policy and an outcome
- Change or stay with your policy position
Belief up-dating and policy learning module III

III. Reinforcement learning via gratification

▶ Idea: Voters reward agents with reelection if their welfare under the implemented policies fits their expectation.
▶ Political actors are interested in being reelected.
▶ Thus, a change in political support leads to a change in policy positions of political actors.

▶ See for example the NAADS-reform in Uganda
Linking policy choices with the CGE

**Standard approach**

Transform policy into a CGE-model parameter
(e.g. trade policy $\rightarrow$ tariff)

**Problem:** How can we translate an infrastructure programme into model parameters?

**Policy impact function**

Parameter of interest: Technological progress

Approach: Estimate the impact of a specific budget distribution on technological progress in a specific sector using expert information (see e.g. Fan and Zhang (2004))
Linking policy choices with the CGE

**Standard approach**
Transform policy into a CGE-model parameter (e.g. trade policy → tariff)

Problem: How can we translate an infrastructure programme into model parameters?

**Policy impact function**
Parameter of interest: Technological progress

Approach: Estimate the impact of a specific budget distribution on technological progress in a specific sector using expert information (see e.g. Fan and Zhang (2004))
Data: Economic system

CGE

- Country statistics on economic indicators

Policy impact function

- Entropy estimation combining data and expert information
Data: Economic system

CGE

- Country statistics on economic indicators

Policy impact function

- Entropy estimation combining data and expert information
Data: Political system

Rules of political games

- Constitutional analysis
- Insights on the policy process from qualitative studies
e.g. Big Man presidentialism

Policy positions

- Political support function: Voter survey + Policy network study
- Policy beliefs: Policy network study
- Communication learning: Policy network study
Data: Political system

Rules of political games

- Constitutional analysis
- Insights on the policy process from qualitative studies
e.g. Big Man presidentialism

Policy positions

- Political support function: Voter survey + Policy network study
- Policy beliefs: Policy network study
- Communication learning: Policy network study
Policy network study: General facts

Main goal: Collect quantitative survey data on policy positions, interests and networks

Method: Face-to-face interviews with relevant actors using standardized questionnaires

Data:

1. Structural variables: measure ties of a specific kind between a pair of actors, i.e. communication
2. Composition variables: measure actors’ attributes, i.e. policy preferences
Question: Preference regarding policy outcomes

Question 2.09  Poverty reduction
Poverty estimates reveal a significant improvement with headcount poverty declining, from 38% in 2002 to 31% in 2005 and 23% in 2010 (Economic Policy Research Centre, Kampala). Research by Benin (2007) has demonstrated that if agriculture in Uganda grew at 6% per annum, the national poverty headcount level would fall from 31.1% in 2005 to below 17.9% by 2015. This would be well below the 28% Millennium Development Goal target (DSIP, p4).

Thinking about Uganda’s future after 2012, at which poverty level should government focus, when spending budget on poverty reduction programmes?

<table>
<thead>
<tr>
<th>23% of population living below the national poverty line</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>5% population living below the national poverty line</th>
</tr>
</thead>
</table>
Political diagnosis: Identifying political performance gaps

1. Performance gap due to incomplete knowledge
   - Calculate the policy choice $\gamma^{know}$ by maximizing agents’ political support functions assuming that they know about the "best-estimate" of the political technology
   - $Gap_{know} = \gamma^{know} - \gamma$
   - Example: The two coalitions and their Self-/Other-Perception
Political diagnosis: Identifying political performance gaps

II. Performance gap due to biased incentives

- Calculate the policy choice $\gamma^{inc}$ by maximizing unbiased political support functions subject to actor-specific beliefs about the political technology

- $Gap_{inc} = \gamma^{inc} - \gamma$

- Example: Non-policy oriented voting
Political diagnosis: Identifying determinants of performance gaps

Simulate policy outcomes and corresponding political performance....

- varying legislative rules
  - Impact of formal legislative rules

- assuming the implementation of effective monitoring and evaluation-systems
  - Impact of innovative policy evaluation and monitoring systems
Political diagnosis: Identifying determinants of performance gaps

Simulate policy outcomes and corresponding political performance...

- varying legislative rules
  → Impact of formal legislative rules

- assuming the implementation of effective monitoring and evaluation-systems
  → Impact of innovative policy evaluation and monitoring systems
Political therapy: Deriving strategies that reduce observed gaps

Reducing knowledge gaps by ... 

- designing evidence-based political processes.
- designing participatory policy processes exploiting wisdom of the crowd effects.

Reducing incentive gaps by ... 

- identifying political mass communication strategies leading to less biased policy beliefs of voters.
- designing participatory policy processes reducing government capture.
Political therapy: Deriving strategies that reduce observed gaps

Reducing knowledge gaps by ...

▶ designing evidence-based political processes.
▶ designing participatory policy processes exploiting wisdom of the crowd effects.

Reducing incentive gaps by ...

▶ identifying political mass communication strategies leading to less biased policy beliefs of voters.
▶ designing participatory policy processes reducing government capture.
Major contributions of the CGPE

- Inform on-going debate about contested policy issues with results from more "realistic" equilibrium models.
- Get an understanding of drivers of inefficient policy processes by determining political knowledge and incentive gaps.
- Suggest solutions to inefficient policy processes using results from simulation studies based on CGPE.
- Provide a computer-based toolkit based on the CGPE which allows national stakeholders to simulate the impacts of their policy choices.
Thank you very much for your attention!