Institute of Economics

UNIVERSITÄT HOHENHEIM

Institute of Economics

This project PICK-ME has received funding from the European Union Seventh Framework Programme FP7/2007-2013 under grant agreement SSH-CT-2010-266959.
Outline of the Research Activity of Stuttgart’s Team
Introduction of the Team in Stuttgart

Matthias Müller

Pier Paolo Saviotti

Andreas Pyka

Kick-off | Introduction of the team | our participation in Pick-Me | our contribution to Pick-Me
Person Months allocated to Work Packages

<table>
<thead>
<tr>
<th>WP</th>
<th>Hours</th>
<th>Description</th>
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<tbody>
<tr>
<td>WP 2</td>
<td>1.60</td>
<td>Review and Taxonomy of Supply-Side and Demand-Side Innovation Policies</td>
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<tr>
<td>WP 3</td>
<td>10.00</td>
<td>Development of an integrated Framework</td>
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<tr>
<td>WP 4</td>
<td>13.25</td>
<td>Demand and the Rate and Direction of R&amp;D and Innovation Efforts</td>
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<tr>
<td>WP 8</td>
<td>9.00</td>
<td>Demand driven Policy Designs for Knowledge Generation and Exploitation</td>
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<tr>
<td>WP 9</td>
<td>0.75</td>
<td>Dissemination</td>
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Our tasks

<table>
<thead>
<tr>
<th>WP 3</th>
<th>Analysis of demand-oriented policies on innovation in a framework shaped by complex systemic interactions</th>
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<tr>
<td>WP 4</td>
<td>Application and adaptation of our TEVECON model to reproduce major patterns and stylized facts which are discovered in empirical analysis</td>
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</table>
• Economic development by the creation of new sectors.

• Given the imbalance between saturating demand and continuously growing productivity an economy at constant composition would find a bottleneck in its long term economic development.

• But the bottleneck can be eliminated by the creation of new goods and services, leading to new sectors (Pasinetti).
• **Hypothesis 1**: The growth in variety is a necessary requirement for long-term economic development.

• **Hypothesis 2**: Variety growth, leading to new sectors, and productivity growth in pre-existing sectors, are complementary and not independent aspects of economic development.
The Story of TEVECON

- Economic system: series of industrial sectors created at different times.

- Combination of intra-sector and inter-sector dynamics.
  - e.g. competition: intra- and inter-sector competition
  - e.g. available financial resources are allocated to different sectors
  - e.g. research funds are distributed among the different activities and sectors
  - e.g. disposable income is distributed among the existing sectors
• Without consumers willing to spend their income for new goods and services, innovations will not succeed to diffuse widely in the economic system.

• Consumers must satisfy their basic needs first.

• Remaining income might be spend for novelties depending on the preferences of the consumers.
The TEVECON Methodology: A Schumpeterian Approach

The general mechanism

• First entrepreneur enters the market (expectation of a temporary monopoly) then imitators enter → rising intensity of competition → inducement for further entry falls until exit starts dominating entry. The original innovation has become part of the ‘circular flow’ (Schumpeter, 1912)

• Sector → oligopoly or monopoly

• Schumpeterian Innovation Competition
• In TEVECON industry evolution is modelled in a systems theoretical approach, i.e. not individual firms or consumers are analyzed but populations of firms which together form an industry or sectoral demand.

• The focus of TEVECON is on Meso-Macro-relationships allowing to investigate non-linear and co-evolutionary developments which manifest on the macro-level of an economy in quantitative and qualitative change.

• TEVECON in its present form is not suited for analyzing the complex patterns of interaction on the micro-level of an economy.
Economic Development

figure 1a) number of firms

figure 1b) employment

figure 1c) income
The central equation in TEVECON

\[ dN_i^t = k_1 \cdot \underbrace{FA_i^t \cdot AG_i^t - IC_i^t}_\text{entry term} - \underbrace{MA_i^t}_\text{exit terms} \]

\( Fa_i^t := \) Financial Availability
\( AG_i^t := \) Adjustment Gap
\( IC_i^t := \) Intensity of Competition
\( MA_i^t := \) Mergers & Acquisitions
The Adjustment Gap

\[ AG^t_i = D^{\text{max}}_i - D^t_i \]

\( D^{t}_i := \text{Demand} \)

\( D^{\text{max}}_i := \text{Maximum Demand (related to technological opportunities and search activities) (e.g. consider the discrepancy after the first computers were available between the actual demand these days and the size of the market today).} \)
What’s behind $D_i^t$ and $D_{\text{max}}^t$?

$D_{\text{max}}$ represents the *technology push* side in economic development:

$$D_{\text{max}} \propto SE$$

$D$ represents *the demand pull side in economic development*:

$$D \propto Y, p$$
The Demand equation in TEVECON

\[ D_i^t = k_{\text{pref}}^i \cdot k_4 \cdot \frac{\text{Dispo}_i^t}{\text{Income}^t} \cdot \frac{Y_i^t \cdot \Delta Y_i^t}{p_i^t} \]
The Architecture of TEVECON
Together with the empirical part of WP4 we try to identify and analyze *stylized facts* of the interdependencies between demand, innovation and economic development.

Two major interfaces with the empirical studies can be envisaged:

- Reproducing these *stylized facts* in a *history-friendly way* in order to find a theoretical explanation of the observed patterns and

- **Calibration** of the model’s parameter with the help of the empirical data.
Pick-Me Experiments with TEVECON

Different policies on the demand side with an impact on innovation processes:

- Income Taxation
- Education Policy
- Subsidies
- Standardization
- Infrastructure
- Public Procurement

Diagram showing variables interacting with demand-oriented innovation policies.
• The model will allow for a large number of numerical experiments to test *in-silico* the effect of different demand-oriented innovation policies.

• Even if the various instruments are designed to affect only one variable, multiple effects are to be expected as the variables in our model co-evolve and a characterized by strong interdependencies.
In WP3 it is intended to explore different possible avenues for a model of demand-oriented policies on innovation shaped by complex interactions.

Interactions between consumers and between consumers and producers very likely have a strong impact on economic development.

With TEVECON in its system-theoretical formulation so far interactions among agents within a population are not considered (e.g. endogenous preference formation etc.).

Therefore we attempt to develop an agent-based version of TEVECON, starting on the sectoral level first.
ABM TEVECON (Micro)
- Heterogeneous actors and their decisions
- Interactions on the demand side
- Interactions between demand and supply

Sectoral Level
→ Development of Structures and complex Patterns through various feedback effects

Macro Level
→ Qualitative Economic Development and Transformation of the Economic System

TEVECON (Industry)
- Schumpeterian Competition
- Structural Change
- Co-Evolution

WP3
WP4
The Agent Based Modeling Approach

• Such a model requires autonomous interacting individuals with heterogeneous characteristics.

• With the Agent Based Modeling Approach macroscopic regularities are generated or ´grown´ on basis of the behaviour of the relevant actors or ´agents´ and their environment.

• An agent in an ABM is characterized by:
  - Autonomy
  - Social ability
  - Reactivity
  - Pro-activity

• Therefore the Agent Based Modeling Approach allows us not only to discover and explain, but also to predict and assess the effects of demand-driven innovation policies.
Although on an aggregate level the characteristics of demand have already been in the focus of research, the consumers, their interactions and their possibilities to contribute knowledge into the processes are more or less ignored.

Consumers are confronted with choices and their decisions are dependent on their own knowledge, knowledge of other consumers etc. Consumption is also to some extent a learning process where the consumers directly or indirectly influence innovation processes.

To understand the effects of demand driven innovation policies in detail, one has to focus on individuals and their interactions which are the targets of political instruments.
One example of the mechanism leading a consumer to buy products

- The consumers´ choice is affected by other consumers, the employer etc. in every single step.

- The consumer and his environment build a self preserving network where information are created, spread and modified.
WP 8: Demand driven policy designs for knowledge generation and exploitation

Lead participant: CASE
Other participants: CCA, UU, UNS, LSE, CSIC, UHOH, SNI
Month: 1 – 42
Presentation prepared for PICK-ME kick-off meeting in Torino, 3-4 Feb, 2011
Will WP8 be the laundry list of policy “pieces”? 

- WP8 distills policy recommendation from WPs 1-7. BUT
- HOW to avoid WP8 becoming a “laundry list” of policy “pieces”?

A. Interact with WPs on their frameworks e.g. SNI’s Mapping Innovation Ecosystems
B. Seek clients’ feedbacks/inputs early on
Imagine we’re finished - Hypothetical Policy Steps

1. **Role I**: Regulatory interventions to improve the policy environment for absorption: e.g. Stigma of Bankruptcy, Work Visas Policy (e.g. Chinese engineering Ph.D.s visas in US),

2. **Role II** – Support Instruments: financial and institutional instruments: e.g. matching grants, seed capital, - sector neutral? crowding out? Incubators?
Firm’s Demand for Innovation

- Serbian case studies: demand depends on corporate governance (ownership) AND market competition.
- Creative destruction: overcome the fear of failure
- GAP of University (Supply) – Business (Demand); EU12 state R&D Institutes – socialist legacy
### Firms’ Innovation Demand: Poland, East and West Germany

#### Initiatives of company over the last 36 months [%]

<table>
<thead>
<tr>
<th></th>
<th>Poland</th>
<th>East Germany</th>
<th>West Germany</th>
<th>Czech Republic</th>
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<tbody>
<tr>
<td>Added new product</td>
<td>34.7</td>
<td>11.0</td>
<td>18.2</td>
<td>18.0</td>
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<tr>
<td>Upgraded existing product</td>
<td>49.0</td>
<td>29.1</td>
<td>49.3</td>
<td>29.7</td>
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<tr>
<td>Discontinued product line</td>
<td>11.5</td>
<td>5.4</td>
<td>14.6</td>
<td>9.8</td>
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<tr>
<td>Obtained ISO</td>
<td>12.4</td>
<td>8.2</td>
<td>3.3</td>
<td>9.5</td>
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Source: WB Enterprise Surveys

Itzhak Goldberg, Europe and Central Asia Region, World Bank
What’s a Co-invention?

- Slovenia, Czech, Slovenia Poland rank high in worldwide patenting
- Specifically, more and more patents are co-inventions: EU12+Germany, EU12+US, Russia + US
- Citations – measure of invention quality use in WP5?
Foreign Demand for Invention in Russia

Figure 2.6: International Coinvention in Russia

Source: Authors’ calculations based on the U.S. Patent and Trademark Office Cassis CD-ROM, December 2006 version.

Note: The graph tracks total counts of patents in which at least one inventor is based in Russia. “Purely indigenous patents” are those generated by a team whose members are all based in a single ECA country.
Foreign Demand in Poland: Interviews with Co-inventors

EPO patent data was used to identify and interview Polish co-inventors:

• PLUS Access to financial support.
• PLUS Expertise, Commercialization and IPRs
• MINUS Western partners sought sole ownership of IPR.
How can policy protect Polish Co-inventors?

• High cost and expense of applying and maintaining in EPO & USPTO beyond the budget of inventor or small firm.

• Public support in Poland to patent their inventions in international markets fell short of what was desired.
## WP8 Deliverables

### List of deliverables

<table>
<thead>
<tr>
<th>Deliverable Number</th>
<th>Deliverable Title</th>
<th>Lead beneficiary number</th>
<th>Estimated indicative person-months</th>
<th>Nature</th>
<th>Dissemination level</th>
<th>Delivery date</th>
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<tr>
<td>D8.1</td>
<td>Report on policy practices to support public procurement</td>
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<td>7.00</td>
<td>R</td>
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<tr>
<td>D8.2</td>
<td>Report on design of demand-driven innovation policies</td>
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<td>7.00</td>
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<tr>
<td>D8.3</td>
<td>Guidelines for policymakers and practitioners</td>
<td>6</td>
<td>9.00</td>
<td>R</td>
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<td><strong>Total</strong></td>
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