The Emergence of Ethanol Sector in Brazil and in the US – The Role of the State

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Outline

- **Initial considerations**
- **Paper presentation**
  - Methodology
  - Theory
  - Brazil
  - The US
  - Results
- **Decription of research Project**

Initial Considerations

- **Demand is for Ethanol will surge**
  - Japan (20-30), Canada (10-10), EU (5.75-10), US (28 bill. Lt. used p.a.)
  - Climate change, GHG emissions, Kyoto, Urban air pollution
- **Supply?**
  - 1st generation technology: available arable land, strong photo synthesis, low cost of land and labor → developing countries
- **Main research question:**
  - *What are the potentials for poor countries to benefit from the up-coming*
  - *market for bio-ethanol as both producers and users?*

A First Step – International Experiences

- **Idea to compare two largest producers world wide – US and Brazil**
- **What made these sectors emerge and what made them ”succesful”?**
- **What was the Role of the State?**
- **A few words on ethanol as fuel**
  - Feedstock specific + energy balance + “green fuel”?
  - Dependent on oil price

Methodology

- **Theoretical Focus on public procurement within an Innovation-system approach**
- **Empirics consist of literature review including reports, articles and books.**

Theory

- **Technology Life Cycle**
  - Infant phase: technological opportunities supplied and demand side "chooses" → variety of designs → uncertainty about technology viability, product design and existence of demand (for the firm)
  - Mature phase: few designs emerged as winners, uncertainty less, diffusion
  - Infant → mature, difficult in the absence of demand
- **Private demand may be absent due to risk and costs of early users - sharing firm's development and learning costs**
  - Technology switch, path dependency, user entry cost, network effects
- **Socializing risk: diffusing information, quality standards, financial incentives**

Theory (2)

- **Public Procurement**
  - *Defined as a set of public measures to induce innovations and/or speed up diffusion of innovations through increasing the demand for innovations, defining new functional requirements for products and services or better articulating demand* (Edler, 2006)
  - *When a public agency places an order for a product or a system which does not exist at the time, but which could (probably) be developed within a reasonable period* (Edquist et al., 2000)
- **Direct vs. Indirect**
- **General vs. Strategic**
- **Can be “better” than R&D subsidies**
- **Picking winners & generic social needs**

Brazil (1)

- **Ethanol production 2005 = 14.5 billion lt. (45% of world production)**
- **Ethanol production 2015 = 30 billion lt.**
- **Brazil's ethanol program (Proalcool) was launched in 1975 as a response to the 1973 oil crisis**
- **Context**
  - Early 1970s: low price of sugar on world markets and overproduction of sugar
  - Stakeholders put under additional pressure due to oil crisis
  - Favorable exit strategy – large-scale ethanol production
  - Implementation "swift" due to governance mode

Brazil (2)

- **1975-1979: Anhydrous ethanol, distilleries, infrastructure and blending policy**
- **1979-1985: Hydrous ethanol, ethanol cars and increase of production**
- **1985-1990: Deregulation and crisis**
  - Relative prices of sugar and oil, shortage and consumer confidence
- **1990-1999: A competitive sector**
  - Subsidies withdrawn, production decrease
- **1999-2007: Renewed interest**
  - FFV, oil situation and national energy security

The US

- Ford T 1908 ran on ethanol! Ethanol production existed as a niche market until oil crises in the 1970s
- Increased support sustained as a part of national (energy) security
- Became part of environmental agenda in 1990s with several policy initiatives (Clean Air Act of 1990) → ethanol consumption grew 2.5% p.a.
- 1997-2005 production increased 300% ← leaded gasoline prohibited 2002
- Lacking investment in infrastructure
- Large differences at state level
- 2005: renewable fuel standard – mandatory ethanol use by volume
- Targeting 2nd generation technology

Results (1)

- **Both response to oil crises, though with different magnitude**
  - Brazil: large-scale production with ambitious production targets
  - US: increased subsidies
- **Brazil more radical while US had continuous development**
  - Strategic vs. General public procurement
- **Brazil: state developed sector and stepped back – in the US the state is heavily supporting still**
- **Cost-effectiveness of Feedstocks crucial**
  - Cheaper for US to import Brazilian-produced ethanol

Results (2)

- **Public procurement has been far more significant in Brazil**
  - Blending policy (20%)
  - Public purchase of ethanol cars (tax incentive to buyer)
  - Price regulation: ethanol < gasoline
  - National campaign promoting ethanol (soft steering)
- **US has not made adequate investments in infrastructure – less effect of price regulation**
  - 1000 outlets in 2005 (US)
  - Nationwide distribution system 1980 (Brazil)
- **Technical development affected only indirectly (agriculture – ethanol)**

Results (3)

- Public procurement is instrumental in creating new markets involving “semi-radical” innovations as ethanol or renewable energy in general
- But, supply-side policy and especially investments in infrastructure are vital for its effect

Further Work

- **Project Level – there are several opportunities**
- **Sectoral National Systems of Innovation approach**
  - Drivers of innovation
  - Transformation of development trajectory
- **Resource-based development path possible?**
  - Global value chains
  - Learning, upgrading and innovation
  - Linkages effects and knowledge spill-over
- **Biofuel as the core of a “development bloc”**
  - Synergy effects and structural tensions

Further Work (2)

- Next step: explorative study of the sector including visit to Brazil
- Expectation: knowledge feedback to my theoretical insights
- Base for formulation more precise research questions