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
- Description 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 ”successful”?
- 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
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% ← led by 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)
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