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# Environmental and Resource Economics, Environmental Management

- Innovation and Sustainable Development
- Energy Economics
- Transport and Mobility
- International Environmental and Resource Policies
- Macroeconomic Analysis of Environmentally Relevant Policies

# **Are there any first mover advantages for pioneering countries on environmental markets ? From national lead market to lead supplier strategies**

Dr. Klaus Rennings  
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Lecture Bocconi University, Milano, June 2014

# Lead Market Strategies

## First Mover, Early Follower and Late Follower

Project within the Research Programme “Economics for Sustainability”  
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# Website: [www.zew.de/leadmarkets](http://www.zew.de/leadmarkets)

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Suchen

**LEAD MARKET**

English

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Sie befinden sich hier: Startseite


**Startseite**


Die globale Diffusion von Umweltinnovationen

Eine nachhaltige Entwicklung kann nur mit weit reichenden Umweltinnovationen und ihrer raschen internationalen Penetration erreicht werden. Entscheidend hierbei ist die Entwicklung und Ausweitung von Lead Markets, auf denen die Erfahrungen gesammelt werden, auf deren Basis technologisches Lernen rasch ablaufen und damit auch die internationale Diffusion beschleunigt werden kann. Inzwischen bereiten sich auch Schwellenländer darauf vor, technologische Führerschaft zu übernehmen.

Vor diesem Hintergrund müssen sich Volkswirtschaften strategisch positionieren. Die globalen Zusammenhänge erfordern es, Lead Market Potentiale nicht nur für Länder wie Deutschland oder für Staatengemeinschaften wie die EU aufzuzeigen, sondern auch die spezifischen Interessenlagen von nach- und überholenden Volkswirtschaften zu integrieren. In diesem Kontext müssen auch alternative Strategieoptionen zu einem First Moving geprüft werden, die bislang in der politischen Diskussion vernachlässigt wurden. So hat auch Deutschland in der Windenergie nicht als First Mover, sondern als Early Follower angefangen, um dann

GEFÖRDERT VOM

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# Environmental Innovation and Societal Transitions

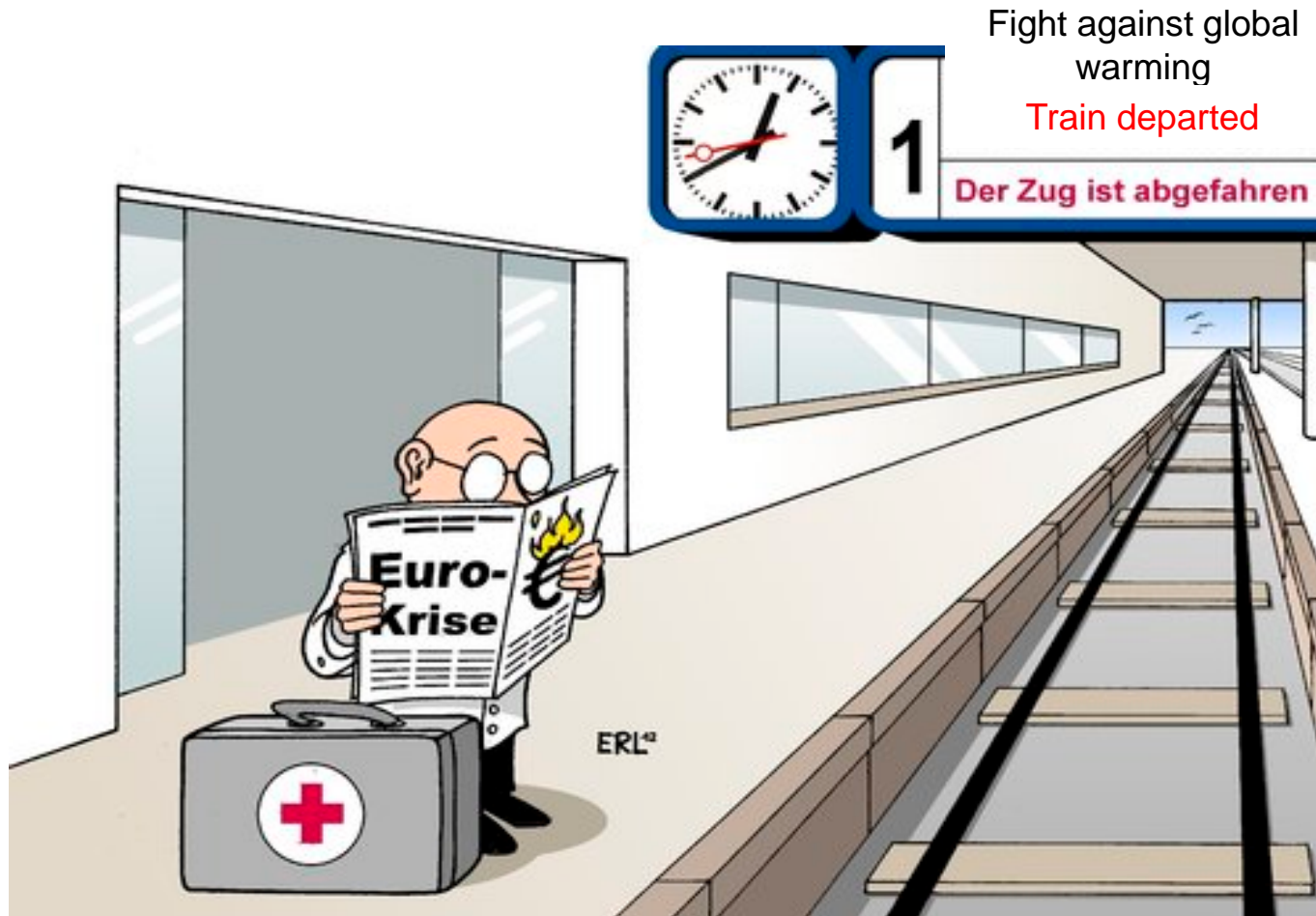
journal homepage: [www.elsevier.com/locate](http://www.elsevier.com/locate)

Editorial

## Introduction: Global diffusion of environmental innovations



# International Climate Negotiations: Disillusioning Result Regarding Economic- Environmental Trade Offs





# First Mover Advantages are Justification for Pioneering Role



“The Union should lead the global efforts to tackle climate change. And European industries should continue to be world leaders.

At the same time, we will also create new markets and new jobs, and make sure that we have the "first mover advantage" in many sectors.”

José Manuel Durão Barroso, 2008

# First Mover Advantages are being used for Law Justification. In Renewable Energy Sources Act (EEG):



„Through the diverse measures of funding renewable energies a strong-selling market has developed(...) Companies profit therefrom on every value added step: from the steel industry over machinery construction to plant construction, but also agriculture and forestry, craft sector and service provider. The so called “first-mover-advantages” for the usage of renewable energies with modern technologies already pay off for Germany in its exports.“

„The first person  
to try crabs”



# Motivation

Cost-benefit analysis of markets for environmental technologies:

Are they in fact all profitable?

What does business management literature tell us about 1st and 2nd mover advantages?

How to translate results to level of national strategies?

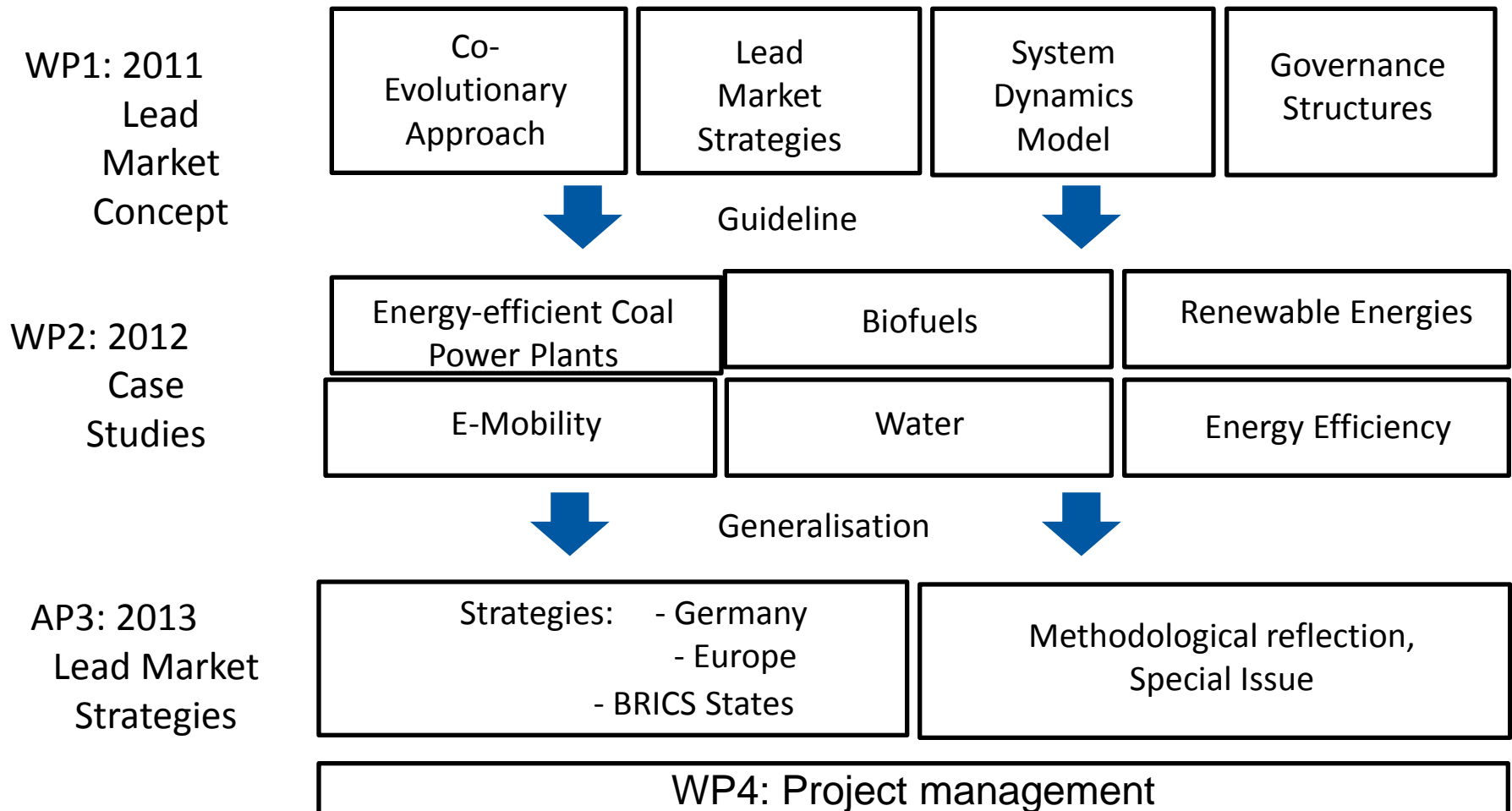
How does a first mover strategy fit to newly industrialised countries such as China and India?

Early Follower or Late Follower strategy more reasonable?

What are realistic strategies regarding Lead Markets for Germany, Europe and China?

# Project on Lead Market Strategies

## WP Inter- and Transdisciplinary Co-ordination



# Structure of this talk

1. Discussion of the Lead Market Concept
2. Review of 1st and 2nd Mover Literature and Policy Strategies
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# Definition Lead Markets

Business Management Literature (Bartlett & Goshal, 1990): Largest, most competitive market

Meyer-Krahmer 1997, Meyer-Krahmer and Reger (1999):

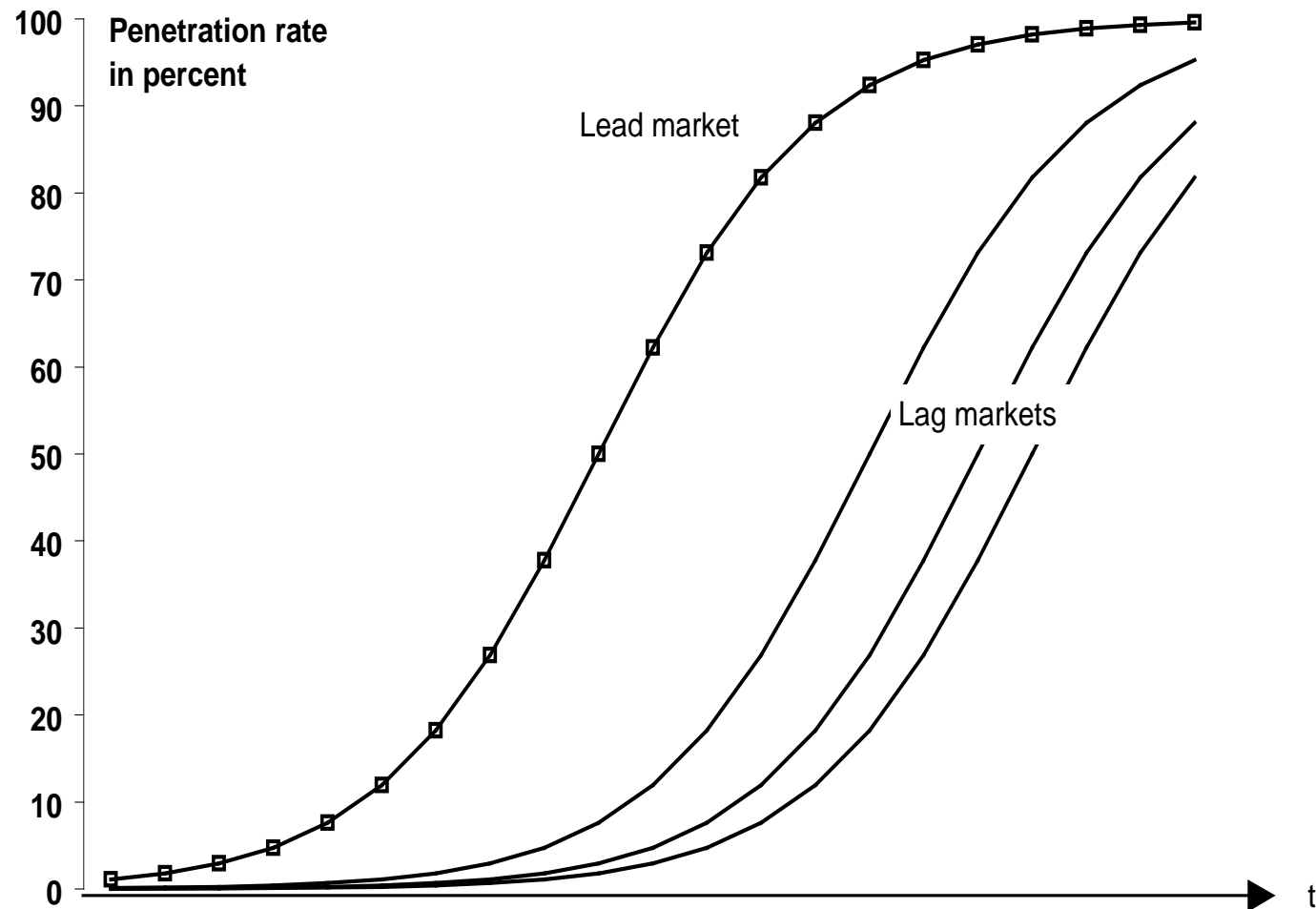
Empirical Observation = Lead Market is a market with innovation-oriented regulation, favourable mix of demand (lead users) and supply conditions (capabilities)

➤ No theoretical foundation

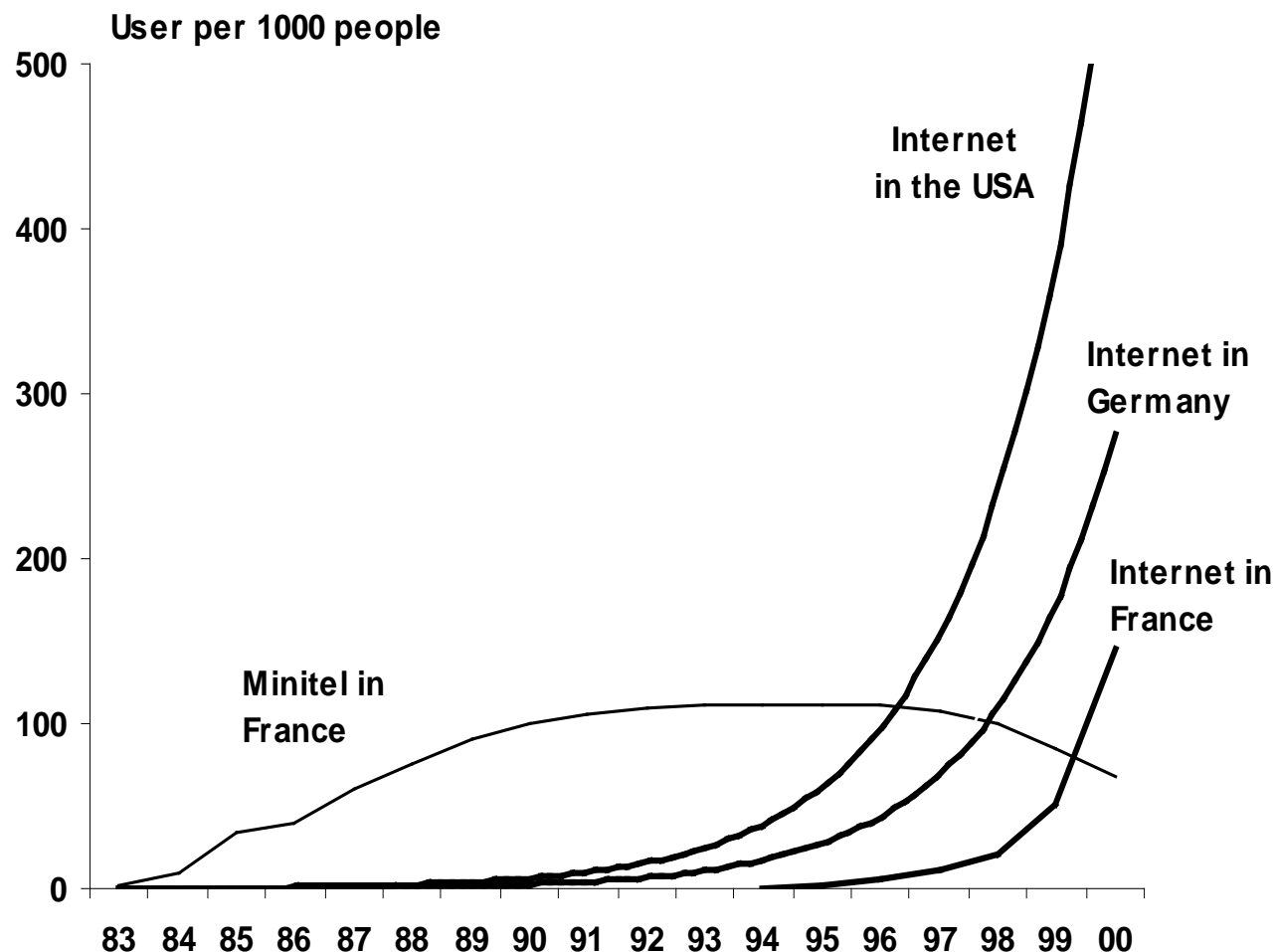
Demand-oriented concept Beise (2001, 2004): A **Lead-Market** is a ...

- ... **regional market**,
- where certain innovations are **early adopted**.
- The innovations design which is preferred in the lead-market is adopted by other countries and dominates other designs which were preferred by the other countries before. The lead market creates the “**globally dominant design**”.

# Pattern of the International Diffusion of Innovations



# Lead market factor: existence of competing innovation designs



# Crucial element of the concept: „innovation design“

An innovation design is ...

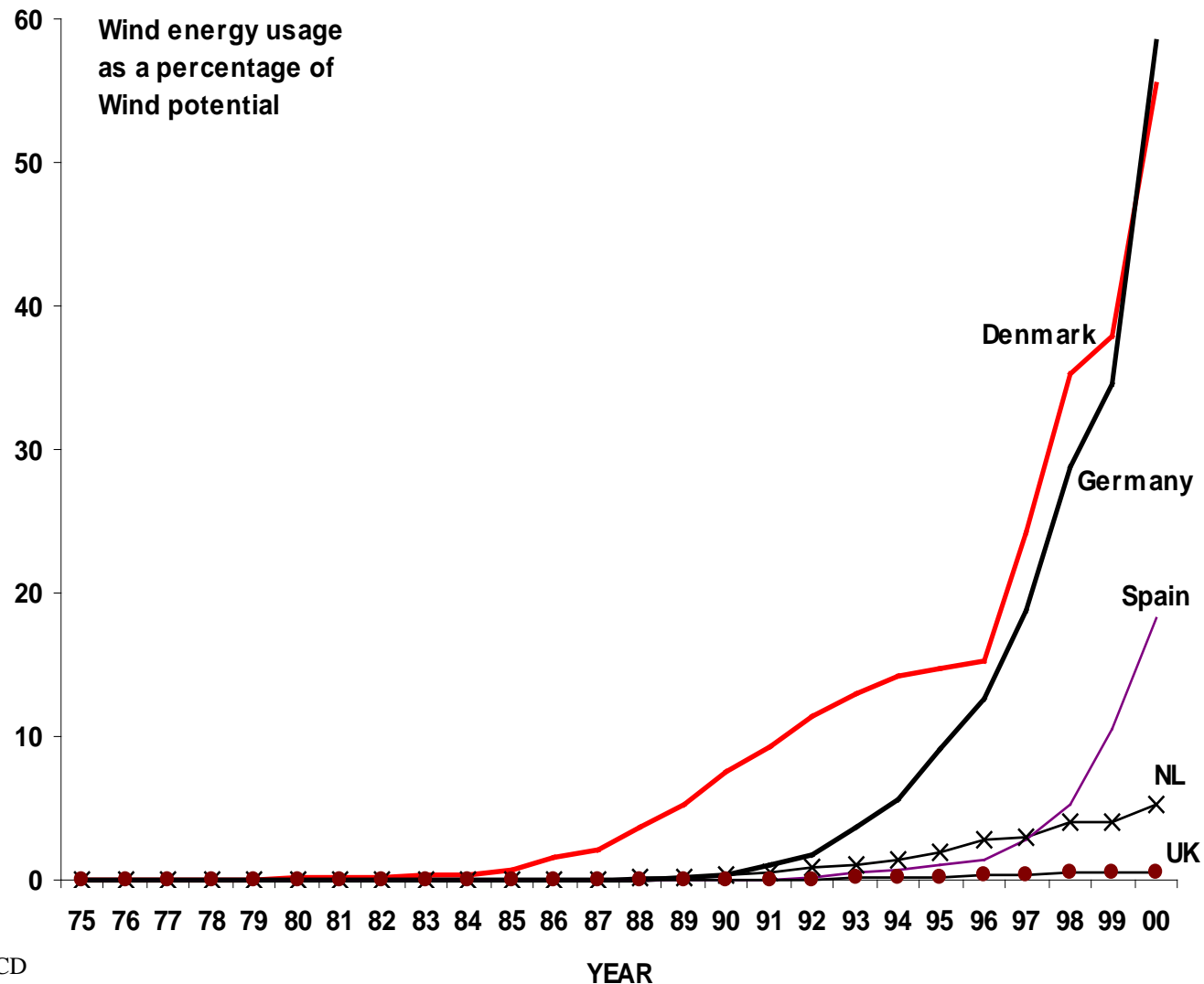
- A technical specification of an innovation idea
- a certain number of product attributes
- a technical standard

Question of „Picking Winners“:

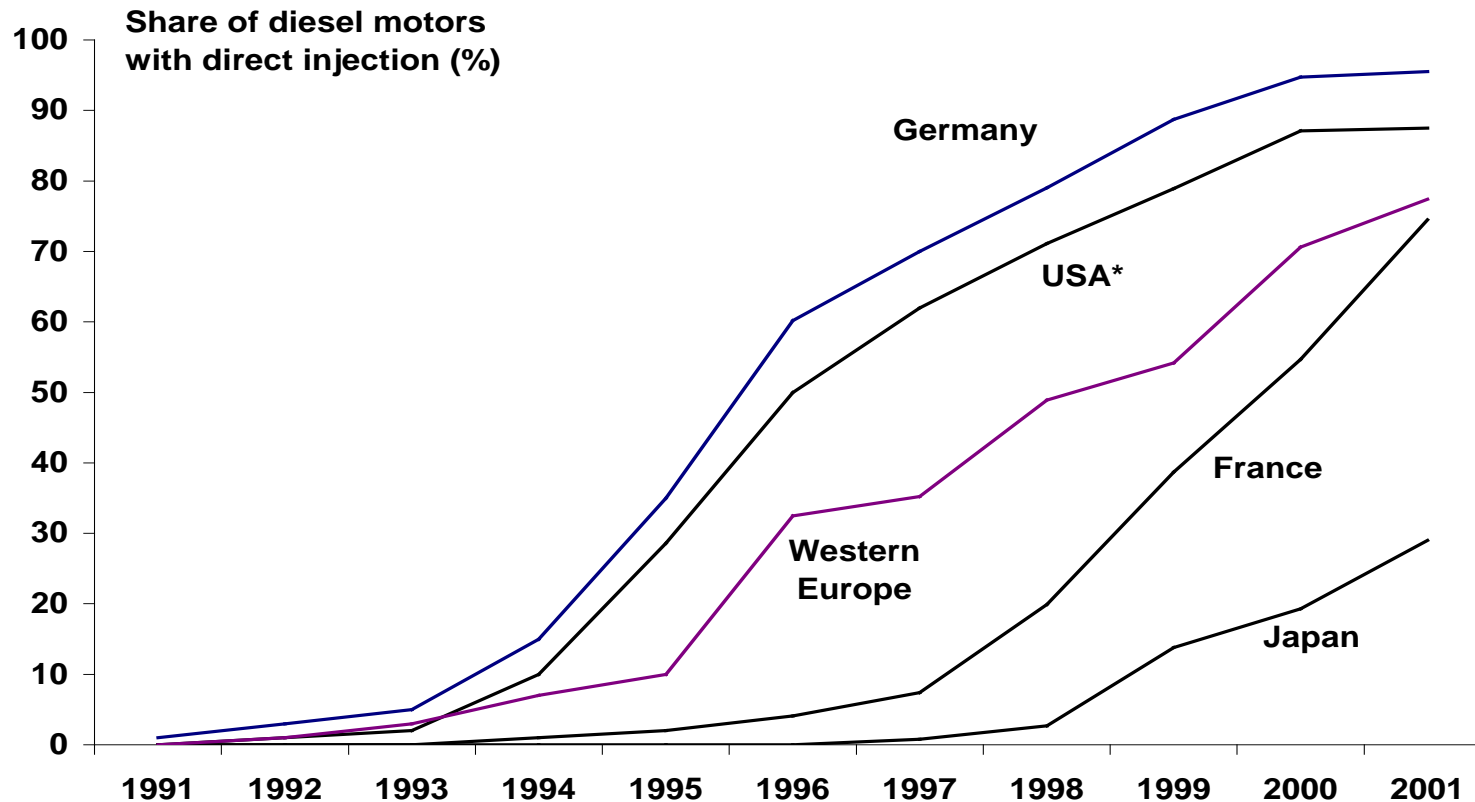
- Open question: only applicable for radical product innovations?
- Globally dominant design or idiosyncratic local/regional design?

# The Process: Invention - Market Introduction - Diffusion

Diffusion of wind energy: depends crucially on regulation



# Scaling up these market niches from a niche to a mass market for pioneers or early followers (lead market approach)



Source: ZEW, Bosch

\* USA: predominantly light trucks

# First Mover Advantage

Simplified requirements:

- International regulation trend, e.g. decarbonization, provides sustaining growth perspectives on corresponding environmental markets
- Lead market has comparative advantages, in other words it has an advantage in technology
- Positive feedback – processes between political regulation, environmental markets and innovation



# Lead Markt Factors



# Lead Market Factors in General:

- Price advantage
  - Learning curves, economies of scope, economies of scale
- Demand advantage
- Transfer advantage
  - Demonstration effect: perceived benefits of innovation especially high for countries with strong communication ties
- Export advantage
  - e.g. similarity of market conditions, experiences
- Market structure advantage:
  - Competitive market

## Additional Factor for Environmental Innovations:

- Regulation advantage:
  - Due to double externality regulation is an important determinant of innovation
  - Peculiarity of eco-innovations: Regulatory Push/Pull effect (Rennings, 2000)

# Lead Markets – a Mid Summer Fairy Tale?



„A lead market is like a country that has being selected to host the world cup. Because of the **home market advantage** the local team has a better chance of winning.“

European Competitiveness Report (2006)

# Eco-Innovation Policy not only Environmental Policy, but Strategic Element of Industrial Policy

- Germany (2006): High Tech Strategy
- Eco-Innovation Action Plan (EC 2010)
- Europe 20-20-20 Strategy ( EC 2010): Maintain Leadership in Green Technologies
- UNEP (2012): China Nr. 1 in Renewable Energy Investment
- Ernst and Young (2012): China Nr. 1 in Renewable Energy Attractiveness Index
- Climate Group (2011): China promotes Strategic Emerging Low-carbon Industries

# Germany (2008): Masterplan Environmental Technology



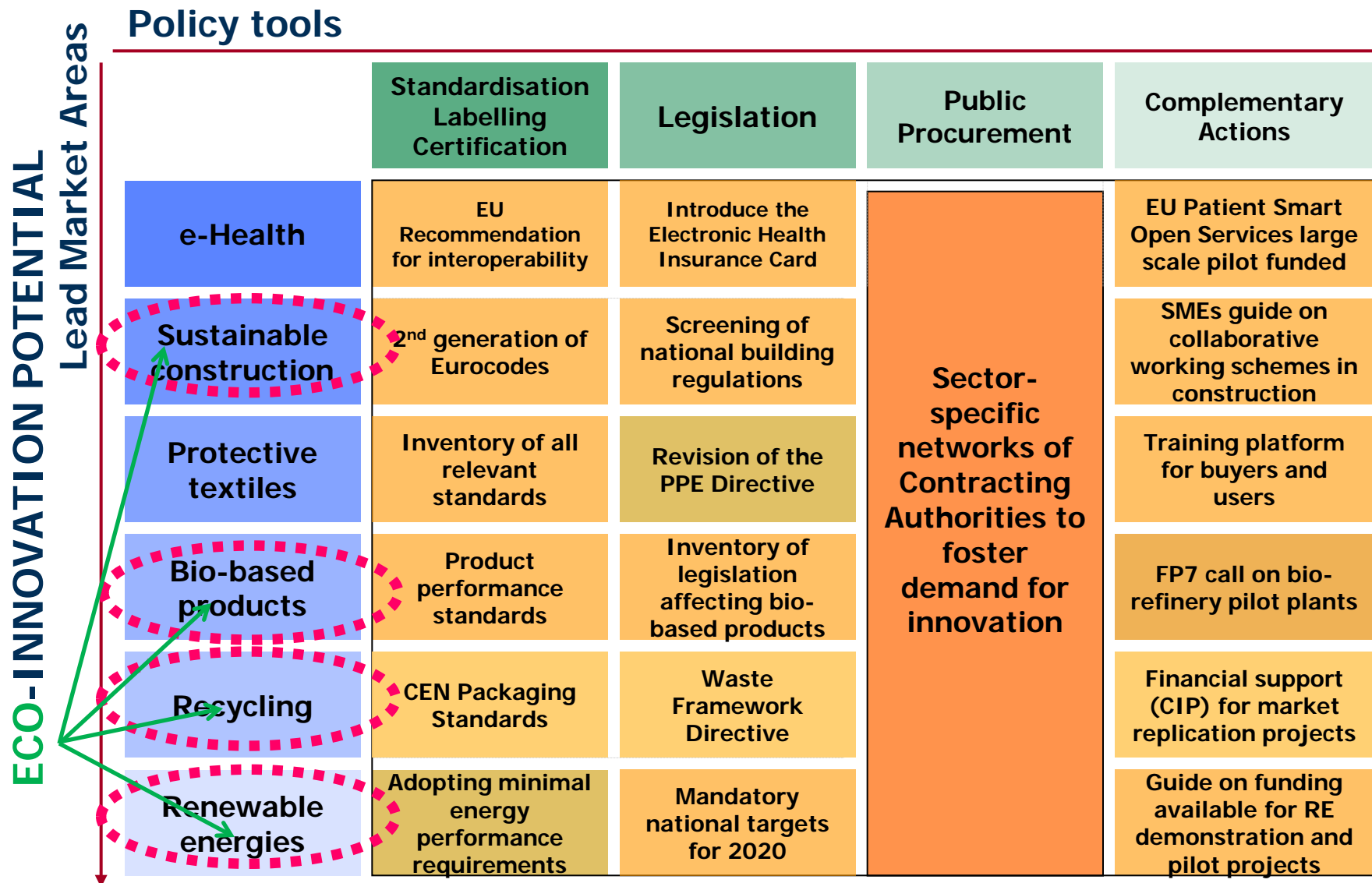
„An enhanced introduction and diffusion of climate friendly technologies  
Will lead to an early specialisation in the field of innovative technologies  
And to an improvement of competitiveness („first-mover-davantages“).“

BMU, 2008, translated

## Current European innovation policies, focus on: the Lead Market Initiative and Innovation Union

- From research & development policies, to innovation policies
- Lisbon strategy (2000) and its revision: the Broad-Based strategy (2006)
- Aho's report (2006) and the demand side policy approach
- i.e. the Lead Market Initiative (2008-2011)  
*Market and societal driven more than technology push...*

# European innovation policies: Lead Market Initiative



**Running activities in 2010**



# Current European innovation policies: the Lead Market Initiative is mainly an issue of policy co-ordination

## Complementing supply-side innovation policy

### Demand-side measures

- Regulation
- Procurement
- Standardisation
- Clusters...

Package  
= LMI

- R&D funding
- Equity support
- Fiscal measures
- Grants, loans
- Trainings, brokerage
- ...

### Supply-side measures

# Critical review of the lead market concept

1. Applicability „dominant design“?
  - Only for mass markets, consumer products, radical innovations?
  - Several dominant designs on different levels, different levels, depending on speed of innovation cycles?

# Critical review of the lead market concept 2

## 2. Regulatory Advantage

- Referring only to single instruments such as Feed-in-Tariff
- Kick-off policies e.g. regarding Solar in Germany, but not Sustainable Dominant Design (Switches to Countries with more favourable Conditions Regarding Climate and Labour Costs)
- Complexity of regulatory framework
- Broader policy mix

# Critical review of the lead market concept 3

## 2. Role of Supply-Side-Dynamics

- Ignored in Lead Market Concept Beise
- Concept against Supply-Bias in the 90ies?
- Technological Capabilities (Dosi, Soete, Fagerberg) remain highly relevant for Innovation Policy
- Tiwari/Herstatt (2012) have introduced the „Technology Advantage“ in case studies for India

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# 1st Mover Advantages

- **Technological leadership**  
due to a quick fall of costs down a learning or experience curve (Lieberman, 1987) or a success in R&D or patent races (Mansfield, 1986)
- **IPRs**  
When IPRs are well-specified and protected, a firm gains competitive advantage through patenting or copyright, or as a trade secret. Mansfield (1985) has however found that successful protection of IPRs against imitation by other firms is a rare case.
- **Preemption of physical, or spatial assets**  
such as skilled workers, unique channels of distribution or manufacturing facilities. It is a seldom the case however that such assets are completely appropriated by a single firm (Lieberman and Montgomery, 1988).
- **Buyer switching costs**  
For example, the success of the Qwerty keyboard can be explained by the fact that consumers are unwilling to learn another system, although it may be superior for modern laptops and computers. As long as they are happy with the Qwerty system, and find it expensive to switch in terms of money, learning costs, it has an advantages over later movers.
- Only technological leadership – if at all - is restricted to a single firm. And in the case of technological leadership it depends on the existence and protection of IPRs, and on the time potential imitators need to find ways around the restriction.

# 2nd Mover Advantages

- **Free-riding on first mover investments**  
This is possible due to the positive spillover of the first mover, especially when IPRs are not well-defined and specified. Many products and services can be easily and inexpensively imitated. In many cases also second movers can profit from improvements of the first mover regarding the learning and experience curve (Lieberman, 1987).
- **Developments of technology or customer needs which arise after the introduction**  
They may be overlooked by the first mover due to incumbent inertia. This argument is taken up by Markides and Geroski (2005) who argue that a first mover is colonizing the product and has typically has a different (engineering) mindset, while a fast second firm with an focus on focuses on consolidation from niche to mass markets.
- **Leapfrogging**  
One main advantage for second movers is leapfrogging (Fudenberg et al., 1983), i.e. catching up to the first mover in fast, big or even giant steps (Hilton, 2001) due to reduced market, technological and regulatory uncertainty.
- No indication in the literature that second mover advantages may be limited to a single firm



# Literature Review: Business Management

- **Main message: Successful innovator is not necessarily the first but very often one of the early movers within the competition of different innovation designs**
- There are mainly empirical studies based on correlation or regression analysis
- Inconsistent in the choice of factors, which are finally responsible for the development of successful global designs.

Results of the empirical studies range from

- „Luck“, to
- leading time and type of innovation (Min/Kalwani/Robinson 2006) and
- technological leadership, preemption of assets and buyer switching costs (Lieberman/Montgomery, 1988) to
- industry, firm and product-specific factors (Gilbert/Birnbaum-More 1996)

# Correlation directions between actors and timing advantages

Level	Factor	Correlation with	
		1 <sup>st</sup> Mover Advantage	2 <sup>nd</sup> Mover Advantage
Industry/ Technology	Degree of fragmentation	+	-
	Velocity of innovation	+	-
	Rate of innovation diffusion	-	+
Product/ Service	Connection to technological infrastructure	+	+
	Degree of novelty	-	+
	Difficulty of production/complexity of technology	-	+
	Customer resources invested (lock in)/switching costs	+	-
Firm Strategy	Cost leadership	-	+
	Differentiation	+	-
	Core Competence	+	+

Source: According to Gilbert and Birnbaum-More (1996)

# Innovation Phases: Product vs. Market Creation (Markides/Geroski 2005)

Early innovation phases:

Product creation

- Overcoming technological lock ins by experimenting (transition management) and creating market niches for pioneers
- E.g. market for E-Mobility

Later innovation phases:

Market creation

- Scaling up these market niches from a niche to a mass market for pioneers or early followers (lead market approach)
- E.g. market for wind energy

# Lead Market Strategies for Environmental Innovations

	Early Mover		Late Mover
Timing strategy	First Mover (Pioneer)	Fast Second (Early Follower)	Second Mover (Late Follower)
Main role	Product creation	Creation Dominant Design	Imitation, Me-too-product
Market	Niche	Mass Market	
Leapfrogging	No	Big steps	Giant steps
Competition factor	Technology	Economic competence (costs, quality)	
Innovation pressure	High		Low
Lead Market Potential	High		Low
Examples China	E-Mobility		Energy Efficiency, Wind, Solar, Clean Coal

# Literature Review: Innovation & Environmental Economics Literature

- Anecdotal evidence on lead market patterns
- “Successful” designs are those which
  - firstly enjoy early national success,
  - are then successfully commercialised worldwide and
  - force other innovation designs out of the market in the medium term, to become the global design or the world standard respectively.
- Examples:  
cellular mobile telephony in the Scandinavian countries, the personal computer in the USA, the industrial robot or the fax machine in Japan, the airbag in Germany and the smart card in France (see e.g. Beise 2001, Beise 2006 and Beise/Cleff 2003)
- First country that adopts a specific design becoming the global dominant design is often not the country where the innovation was invented or the technology used for it mostly developed. On the contrary it is often another country that is leading the worldwide adoption of an innovation: This country can be called the Lead Market.

# Literature Review: Innovation & Environmental Economics Literature

Lead market patterns exist

Ingredients:

- Lead Market Factors

Country specific R&D profile (for BRICS z.B. Walz et al. 2008):

- F&E intensity
- Importance sustainability
- Human resources
- Investment risk
- Level of socio-economic research
- Activities in sustainability research

Criteria for Lead Markets:

- Development of innovation cluster which can not be easily copied or transferred to other countries

# Profitability of Lead Markets?

- Porter hypothesis
- Controversial discussion in environmental economics over past decades
- Conclusion (Ambec et al., 2013): Positive innovation and competitiveness effects of regulation exist, they do however not fully compensate the costs of regulation

# Literature Review: Development Economics

- Catching up is cheap due to leapfrogging
- Since the creation of new products and processes and the development of new markets is expensive, one should reflect carefully which products and markets should be selected



# Literature Review:

## Development Economics

- Leapfrogging strategies to enter environmental markets exist:
- Hilton (2004): Giant steps phase out lead
- Watson (2011): Case studies steel industry South Korea, automotive industry South-Korea, wind energies China and India
- Industrial policy aspects also relevant in BRICS countries, e.g. Chinese support policies often only for domestic production

# Important Criterion: Success Factors Should not be Easy to Copy or Transfer

Country specific R&D profiles (for BRICS countries see Walz et al. 2008) gather among others R&D intensity, level of socio-economic research, activities in sustainability research

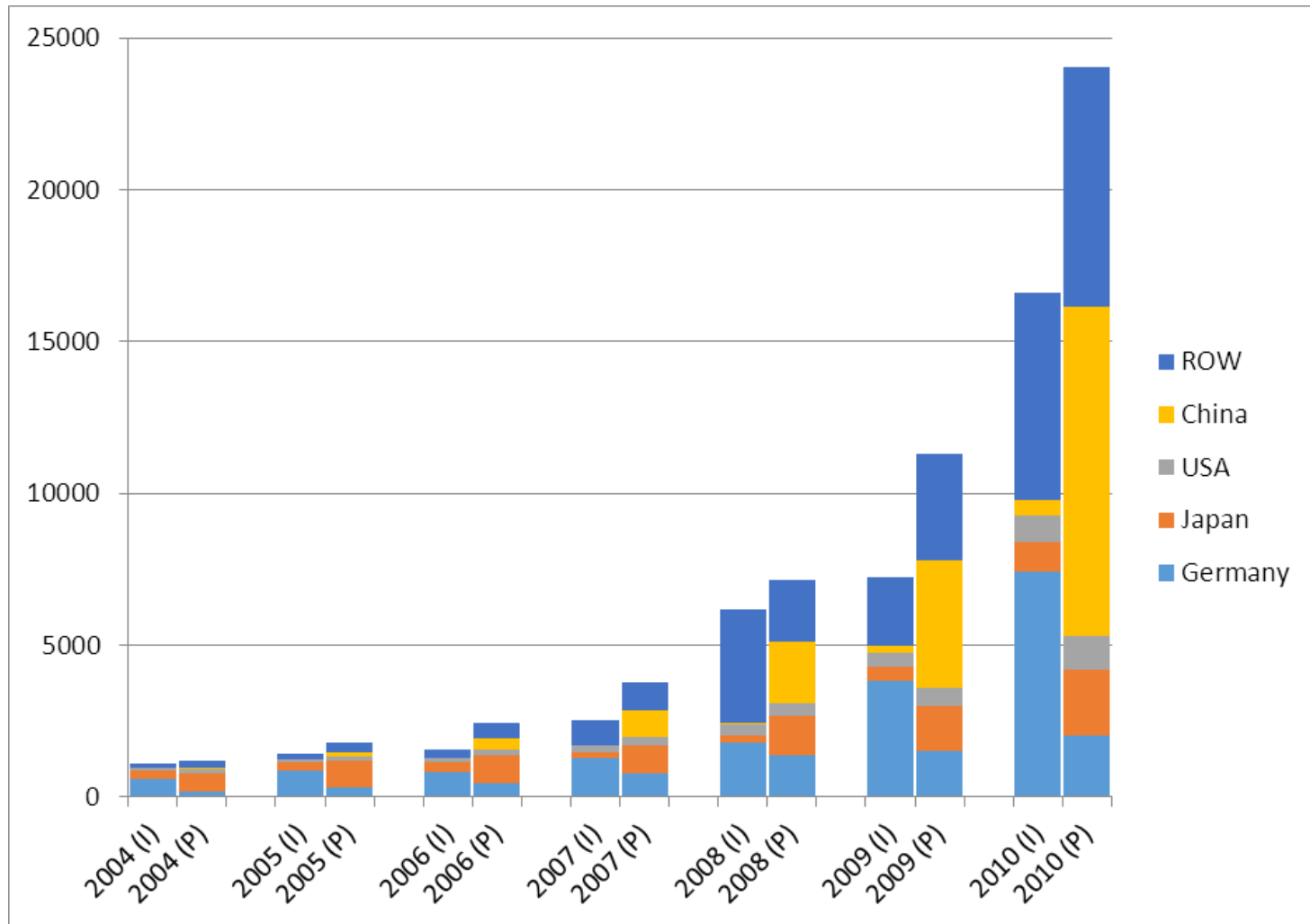
Germany:

- Lead market approach traditionally demand-orientated
- Experience with photovoltaic market: more focus on supply factors
- Used in strategy for e-mobility of the National Platform electric mobility (NPE): lead supplier and lead market
- Strong focus on supply side measures, e.g. qualification, showcase projects

Lead Market Project:

- Acquisition, measurement of lead supplier factors in addition to demand orientated factors

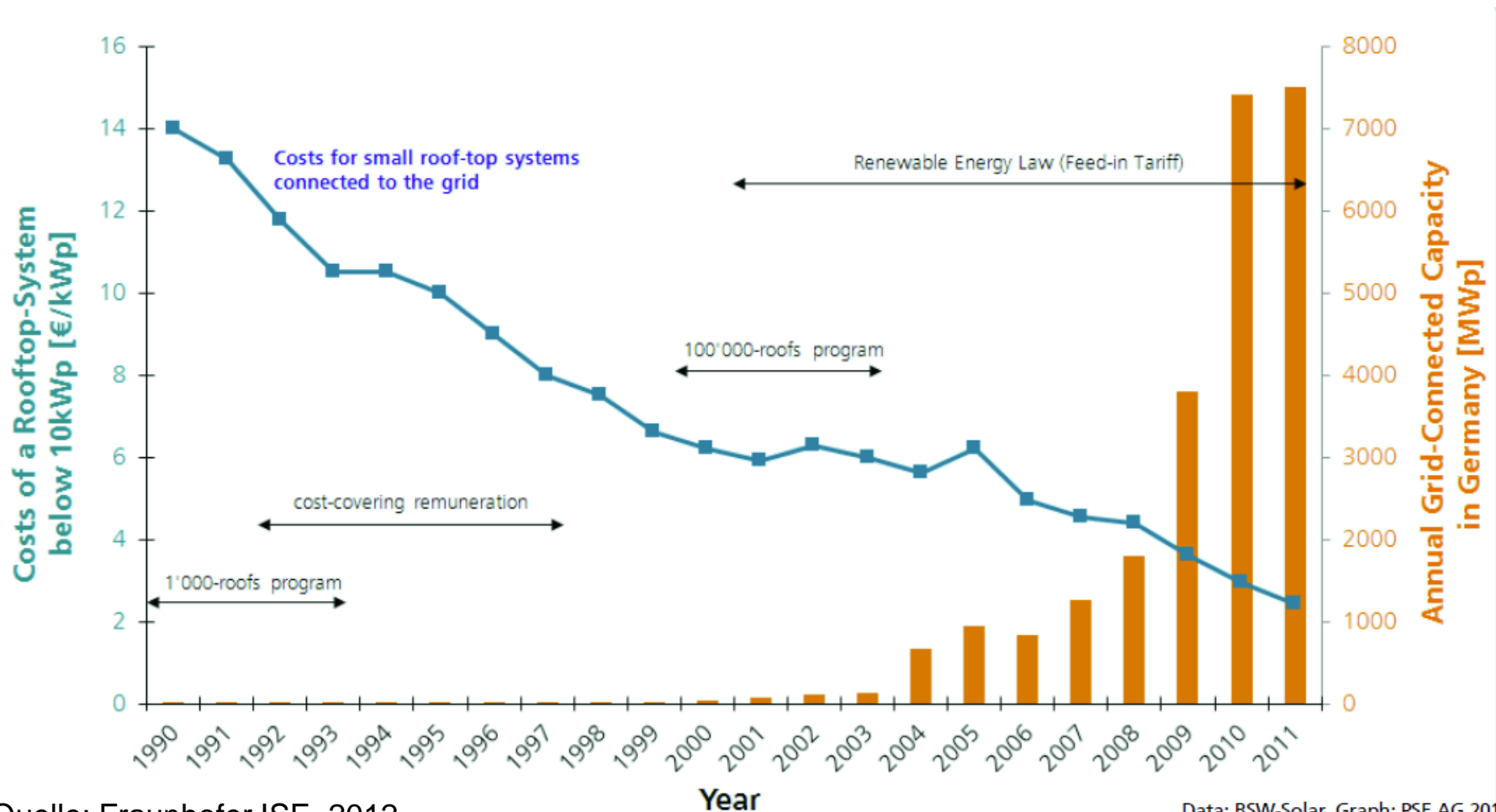
# Solar World Market: German Focus on Demand Policies



I =  
Installation  
P =  
Production

Source:  
Earth Policy  
Institute  
Database

# Solar Germany: Effective Demand Policies offer Potential for Market Entry of Chinese Firms



Quelle: Fraunhofer ISE, 2012

Data: BSW-Solar, Graph: PSE AG 2012

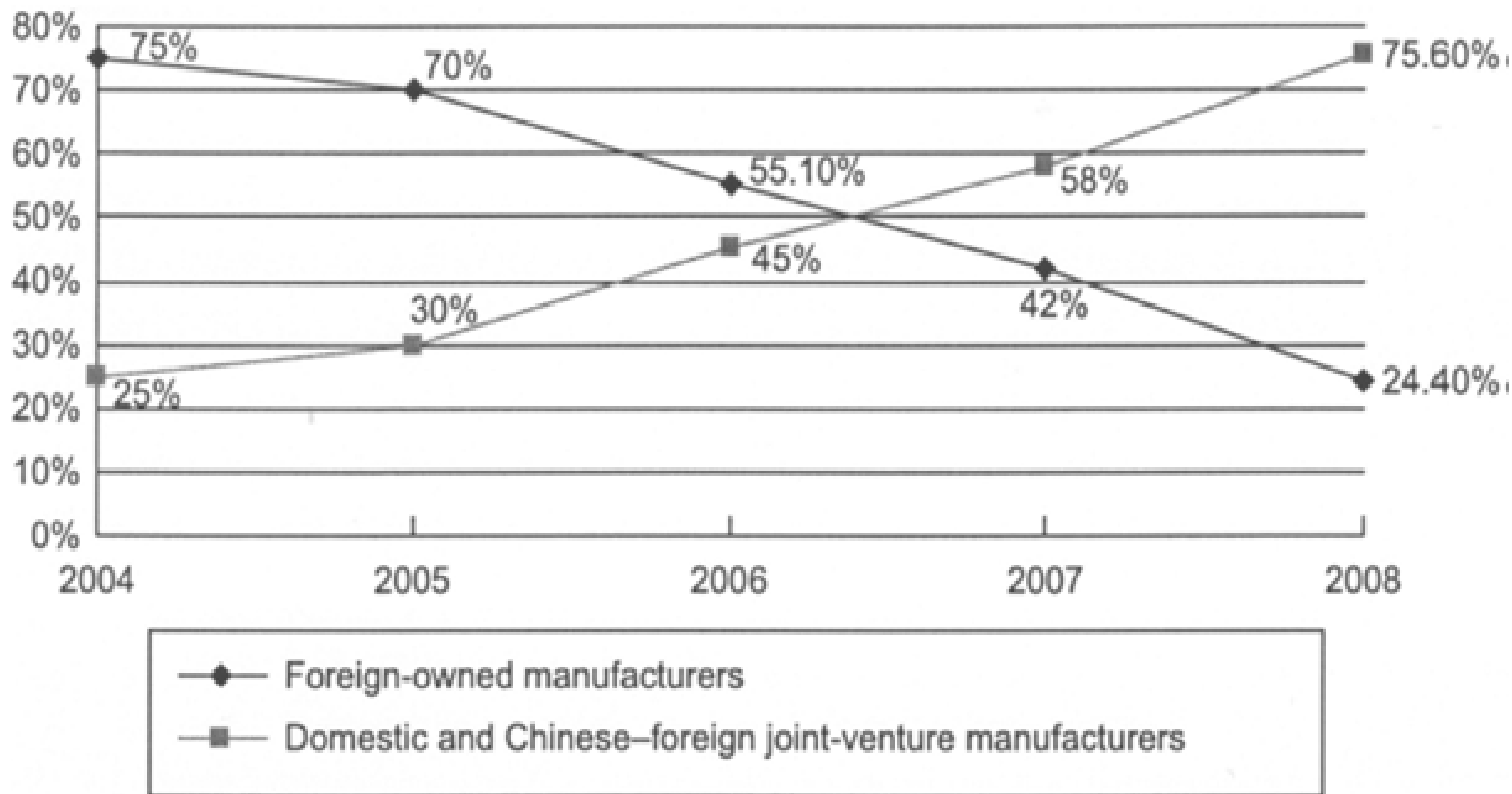
# From lead markets to lead suppliers?

Share of German photovoltaic suppliers on domestic pv market

	2000	2001	2002	2003	2004	2005	2006	2007	2008
<b>Capacity installed in MW</b>	100	178	258	408	1018	1881	2711	3811	5311
<b>Annual increase in MW</b>	-	78	80	150	610	863	830	1100	1500
<b>Annual cell production in Germany in MW</b>	16	33	54	98	187	319	530	842	1450

Source: BMU (2009) and BSW (2009), cited in Frondel et al. (2010).

# Changes in market shares in China wind energy market



Source: Zhang et al. (2009)

# Lead market not always attractive from a perspective of industrial policy

- Lessons learned from the German feed-in tariffs for renewables
- National E-Mobility Strategy takes supply factors into account
- Argues for a German lead market AND lead supplier strategy

# Lead Supplier Strategy German Platform E-Mobility

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## Technology Push Measures

- R&D programme and networking in battery, engine, lightweight, information and communication technologies, recycling and integration
- Academic and occupational qualification and education
- Harmonisation of international standards and norms

## Market Pull Measures

- Privileges of e-cars regarding parking
  - Compensation for users of company e-cars
  - Tax depreciations for firms
  - Programs from the Kreditanstalt für Wiederaufbau for private use of e-cars
  - Annual tax incentives
- 

Source: Nationale Plattform Elektromobilität (2011)



# Preliminary conclusions

- Lead Markets approach must be extended to cover also 2nd Mover strategies not only for newly industrialized countries (with large potentials for leapfrogging), but also for industrialized countries
- There seem to be at least early mover advantages
- However, late movers also profit from leapfrogging
- Selection of the appropriate strategy should be made carefully and depends on the available lead market advantages, market and technology characteristics, and on the R&D profile of a country
- To be analysed in case studies
- No literature available on switch from 2nd mover to 1st mover strategy

# Avoid market pull bias

- Avoid an unbalanced demand policy and develop also innovation capacities on the supply side
- Lead supplier strategy reasonable
- Industrial policy aspects also relevant for leapfrogging strategies in NIC
- Solar and E-Mobility Market: Attractive and increasing future markets
- Not any more the central questions whether first mover advantages exist at all
- Early mover advantages sufficient for policy makers

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# Evidence from Case Studies in General 1

- Classical (demand orientated) lead market advantages (like price, demand, regulation) are mainly noticeable for emerging countries like china
- Chances for Germany especially mainly on supply side (lead supplier, technology advantage)

# Evidence from case studies in General 2

- National level of analysis for multinational firms and alliances is not always adequate due to an internationalisation of value chains (e.g. biofuels for airplanes, e-mobility)
- But national rooms for manoeuvre exist for first mover policy (research policy, infrastructure, regulation)
- Risk of second mover Advantages for emerging countries
- What are the options for industrialised countries?

# Empirical Evidence from Case Studies in General 3

- First mover advantages exist, but not generally
- Depending on
  - examined technology
  - part of the supply chain
- First mover advantages for R&D-intensive goods
- Second mover advantages for labour-intensive goods
- Some firms follow a first mover strategy for individual technologies and a second mover strategy for other technologies
- First and second mover advantages depend on specific technology market

# Emerging Markets for green Technologies according to German Ministry of Environment

## Energy production and storage

- Power plant technologies
- Renewable energies
- Energy storage technologies
- Fuel cell technologies

## Resource and material efficiency

- Eco design
- Resource and material efficient Production processes
- Renewable resources

## Circular Economy, Waste, Recycling

- Substantial utilization/ Recycling
- Energetic/ thermal utilization
- Disposal
- Circular economy/ innovative Product creation

## Energy efficiency

- Facilities technology
- Devices
- Procedure and Production processes
- Industrial interdisciplinary technology
- Energy services

## Sustainable mobility

- Drivetrain technology
- Automotive engineering and design
- Traffic infrastructure
- Emissions reduction in traffic
- Traffic concepts/management
- Bio fuels

## Sustainable water economy

- Water supply
- Reduction of water consumption and furnish
- Effluent disposal
- Flood protection
- Water economy services

# Lead markets for clean coal technologies

-

## A case study for China, Germany, Japan and the USA

### Authors:

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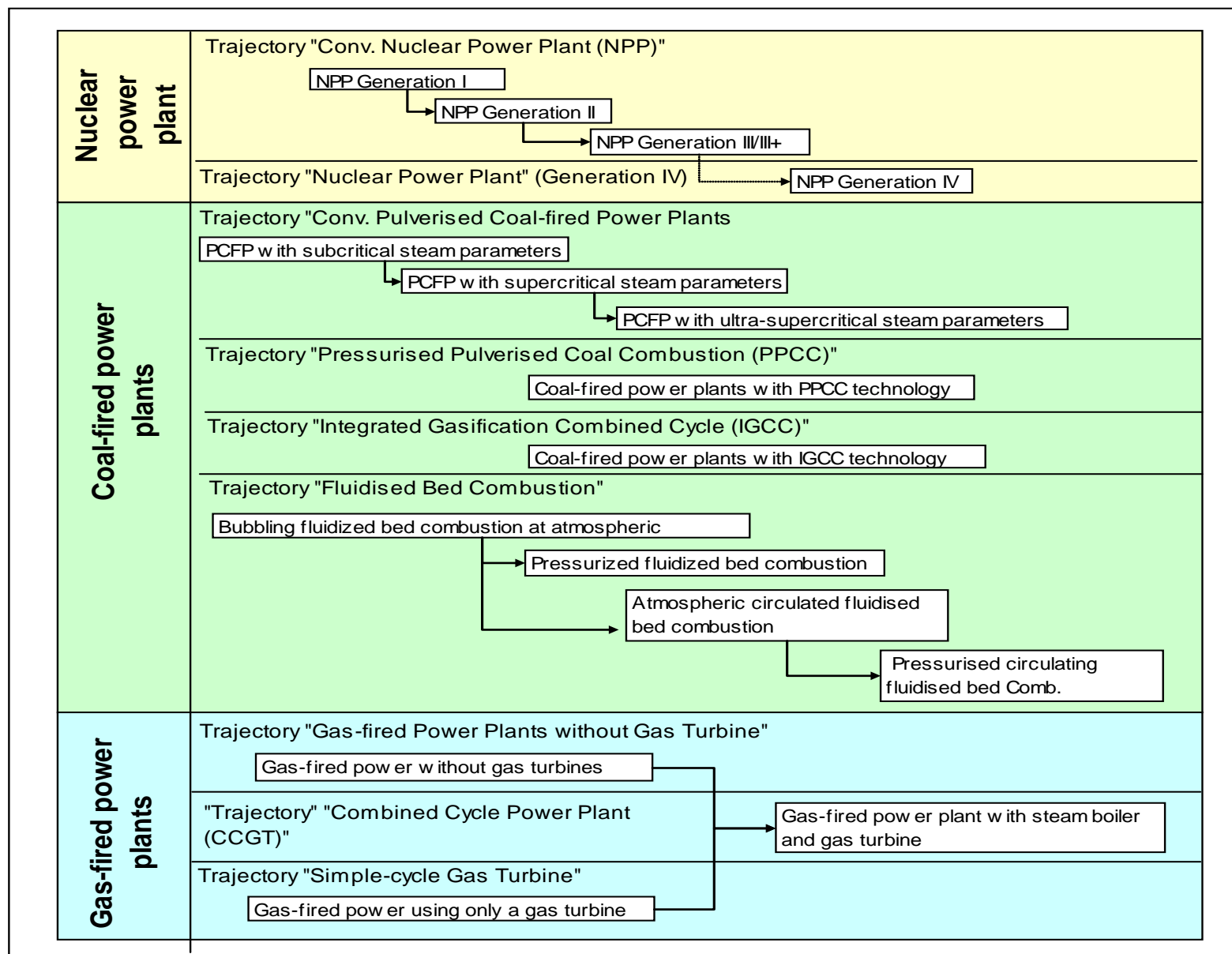
Stefan Vögele, Forschungszentrum Jülich (FZJ)



# Motivation und Targets

- Relevance: Coal is a substantial energy source, even in future especially for emerging countries
- Controversies towards coal as energy source during climate change
- Germany compiled lead market potentials on the market of coal technologies in the past decades through incremental innovations
- Does a lead market in a “traditional” technology switch into an emerging country with high market growth or does the innovation advantage remain in developed countries?

# Key technological trajectories in power plant technology



## **Besides an overview of all relevant technologies we analyze the diffusion of the following technologies:**

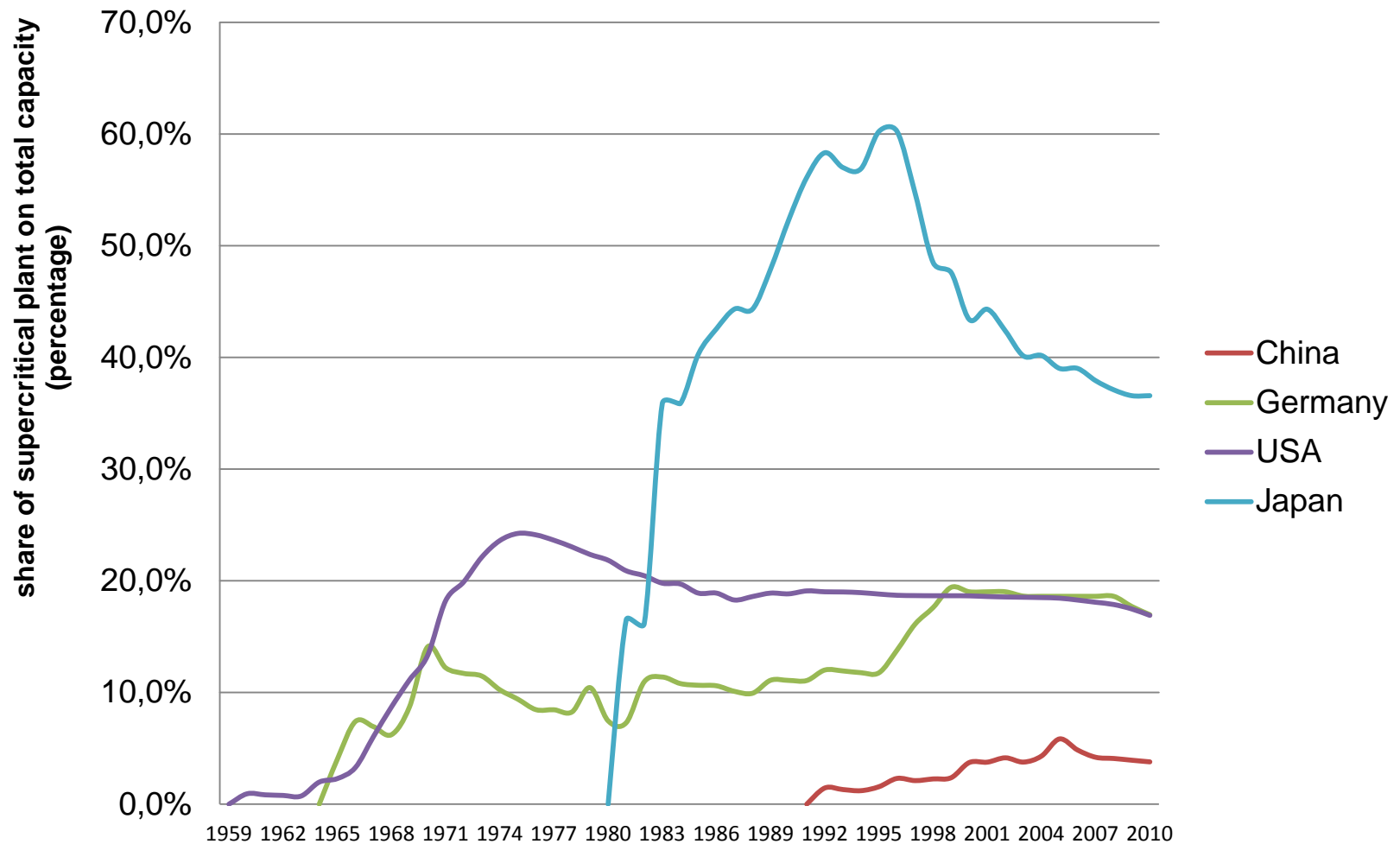
- Most important trajectory is the pulverized bed combustion (PC) with a share of 90% of coal-fired capacity worldwide
- Different steam conditions: Subcritical (about 540° C), supercritical (between 540° C and 600° C) and ultra-supercritical (more than 600° C)
- Ultra-supercritical technologies may achieve an efficiency of 50% compared to supercritical technologies (40%-43%)

## Data and Method

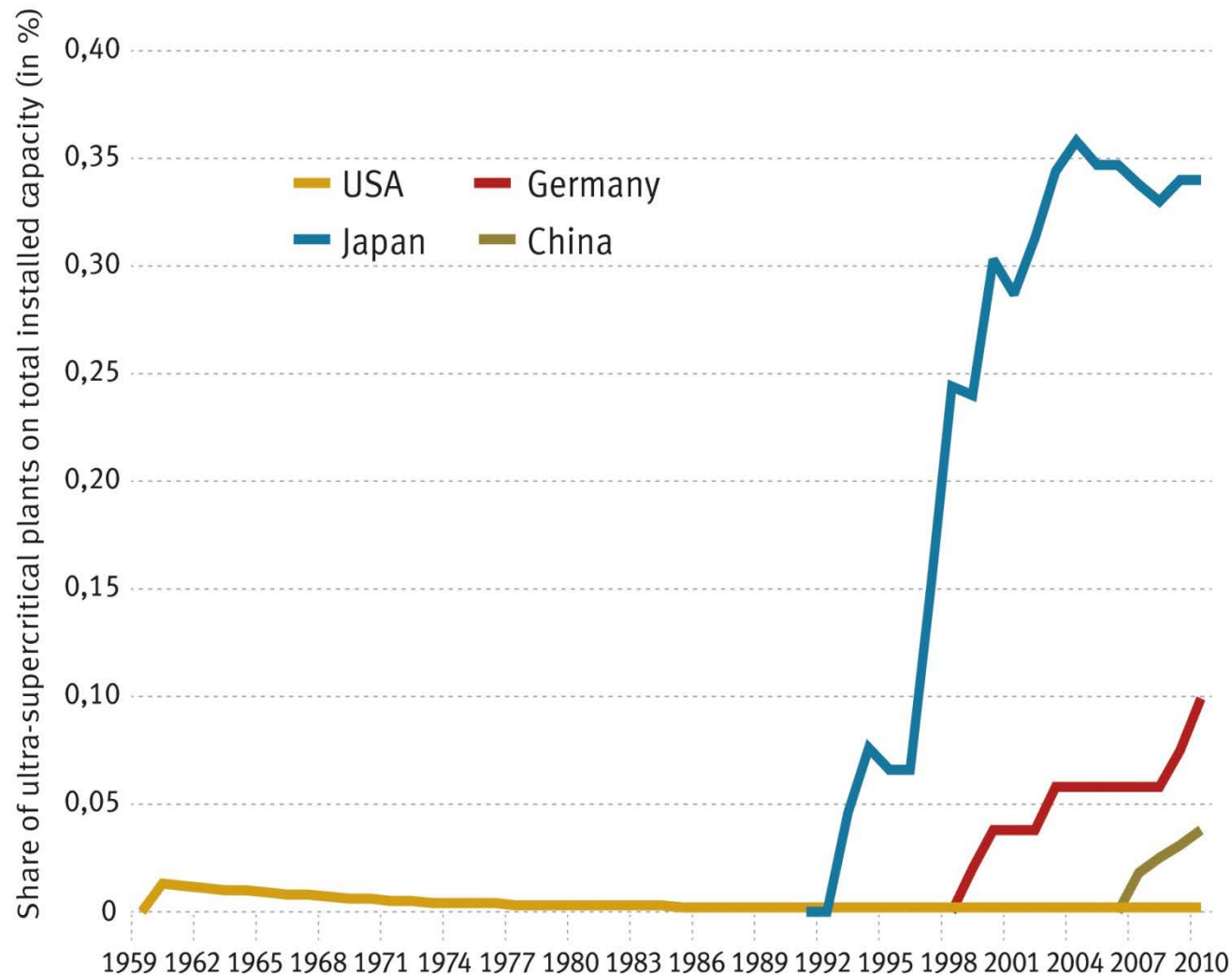
- Ex-post-case-study: long term observation possible
- Analysis of technologies pulverized firing
- Data available: Clean Coal Database (IEA - International Energy Agency)
- Validation through company interviews: lead market currently stable, but permanently questionable

# Diffusion Curves of Coal-fired Power Plants

## Diffusion of supercritical coal-fired power plants



# Ausbreitung ultra-superkritischer Kohlekraftwerke



Quelle: Eigene Berechnungen nach Internationaler Energieagentur (2011)

# Results

Lead Market Factors	China	Germany	Japan	US
Price	++	0	0	++
Demand	++	0	0	+
Export	++	++	++	0
Transfer	0	+	++	0
Regulation	++	0	0	0
Market	0	+	0	0
Technological Capabilities	0	+	++	0

# Results

- Quantification of indicators for lead market factors:
  - Price advantage (China)
  - Demand advantage (China)
  - Exports advantage (boiler: China; turbines: Japan, Deutschland)
  - Transfer advantage (Japan)
  - Regulation advantage (China)
- Consideration of supply aspects, e.g. patents (lead supplier) (Japan)



# Selected Indicators

## a) Demand Advantage

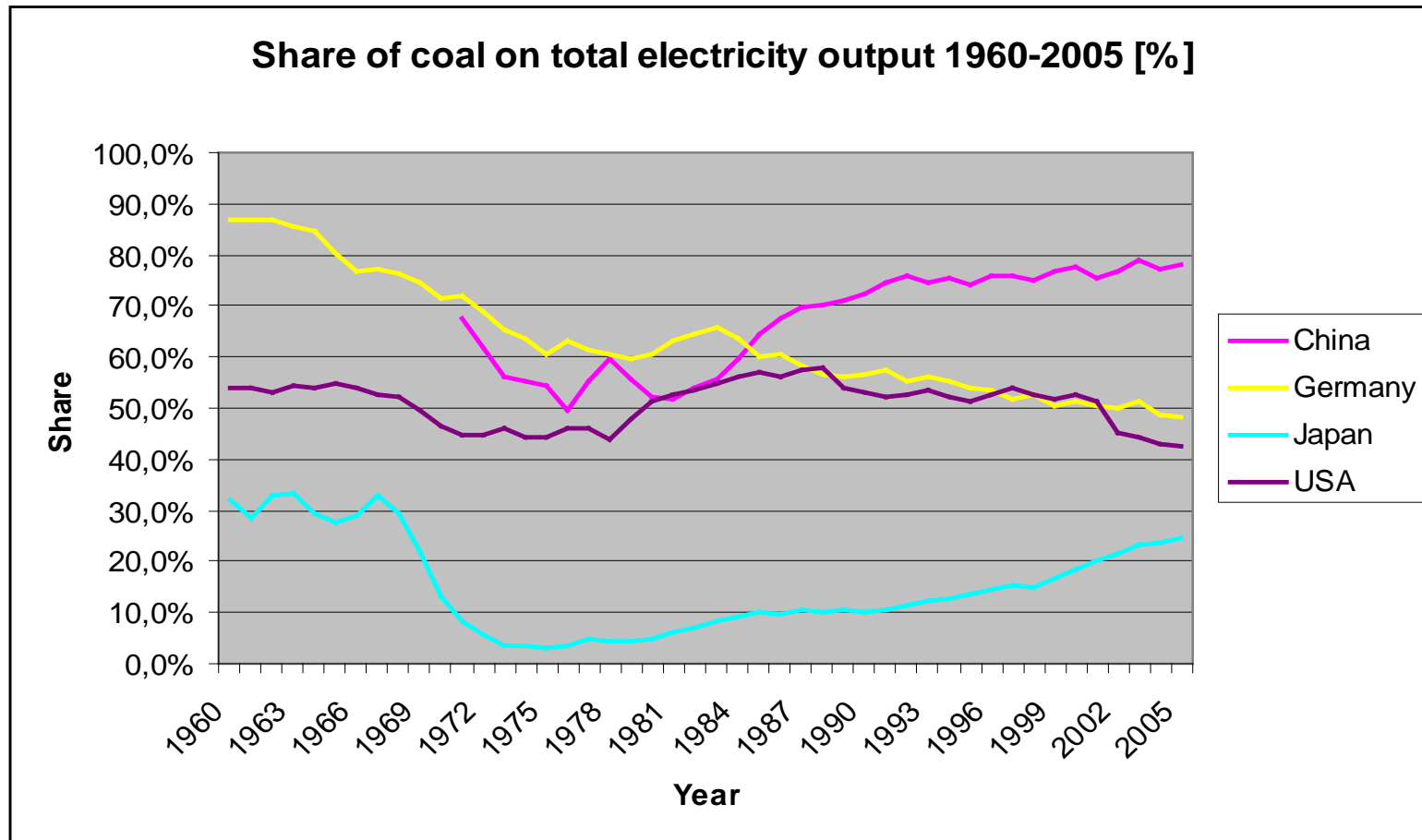
Those countries showing high electricity consumption will also show high demand for new and efficient power plants

### *Indicators*

- Total Final Electricity Consumption (TFEC)
- $\text{TFEC per capita} = \text{TFEC} / \text{population (kWh / capita*a)}$ 
  - Electricity Intensity  $\text{TFEC [kWh] / GDP [US\$]}$ 
    - Share of coal
  - Average age of coal power plants

## Relevance of Coal:

- Share of coal on total electric supply = (Electrical output of coal-fired power plants [GWh] ) / (Total electricity output of energy sector [GWh]) [%]



# Price advantage

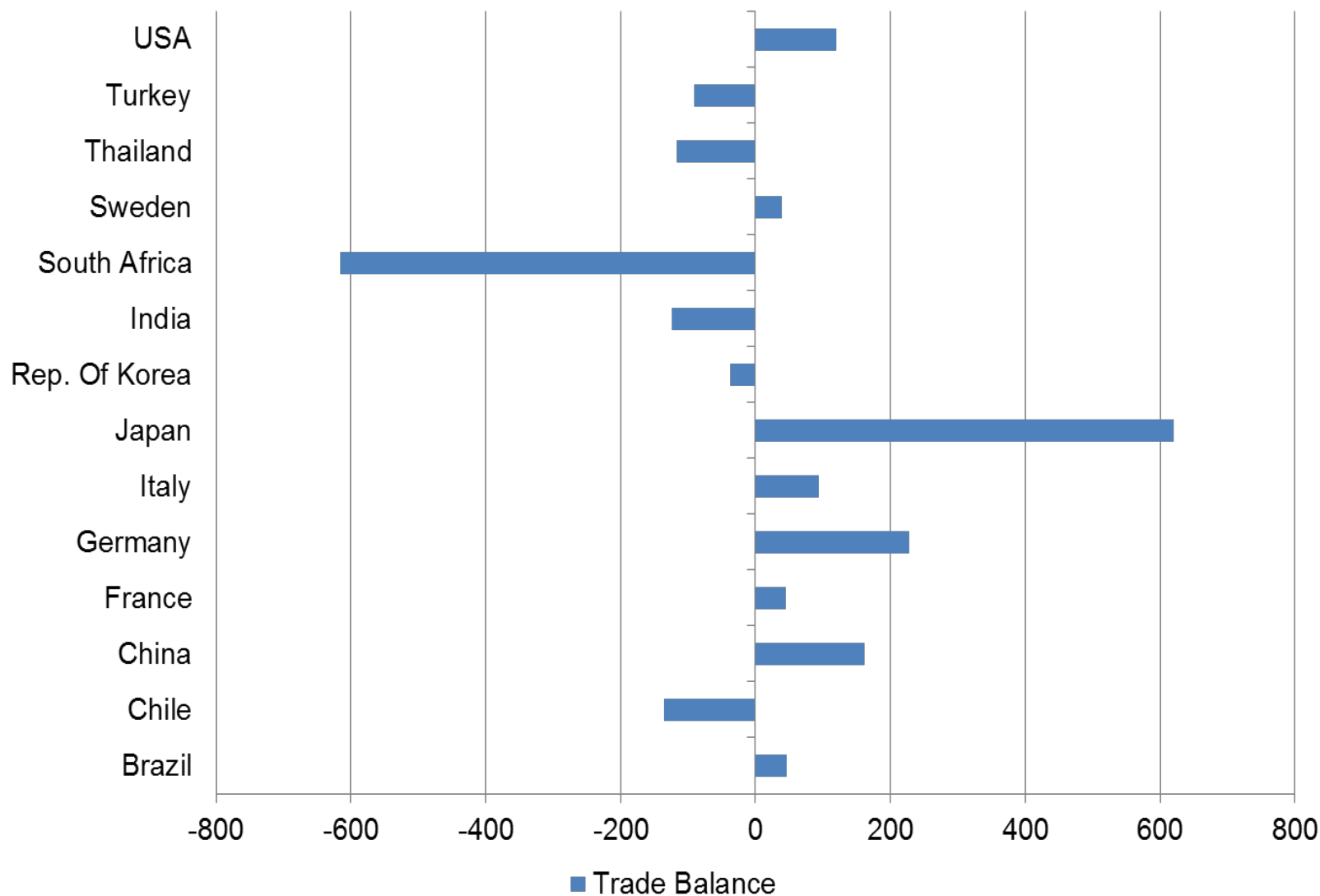
## Indicators

- Proved fuel reserves in the respective country
- Fuel prices (unfortunately no data for China)

## Export Advantage

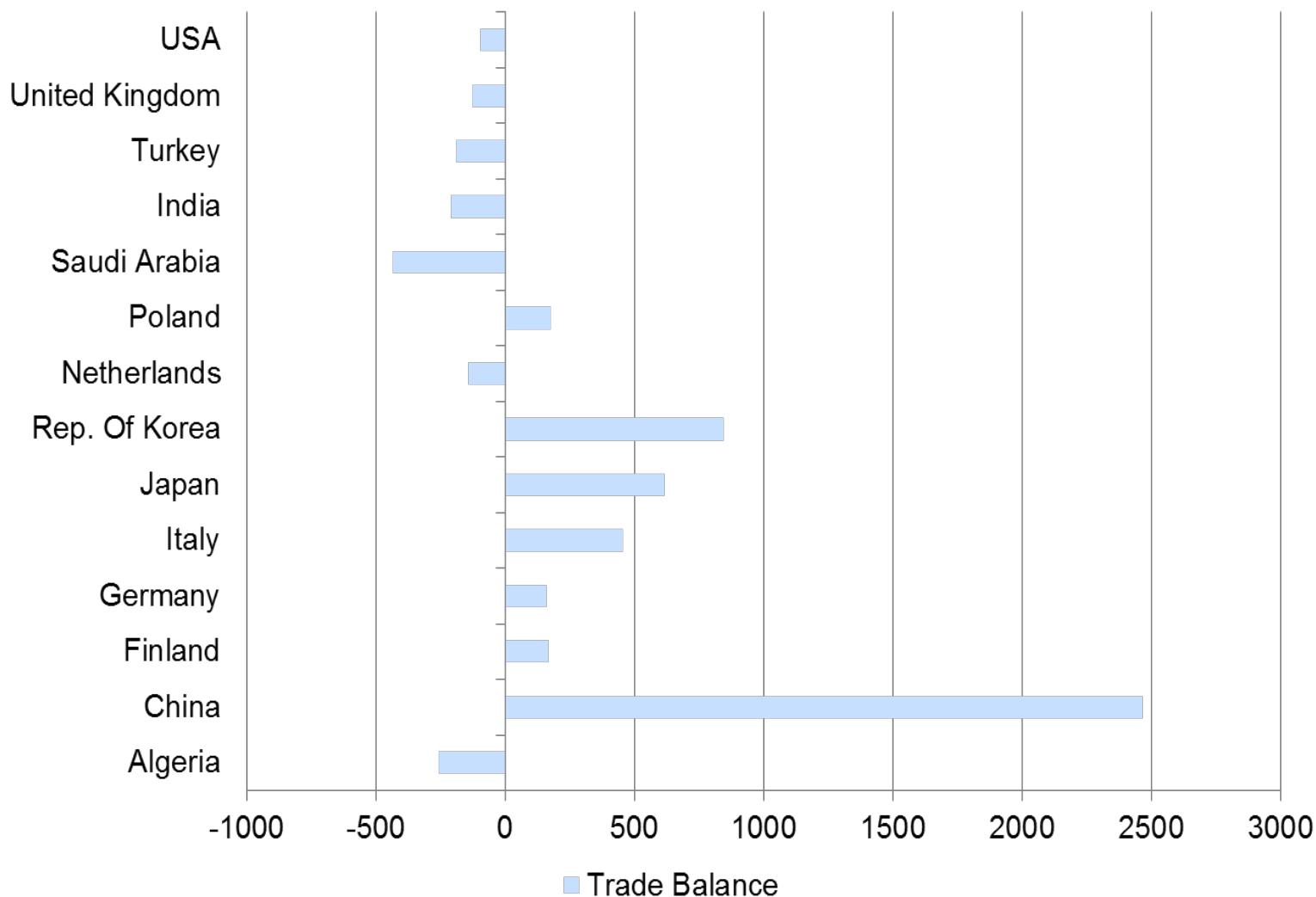
- China, Republic of Korea and Japan as the top exporters of steam boilers
- Japan, Germany and China leading countries for steam turbines
- Germany as an important producer of components for ultra-super-critical technologies (e. g. Saarschmiede GmbH in Völklingen: Expert interview)

## Trade Balance Steam Turbines in 2010, in millions US \$



Source: UN Comtrade 2012

## Trade Balance Steam Boilers in 2010, in millions US \$



Source: UN Comtrade 2012

# Transfer Advantage

## Indicators

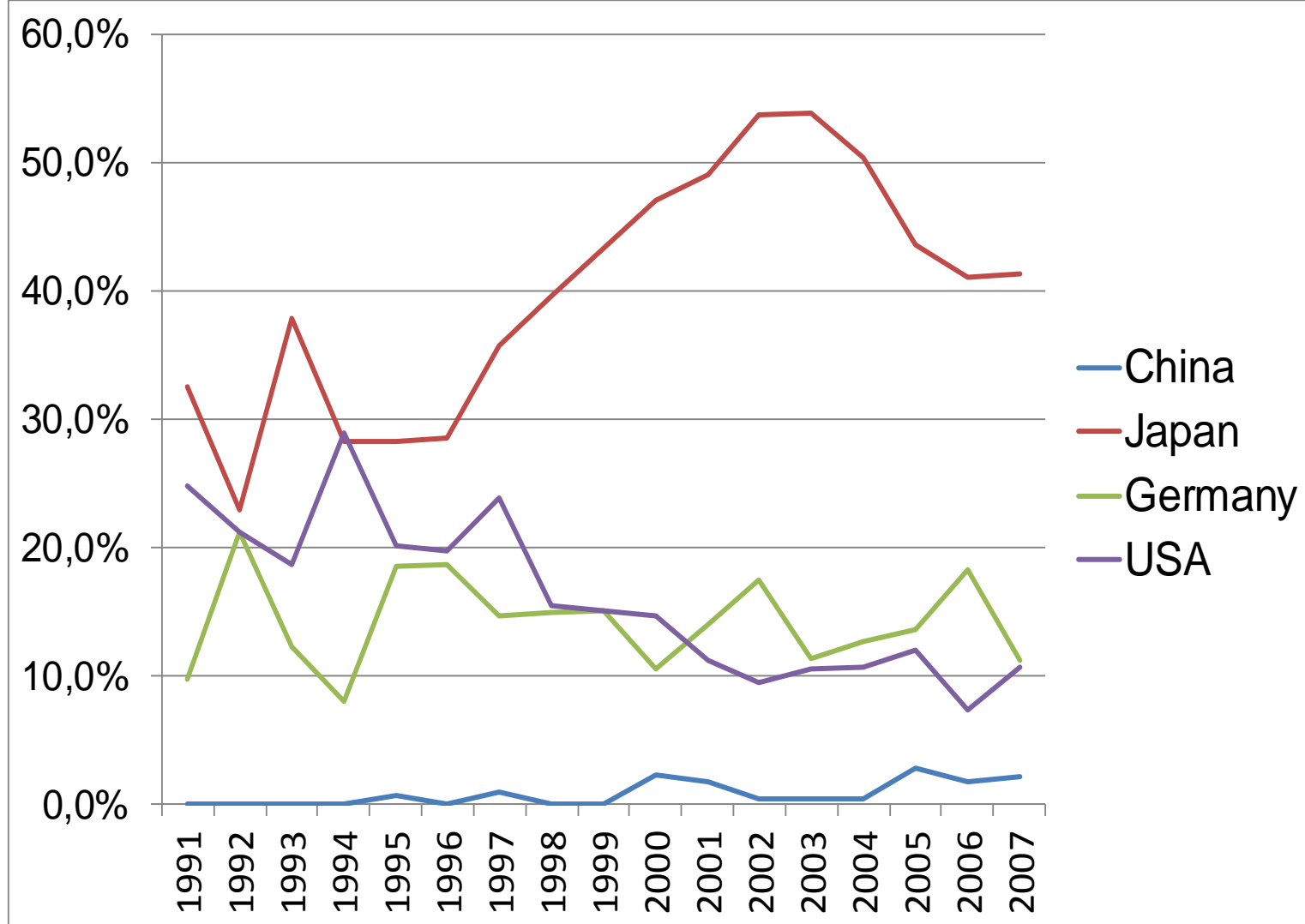
- Degree to which R&D matters in a country;
- R&D related to coal technologies and CCS (Carbon Capture Storage);
  - Number of demonstration plants in a country;
- Efficiency of coal-fired power plants (output of electricity sector/input electricity sector).

## Indicators Transfer Advantage

Country	R&D in general (2007/8/9)	R&D related to fossil fuels (2005)	Number of demonstration plants (2007)	Average Efficiency (2005)
Germany	2.82	0.007	8	39.0
Japan	3.44	0.003	21	42.0
USA	2.79	0.0005	12	36.4
China	1.5	-	9	31.0



## Technological Capabilities: World Market Shares Patents: Coal-fired Power Plant Technologies



Source: ISI (2012).

# Market Structure Advantage

## Indicators

- Number of suppliers
- Use of the Global Competitiveness Index (GCI) as a proxy

# Regulation Advantage

## Indicators

- Existence of carbon-taxes and/or a emission trade system
- Importance of renewable energy electricity production
  - Social acceptance of coal technologies

# Conclusions case study coal power plants

- Lead Market until 1980 United States, then Switch to Japan
- Japan has comparative advantages in transfer advantage, lead supply
- Also Germany successful in coal technology
- Japan and Germany lead the world market for turbines
- China is catching up regarding price, demand and regulation advantages
- China leads the market for boilers with low and medium quality
- Emerging countries are very ambitious regarding future development (700 Degree Power Plant). Question if or how long lead market can be hold by Japan and Germany

# Structure of this talk

1. Discussion of the Lead Market Concept
2. Review of 1st and 2nd Mover Literature and Policy Strategies
3. Case Study Clean Coal Technologies
4. Policy Strategies Environmental Lead Markets

# Lead Market Strategies

Generally: Change of industry politics in globalized world

- In the 80ies, especially in western countries
- Supply and demand: Competition not as globalised as today
- Lead market approach: demand orientated

In the 90ies, in western countries und emerging countries:

- Supply and demand fall apart
- Multi national companies: can lead markets and lead suppliers be separated?
- Globalization: supply side of increasing interest

## Options for Political Strategies

- In case of first mover advantages: classical first mover policy
  - Competition: increasing efficiency
  - Protection of property rights: trade and property rights, integration of environment regulations in world trade order
- 
- Classical first mover strategy (in cases where first mover advantages exist)
  - Environmental foreign policy (e.g. border tax adjustments)
  - Selective industrial policy (i.e. focus on market segments where the domestic industry is competitive)

# Classical First Mover Strategy

- In Case of Success (e.g. Wind Energy Germany)
- Situation: High Lead Market Potentials for Environmental Innovation
- Targets: Development home market, Establishing and extension of ambitious standards, quality competition
- Instruments: Innovation policy, environmental standards, promotion export of environmental technology
- Actors: Firms, Coordination Ministries (Environment, Research, Innovation, Development)
- Capacities: Data on economic and ecological performance useful



# Selective Industrial Policy

- In cases where a country is competitive only with partial components (e.g. solar modules vs. system integration)
- Identification und support of promising technologies
- Instruments: Selective subsidies, exit strategy for less competitive value chains
- Capacities: Continuous evaluation of technologies and international markets

# Foreign environmental policy

- Changing the rules of the game, correcting distortion of competition  
Target: protection of domestic market  
Example: tariffs solar industry
- Instruments: Development of international regimes (environment and innovation), bi- or multinational cooperation
- Actors: Coordination environmental. Foreign and economic policy, World Trade Organisation
- Capacity: Continuous analysis of competition



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Geld

## Preisdumping: Solarkrieg zwischen Europa und China eskaliert

Von *Claus Hecking* und *Stefan Schultz*

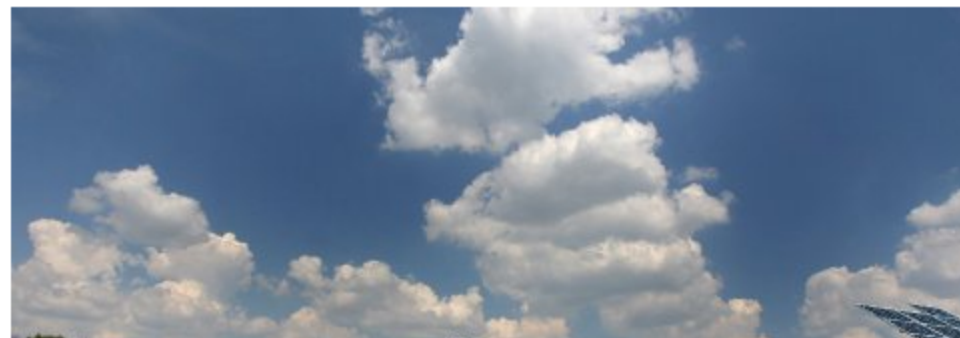
**Im Solarsektor droht nach SPIEGEL-ONLINE-Informationen großer Ärger. Europäische Hersteller werfen Chinesen vor, die mit der EU vereinbarten Mindestpreise systematisch zu unterbieten. Stimmen die Vorwürfe, ist das komplette Abkommen zwischen Peking und Brüssel bedroht.**

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# Conclusions

- 1) The development and international diffusion of environmental technologies remains to be policy driven
- 2) Globalisation increases second mover advantages and the problem of a deadlock in environmental policy
- 3) Strategy options allow governments to react
- 4) Important: Policy coordination, including international cooperation, continuous evaluation and monitoring of policies
- 5) Technology specific design of environmental innovation policy necessary

Thanks for your attention!

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