Innovation als Treiber von Wachstum

Management Perspektiven
Friedrichshafen, 14. April 2010

Dr Peer Ederer
Three levers for medium / long term economic performance

1. Create new human capital
2. Utilise human capital
3. Yield high human capital productivity

return on
+ financial capital = GDP
Education determines wealth creation

Source: The Race between education and technology, Goldin and Katz 2008
Education determines wealth creation – but how?

<table>
<thead>
<tr>
<th>Period</th>
<th>Labor Productivity</th>
<th>Education Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1915 – 1940</td>
<td>2.45</td>
<td>0.50</td>
</tr>
<tr>
<td>1940 – 1960</td>
<td>2.92</td>
<td>0.49</td>
</tr>
<tr>
<td>1960 – 1980</td>
<td>2.41</td>
<td>0.59</td>
</tr>
<tr>
<td>1980 – 2005</td>
<td>2.18</td>
<td>0.37</td>
</tr>
<tr>
<td>1915 – 2005</td>
<td>2.47</td>
<td>0.48</td>
</tr>
</tbody>
</table>

Source: The Race between education and technology, Goldin and Katz 2008
Introducing:
Learning on the job in human capital accounting

Source: The Human Capital Center Lisbon Council and Deutschland Denken! eV
Introducing:
Talent = a measure of „learning to learn“ capacity

Source: The Human Capital Center Lisbon Council and Deutschland Denken! eV
Learning capacity of employees in the European car industry ($r^2 = 0.92$)

Source: Deutschland Denken! eV
Cross company comparison of human capital productivity 2002 – 2006 (Sales in $/HC endowment)

Source: Master Thesis at the Asian Institute of Technology under supervision of Ederer
Human capital index published in 2006 and 2007

The Economist
October 2006

“No one has worked out the impact of knowledge like this before.”
Massive amounts of human capital investments required in Germany

Source: Deutschland Denken! eV
A business plan for Germany
"Why do I have to learn how to write my name? I always pay for everything with cash."
Higher expenditure induces increased life expectancy

US, 1960-2006

Health Expenditures in % of GDP

Female life expectancy at birth in years

$R^2 = 0.9301$

Source: OECD 2009; UNdata 2009
Increased life expectancy is related to more education

Selected representative countries globally, 2006

\[ R^2 = 0.7407 \]

Source: UNdata 2009
More education creates higher income

Selected representative countries globally, 2006

Source: OECD 2009; UNdata 2009
More income causes higher health expenditures

Projection of health expenditures as share of gross income in Germany

<table>
<thead>
<tr>
<th>Source</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dudey (1993)</td>
<td>26%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knappe (1995)</td>
<td>25%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oberdieck (1998)</td>
<td>30%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buttler et al. (1999)</td>
<td>&gt;30%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breyer; Ulrich (2000)</td>
<td>23%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIW (2001)</td>
<td></td>
<td>28% - 34%</td>
<td></td>
</tr>
<tr>
<td>Postler (2003)</td>
<td></td>
<td>23% - 40%</td>
<td></td>
</tr>
<tr>
<td>Hall (2004)</td>
<td></td>
<td>23% - 45%</td>
<td></td>
</tr>
</tbody>
</table>

Hall (2004) determines the share of health expenditures of GDP in US.

Source: Hall 2004; Schlander 2005
Life expectancy will rise sharply

Life expectancy of a 65-year old today and in 2040

- Male of today's 65 year old: 82.8
- Female of today's 65 year old: 85.2
- Male of 65 year old in 2040: 95.1
- Female of 65 year old in 2040: 99.7

Source: DAV 2008; Statistisches Bundesamt 2008
Example: Electric drive is an innovation in the transportation sector

Type of battery, its maximal energy density and date of commercialization

<table>
<thead>
<tr>
<th>Year</th>
<th>Battery Type</th>
<th>Wh/kg (max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1881</td>
<td>Lead Acid</td>
<td>50</td>
</tr>
<tr>
<td>1901</td>
<td>Nickel Iron</td>
<td>50</td>
</tr>
<tr>
<td>1920</td>
<td>Nickel Zinc</td>
<td>50</td>
</tr>
<tr>
<td>1956</td>
<td>NiCad</td>
<td>50</td>
</tr>
<tr>
<td>1960</td>
<td>Sodium Sulphur</td>
<td>50</td>
</tr>
<tr>
<td>1962</td>
<td>Zebra NaNiCl</td>
<td>50</td>
</tr>
<tr>
<td>1990</td>
<td>NiMH</td>
<td>50</td>
</tr>
<tr>
<td>1992</td>
<td>LiCoO2</td>
<td>50</td>
</tr>
<tr>
<td>1997</td>
<td>Zinc Air</td>
<td>50</td>
</tr>
<tr>
<td>1999</td>
<td>LiMn2O4</td>
<td>50</td>
</tr>
<tr>
<td>2003</td>
<td>Lithium Metal</td>
<td>50</td>
</tr>
<tr>
<td>2003</td>
<td>Li2S8</td>
<td>50</td>
</tr>
</tbody>
</table>

Source: mpoweruk.com 2008
Renewable energy is primarily an economic opportunity

Energy supply, costs and employment in Germany

Renewables

- Employment: 250,000
- Annual invest + operations: 12 bn €
- Domestic renewables: 6.7% of TPES

Energy imports

- Energy imports: 61.3% of TPES
- Fuels: 9%
- Operations: 27%

Import costs ca. 50 bn €

Source: BMU 2006; BMU 2008; BMWi 2008; EC 2009;
In 2033 Europe will have many more better jobs

Labor force by occupation, target structure based on extrapolation

Source: Eurostat 2008; Statistisches Bundesamt 2008; Deutschland Denken! e.V.
Plenty new jobs for experts and managers

Change of occupational composition in percent of total labor force

Source: Eurostat 2008; ILO 2008; Deutschland Denken! e.V.
"If you're rich enough to send me to a fancy, private college, why do I have to go?"
Some Audiences

Economic Policy Committee of the European Finance Ministers

World Bank, Chief Economist Series

OECD Education Department and their INES B expert network from 28 countries

US State Department, Intelligence and Research Bureau

Federal Government of Canada, Policy Research Initiative

Centre d’analyse stratégique of the French Prime Minister’s Office

Korea Research Institute for Vocational Education and Training

European Union, Interreg IVb North Sea Region Programme

South African Qualification Authority

City of Madrid
12 Main Innovation Paradoxes

**INPUTS**
- **Scientific <-> Pragmatic**
  - Driver: Technology <-> Solutions
  - Style: Invention <-> Imitation
  - Method: Exploration <-> Exploitation

**OUTPUTS**
- **Narrow <-> Broad**
  - Target: Product <-> Process
  - Impact: Add-on <-> Breakthrough
  - Focus: Specific Users <-> Generic Users

**CONFIGURATION**
- **Concentrated <-> Dispersed**
  - Geographic: Local Arena <-> Global Arena
  - Inside Org. Unit: Dedicated <-> Cross-functional Resources
  - Outside Org. Unit: Stand-alone <-> Networked

**PROCESS**
- **Deterministic <-> Open**
  - Culture: Logic <-> Creative
  - Structure: Control <-> Chaos
  - Procedure: Deliberate <-> Emergent