Innovation and Competitiveness: Implications for Policy and Saudi Arabia

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This presentation draws on ideas from Professor Porter's articles and books, in particular, *The Competitive Advantage of Nations* (The Free Press, 1990), "Building the Microeconomic Foundations of Competitiveness," in *The Global Competitiveness Report* (World Economic Forum), "Clusters and the New Competitive Agenda for Companies and Governments" in *On Competition* (Harvard Business School Press, 2008), and ongoing research on clusters and competitiveness. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means - electronic, mechanical, photocopying, recording, or otherwise - without the permission of Michael E. Porter. Further information on Professor Porter's work and the Institute for Strategy and Competitiveness is available at [www.isc.hbs.edu](http://www.isc.hbs.edu)
What is Competitiveness?

- Competitiveness depends on the **productivity** with which a nation uses its human, capital, and physical resources.
  - Productivity **sets the sustainable standard of living** (wages, returns on capital, returns on natural resources)
  - It is not **what** industries a nation competes in that matters for prosperity, but **how productively** it competes in those industries
  - Productivity in a national economy arises from a **combination of domestic and foreign firms**
  - The productivity of **“local” or domestic industries** is fundamental to competitiveness, not just that of export industries

- Only **competitive** businesses can create jobs, rising income, and wealth
- Nations compete to offer the **most productive environment for business**
- The public and private sectors play **different but interrelated roles** in creating a productive economy
Endowments create a **foundation** for prosperity, but true prosperity is created by **productivity** in the use of endowments.

Macroeconomic competitiveness sets the **potential** for high productivity, but is **not sufficient**.

Productivity ultimately depends on improving the **microeconomic capability** of the economy and the **sophistication of local competition**.
Quality of the National Business Environment

- **Context for Firm Strategy and Rivalry**
  - Local *rules and incentives* that encourage investment and productivity
    - e.g., salaries, incentives for capital investments, intellectual property protection, corporate governance standards
  - Open and vigorous *local competition*
    - Openness to foreign competition
    - Competition laws

- **Factor (Input) Conditions**
  - Access to high quality *business inputs*
    - Efficient access to natural endowments
    - Human resources
    - Capital availability
    - Physical infrastructure
    - Administrative and information infrastructure (e.g. registration, permitting, transparency)
    - Scientific and technological infrastructure

- **Demand Conditions**
  - Sophisticated and demanding *local customers and needs*
    - e.g., Strict quality, safety, and environmental standards
    - Consumer protection laws

- **Related and Supporting Industries**
  - Availability of *suppliers and supporting industries*

- **Many things matter** for competitiveness
  - Successful economic development is a process of *successive upgrading*, in which the business environment improves to enable increasingly sophisticated ways of competing
The Houston Oil and Gas Cluster

Upstream

- Oil & Natural Gas Exploration & Development
- Oil & Natural Gas Completion & Production

Downstream

- Oil Transportation
- Oil Trading
- Oil Refining
- Oil Distribution
- Gas Gathering
- Gas Processing
- Gas Trading
- Gas Transmission
- Gas Distribution
- Gas Marketing
- Oil Wholesale Marketing
- Oil Retail Marketing

Oilfield Services/Engineering & Contracting Firms

Equipment Suppliers
(e.g. Oil Field Chemicals, Drilling Rigs, Drill Tools)

Specialized Technology Services
(e.g. Drilling Consultants, Reservoir Services, Laboratory Analysis)

Subcontractors
(e.g. Surveying, Mud Logging, Maintenance Services)

Business Services
(e.g. MIS Services, Technology Licenses, Risk Management)

Specialized Institutions
(e.g. Academic Institutions, Training Centers, Industry Associations)
Determinants of Competitiveness
Relative Impact by Stage of Development

Notes:
- Weights in a linear model across all economies: Micro: 0.31, SIPI: 0.41, Macro Policy: 0.28
- Middle-stage weights are an average of Low- and High-stage weights.
## Competitiveness Upgrading in Saudi Arabia, 2007 - 2010

### Macroeconomic Competitiveness

<table>
<thead>
<tr>
<th>Selected Survey Indicators</th>
<th>Improvement in Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decentralization of economic policymaking</td>
<td>+65</td>
</tr>
<tr>
<td>Business costs of corruption</td>
<td>+64</td>
</tr>
<tr>
<td>Quality of primary education</td>
<td>+42</td>
</tr>
<tr>
<td>Business costs of crime and violence</td>
<td>+42</td>
</tr>
<tr>
<td>Effectiveness of law-making bodies</td>
<td>+38</td>
</tr>
<tr>
<td>Freedom of the press</td>
<td>+34</td>
</tr>
<tr>
<td>Irregular payments by firms</td>
<td>+33</td>
</tr>
<tr>
<td>Judicial independence</td>
<td>+31</td>
</tr>
<tr>
<td>Transparency of government policymaking</td>
<td>+27</td>
</tr>
<tr>
<td>Reliability of police services</td>
<td>+23</td>
</tr>
<tr>
<td>Property rights</td>
<td>+23</td>
</tr>
</tbody>
</table>

Source: WEF Global Executive Opinion Survey, fixed sample of 128 countries
Transparency International Corruption Perception Index

Saudi Arabian Ranking Over Time

Source: Transparency International Corruption Perception Index
## Competitiveness Upgrading in Saudi Arabia, 2007 - 2010

### Microeconomic Competitiveness

<table>
<thead>
<tr>
<th>Selected Survey Indicators</th>
<th>Improvement in Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedures required to start a business</td>
<td>+89</td>
</tr>
<tr>
<td>Business impact of rules on FDI</td>
<td>+88</td>
</tr>
<tr>
<td>Regulation of securities exchanges</td>
<td>+78</td>
</tr>
<tr>
<td>Time required to start a business</td>
<td>+75</td>
</tr>
<tr>
<td>Restrictions on capital flows</td>
<td>+71</td>
</tr>
<tr>
<td>Stringency of environmental regulations</td>
<td>+67</td>
</tr>
<tr>
<td>Prevalence of trade barriers</td>
<td>+62</td>
</tr>
<tr>
<td>Protection of minority shareholders’ interests</td>
<td>+61</td>
</tr>
<tr>
<td>Prevalence of foreign ownership</td>
<td>+59</td>
</tr>
<tr>
<td>Efficacy of corporate boards</td>
<td>+58</td>
</tr>
<tr>
<td>Low market disruption from state-owned enterprises</td>
<td>+57</td>
</tr>
</tbody>
</table>

Source: WEF Global Executive Opinion Survey, fixed sample of 128 countries
Saudi Arabian Ranking Over Time

Source: World Bank, SAGIA
Progress on Business Regulation
Leading Countries, 2006 - 2011

Reform Intensity, 2006 - 2011

Saudi Arabia

Source: World Bank Reform Intensity Index, World Bank
Saudi Arabia’s Progress on Competitiveness

• Competitiveness has become **central to Saudi Arabia’s economic policy agenda**

• Programs like “10 by 10” have set **measurable goals** to motivate rapid progress

• Substantial reforms have been implement in areas like **business regulation, education, and financial markets.**

• Large **investments** have been made to improve infrastructure, create economic cities, develop the petro-chemical cluster, and launch ambitious academic institutions like KAUST

• Significant competitiveness challenges **remain**

• But Saudi Arabia’s position in international assessments of competitiveness has **improved markedly**
Improving Competitiveness: The Innovation Imperative

- **Innovative Capacity**
- **Competitiveness Improvement**
- **Prosperity Growth**

*Productivity Growth*
Moving to an Innovation-Driven Economy

Factor-Driven Economy

Investment-Driven Economy

Innovation-Driven Economy

Low Cost Labor and Natural Endowments

Productivity in Producing Products and Services

Unique Products and Processes

Technological Progress and Economic Development

DEVELOPING ECONOMIES

Assimilate
- Assimilate foreign technology
- Skill improvement
- Technology transfer institutions

Enhance
- Modify and improve foreign technology
- College education
- Applied research organizations

Create
- Create new knowledge, products, and services
- Advanced university education, especially in science, technology, and management
- Scientific research institutions

ADVANCED ECONOMIES
Innovative Output
Selected OECD Countries, 1999 to 2009

Average U.S. utility patents per 1 million population, 2007-2009

CAGR of US-registered patents, 1999 to 2009

Source: USPTO (2010), Groningen Growth and Development Centre, Total Economy Database (2010)
The innovative capacity of an economy depends on the strength of each area and on the linkages among them.

Source: Furman, Porter/Stern
Common Innovation Infrastructure

**Innovation Resources**
- Science and engineering workforce
- Access to universities and postgraduate education
- Funding for basic science and technology
- Sophisticated Information Technology infrastructure

**Innovation Policy**
- Intellectual property protection
- R&D incentives
- Government procurement of advanced products
- Openness to international trade and investment
Science and Engineering Workforce

Researchers per 1,000 Employees

Source: OECD
Clusters and Innovation

- Clusters **increase productivity** and **operational efficiency**
- Clusters stimulate and enable **innovations**
- Clusters facilitate **commercialization** and **new business formation**
- Clusters reflect the fundamental importance to productivity and innovation of **linkages and spill-overs** across firms and associated institutions
## Institutions for Collaboration
### Selected Massachusetts Organizations, Life Sciences

### Life Sciences Industry Associations
- Massachusetts Biotechnology Council
- Massachusetts Medical Device Industry Council
- Massachusetts Hospital Association

### General Industry Associations
- Associated Industries of Massachusetts
- Greater Boston Chamber of Commerce
- High Tech Council of Massachusetts

### Economic Development Initiatives
- Massachusetts Technology Collaborative
- Mass Biomedical Initiatives
- Mass Development
- Massachusetts Alliance for Economic Development

### University Initiatives
- Harvard Biomedical Community
- MIT Enterprise Forum
- Biotech Club at Harvard Medical School
- Technology Transfer offices

### Informal networks
- Company alumni groups
- Venture capital community
- University alumni groups

### Joint Research Initiatives
- New England Healthcare Institute
- Whitehead Institute For Biomedical Research
- Center for Integration of Medicine and Innovative Technology (CIMIT)
Share of World Exports by Cluster
Taiwan, 2009

Note: Clusters with overlapping borders have at least 20% overlap (by number of industries) in both directions.
Capacity for Entrepreneurship

Skills
- Entrepreneurship training
- Mentorship programs
- Entrepreneur networks

Capital
- Risk capital providers
- Angel funding
- Tax policies encouraging risk capital

Infrastrucure
- Access to facilities, incubators
- Services for start ups (legal, accounting, HR)

Policies
- Ease of incorporation
- Ease of doing business
- Bankruptcy laws

Culture
- Public recognition of entrepreneurs
- Risks of failure
Total Early-Stage Entrepreneurial Activity
G.E.M. Index, 2009

Source: Global Entrepreneurship Monitor (2010)
## Progress Towards an Innovation-Driven Economy

**Saudi Arabia and other Emerging Economies**

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GCC</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>38</td>
<td>96</td>
<td>184</td>
<td>6%</td>
</tr>
<tr>
<td>Kuwait</td>
<td>14</td>
<td>23</td>
<td>79</td>
<td>6%</td>
</tr>
<tr>
<td>United Arab Emirates</td>
<td>7</td>
<td>11</td>
<td>48</td>
<td>7%</td>
</tr>
<tr>
<td><strong>Latin America</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Argentina</td>
<td>184</td>
<td>292</td>
<td>444</td>
<td>3%</td>
</tr>
<tr>
<td>Brazil</td>
<td>269</td>
<td>613</td>
<td>1,032</td>
<td>5%</td>
</tr>
<tr>
<td>Chile</td>
<td>31</td>
<td>76</td>
<td>147</td>
<td>5%</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>15</td>
<td>27</td>
<td>46</td>
<td>6%</td>
</tr>
<tr>
<td>Mexico</td>
<td>393</td>
<td>446</td>
<td>738</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Asia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>134</td>
<td>571</td>
<td>6,019</td>
<td>14%</td>
</tr>
<tr>
<td>India</td>
<td>108</td>
<td>442</td>
<td>3,987</td>
<td>13%</td>
</tr>
<tr>
<td>Indonesia</td>
<td>15</td>
<td>44</td>
<td>56</td>
<td>5%</td>
</tr>
<tr>
<td>Malaysia</td>
<td>19</td>
<td>132</td>
<td>935</td>
<td>14%</td>
</tr>
<tr>
<td>Thailand</td>
<td>18</td>
<td>72</td>
<td>229</td>
<td>9%</td>
</tr>
</tbody>
</table>

**Note:** CAGR based on period averages.

**Source:** U.S. Patents, US Patent and Trademark Office
## Innovation in Saudi Arabia
### Leading Patent Originators

<table>
<thead>
<tr>
<th>Organization</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saudi Arabian Oil Company</td>
<td>12</td>
<td>5</td>
<td>10</td>
<td>20</td>
<td>8</td>
<td>55</td>
</tr>
<tr>
<td>Saudi Basic Industries Corporation</td>
<td>3</td>
<td>7</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td>King Fahd University Of Petroleum And Minerals, Research Institute</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Other organizations</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>Individually Owned Patents</td>
<td>1</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total Saudi Utility Patents</strong></td>
<td><strong>18</strong></td>
<td><strong>19</strong></td>
<td><strong>20</strong></td>
<td><strong>30</strong></td>
<td><strong>22</strong></td>
<td><strong>109</strong></td>
</tr>
</tbody>
</table>

Note: Includes only organizations receiving more than 5 patents in this period
Source: USPTO (2010)
Distribution of Saudi Arabian Innovation Output

Science Research Indicators:
Kingdom of Saudi Arabia (2000-2006)

Legend

<table>
<thead>
<tr>
<th>Key</th>
<th>Indicator</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>☢️</td>
<td>Publications</td>
<td>1 - 5434</td>
</tr>
<tr>
<td>☣️</td>
<td>USPTO Utility Patent Grants</td>
<td>1 - 88</td>
</tr>
</tbody>
</table>

Data Sources: ISI Web of Science (Publications), Delphion (Patents)

Source: Monitor Company
# Selected Innovation Policy Initiatives

## Saudi Arabia

### Universities and Science Parks
- King Abdullah University of Science and Technology (KAUST)
- King Abdulaziz City for Science and Technology (KACST)
- King Fahd University of Petroleum and Minerals (KFUPM)
- KAUST Research Park and Innovation Cluster
- Dhahran Techno-Valley
- Riyadh Techno Valley

### Policies
- National Science, Technology & Innovation Plan (NSTIP)
- STC Venture Capital Fund
- Economic Offset Program
- The Centennial Fund
- SMEs Funding Guarantee Program
- Scientific Creativity Awards / Intel Int’l Science and Engineering Fair
- Mawhiba Young Leader Program

- Numerous government initiatives to support innovation

Source: Monitor Company
Innovation in Saudi Arabia: Progress

• Significant efforts to improve common innovation infrastructure

• High dependence on expatriate skills and challenges in developing local human resource capacity

• Programs focused on leading global partners and high involvement of government, with the need to foster greater grassroots efforts involving a wide array of Saudi companies

• Cluster development remains concentrated in oil and industries and petrochemicals

• Entrepreneurship has only recently become a priority

• Innovation programs are in need of greater coordination
An Innovation Agenda for Saudi Arabia
The Next Steps

• Supplement leading edge research efforts with programs targeted at mainstream Saudi companies
  – Technology Transfer
• Improve linkages between academic institutions and companies
• Organize innovation policy more tightly around clusters
  – This will improve coordination across the large number of individual policy efforts to support innovation
• Launch comprehensive program to improve capacity for entrepreneurship

• Define a distinctive role for Saudi Arabia in the global innovation system
Competitiveness and Innovation

• Competitiveness upgrading is a **critical priority** for every country – even more so after the recent crisis

• As economies progress, further gains in competitiveness increasingly require **innovation**

• Innovation occurs, where a strong **innovation infrastructure**, **dynamic clusters**, and an **entrepreneurial culture** are tightly connected

• Saudi-Arabia has over the last few years been **leading reformer**, significantly improving its competitiveness fundamentals

• To revive the **innovative traditions** of the Arab world, Saudi Arabia needs to deepen and diversify its cluster portfolio and create a more environmental climate