The Competitive Advantage of Taiwan

Professor Michael E. Porter
Harvard Business School

Commonwealth Speech
Taipei, Taiwan
July 31, 2001

Taiwan’s Current Malaise

- Recent economic downturn
- Highest unemployment in decades
- Uncertainty of future relationship to China
Taiwan’s Economic Performance

Note: Irish GNP per capita is about 20% lower than the reported GDP per capita figure due to large dividend outflows to foreign investors. We use GNP per capita for Ireland because it is more representative. For other countries GDP and GNP are very similar.

Source: WEO
Asian Economic Performance By Country

Source: EIU
International Patenting Output

Annual U.S. patents per 1 million population, 2000


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Increase in the annual number of U.S. patents per 1 million population, 1990 to 2000

U.S. Information Technology Investment
Share of Real Private Non-residential Investment by Type

Note: Quarterly data seasonally adjusted at annual rates
Source: BEA, author’s calculations
U.S. Information Technology Investment
Level of Real Private Non-residential Investment by Type

Real Private US Non-Residential Investment, Billions of 1996 US-

Note: Quarterly data seasonally adjusted at annual rates

Source: BEA, author’s calculations
Taiwan’s Economic Challenges
Three Agendas

I. Addressing some **chronic weaknesses**
II. Making the **transition** from an Investment-driven to a true **Innovation-driven economy**
III. Defining Taiwan’s **economic relationship to China**

• These agendas are integrally connected
Sources of Rising Prosperity

• A nation’s standard of living (wealth) is determined by the **productivity** with which it uses its human, capital, and natural resources. The appropriate definition of competitiveness is productivity.
  
  – Productivity depends both on the **value** of products and services (e.g. uniqueness, quality) as well as the **efficiency** with which they are produced.
  
  – It is not **what** industries a nation competes in that matters for prosperity, but **how** firms compete in those industries.
  
  – Productivity in a nation is a reflection of what both domestic and foreign firms choose to do in that location. The location of ownership is secondary for national prosperity.
  
  – The productivity of “**local**” industries is of fundamental importance to competitiveness, not just that of traded industries.
  
  – Devaluation does not make a country more “competitive”, rather it reveals a **lack of fundamental competitiveness**.

• Nations compete in offering the **most productive environment** for business.

• The public and private sectors play **different but interrelated roles** in creating a productive economy.
Innovation and Prosperity

• For advanced economies innovation has the critical role supporting high levels of prosperity
Determinants of Productivity and Productivity Growth

Macroeconomic, Political, and Legal Context for Development

Microeconomic Foundations of Development

- Sound macroeconomic policies and a stable political/legal context are necessary to ensure a prosperous economy, but not sufficient.
- Competitiveness ultimately depends on improving the microeconomic foundations of competition.
Productivity and the Microeconomic Business Environment

Context for Firm Strategy and Rivalry

• A local context that encourages efficiency, investment, and sustained upgrading
• Open and vigorous competition among locally based rivals

Factor (Input) Conditions

• High quality, specialized inputs available to firms:
  - human resources
  - capital resources
  - physical infrastructure
  - administrative infrastructure
  - information infrastructure
  - scientific and technological infrastructure
  - natural resources

Demand Conditions

• Sophisticated and demanding local customer(s)
• Unusual local demand in specialized segments that can be served globally
• Customer needs that anticipate those elsewhere

Related and Supporting Industries

• Presence of capable, locally-based suppliers and firms in related fields
• Presence of clusters instead of isolated industries
The California Wine Cluster

Grapestock
Fertilizer, Pesticides, Herbicides
Grape Harvesting Equipment
Irrigation Technology
Growers/Vineyards
State Government Agencies (e.g., Select Committee on Wine Production and Economy)
Educational, Research, & Trade Organizations (e.g. Wine Institute, UC Davis, Culinary Institutes)
Wineries/Processing Facilities
Winemaking Equipment
Barrels
Bottles
Caps and Corks
Labels
Public Relations and Advertising
Specialized Publications (e.g., Wine Spectator, Trade Journal)
California Agricultural Cluster
Tourism Cluster
Food Cluster

Sources: California Wine Institute, Internet search, California State Legislature. Based on research by MBA 1997 students R. Alexander, R. Arney, N. Black, E. Frost, and A. Shivananda.
Global Competitiveness Report 2000
The Relationship Between Microeconomic Competitiveness and GDP Per Capita, 1999 Data

Microeconomic Competitiveness Index


* Adjusted for Purchasing Power Parity
Stages Of Economic Development

Resource-driven Economy

- Basic factor conditions (low cost labor, natural resources, geographic location) are the dominant sources of competitive advantage
- Technology is assimilated through imports, FDI, and imitation
- Companies compete on price and lack direct access to consumers
- Companies have limited roles in the value chain, focus on assembly, labor intensive manufacturing, and resource extraction
- The economy is highly sensitive to world economic cycles, commodity prices, and exchange rates

Investment-driven Economy

- Efficiency in producing standard products and services is the dominant source of competitive advantage
- Technology is accessed through licensing, joint ventures, FDI, and imitation
- The nation is not only assimilating foreign technology, but has the capacity to improve on it
- The national diamond supports heavy investment in efficient infrastructure and modern production processes
- Companies serve OEM customers and extend capabilities more widely in the value chain
- The economy is concentrated on manufacturing and outsourced service exports

Innovation-driven Economy

- Innovative products and services at the global technology frontier are the dominant sources of competitive advantage
- The national diamond is characterized by strengths in all areas together with the presence of deep clusters
- Companies compete with unique strategies that are often global in scope
- The economy has a high service share, and is resilient to external shocks

Taiwan’s Current Position

- Primary focus on manufacturing
- Compete on price and efficiency
- Prevalent strategy of serving OEM customers
- High rate of investment in modern production methods and assimilating technology
- Strong capabilities to improve and enhance foreign technology
- Export-led growth
- Substantial government role in steering the economy
- Emerging innovative capacity

- Investment-driven stage
Limits Of The Current Strategy

- Labor costs are now high relative to neighboring countries
- Other domestic costs are rising
- Taiwan is facing increasing pressure in export markets

- Taiwanese companies are investing heavily in lower wage-locations in the region to maintain current strategies
  - The proximity of China offers an easily available alternative location with access to a huge domestic market

- Taiwanese exports are heavily dependent on a single cluster in which other Asian countries also compete
  - The U.S. downturn in IT investment has a large impact on Taiwan
Taiwan’s Economic Agenda in 2001

I. Addressing some chronic weaknesses

II. Making the transition from an Investment-driven to a true Innovation-driven economy

III. Defining Taiwan’s economic relationship to China
# Global Competitiveness Report 2000
## Taiwan’s Ranking

<table>
<thead>
<tr>
<th>Rank</th>
<th>Current Competitiveness Index</th>
<th>Company Strategy &amp; Operations Index</th>
<th>National Business Environment Index</th>
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</thead>
<tbody>
<tr>
<td>1</td>
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*Note: Taiwan is listed separately in the National Business Environment Index.*
Taiwan’s Economic Agenda in 2001

I. Addressing some chronic weaknesses
   – Improve physical infrastructure
Physical Infrastructure
Taiwan’s Relative Position

**Competitive Advantages**
Relative to GDP per Capita

<table>
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<tr>
<th>Factor (Input)</th>
<th>Country Ranking</th>
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<tbody>
<tr>
<td>General Internet Use</td>
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<td>Government Infrastructure Investment</td>
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<td>Railroad Infrastructure Development</td>
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<td>Availability of Cellular Phones</td>
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<td>International Direct Dial</td>
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<td>Communication Costs</td>
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<td>Overall Infrastructure Quality</td>
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<td>Telephone / Fax Infrastructure Quality</td>
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<td>Computer Utilization</td>
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<td>Air Transport Infrastructure Quality</td>
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<td>Port Infrastructure Quality</td>
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Note: Rank by countries; overall Taiwan ranks 21 (21 on Quality of Business Environment)
Source: Global Competitiveness Report 2000
Taiwan’s Economic Agenda in 2001

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   – Upgrade domestic financial markets
Financial Markets
Taiwan’s Relative Position

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<td>Ability to Finance Start-ups</td>
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<td>Ease of Access to Loans</td>
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<td>Venture Capital Availability</td>
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<tr>
<td>Financial Market Sophistication</td>
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<td>Financial Disclosure Requirements</td>
<td>28</td>
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<tr>
<td>Access to Local Equity Market</td>
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   – Increase transparency, openness and legal accountability
## Openness and Accountability

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<td>Judicial Independence</td>
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<td>Adequacy of Private Sector Legal Recourse</td>
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<td>Political Protection of Private Businesses</td>
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<td>Extent of Required Financial Disclosure</td>
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   – Increase transparency, openness and legal accountability
   – **Boost the efficiency of domestic industries**
# Competition and Local Prices

## Relative Prices for Local Goods and Services, 2000

<table>
<thead>
<tr>
<th>Rank</th>
<th>GDP per capita (current exchange rate) Index rank</th>
<th>GDP per capita (PPP) Index rank</th>
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II. Making the transition to a true Innovation-driven economy
    – Transform company strategies
Determinants of Relative Performance
Types of Competitive Advantage

- Differentiation (Non-Price Value)
- Competitive Advantage
- Lower Cost
Sources of Competitive Advantage

Operational Effectiveness

• Assimilating, attaining, and extending best practice

Do the same thing better

Strategic Positioning

• Creating a unique and sustainable competitive position

Compete in a different way
Position: Variety/Needs/Access-Based

**Dell Computer**

**Set of Activities**
- Prices 15% below rivals
- Employees of institutional customers get same discount on personal machines
- Direct sale via sales force, telephone, and the Internet
- Models include most up to date components
- Build to order from a menu of options
- Assemble only, using just-in-time relationships with nearby suppliers
- Outsource maintenance and repair
- Limited R&D

**Particular Product Variety**
- Large corporate and institutional customers and their employees

**Particular Customer Group**
- Moderate range of standard, mid- and large capacity personal computers, PC servers, and PC workstations with low support requirements
Typical Company Strategies in Taiwan

- Concentrate on manufacturing versus services
- Rapid adoption of new technologies
- Compete on price and time-to-market
- Serve OEM customers in the US and other Asian countries
- Focus R&D on cost and process improvements
- Seek low cost inputs
- Invest modestly in human capital

Many Taiwanese companies face a strategic transition from competing on cost to competing on unique products and services
### Company Operations and Strategy

#### Taiwan’s Relative Position

<table>
<thead>
<tr>
<th>Competitive Advantages Relative to GDP per Capita</th>
<th>Country Ranking</th>
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<tbody>
<tr>
<td>Customer Orientation</td>
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<tr>
<td>Licensing of Foreign Technology</td>
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<td>Senior Management Recruitment</td>
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<td>Extent of Branding</td>
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<td>Marketing Expertise</td>
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<td>Production Processes</td>
<td>20</td>
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<tr>
<td>Attention to Staff Training</td>
<td>20</td>
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<td>Extent of Regional Sales</td>
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<td>Product Designs</td>
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<td>Control of International Distribution</td>
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<td>Company Spending on R&amp;D</td>
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<tr>
<td>Breadth of International Markets</td>
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Note: Rank by countries; overall Taiwan ranks 21 (18 on Company Operations and Strategy)

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II. Making the transition to a true Innovation-driven economy
   – Transform company strategies
   – Upgrade Taiwan’s scientific and technological capacity
Change in R&D Investments
Compound Annual Growth Rate in R&D Expenditures, 1985-1998

Science and Technology Infrastructure  
Taiwan’s Relative Position

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<tr>
<th>Competitive Advantages Relative to GDP per Capita</th>
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<td>Patents Per Capita (2000)</td>
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<td>Quality of Scientific Research Institutions</td>
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<td>Intellectual Property Protection</td>
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<td>Company Spending on R&amp;D</td>
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Source: Global Competitiveness Report 2000
Composition of Taiwanese Patenting in the US
Top Patenting Industries and Companies, 1999

• Top 15 Taiwan-based companies by U.S. patents filed in 1999
  – TAIWAN SEMICONDUCTOR MANUFACTURING CO., LTD. (288 patents)
  – UNITED MICROELECTRONICS CORPORATION (285)
  – INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE, TAIWAN (203)
  – VANGUARD INTERNATIONAL SEMICONDUCTOR CORPORATION (107)
  – WINBOND ELECTRONICS CORP. (102)
  – HON HAI PRECISION IND. CO., LTD.
  – NATIONAL SCIENCE COUNCIL
  – TEXAS INSTRUMENTS - ACER INCORPORATED
  – MOSEL VITELIC, INCORPORATED
  – MUSTEK SYSTEMS, INC.
  – UNITED SEMICONDUCTOR CORP.
  – MACRONIX INTERNATIONAL CO., LTD.
  – ACER PERIPHERALS, INC.
  – PRIMAX ELECTRONICS LTD.

• The top 15 Taiwan-based companies account for 23% of all patents filed by all Taiwanese entities

• Electronics cluster dominates patent filing with more than 80% of all filings
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   – Transform company strategies
   – Upgrade Taiwan’s scientific and technological capacity
   – Upgrade the quality of human capital
Comparison of Expenditure on Education
Growth and Level of Spending by Country

Public expenditure on education, Share of GDP 1996

Source: UN

Growth of public education spending, CAGR 1990 - 1996

Countries included:
- Sweden
- Canada
- Finland
- New Zealand
- Ireland
- Australia
- Malaysia
- S Korea
- Singapore
- Thailand
- Taiwan
- US
- UK
- Australia
- New Zealand
- Ireland
- Malaysia
- S Korea
- Singapore
- Thailand
- Taiwan

Source: UN
Improvements in the Quality of the Workforce
Researchers Per Ten Thousand Workers, 1998 and 1985

Number of researchers per 10’000 workers

Note: Taiwan data is for 1988 and 1998
## Education System  
Taiwan’s Relative Position

### Competitive Advantages Relative to GDP per Capita

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II. Making the transition to a true Innovation-driven economy
   – Transform company strategies
   – Upgrade Taiwan’s scientific and technological capacity
   – Upgrade the quality of human capital
   – Create advanced demand conditions
### Demand Conditions

Taiwan’s Relative Position

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Note: Rank by countries; overall Taiwan ranks 21 (21 on Quality of Business Environment)
Source: Global Competitiveness Report 2000
Finnish Wireless Cluster

**Factor (Input) Conditions**
- Substantial public investment in telecommunications-related R&D, with a focus on wireless technology
- Significant local venture capital for mobile applications
- Finland is becoming an international center for WAP development (e.g., Hewlett Packard, Siemens)

**Demand Conditions**
- World’s most sophisticated consumers
- 70 percent penetration of mobile phones (20 percent of households have abandoned wireline phones)
- First country to allocate licenses for 3rd generation wireless networks (3 competitive groups)
- Heavy usage of short message services
- Finland is a test market for WAP applications

**Related and Supporting Industries**
- Finland is home to Nokia, the world’s most competitive handset company
- There are approximately 3,000 Finnish firms in telecom and IT related products and services

**Context for Firm Strategy and Rivalry**
- A history of competition in telecommunications services throughout the 20th century
- Early to deregulate in telecom related industries
- More than 100 local operators
- Active local rivalry in wireless communications

Environmental Regulation and Competitiveness

- Competing based on weak environmental standards **perpetuates low incomes**
- Corporate pollution is a sign of **inefficient and unproductive use** of resources
  - **Firm**
    - Inefficient extraction of resources
    - Incomplete material utilization
    - Unnecessary waste products
    - Unnecessary energy use
    - Unproductive land use
  - **Customer**
    - Usable materials in products that are discarded
    - Products that use energy inefficiently
    - Discarded or unnecessary packaging
- The need to control or treat pollution causes companies to perform activities that add cost but create **no customer value**
  - e.g., handling, storage, processing, disposal
- Pollution is a reflection of **unsophisticated technology and weak management**

**Strict environmental regulation** stimulates the upgrading necessary to achieve advanced economic development
Taiwan’s Economic Agenda in 2001

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   – Improve physical infrastructure
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     – Encourage private sector-led cluster development
     – Widen the base of cluster in the economy
Taiwanese Clusters

Established Clusters

• Electronics
• Plastics
• Textiles and apparel

Other Clusters

?
Public / Private Cooperation in Cluster Upgrading
Minnesota’s Medical Device Cluster

Context for Firm Strategy and Rivalry

- Aggressive trade associations (Medical Alley Association, High Tech Council)
- Effective global marketing of the cluster and of Minnesota as the “The Great State of Health”
- Full-time “Health Care Industry Specialist” in the department of Trade and Economic Development

Factor (Input) Conditions

- Joint development of vocational-technical college curricula with the medical device industry
- Minnesota Project Outreach exposes businesses to resources available at university and state government agencies
- Active medical technology licensing through University of Minnesota
- State-formed Greater Minnesota Corp. to finance applied research, invest in new products, and assist in technology transfer

Demand Conditions

- State sanctioned reimbursement policies to enable easier adoption and reimbursement for innovative products

Related and Supporting Industries

- Minnesota Project Outreach exposes businesses to resources available at university and state government agencies
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Massachusetts Clusters  
Widening the Cluster Base

- Information Technology
- Healthcare
- Financial Services
- Environmental Products and Services
- Specialty Paper
- Polymers
- Metalworking
- Tourism and Leisure
- Apparel Textiles and Footwear
- Marine
Organizing for Competitiveness
Commonwealth of Massachusetts

Governor’s Council on Economic Growth and Technology

Functional Task Forces
- International Trade
- Marketing Massachusetts
- Tax Policy and Capital Formation
- Technology Policy and Defense Conversion

Issue Groups
- Cost of Doing Business
- Financing of Emerging Companies
- Health Care Restructuring
- Revitalizing Western Massachusetts

Industry Cluster Working Groups
- Advanced Materials
- Biotechnology and Pharmaceuticals
- Defense
- Marine Science and Technology
- Medical Devices
- Software
- Telecommunications
- Textiles
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   – Widen the base of cluster in the economy
   – **Shift the role of government**
## Appropriate Roles of Government in Economic Development

1. Establish a **stable and predictable** macroeconomic, political, and legal environment

2. Improve the availability, quality, and efficiency of **general purpose inputs, infrastructure, and institutions**

3. Set overall **rules and incentives** governing competition that encourage productivity growth

4. Facilitate **cluster development and upgrading**

5. Create an explicit, ongoing **process of economic change** and competitive upgrading which informs citizens and mobilizes the private sector, government at all levels, educational and other institutions, and civil society.
Recent Taiwanese Economic Policies

- Public sector investment to stimulate the economy
- Direct loans, tax relief, and export processing zones
- "Job creation program" to attempt to create 44,000 new regional jobs
- ‘Special’ measures of the Cabinet’s Financial and Economic Task Force:
  - Guarantee to keep tax rates stable for 4 years
  - Rescind the 2% business tax on banks
  - Enlarge SME Credit Guarantee Fund and provide preferential loans
  - Encourage the entry of international asset management companies to help speed up financial sector modernization
  - Assure reliable supplies of power and water
  - Allocate funds to ensure availability of land in industrial zones
  - Assist traditional industries and SMEs with upgrading and restructuring
  - Enhance local workforce skills and import foreign labor

Source: ROC Government Reports
Government Policy Towards Employment

Job Creation strategy
- Subsidies to create jobs
  - Wage subsidies
  - Foreign Direct Investment subsidies
- Jobs are costly and often unsustainable

Competitiveness strategy
- Creating the conditions for productivity and cluster development
  - Improving the efficiency of infrastructure
  - Cluster-based training
  - Improving the flexibility of labor markets
- Healthy clusters generate competitive jobs that are sustainable

There is no direct and easy answer to job creation; short-term solutions are costly and do not often succeed in the long run.
Taiwan’s Tax Revenues

Tax Revenues As Percentage Of GDP
Selected Countries, 1998

![Bar chart showing tax revenues as percentage of GDP for Finland, Ireland, US, and Taiwan. Finland has the highest percentage, followed by Ireland, US, and Taiwan.]
Cluster Policy versus Industrial Policy

**Industrial Policy**

- **Target** desirable industries / sectors
- Focus on domestic companies
- Intervene in competition (e.g., protection, industry promotion, subsidies)
- Centralizes decisions at the national level

**Cluster-based Policy**

- **All** clusters can contribute to prosperity
- Domestic and foreign companies both enhance productivity
- Relax impediments and constraints to productivity
- Emphasize cross-industry linkages / complementarities
- Encourage initiative at the state and local level

Distort competition

Enhance competition
Taiwan’s Economic Agenda in 2001

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III. Defining Taiwan’s economic relationship with China
Taiwan’s Export Destinations
1995 to 2000

Taiwan average export growth 1995-2000: 6.1%

Share of Taiwan’s total exports in 2000

Note: Size of bubble is $ volume of exports to destination country
Source: Taiwan National Statistics
Taiwan’s Trade With China

Source: Taiwan National Statistics
Taiwan’s Economic Relationship To China

- The economic relationship with China will inevitably be important
  - Common language
  - Strong historical ties
  - Strong personal ties through family relationships and migration
  - Substantial economic presence of Taiwanese companies in China
- The key question is what kind of relationship it will be

- Taiwan’s goal should be to create a mutually beneficial relationship that supports Taiwan’s higher standard of living
- Taiwan needs to define a unique role vis-à-vis China that
  - Builds on its distinctive strengths
  - Offsets China’s weaknesses and rigidities
Economic Relationship To China
Criteria for Mutually Beneficial Roles for Taiwan

• A unique position builds on specialization in areas where Taiwan can give China access to its competitive advantages

  – In clusters where Taiwan will for the foreseeable future provide a more conducive environment than China

  – In parts of the value chain where Taiwan has developed unique advantages that China will have difficulty replicating
Economic Relationship To China
Illustrative Roles for Taiwan

Role in the Value Chain

• R&D and Design
  – For the foreseeable future, Taiwan should offer a better R&D infrastructure and more conducive environment for innovation than China
  – Taiwan can play this role combined with manufacturing activities located on the mainland and provide a competitive advantage to the region

• Sophisticated Services
  – Taiwan can develop its professional services for China’s export industries

Complementary Fields of Specialization

• Education and Training
  – Taiwan can improve its management education capabilities to educate the business leaders of the region
  – Taiwan can build on its science and technology base to become the center of science education in the region

• Media/Entertainment
  – Taiwan’s more liberal media environment gives it the potential to become a media/entertainment/publishing-hub for the region
Economic Transition And Relationship To China
Reinforcing Agendas

Successful transition to the Innovation-driven stage makes a mutually beneficial relationship to China more likely.

Proximity to China increases the pressure on Taiwan to move from the Investment-driven to the Innovation-driven stage.