

Asian Electronic Manufacturing Update

Panel members:

William Boulton

David Hodges

Michael Pecht

Jan Vardaman

Agenda

9:20 Introduction (W. Boulton, Panel Chair)

9:35 Government Budget, Policies, & Programs (W. Boulton)

10:00 Semiconductor and Computer Industry (M. Pecht)

10:30 Break

10:50 Design and Testing (D. Hodges)

11:20 Assembly (J. Vardaman)

11:50 Discussion (open)

12:15 Lunch Break

Agenda

**1:30 Contemporary Integrated
Manufacturing Systems (C. Wu)**

**2:00 Assembly Technologies (T.
Onishi)**

2:30 Break

2:50 Summary (W. Boulton)

3:10 Discussion

4:30 Adjourn

Purpose of trip

- **Key electronics technologies**
 - **Design**
 - **Semiconductors**
 - **Board technologies**
 - **Manufacturing capabilities**
 - **Computers**
 - **Test and Analysis**

Future trends and policies

Overview of Trip



Beijing:

MII, Tsinghua, CIDC, US Embassy

Xian:

Datung Telecom, IRICO, Orient (Future)

Shanghai:

Parlex, HuaHong NEC, Huajing, Fudan University

Hong Kong:

Dr. Ko, HKPC, Compass

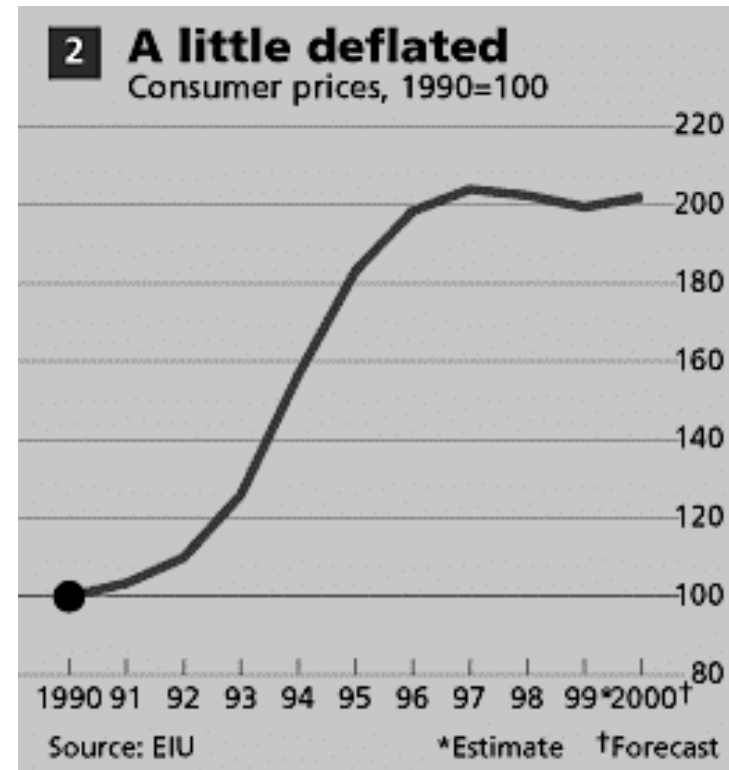
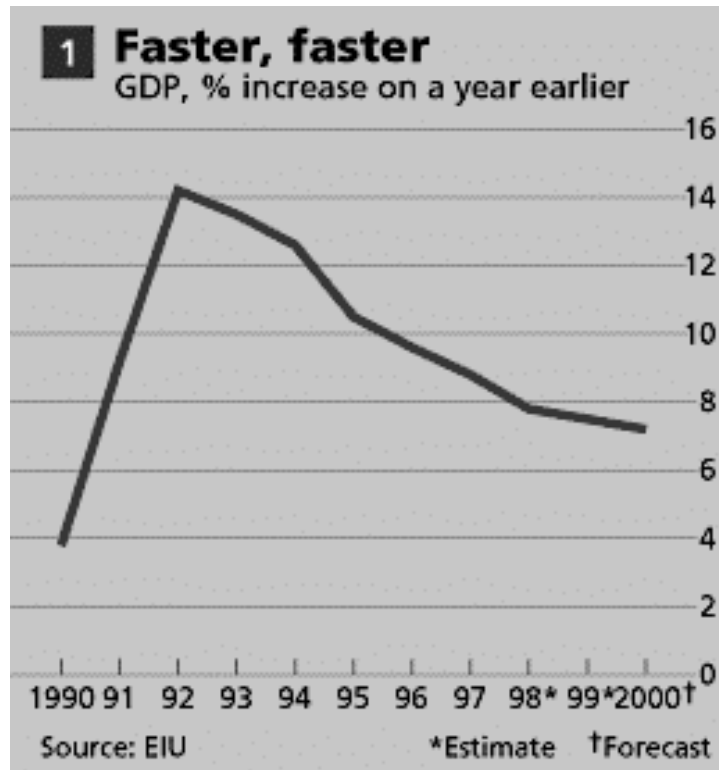
Shenzhen:

Namtai, Whitways, Legend

ECONOMIC BACKGROUND

| | 1997 | 1998 | 1999 | 2000 |
|--|---------|-------|-------|-------|
| GDP (US\$b) | 918 | 960 | 1,010 | 1,081 |
| GDP per capita (US\$) | 742 | 769 | | |
| Population (m.) | 1,236.3 | 1,248 | | |
| GDP by sector (% of GDP): | | | | |
| Primary sector | 18.7 | 18 | | |
| Secondary sector | 49.2 | 49.2 | | |
| of which: Industry | 42.5 | 42.2 | | |
| Construction | 6.7 | 7.1 | | |
| Tertiary sector | 32.1 | 32.8 | | |
| of which: Commerce | 8.4 | 8.3 | | |
| Transport, telecommunications | 6.1 | 6.3 | | |
| Demographic(1995; % of total): | | | | |
| Han Chinese | 91 | | | |
| Zhuang | 1.5 | | | |
| Other minorities | 7.5 | | | |
| Employment by sectors (% of total; 96): | | | | |
| State-owned enterprises | 15.9 | | | |
| Collective-owned enterprises | 4.3 | | | |
| Private and others | 79.8 | | | |

Fiscal Concerns



Economy Expected to Grow an Average 7.3% Annually Until 2020

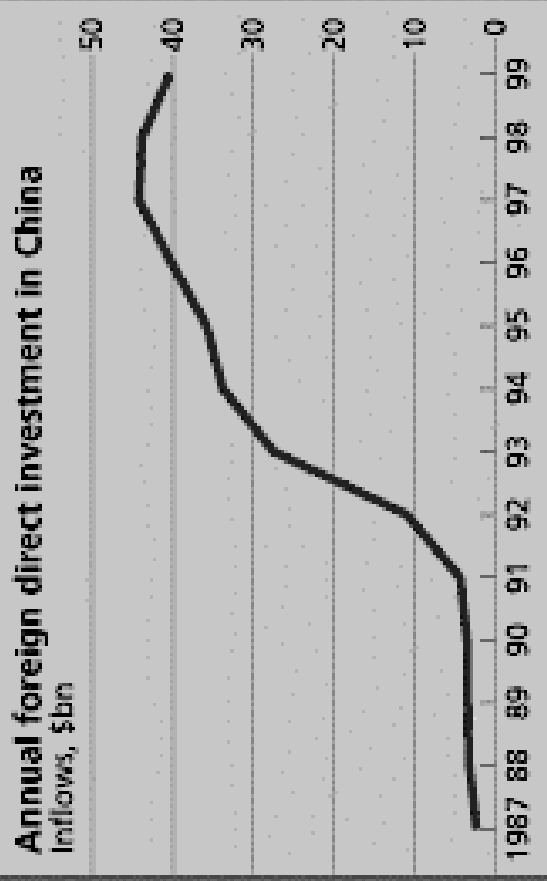
The economy grew an average 9.9 per cent between 1994 and 1998. It grew 7.1% in 1999. Gross domestic product grew a year-on-year 8.1 per cent in the first quarter of 2000. A government think-tank forecast projects an average 7.3 per cent a year until 2020.

(South China Morning Post)

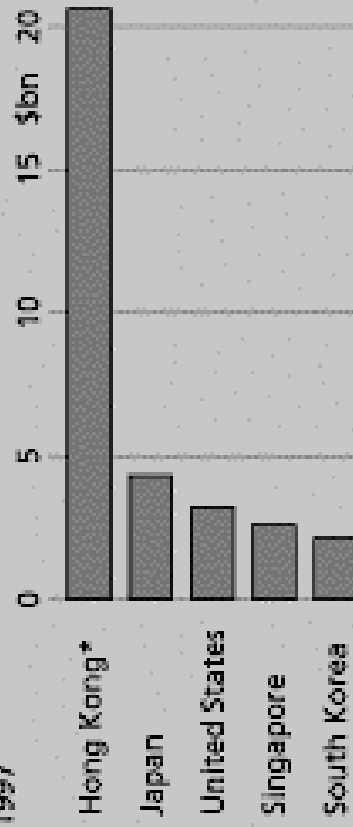
ECONOMIC HIGHLIGHT: State Spending Fails to Restore Consumption



3 The gold rush slows



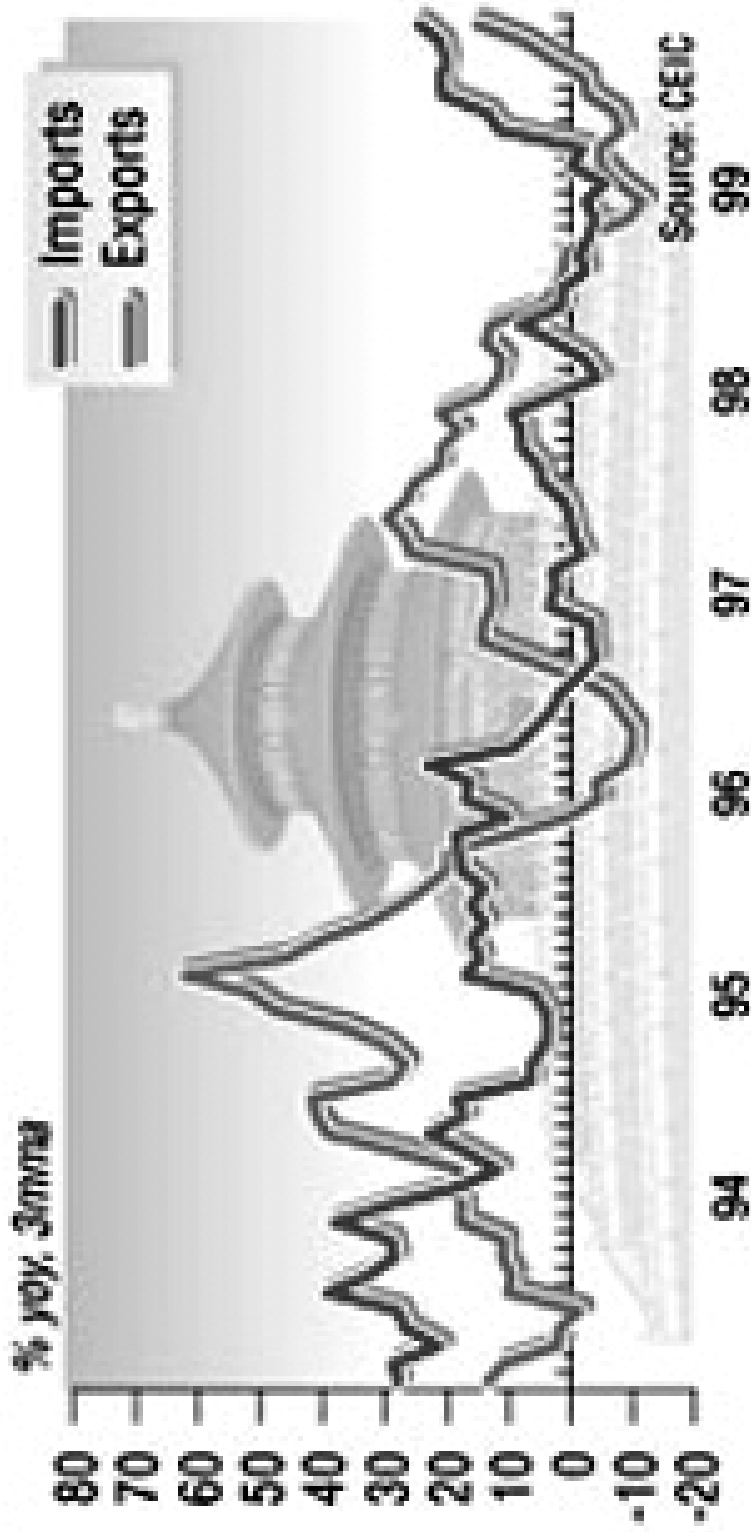
Five biggest foreign direct investors
1997



Source: UNCTAD

*Includes most of Taiwan's FDI

SECTOR HIGHLIGHT: Trade



China's IC Industry in Short Supply

1. Output and sales of domestic micro-electronic industry:

| Year | Sales | Output of IC |
|------|---------------|---------------|
| 1997 | 1.677 billion | 5.245 billion |
| 1998 | 2.216 billion | 5.851 billion |
| 1999 | 4.15 billion | 9.87 billion |

2. Demand amount of domestic Market

| Year | Requirement | Market |
|------|-----------------|--------------|
| 1998 | 12 billion Yuan | 36.4 billion |

3. Estimate demand amount of domestic market:

| Year | Requirement | Market |
|------|-------------|-------------------|
| 2000 | 18 billion | 52.3 billion Yuan |
| 2005 | 36 billion | 100 billion Yuan |
| 2010 | 70 billion | 200 billion Yuan |

4 Trade ties

China's trade, 1998, \$bn

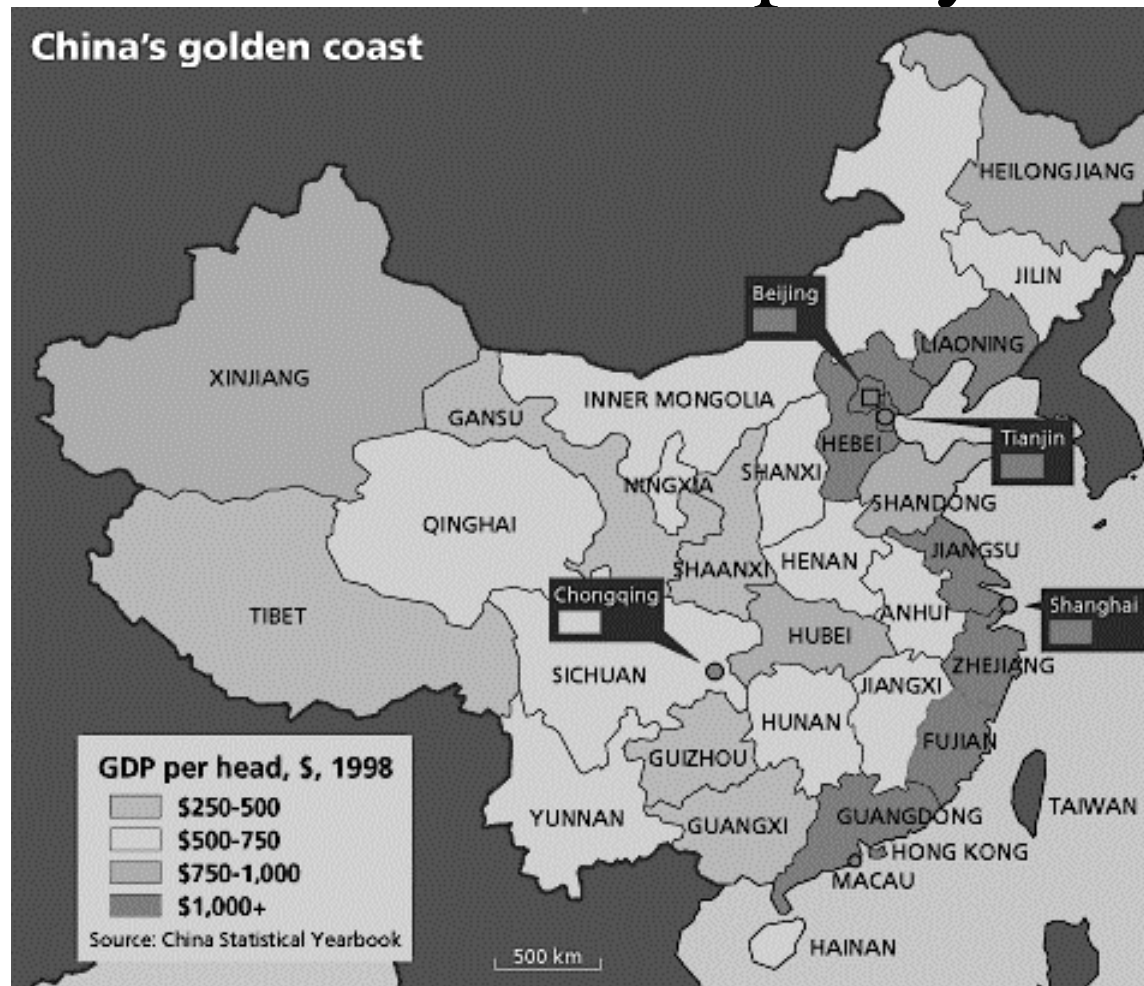
| Partner | Imports | Exports |
|-----------------|----------------|----------------|
| United States | 17.0 | 38.0 |
| Europe | 4.5 | 5.0 |
| Asia (ex-Japan) | 52.8 | 63.4 |
| Japan | 28.3 | 29.7 |
| Rest of world | 37.7 | 47.4 |

Sources: IMF

Policy Priorities

- Continue developments (17% VAT tax, need 18 million new jobs per year)
- Income gap (\$4,000=East vs \$200=West).
- Capital and markets (FDI & stock markets).
- Electronics (Internet, ICs, and Software).
- Western infrastructure (\$12 bn water pipeline).
- State Owned Enterprises (Welfare system).

Income Discrepancy



Beijing, Shanghai and Shenzhen all report about 15% annual growth, far above the national 7.1% annual average in 1999.

Riots from SOE closures.

- February riot of 20,000 people for mine closing in northeastern town of Yangjiazhanzi
- 31 mass protests in the first half of 1999 in Fujian
- 5,128 reported thefts from SOEs in Fujian

China's Strengths

- Attractive 1.3 billion market.
- Unlimited low-cost workforce.
- Low market penetration rates.
- Rapid GNP growth rates.
- Industrial parks with tax incentives.
- Rapid economic/political reforms (WTO).

Future Trends and Policies

- Development is priority in west (\$280 vs \$3800)
- SOEs are in decay and costly to Banks (North and West China)
- Development requires FDI (IC & software, or FDI in West adds 3 year tax incentive)
- Electronics is pillar industry (Large scale computer project 863)
- Military vs Development tradeoff is Key Strategic Issue

Key Findings

- **Equipment is available to meet industry needs.**
- **Design, Assembly, and Test is competitive for most electronics products, including PDAs and Portable Phones.**
- **Electronics centers are moving west (Chengdu and Xi'an).**
- **HK provides Capital, Staff, and Distribution (re-import to avoid VAT).**
- **Future technology will include Taiwan (One-China Policy).**

I. China

- Government programs are key: 909 (ICs), 863 (CIMS), Torch (Industrial Parks).
- Shanghai, Beijing, Tianjin, Chongqing are Government Controlled (coast vs control cultures).
- Shanghai, Beijing, Shenzhen, and Xi'an/Chengdu are electronics centers.
- SOEs are North, Northeast, and West.

China's Golden Projects

| Name | Full Title | Major Ministries, Departments |
|---------------------------------|---|--|
| Golden Bridge (JinQiao) | National Public Economic Information Communication Network | Ministry of Electronics, State Information Centre, Ji Tong Co. |
| Golden Card (JinKa) | Electronic Money Project | PBoC, Ministry of Electronics, Ministry of Internal Trade, Great Wall Computer Co. |
| Golden Customs (JinGuan) | National Foreign Economic Trade Information Network Project | Ministry of Foreign Trade, Customs Department, Ji Tong Co. |
| Golden Sea (JinHai) | | State Statistical Bureau, PBoC, State Information Centre |
| Golden Macro (JinHong) | National Economic Macro-Policy Technology System | China ExIm Bank, Ministry of Finance, State Information Centre |
| Golden Tax (JinShui) | Computerised Tax Return and Invoice System Project | Ministry of Finance, Ministry of Electronics, National Taxation Bureau, Great Wall Computer Co |
| Golden Intelligence (JinZhi) | China Education and Research Network (CERNET) | State Education Commission |
| Golden Enterprise (JinQi) | Industrial Production and Information Distribution System | State Economic and Trade Commission |
| Golden Agriculture (JinNong) | Overall Agricultural Admin. and Information Service System | Ministry of Agriculture |
| Golden Health (JinWei) | National Health Information Network | Ministry of Health |
| Golden Info. (JinXin) | State Statistical Information Project | State Statistical Bureau |
| Golden Cellular (JinFeng) | Mobile Communications Production and Marketing Project | Ministry of Electronics Industry |
| Golden Switch (JinKai) | Digital 2000 Switch Systems Production Project | Ministry of Electronics Industry, Ministry of Posts and Telecoms |

II. China

- Government programs support: (909 ICs) (863 CIMS), (Torch Industrial Parks).
- Government Controlled Cities: Shanghai, Beijing, Tianjin, and Chongqing have different cultures.
- Shanghai, Beijing, Shenzhen, and Xi'an/Chengdu are the electronics centers.
- Targeting North, Northeast, and West.

The Central Kingdom



III. China

- Government programs support: (909 ICs) (863 CIMS), (Torch Industrial Parks).
- Shanghai, Beijing, Tianjin, Chongqing are Government Controlled (coast vs control cultures).
- Shenzhen, Shanghai, Beijing, and Xi'an/Chengdu are electronics centers.
- Targeting West, North, and Northeast.

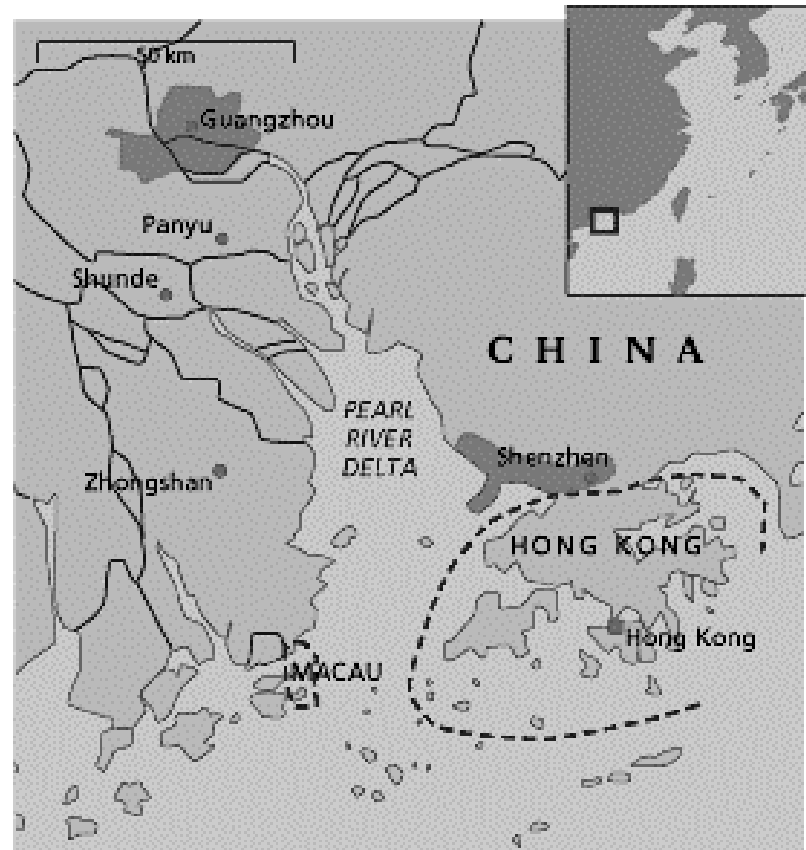
Shanghai

- High-tech Industrial Parks. Responsive leaders. Allows sole proprietorships.
- Silicon Valley (Wuxi, Suzhou, Pudong, Nanjing)
- Hua Hong NEC (909 project)
- Huajing for discrete, bipolar, and MOS ICs.
- Fudan Microanalysis Center (compares to US/Japan). Reverse engineering.
- Parlex: Flex circuits (auto industry).

Beijing

- Leading Universities: Involved in government projects (CIMS).
- Government Center: MII (MEI and MPT) focus is on Internet as pillar industry.
- CIDC: a leading design center (MP3 design, Asics designs).

Pearl River Delta



- **One Economic Development Zone.**
- **May become Centrally Controlled.**

HK Economic Situation

- The world's freest economy
- The world's most service-oriented economy
- The world's 2nd highest per capita holding of foreign currency
- The 2nd largest source of outward foreign direct investment in Asia
- The world's 4th largest foreign exchange reserves holding

Hong Kong Economic Indicators

| | 1997 | 1998 | 1999 | 2000 |
|---|---------------------------|---------------------------|---------------------------|---------------------------|
| Population (mn) | 6.6¹ | 6.8¹ | 6.9¹ | 6.9⁴ |
| Gross Domestic Product (US\$ bn) | 169.7² | 162.4² | 157.7³ | 163.1⁵ |
| Real GDP Growth(%) | 5.0² | - 5.1² | 2.9³ | 5.0⁵ |
| GDP Per Capita (US\$) | 26,103² | 24,288² | 23,200³ | 23,530⁵ |
| Inflation (%) | 5.8 | 2.8 | - 4.0 | - 5.1⁶ |
| Unemployment Rate (%) | 2.5 | 4.7 | 6.2 | 5.6⁶ |

¹ End-period figures ² Revised estimates (Mar 2000) ³ Preliminary estimates (Mar 2000)

⁴ Current estimates ⁵ Projections ⁶ Jan-Mar 2000

HK Threats

- China gap closing faster than expected.
- Western labor costs in HK.
- No incentives for new business in HK.
- Shenzhen and Shanghai are more entrepreneurial.
- Namtai is ODM for PDA/PPC. LCD modules for Japan. (COB, TAB, OLB, & SMT technologies)
- Whitways is job shop. (SMT, COB, Injection Molding)

China Salaries/Month (US\$)

| | HK | Mainland |
|--------------------------|--------|----------|
| • Head of Government | 34,807 | 266 |
| • Professor | 16,287 | 453 |
| • CEO | 15,975 | 2,865 |
| • Controller | 11,022 | 2,457 |
| • Manufacturing Director | 10,150 | 1,866 |
| • Sales Director | 8,454 | 1,524 |
| • Systems Engineer | 3,774 | 746 |

Source: AsiaWeek Salaries Survey 2000

HK Opportunities

- “Global front-end design”?
- Applied S&T Research Institute?
- University cooperation/laboratories (China). UST is doing new designs (HD, MP, CSP, Mobile).
- First new company (Compass uses HKPC and City University labs). New Singapore site. Next Shanghai.
- Infrastructure (containers, air port)? HK redistribution center (China 17% VAT repayment).

IV. China

- Government programs support: (909 ICs) (863 CIMS), (Torch Industrial Parks).
- Shanghai, Beijing, Tianjin, Chongqing are Government Controlled (coast vs control cultures).
- Shanghai, Beijing, Shenzhen, and Xi'an/Chengdu are electronics centers.
- Targeting West, Northeast, and North.

Xi'an

- Next Electronics Center: 60% of State Development Budget directed to West in next five-year plan.
- City renewal and high-tech industrial park: Orient (Future) Software.
- Tourist center (Terracotta warriors).
- Military/University center.

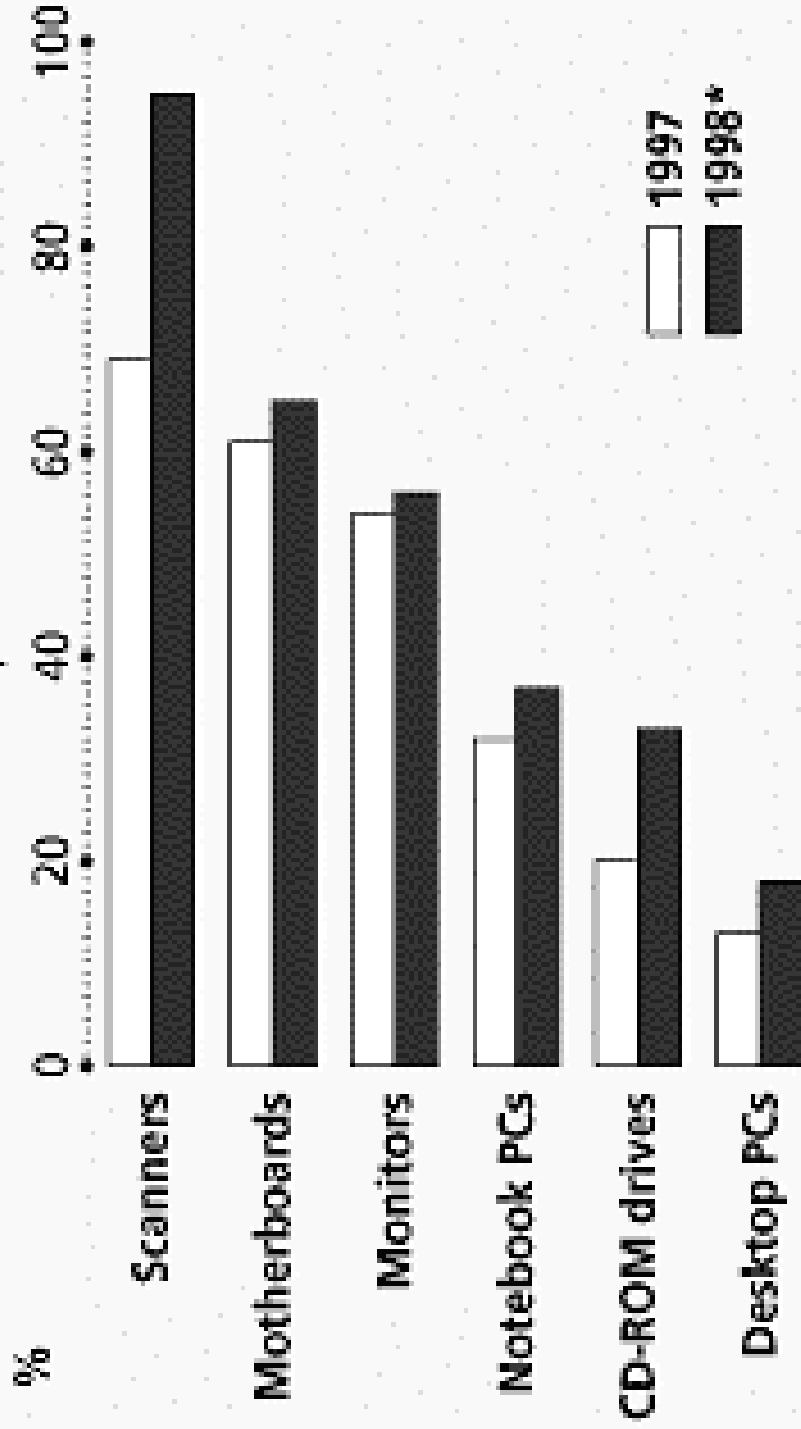
Summary

- **China has Technology and Labor.**
 - Design, COB, COG, BGA Xray, and rapid prototyping.
 - ASICs can be made anywhere.
 - Unlimited \$100/month factory labor.
- **Development is Top Political Priority.**
 - WTO/FDI/industrial parks/extended tax incentives/R&D.
 - Western regions top priority (Chengdu/Xi'an).
- **“One China” impact is great.**
 - Electronics technologies (>50% world market shares).
 - Leading edge assembly technologies (TSMC, Acer, etc).
 - US military capabilities and equipment.
- **Military strategy?**
 - Global alliances and purchases (Israel).
 - Political influence (Korean unification).
 - Focus on SOE capabilities (TQM & technology).

On top of the world

5

Taiwan's share of world computer markets



Sources: Market Intelligence Centre; IDC; The Economist estimates

*Forecast