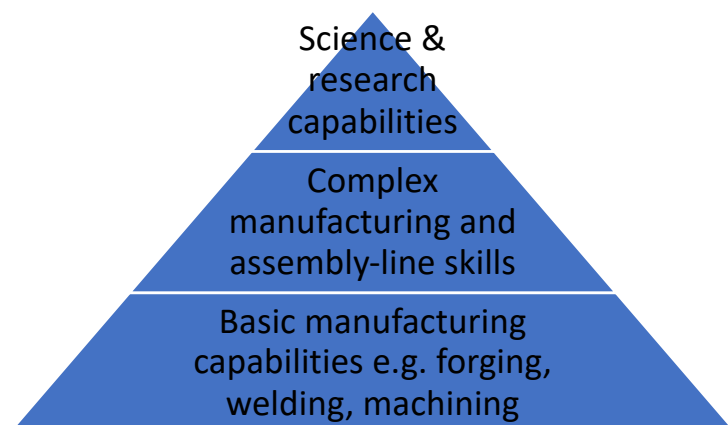


# SAMPLE

## Technology policy and the knowledge-based economy

### China's technological capabilities



- China emerged from its socialist era with a strong base (industrial skills are widespread) – also emerged with relatively strong capabilities in science and research capabilities
- The middle is quite weak – China has few firms with significant leading-edge technologies
  - Thus attempting to move down its scientific capabilities to the factory floor, upgrade existing factories to move up the value chain

### Triad for analysing technology in an economic context

Factor	Overview
<b><u>Technology effort</u></b>	<ul style="list-style-type: none"> <li>• The volume of <u>research</u> committed to R&amp;D</li> <li>• The <u>policy</u> strategy that guides R&amp;D</li> <li>• Contributes to accumulating knowledge (generates knowledge)</li> </ul>
<b><u>Human resource base</u></b>	<ul style="list-style-type: none"> <li>• Defines the possible <u>capabilities</u></li> <li>• Reflects the <u>LR outcome of the technology base</u></li> <li>• Contributes to accumulating knowledge (generates knowledge)</li> </ul>
<b><u>Institutions and incentives</u></b>	<ul style="list-style-type: none"> <li>• Determines what ideas and technologies <u>actually get applied</u> to the production process</li> <li>• Determines how much of the accumulated knowledge will be used (applies knowledge)</li> </ul>

### Technology effort (R&D)

- USUALLY: Modern technologies / innovations almost entirely from the rich countries
  - In a way can benefit developing nations, who can pick and choose the successful ones to adopt rather than spend a fortune on speculative / risky R&D ventures

- **However** – practical obstacles exist e.g. time and skill required to identify and adopt appropriate technology; initial low productivity post-introduction; IP barriers to access

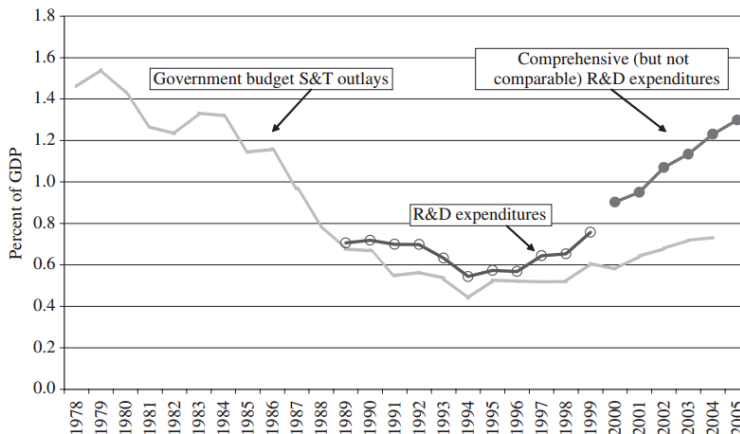


Figure 15.2  
R&D expenditures (percent GDP)

China's R&D / S&T (science and tech) expenditure

- **During reform era**, China tried to keep government **R&D outlays high**
- However – this level was **not sustainable** → declining SOE revenues, existing R&D effort was not economically viable
- R&D scaled back to levels actually in line with other nations, however China actively sought higher R&D/GDP ratios
- From 2000, outlays began to

increase once more – through numerous channels

- Is now catching up to OECD levels

#### Strategies of R&D investment

- R&D expenditure has widespread support
- Restless ongoing search for institutions and policies to support china's ongoing drive to become technology power
  - When policy proves ineffective, it is dropped. New policies trialled all the time.
- **Today**: technology effort extremely diverse + multi-stranded

Strategy	Overview
<b>Do it yourself</b> <b>(socialist era)</b>  Still exists, but confined mostly to <u>national security</u>	<ul style="list-style-type: none"> <li>• <u>Leaders in China set a few key tasks, planners coordinate and fund flexible multidisciplinary and multiskilled research groups</u> to pursue these goals</li> <li>• Effective for <u>military</u> purposes – development of bombs and missiles</li> <li>• <b>However</b> – similar problem as with the <i>Soviets</i> – <u>bad at transferring the technology to the consumer / civilian economy</u></li> <li>• Planners <u>do not have the technical capabilities to evaluate technologies</u>, so developers can use more experimental methods that are not economically viable</li> <li>• <u>No incentives to commercialise</u> their inventions</li> </ul>
<b>Buy it</b> <b>(Third Plenum)</b>  As above	<ul style="list-style-type: none"> <li>• <b>Massive purchases of industrial machinery</b> seen as quickest route of out China's scientific isolation</li> <li>• Local governments allowed to <u>import</u> equipment</li> <li>• <b>Problem</b>: importation often excessive, duplication common</li> <li>• Very <u>expensive, ineffective, inefficient</u> way of <u>introducing</u> new tech</li> <li>• In the 80s as <u>SOEs' revenues fell</u>, they could <u>no longer afford</u> prestige purchases</li> </ul>
<b>Bargain for it</b> <b>(80s)</b>	<ul style="list-style-type: none"> <li>• China initiated complex <b>negotiations with a large number of MNCs</b> – trading Chinese market <u>access for technology sharing</u></li> <li>• China sought highly restrictive / comprehensive deals; MNCs unwilling to give up tech</li> <li>• <b>Very few projects actually succeeded</b> in <u>producing technology transfer</u></li> </ul>
<b>Seed it</b>	<ul style="list-style-type: none"> <li>• China <b>scaled back direct government research</b> – developed more sophisticated funding</li> </ul>

<b>(mid-late 80s)</b>	<ul style="list-style-type: none"> <li>• Budget <u>allocations</u> to research institutions <u>cut</u> – partially <u>replaced</u> with a <u>system of competitive grants</u></li> <li>• Required submissions to funding agencies – key is Natural Sciences Foundation</li> <li>• New program to <b>diffuse key civilian technologies</b> (<u>86-3 Program</u>)</li> <li>• Later succeeded by the <u>97-3 Program</u></li> <li>• Other plans: Torch Program – bank loans for technology adoption by enterprises; Spark plan – technological upgrading of TVEs</li> </ul>
<b>Encourage spin-offs (80s)</b>	<ul style="list-style-type: none"> <li>• Policymakers tried to <b>give research institutes stronger incentives to diffuse technologies into the civilian economy</b></li> <li>• <u>Institutes and universities allowed to contract with enterprises to provide technical services</u> – also allowed to establish their <u>own commercial subsidiaries</u></li> <li>• Resulted in some leading computer / IT firms – e.g. Lenovo spun off from the Institute for Computer Technology of the Chinese Academy of Sciences (1984)</li> </ul>
<b>Open up to FDI (1992 onwards)</b>	<ul style="list-style-type: none"> <li>• <b>FDI inflows introduced funding into medium-</b> and high-tech sectors, also integrated China into global production networks of high-technology items</li> <li>• New deal – <b>market access and IPR protection in exchange</b> for technology transfer</li> <li>• <u>Accession to WTO</u> in 2001 codified and made binding the promises China made to promote this deal</li> </ul>
<b>Support domestic entrepreneurship (late 90s onward)</b>	<ul style="list-style-type: none"> <li>• 1999 – Chinese firms given widespread support to enter high-tech fields as private firms and start ups</li> <li>• <b>Government supports virtually all technologically advanced spin-offs</b> from schools and research institutes</li> <li>• <u>Tax breaks, low-interest credit access</u>, preference in procurement decisions</li> </ul>

#### Rankings

- 22 – Global Innovation Index 2017
- 16 – Quality of Innovation 2017
- Shenzhen-Hong Kong the 2<sup>nd</sup> most inventive subnational cluster in the world
  - Tokyo-Yokohama 1<sup>st</sup>; Silicon Valley (San Jose-San Fran) 3<sup>rd</sup>

#### Human capital resource base

- China has an enormous number of technical personnel employed
  - Very high number of researchers – **however** as a % of the workforce, still below OECD levels
- Number of STEM graduates on the increase (just under half of all graduates)
- Returning students from overseas studies are also extremely valuable, on the increase
  - High proportion of students do in fact return
  - Usually return with some work experience

#### Institutions and incentives

##### Current policy stance

- China has abandoned much of the ideological baggage that once inhibited technological development (think – DIY, bargain for it policies)
- “National industry” has been redefined – initially only meant SOEs, but now includes foreign-invested firms, start-up private enterprises (e.g. **Huawei**, Lenovo)
- Increasingly **relaxed approach to foreign investment and technology transfer contracts**

##### Regulatory / institutional efforts

- Human resources are the foundation of development policy – increased spending on education
- High-tech trade the top priority of foreign trade development

- Corporate governance improvements – separation of management & ownership
- **Technology policy:** Tax breaks, subsidised credit, procurement preferences, lower land prices, cooperative regulatory procedures

## Fintech and the financial system

### Key factors contributing to the surge/rise of fintech in China

- **Light regulation**
  - China has allowed trade and manufacturing companies to be granted finance-related operating licences
    - E.g. Alibaba, Tencent (AliPay, WeChat Pay)
- **Underservicing**
  - Previously Repressive financial policy has created an undersupply of financial services, especially for SMEs, low income households
- **Transaction facilitation**
  - IT tools, especially mobile terminals and big data analysis, increasingly offer effective ways for internet finance to increase its efficiency, control risk
  - Biggest issue is pricing, which is generally harder to do for SMEs, low-income households as they have fewer assets to collateralise, less info available – this problem can be solved with big data, data collection
  - China has millions of mobile phones – there is ubiquitous connectivity

.....

.....

..

# Theoretical frameworks for EMNEs' internationalisation

## Early development of internationalisation theories

Strategy	Overview
<b>1950-60s</b> Vernon's product Life Cycle framework	<ul style="list-style-type: none"> <li>Exploitative internationalisation with <b>competitive advantage</b> - Attract FDI into areas where Chinese firms have a competitive advantage</li> </ul>
<b>1960s-70s</b> Buckley's Internationalisation theory	<ul style="list-style-type: none"> <li><b>Internalising</b> imperfect market through internationalisation expansion –<b>Cross-border “vertical integration”</b> – <u>emphasis on the distribution / supply side from OVERSEAS</u> – Yi bitched out a student who suggested this was vertical integration</li> </ul>
<b>1980s-90s</b> <b>DUNNING</b> framework	<ul style="list-style-type: none"> <li><b>OLI – ownership, location, internalisation advantage</b></li> <li>Three potential sources of advantage that may underlie a firm's decision to become MN</li> <li>Ownership advantage – often relate to assets that can be applied to production at different locations without reducing their effectiveness e.g. product development, patents, marketing skills (intangible assets)</li> <li>Location advantage – where firms choose to locate</li> <li>Internalisation advantages – influences how a firm chooses to operate overseas, trading off the savings in transaction costs</li> </ul>

## Linkage-leverage-learning framework (MATHEWS)

- **EMNEs do not build their international empires entirely from their own resources and acquired capabilities**
  - They link these with existing players and leverage resources from them
- **LLL is a strategic framework focused on accelerated internationalisation (O is missing in OLI) – not own proprietary tech, management capabilities not as developed.**

L	Overview
<b>Linkage</b>	<ul style="list-style-type: none"> <li><u>Connecting</u> with and making use of <u>technology-rich companies</u> or companies already <u>active</u> in target markets. (<b>Identifying and bridging gaps</b>)</li> <li>Firms with a <u>shortage</u> of <b>strategic resources</b> can make up the <u>deficiency</u> through linkages</li> </ul>
<b>Leverage</b>	<ul style="list-style-type: none"> <li>Gaining access to technologies and / or market position</li> <li>Explores ways that <b>linkages can be established so that resources can be leveraged</b>, the resources themselves and their leverage potential</li> <li>E.g. through JVs, supply chain contracts, technology licensing agreements, partnerships focused on market entry</li> </ul>
<b>Learning</b>	<ul style="list-style-type: none"> <li><b>Repeated application of linkage and leverage</b> as a means of building the dynamic <b>capabilities</b> of the EMNE, equipping it with necessary capabilities</li> </ul>

.....

...

.

SOEs today – China still has the largest number of SOEs

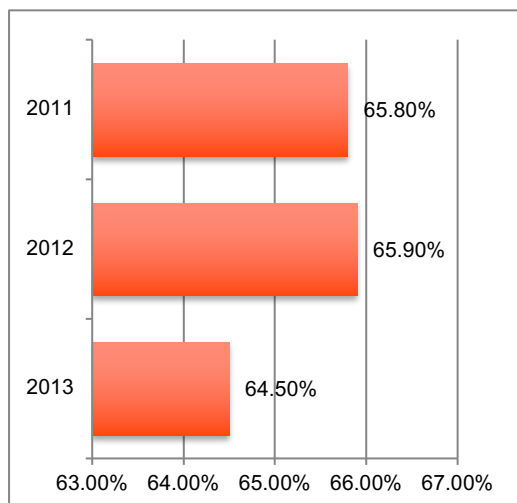
Central vs. local comparison

Metric	Central	Local
Number of firms	52,000	103,000
Number of employees	17.63m	19.35m
Total assets	46.8 trillion RMB	55.5 trillion RMB

SOE Governance

Level of SASAC	Responsibilities	SOEs under control
State Council (Central)	<ul style="list-style-type: none"> <li>Petroleum and refining</li> <li>Metallurgy</li> <li>Electricity</li> <li>Military industry</li> <li>Telecommunications</li> </ul>	<ul style="list-style-type: none"> <li>Sinopec</li> <li>PetroChina</li> <li>China Mobile</li> <li>China International Marine Containers</li> </ul>
Ministry of Finance	<ul style="list-style-type: none"> <li>Transport</li> <li>Cultural enterprises</li> <li>Finance</li> </ul>	<ul style="list-style-type: none"> <li>China Railway Group</li> <li>ICBC</li> <li>ABC</li> </ul>
Local	<ul style="list-style-type: none"> <li>Industrial enterprises</li> <li>Utility enterprises</li> <li>Urban development and investments</li> </ul>	

High leverage (D/A ratio)



....Originally, SOEs earned huge profits → transferred to the state budget and allocated to other non-financial SOEs

As reform closed down many SOEs / hindered their profitability, industrial finance became a problem

**SOLUTION:** non-financial SOEs could easily get low-interest loans from banks (also SOEs)  
= Good solution to solve budgetary shortfall, high domestic household savings rates

**However** – resulted in an accumulation of NPLs – bank credits were granted to inefficient firms and credit risk was not properly managed by either party (bank / SOE)

....

....

.....

...

## Phase 1 | 1978 – 1992

→ use instruments of planned economy to shift resources toward household sector and relieve macroeconomic

stresses @ beginning of reform

### Dual-track system

- Coexistence of a traditional plan + market channel for the allocation of goods
- Two-tier pricing system for most goods
  - State-set planned price, and a market price
- Applied to the state sector and industrial economy
  - All factories, including state-owned ones (SOE's), used a dual-track system in their introduction to the free market

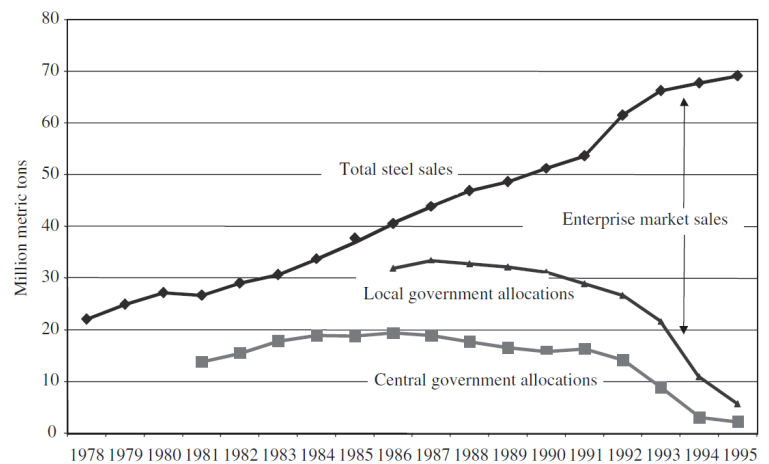


Figure 4.1  
Steel production and planned allocation

### Specific (particularistic) contracts

- Reformers signed individual contracts with every SOE, specifying
  - Tax payments – no regular tax system – rates specific to individual enterprises
  - Contributions to the material-balance plan
- Could tailor reform plans to individual companies to enable them to reform without suffering losses

### Market entry = only form of competition

- Central government relaxed its monopoly over certain industries
- **Protected industrial sector effectively opened to new entrants** (including TVEs) in 1979
  - Significant increase in the number of market players → **increased competition**

### Pricing system

- Flexible prices to match supply and demand
- 1985 developments
  - Market prices given legal sanction for sale of goods in excess of government “track”
  - **Transactions between state and non-state sectors permitted**
    - Simple trade now accompanied by various kinds of joint ventures and cooperative agreements

### Incremental managerial reforms

- Internal transitions that **shifted management focus away from mere plan fulfilment → profitability**
- Alternative to privatisation – adopting the free market mindset within a business still connected to the planned economy

### Disarticulation

- Successive sections of the economy incrementally separated from the planned economy
  - E.g. rural reform first, then industrial
  - Major factor in reform success in the countryside
    - Policymakers realised it was not necessary for all the countryside to be integrated into the planned economy
- Major example – **special economic zones**
  - Export-oriented enclaves with (initially) almost no links to the rest of the economy

### Initial results

**Macroeconomic st..... see more when purchase notes ;)**