Machinery

Factory Automation in China

Katsushi SAITO
Head of Asia-Pacific Industrials Research

Wenjie GE

Yankun HOU
Head of Industrials and Autos Research, Asia ex-Japan
Value chain: Japanese/European makers competitive in upstream and downstream

Smile curve: Competitiveness of Japanese/Chinese companies

Profitability

Core components (upstream)
- SMC (pneumatic machinery)
- Fanuc (NC equipment)
- THK (linear guides)
- Nabtesco (hydraulic equip.)
- Siemens (NC equipment)

Assembly (midstream)
- Haitian International (injection molding machinery)
- Shenyang Machine Tool (machine tools)
- Sany Heavy Industry (construction machinery)

Services (downstream)
- Komatsu (construction machinery)
- Kubota (agricultural machinery)
- Daikin Industries (air conditioners)
- Kone Elevator (elevators)
- Schindler Elevator (elevators)

Source: Nomura
# Global machinery makers: (1) Factory automation

<table>
<thead>
<tr>
<th>Industry</th>
<th>Japan</th>
<th>Europe/North America</th>
<th>China/Taiwan/Korea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumatic equipment</td>
<td>SMC(6273 JP) CKD(6407 JP)</td>
<td>Festo(Unlisted) Parker Hannifin(PH US)</td>
<td>Airtac(1590 TW)</td>
</tr>
<tr>
<td>Linear guides</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NC equipment</td>
<td>Fanuc(6954 JP) Mitsubishi Electric(6503 JP)</td>
<td>Siemens(SIE GY)</td>
<td>Wuhan Huazhong Numerical Control(300161 CH) GSK CNC Equipment(Unlisted)</td>
</tr>
</tbody>
</table>

Source: Nomura
# Global machinery makers: (2) Other machinery

<table>
<thead>
<tr>
<th>Industry</th>
<th>Japan</th>
<th>Europe/North America</th>
<th>China/Taiwan/Korea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheet metal processing machines</td>
<td>Amada(6113 JP)</td>
<td>Trumpf(Unlisted)</td>
<td>Jiangsu JinFangYuan CNC Machine(Unlisted) &lt;br&gt;Jiangsu Yawei Machine Tool(002559 CH)</td>
</tr>
<tr>
<td>Machine tools</td>
<td>Yamazaki Mazak(Unlisted) &lt;br&gt;Okuma(6103 JP) &lt;br&gt;Moriseiki(6141 JP) &lt;br&gt;Makino Milling Machine(6135 JP) &lt;br&gt;Amada(6113 JP)</td>
<td>Gildemeister(GIL GY) &lt;br&gt;MAG(Unlisted) &lt;br&gt;Haaz(Unlisted) &lt;br&gt;Heller(Unlisted)</td>
<td>Shenyang Machine Tool(000410 CH) &lt;br&gt;Dalian Machine Tool(Unlisted) &lt;br&gt;Hyundai Wia(011210 KS) &lt;br&gt;Doosan Infracore(042670 KS)</td>
</tr>
<tr>
<td>Construction machinery</td>
<td>Komatsu(6301 JP) &lt;br&gt;Hitachi Construction Machinery(6305 JP) &lt;br&gt;Kobe Steel(Kobelco Construction Machinery, 5406 JP)</td>
<td>Caterpillar(CAT US) &lt;br&gt;Volvo(VOLVB SS)</td>
<td>Doosan Infracore(042670 KS) &lt;br&gt;Hyundai Heavy(009540 KS) &lt;br&gt;Sany Heavy Industry(600031 CH) &lt;br&gt;Lonking(3339 HK) &lt;br&gt;Zoomlion(1157 HK)</td>
</tr>
<tr>
<td>Agricultural machinery</td>
<td>Kubota(6326 JP) &lt;br&gt;Iseki(6310 JP) &lt;br&gt;Yanmar(Unlisted)</td>
<td>John Deere(DE US) &lt;br&gt;New Holland(Unlisted)</td>
<td>First Tractor(38 HK) &lt;br&gt;Foton Lovol Heavy Industries(Unlisted)</td>
</tr>
</tbody>
</table>

Source: Nomura
What drives China FA?

Shanghai and Beijing minimum wages (%y-y)

Source: CEIC, Nomura
Machine tools without NC

Source: Nomura
Machine tools with NC

Source: Nomura
NC ratio = machine tools equipped with NC systems / total machine tools (volume basis)

Source: Japan Machine Tools Association, CEIC, Nomura
Japan/China NC machine tools output

Source: Japan Machine Tools Association, CEIC, Nomura
Japan is the leading exporter of machine tools to China

**Demand structure**

- **Germany/Switzerland**
- **Japan/Germany**
- **South Korea**
- **Taiwan**
- **China (Domestic)**

**Pricing image (Made in Japan = 100)**

- High grade/specialized: 120-150
- High grade/mass production: 100
- Medium grade/mass production: 50-70
- Low-priced: ~30

Note: Prices are rough estimates.
Source: Nomura based on interviews

**Chinese imports of machine tools by origin**

- Japan
- Germany
- Taiwan
- US
- South Korea

Source: Nomura based on data from Japan Machine Tools Association
Fanuc: Top share for NC equipment in China

### Market share for NC equipment

<table>
<thead>
<tr>
<th>Region</th>
<th>Fanuc's share</th>
<th>Major competitors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>70</td>
<td>Mitsubishi Electric</td>
</tr>
<tr>
<td>North America</td>
<td>30</td>
<td>Siemens</td>
</tr>
<tr>
<td>Europe</td>
<td>36</td>
<td>Siemens, Heidenhain(Germany)</td>
</tr>
<tr>
<td>Korea and Taiwan</td>
<td>80</td>
<td>Mitsubishi Electric</td>
</tr>
<tr>
<td>China</td>
<td>50</td>
<td>Siemens, Mitsubishi Electric</td>
</tr>
<tr>
<td>India</td>
<td>50</td>
<td>Siemens</td>
</tr>
<tr>
<td>World total</td>
<td>50</td>
<td>Siemens</td>
</tr>
</tbody>
</table>

Note: Volume basis. FY08 Nomura estimates. Source: Nomura

### Total sales by region (FY10E)

- **Fanuc clients**
  - Asia: 52%
  - Japan: 25%
  - The Americas: 12%

- **Factoring in indirect exports by clients**
  - Asia: 60%
  - Japan: 14%
  - Europe: 12%
  - The Americas: 13%

Source: Nomura

---

NOMURA JAPANESE EQUITY RESEARCH
Chinese largest maker: Shenyang Machine Tool
Shenyang Machine Tool: Origin of key components

<table>
<thead>
<tr>
<th>名称</th>
<th>厂家</th>
</tr>
</thead>
<tbody>
<tr>
<td>系统</td>
<td>FANUC</td>
</tr>
<tr>
<td>主电机</td>
<td>FANUC</td>
</tr>
<tr>
<td>主电机</td>
<td>FANUC</td>
</tr>
<tr>
<td>X轴电机</td>
<td>FANUC</td>
</tr>
<tr>
<td>Z轴电机</td>
<td>FANUC</td>
</tr>
<tr>
<td>X轴导轨</td>
<td>INA</td>
</tr>
<tr>
<td>Z轴导轨</td>
<td>INA</td>
</tr>
<tr>
<td>刀架</td>
<td>DUPLOMATIC</td>
</tr>
<tr>
<td>Z1轴丝杠</td>
<td>THK</td>
</tr>
<tr>
<td>Z2轴丝杠</td>
<td>THK</td>
</tr>
<tr>
<td>X1轴丝杠</td>
<td>THK</td>
</tr>
<tr>
<td>X2轴丝杠</td>
<td>THK</td>
</tr>
<tr>
<td>正卡盘</td>
<td>亿川</td>
</tr>
<tr>
<td>正油缸</td>
<td>亿川</td>
</tr>
<tr>
<td>倒卡盘</td>
<td>亿川</td>
</tr>
<tr>
<td>倒油缸</td>
<td>亿川</td>
</tr>
<tr>
<td>正主轴轴承</td>
<td>NSK</td>
</tr>
<tr>
<td>正主轴轴承</td>
<td>NSK</td>
</tr>
<tr>
<td>丝杠轴承</td>
<td>NSK</td>
</tr>
<tr>
<td>倒主轴轴承</td>
<td>NSK</td>
</tr>
<tr>
<td>倒主轴轴承</td>
<td>NSK</td>
</tr>
</tbody>
</table>

Source: Nomura based on company material
Machine Tools: Fanuc NC
Machine Tools

Source: Nomura
Machine Tools: GSK NC
Machine Tools

Source: Nomura
Machine Tools: Fiyang NC

Source: Nomura
Machine Tools: Pneumatic Equipment (SMC)
Machine Tools: Pneumatic Equipment (AirTac)

Source: Nomura
SMC: Top share for pneumatic equipment in China

Market share in China (FY 10)

- SMC, 37%
- Airtac, 14%
- Festo, 13%
- CKD, 4%
- Others, 32%

Sales by region (FY11E)

- Japan, 41%
- China, 12%
- Europe, 16%
- Other Asia, 15%
- North America, 13%
- Others

Source: Nomura
FA level in China (Robots)

Welding robots installed of every 1,000 automobile produced

Japan

Germany

South Korea

North America

Robots installed of every 1,000 automobile produced

China

Assuming half of the installments are welding robots

Source: International Federation of Robotics, Nomura
Automobile Assembly Line

Source: Nomura
Automobile Assembly Line

Source: Nomura
FA level in China (Robots)

Welding robots per line at plants of Japanese/European automakers located in industrialized nations indexed at 100

- **Japan/US/European companies' plants in industrialized nations**: 100
- **Japan/US/European companies' plants in China**: 50–70
- **Chinese companies' plants in China**: 10–50

Source: Nomura based on interviews
Collaboration between Machine tools and Robot
Industrial Robot: Pneumatic equipment
Industrial Robot (Siasun): China local brand
Industrial Robot (Siasun): Components are from Japan
Industrial Robot used in Auto industry(1)

Source: Nomura
Industrial Robot used in Auto industry(2)
Pneumatic equipment used in Auto Parts Assembly

Source: Nomura
Automation line

Source: Nomura
Automobile Assembly Line

Source: Nomura
Zoom up: Pneumatic equipments are from Japan
Appendix:
iPad aluminum body is machined by Fanuc machine tool

Source: Nomura
Fanuc: Robo-drill

Source: Nomura based on company material
Fanuc: Fist robot

Source: Nomura
Excavators in China: Komatsu is #1 with premium prices

Excavator market share in China (over 6t, CY2010)

- Komatsu (Japan): 16%
- Sany Heavy (China): 10%
- Hyundai Heavy (Korea): 10%
- Doosan Infracore (Korea): 12%
- Kobelco (Japan): 10%
- Caterpillar (US): 7%
- Volvo (Lingong) (Sweden/China): 4%
- Lingong (China): 3%
- Sunward (China): 2%
- Other: 11%

Source: Nomura
Hydraulic equipment controls the movement of hydraulic excavators

- **Engine** (Komatsu)
- **Hydraulic pump** (Kawasaki)
- **Hydraulic valve** (Kawasaki)
- **Swing motor** (Toshiba)
- **Cylinder** (KYB)

- Forward/reverse motion
- Rotary motion
- Extension/retraction and digging motion of arm

Source: Nomura based on company material