Industrial Upgrading, Job Creation, and Poverty Reduction in China

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The China Miracle

• China has successfully maintained more than 8% annual GDP growth rates in the last four decades and registered a 15% annual growth rate for international trade.

• China is the second largest economy, largest trade country in goods, second largest trade country in service in the world.

• The successful reform is due to adopt a comparative-advantage-following (CAF) development strategy, driven by China’s factor endowments (Lin, 2012), as well as the market access due to the WTO accession.

• China thus exhibits a gradual structural transformation and industrial upgrading, creates job opportunity and hence reduce its poverty.
China’s Industrial Growth & Structural Upgrading

• Since its economic reform in 1978, China adopts the Comparative-Advantage-Following development strategy based on its factor endowments (Lin, 2003, Yao-Yu, 2009).

• Examine China’s production structure and industrial upgrading by examining:
  – Structural Transformation
  – Value-chain Upgrading
  – Dynamic Evolution of Comparative Advantage
  – Intra-industry Trade and Processing Trade
  – Industrial Productivity Growth
Sectorial Structural Transformation

• The GDP sectoral composition of China witnessed an industrial structural change after its economic reforms.

• The share of secondary industry in GDP remained the same.

• Service industry increases gradually, account for more than a half in 2015.
Dynamic Changes: Shares of Manufacturing Sectors in Manufacturing GDP (1999)

value-added share of manufacturing sectors, 1999

- Measuring Instruments
- Communication Equipment, Computers
- Electrical Machinery and Equipment
- Transport Equipment
- Special Purpose Machinery
- General Purpose Machinery
- Metal Products
- Non-ferrous Metals
- Ferrous Metals
- Non-metallic Mineral Products
- Plastics
- Rubber
- Chemical Fibers
- Medicines
- Chemical Materials and Chemical Products
- Petroleum, Coking, Nuclear Fuel
- Articles for Culture, Education and Sport
- Printing
- Paper and Paper Products
- Furniture
- Timber, Wood, Bamboo
- Leather, Fur, Feather and Related Products
- Wearing Apparel, Footwear and Caps
- Textile
- Tobacco
- Beverages
- Manufacture of Foods
- Processing of Food
- Mining of Other Ores
- Mining and Processing of Nonmetal Ores
- Mining and Processing of Non-Ferrous Metal Ores
- Mining and Processing of Ferrous Metal Ores
- Extraction of Petroleum and Natural Gas
- Mining and Washing of Coal
Dynamic Changes: Shares of Manufacturing Sectors in Manufacturing GDP (2009)
Value-Chain Upgrading in Trade Sectors

- China is the largest exporter and the second largest importer in the world today.

- The fast growing trade is mainly due to a CAF strategy and the foreign access of the market scale.

- China’s exports exhibited four different phases in which the value-chain is upgraded.
  - Low value-added Mineral Fuels such as oils (1979-1985)
  - Labor-intensive goods such as textile and garments (1985-1995)
  - Capital-intensive goods such as transport equipment (1996-2000)
  - High-tech. products such as scientific instrument and pharmaceuticals (2001- present)
## Value-Chain Upgrading in Trade Sectors

### Table 1: China’s Export and Import Composition by Sector (at current prices)

<table>
<thead>
<tr>
<th>Year</th>
<th>Agriculture</th>
<th>Industry</th>
<th>Mineral Fuels, &amp; Lubricants</th>
<th>Light Manufacturing</th>
<th>Machinery &amp; Transport Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>50.3</td>
<td>49.7</td>
<td>23.62</td>
<td>22.07</td>
<td>4.65</td>
</tr>
<tr>
<td>1985</td>
<td>50.56</td>
<td>49.44</td>
<td>26.08</td>
<td>16.43</td>
<td>2.82</td>
</tr>
<tr>
<td>1992</td>
<td>20.02</td>
<td>79.98</td>
<td>5.53</td>
<td>19</td>
<td>15.56</td>
</tr>
<tr>
<td>1996</td>
<td>14.52</td>
<td>85.48</td>
<td>3.93</td>
<td>18.87</td>
<td>23.38</td>
</tr>
<tr>
<td>2001</td>
<td>9.9</td>
<td>90.1</td>
<td>3.16</td>
<td>16.46</td>
<td>35.66</td>
</tr>
<tr>
<td>2009</td>
<td>5.25</td>
<td>94.75</td>
<td>1.7</td>
<td>15.38</td>
<td>49.12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Agriculture</th>
<th>Industry</th>
<th>Mineral Fuels, &amp; Lubricants</th>
<th>Light Manufacturing</th>
<th>Machinery &amp; Transport Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>34.77</td>
<td>65.23</td>
<td>1.01</td>
<td>20.75</td>
<td>25.57</td>
</tr>
<tr>
<td>1985</td>
<td>12.52</td>
<td>87.48</td>
<td>0.41</td>
<td>28.16</td>
<td>38.43</td>
</tr>
<tr>
<td>1992</td>
<td>16.45</td>
<td>83.55</td>
<td>4.43</td>
<td>23.92</td>
<td>38.86</td>
</tr>
<tr>
<td>1995</td>
<td>18.49</td>
<td>81.51</td>
<td>3.88</td>
<td>21.78</td>
<td>39.85</td>
</tr>
<tr>
<td>1996</td>
<td>18.32</td>
<td>81.68</td>
<td>4.95</td>
<td>22.61</td>
<td>39.45</td>
</tr>
<tr>
<td>2001</td>
<td>18.78</td>
<td>81.22</td>
<td>7.17</td>
<td>17.22</td>
<td>43.94</td>
</tr>
<tr>
<td>2009</td>
<td>28.81</td>
<td>71.19</td>
<td>12.33</td>
<td>10.71</td>
<td>40.54</td>
</tr>
</tbody>
</table>
Top Products in China’s Exports

- Low value-added and labor-intensive products were no longer in the top 10 exports of China today.
- The top exports of China are electrical machinery and equipment, followed by machinery and mechanical appliances.
- The top 3 categories account for 50% of total exports.

<table>
<thead>
<tr>
<th>Rank</th>
<th>HS 2-digit Category</th>
<th>Code</th>
<th>% of total Exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Electrical Machinery &amp; Equipment</td>
<td>85</td>
<td>25.45</td>
</tr>
<tr>
<td>2</td>
<td>Machinery &amp; Mechanical Appliances</td>
<td>84</td>
<td>14.37</td>
</tr>
<tr>
<td>3</td>
<td>Mineral Fuels &amp; Mineral Oils</td>
<td>27</td>
<td>10.66</td>
</tr>
<tr>
<td>4</td>
<td>Optical &amp; Photographic Instruments</td>
<td>90</td>
<td>6.67</td>
</tr>
<tr>
<td>5</td>
<td>Plastics and Articles thereof</td>
<td>39</td>
<td>4.95</td>
</tr>
<tr>
<td>6</td>
<td>Ores, Slag &amp; Ash</td>
<td>26</td>
<td>4.44</td>
</tr>
<tr>
<td>7</td>
<td>Organic Chemicals</td>
<td>29</td>
<td>3.86</td>
</tr>
<tr>
<td>8</td>
<td>Iron &amp; Steel</td>
<td>72</td>
<td>3.29</td>
</tr>
<tr>
<td>9</td>
<td>Vehicles other than Railway</td>
<td>87</td>
<td>2.24</td>
</tr>
<tr>
<td>10</td>
<td>Copper and Article thereof</td>
<td>74</td>
<td>2.20</td>
</tr>
</tbody>
</table>
In the new century the value-added ratios for high-tech. sectors exhibit fast growth rates.

The value-added ratio of computer and office equipment increased from 4.3 to 24.7, a more than five-fold increase.
Dynamic Evolution of Comparative Advantage

- China exports huge volumes of machinery and transport equipment.
- Does China have comparative advantages in such products?
- China still has comparative advantage on textiles & apparel, with a declining RCA, but has an increasing RCA on machinery & transport equipment

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<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Animals &amp; Vegetable</td>
<td>0.210</td>
<td>0.364</td>
<td>0.284</td>
<td>0.29</td>
</tr>
<tr>
<td>1</td>
<td>Foodstuff &amp; Beverages</td>
<td>1.310</td>
<td>0.977</td>
<td>0.894</td>
<td>1.254</td>
</tr>
<tr>
<td>2</td>
<td>Tobacco &amp; Mineral</td>
<td>0.710</td>
<td>0.872</td>
<td>0.999</td>
<td>1.16</td>
</tr>
<tr>
<td>3</td>
<td>Chemical &amp; Plastics</td>
<td>1.439</td>
<td>1.218</td>
<td>0.877</td>
<td>0.802</td>
</tr>
<tr>
<td>4</td>
<td>Leather, Woods, &amp; Papers</td>
<td>1.080</td>
<td>1.201</td>
<td>0.945</td>
<td>0.95</td>
</tr>
<tr>
<td>5</td>
<td>Textiles &amp; Apparel</td>
<td>3.692</td>
<td>2.637</td>
<td>1.905</td>
<td>1.512</td>
</tr>
<tr>
<td>6</td>
<td>Footwear &amp; Glass</td>
<td>0.365</td>
<td>0.265</td>
<td>0.17</td>
<td>0.165</td>
</tr>
<tr>
<td>7</td>
<td>Metals</td>
<td>1.080</td>
<td>1.259</td>
<td>0.867</td>
<td>0.78</td>
</tr>
<tr>
<td>8</td>
<td>Machinery &amp; Transport Equipment</td>
<td>1.014</td>
<td>1.085</td>
<td>1.231</td>
<td>1.149</td>
</tr>
<tr>
<td>9</td>
<td>Miscellaneous Manufactured</td>
<td>0.667</td>
<td>0.604</td>
<td>0.829</td>
<td>0.886</td>
</tr>
</tbody>
</table>
Product Sophistication & Intra-Industry Trade

- Product sophistication is a common index to measure manufacturing upgrading.
- China exports are more sophisticated than countries with similar per-capita GDP (Rodrik, 2006)
- A hypothesis attributes this phenomenon to the prevalence of intra-industry trade, due to market expansion.
- Industries like machinery, transport equipment, and optical and photographic products have high levels of intra-industry trade.

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<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Textile and Apparel</td>
<td>0.58</td>
<td>0.61</td>
<td>0.49</td>
<td>0.24</td>
</tr>
<tr>
<td>Footwear</td>
<td>0.18</td>
<td>0.10</td>
<td>0.07</td>
<td>0.06</td>
</tr>
<tr>
<td>Machinery</td>
<td>0.64</td>
<td>0.74</td>
<td>0.94</td>
<td>0.81</td>
</tr>
<tr>
<td>Transport Equipment</td>
<td>0.53</td>
<td>0.87</td>
<td>0.97</td>
<td>0.83</td>
</tr>
<tr>
<td>Optical and Photographic</td>
<td>0.88</td>
<td>0.98</td>
<td>0.89</td>
<td>0.77</td>
</tr>
</tbody>
</table>
The Return of the CAF Development Strategy!

- Is the prevalence of intra-industry trade in capital-intensive industries the consequence or the cause of economic development?
- It still follows role of CAF strategy via processing trade (Lin, 2012).
- A domestic firm initially imports raw materials or intermediate inputs. After the materials undergo local processing, the domestic firm exports the value-added final goods (Yu, 2015)
A direct way to check manufacturing upgrading is to check industrial firm’s TFP growth. Calculate the Olley-Pakes (1996) semi-parametric TFP for Chinese large manufacturing firms (2000-2008). The average industrial TFP growth rate is 2.43% when measured by gross output and reaches 7% when measured by value-added output.

<table>
<thead>
<tr>
<th>Industries</th>
<th>Labor</th>
<th>Materials</th>
<th>Capital</th>
<th>TFP</th>
<th>TFP Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacture of Textile (17)</td>
<td>.056</td>
<td>.879</td>
<td>.036</td>
<td>1.393</td>
<td>-1.27</td>
</tr>
<tr>
<td>Manufacture of Apparel, Footwear &amp; Caps (18)</td>
<td>.096</td>
<td>.796</td>
<td>.019</td>
<td>1.323</td>
<td>1.68</td>
</tr>
<tr>
<td>Printing, Reproduction of Recording Media (23)</td>
<td>.063</td>
<td>.847</td>
<td>.052</td>
<td>1.433</td>
<td>3.83</td>
</tr>
<tr>
<td>Manufacture of Articles For Culture (24)</td>
<td>.068</td>
<td>.827</td>
<td>.045</td>
<td>1.374</td>
<td>5.03</td>
</tr>
<tr>
<td>Manufacture of Transport Equipment (37)</td>
<td>.077</td>
<td>.804</td>
<td>.058</td>
<td>1.405</td>
<td>3.09</td>
</tr>
<tr>
<td>Manufacture of Communication Equipment (40)</td>
<td>.094</td>
<td>.785</td>
<td>.148</td>
<td>1.678</td>
<td>3.99</td>
</tr>
<tr>
<td>All industries</td>
<td>.061</td>
<td>.828</td>
<td>.075</td>
<td>1.454</td>
<td>2.43</td>
</tr>
</tbody>
</table>
How China Realized Structural Transformation and Industrial Upgrading?

• The successful economic reform of China can be directly attributed to its “dual-track” strategy (Lin et al., 2004).

• Gov. provided transitional protection and subsidies to state-owned sectors as a way of maintaining stability.

• Gov. adopted growth identification and facilitation to support new entry to sectors consistent with the CAF strategy.

• Policy Design:
  – Reform of Micro-management Arrangement (SOEs & TVEs reform)
  – “Dual-Track” Price Reform on Output and Input Factors
  – Incremental Reform in the Viable Sectors
  – Open-up Policies and Reform
Open-Up Policies and Reform

• China’s openness ratio increased from 10% in the 1970s to around 3-quarter in 2007, now down to 1/3.

• The “export-led” growth is the economic consequence of the implementation of the CAF strategy.
  – **Supply:** produced many labor-intensive goods caused by CAF
  – **Demand:** China’s domestic consumption market is relatively small

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**Figure 7: Export and Imports (% of GDP), 1978-2010**

- **Expshare**
- **Impshare**
Effect of Structural Transformation on Employment and Poverty Reduction

• China enjoyed huge “demographic dividend” in the last three decades, though facing a possible aging challenge in the future.
• China’s dependency ratio is one of the lowest ratio in the world (Tian et al., 2012)
China’s Low Urbanization Rate

- China’s current urbanization rate is only 55%.
China’s Urban-Rural Divide

- China’s rural people are still relatively poor
“Open-Up” Policies and Reform

- Set up various free-trade zones.
- The process starts from points (i.e., some cities) to lines (i.e., eastern coastal zones) and then to an entire area (i.e., eastern and central provinces).

Sources: Author’s own compilation.
“Open-Up” Policies and Reform

- **Trade Liberalization**
  - the simple average of China’s import tariffs declined from approximately 42% in 1992 to approximately 35% in 1994
  - China cut its import tariff from 35% in 1994 to 17% in 1997.

- **The WTO Accession in 2001**
  - With a larger international market, Chinese firms were able to expand their production along with China’s dynamic comparative advantage, becoming a “world factory.”

- **Establishment of Export Processing Zones in 2000.**

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<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Special Economic Zone (SEZ)</td>
<td>0</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Export Processing Zone (EPZ)</td>
<td>58</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Economic &amp; Technological Development Zone (ETDZ)</td>
<td>17</td>
<td>20</td>
<td>12</td>
</tr>
<tr>
<td>High-tech Industrial Development Zone (HIDZ)</td>
<td>0</td>
<td>53</td>
<td>0</td>
</tr>
<tr>
<td>Bonded Zones (BZ)</td>
<td>0</td>
<td>14</td>
<td>1</td>
</tr>
</tbody>
</table>
Structural Transition and Employment Change across Sectors

- The employment change by sector is positively associated with China’s structural formation.
- Along the movement from CAD strategy to CAF strategy, many people are liberalized from Agriculture to Industry and Service Sector.
Evolution of Structural Change in Employment

- Exhibit four stages
  - The Implementation of Household responsibility system
  - The Emerging TVEs
  - The Onset of the reform in the SOEs
- 1992-1996: China further alleviated the migration restriction from rural to urban areas
Evolution of Structural Change in Employment

- Labor Migration is mainly from the western and central regions to the coastal regions.
Evolution of Structural Change in Employment

- 1996-2001: the slow pace of structural change in employment
  - The East-Asian Financial Crisis in 1997
  - The Hard-time of the SOEs reform (triangle-debts problem)
- Since WTO accession, Membership to the WTO granted China access to a larger international market, which provided better opportunities for China to implement its CAF strategy.
Evolution of Structural Change in Employment

- Examine the change in share of manufacturing employment to the entire employment in the secondary industries over time.

- In 1982, manufacturing workers accounted for around 71% of labor in the secondary industry.

- The proportion was reduced to only around 50% in 2009.

- The movement is partly because of the labor-saving improvement in technology.

- In 2009, the sector with the largest employment was manufacturing of communication equipment (9%), followed by that of transport equipment (8%).

- Suggests that the employment structure within the manufacturing sectors move along with industrial upgrading.
Evolution of Structural Change in Employment

Proportion of Number of Employees in Manufacturing

- Communication Equipment
- Transport Equipment
- Textile
- Chemical Raw Material
- Apparel
- General Purpose Machinery
- Electrical Machinery & Equipment
- Nonmetallic Mineral Products
- Ferrous Metals
- Special Purpose Machinery
- Metal Products
- Medicines
- Leather, Fur, Feather & its Products
- Non-ferrous Metals
- Plastic
- Beverages
- Foods
- Measuring Instruments
- Paper and Paper Products
- Petroleum, Coking, Processing
- Artwork, Other Manufacture
- Rubber
- Articles for Culture, Education, Printing, Recording Media
- Furniture
- Timbers, Wood
- Chemical Fiber
- Tobacco
- Recycling and Disposal of Waste
Trade Liberalization & Job Employment

- Trade liberalization creates more job flow (Rodriguez-Lopez & Yu, 2016)
- Evidence from Chinese manufacturing firms (2000-08)
Structural Transformation & Poverty Reduction

- With CAD strategy, the profit generated by the heavy industries was not used for consumption but for further capital accumulation.
- At least 30% of people lived below the poverty line before reform.
- With CAF strategy, poverty in China was alleviated to less than 3% of its total population.
Why Industrial Upgrading can reduce Poverty?

• The burst of TVEs in line with the structural transition in China
  – TVEs provided huge working opportunities for peasants.
  – Compared with working in the primary sectors, obtaining a job in the TVEs generally secured a higher income.

• Trade globalization creates job opportunity
  – Processing trade
  – WTO and foreign market accession

• The increasing share of service industry.
  – The increase in employment in services is more prominent than that in the secondary industry.
  – the employment ratio in service industry increased from 12.2% in 1978 to around 33% today.
  – the employment ratio in secondary industry only increased from 17.3% in 1978 to around 27% today.

• Support and facilitation from the government
  – A generous anti-poverty funding to facilitate poor areas
  – A Western Development Program
Conclusions

• China’s economic miracle is due to the application of the CAF strategy.

• Two sets of polies are essential:
  – Export-led growth
  – Access to large market scale

• The successful structural transformation and manufacturing upgrading created many new working opportunities

• Poverty in China was greatly reduced.