From “Made in China” to “Innovated in China”: Necessity, Prospect, and Challenges

Shang-Jin Wei

Based on joint research with Zhuan Xie and Xiaobo Zhang
Prepared for a special issue of *Journal of Economic Perspective*
• China matters for the world
  – China and US macro-economy
    • Low interest rate and housing bubble
    • The rise of Donald Trump?
  – Neglected positive side
    • Higher living standard due to trading with China
    • Faster growth across the world due in part to the rise of China
China’s (past) growth has been spectacular

Real per capita GDP

Average real per capita GDP growth, 1980-2015

China
Equatorial Guinea
Bhutan
Korea
Vietnam
Maldives
Taiwan
India
Sudan
Sri Lanka

Note: Figures in 2011 PPP.
Source: ADB calculations from WEO April 2016.
Notes: Figures in 2011 PPP. Excluding outliers: Liberia and Equatorial Guinea
Some numbers to put things in perspective

• Average real per capita GDP growth of 8.7% during 1980–2015

• Real per capita GDP increased from $714 in 1980 to $13,277 in 2015

• Only Equatorial Guinea has exceeded China’s performance

• Real per capita GDP growth of more than 6% for 25 consecutive years from 1990–2015

Note: Figures in 2011 PPP.
Reasons for the growth success (1)

• Policy actions

• Economic fundamentals
Reasons for the growth success (2)

- **Policy actions**
  - Embracing market oriented reforms
    - Agriculture - “household responsibility system”
    - Industry and service
      - “grasp the large and let go of the small”
      - Lower entry barriers
  - Embracing globalization
    - “Democratization” of trading rights
    - Openness to FDI
    - Accession to the WTO
  - Minimizing resistance
    - Dual track system
    - Special economic zones
    - Political centralization + economic decentralization
Reasons for the growth success (3)

Economic Fundamentals:
low wage + favorable demographics

Rank of real per capita GDP among 138 non-OECD countries

Share of working age cohort (15-59) in population (%)

Note: Figures in 2011 PPP.
Source: ADB calculations from WEO April 2016.

Source: Haver Analytics.
Rio Olympics opening ceremony
Beijing Olympics opening ceremony
Chinese factories: Past and present
Growth rate of GDP and TFP

Let capital share=0.5
Capital and workers as input. The parameters are different capital income share.
TFP (adjusting for schooling of labor force)

Capital and number of workers, average years of education as input.
Contribution of K, L and TFP

Capital share is 0.5
Contribution of K, H and TFP

H = education* L. Capital share is 0.5.
Growth is likely to moderate further

- Due to cyclical (weak global economy) and structural factors (rising wages, shrinking workforce)
- Changes to postpone retirement age, increase female labor force participation, and relax family planning policy will not reverse the trend in the short-run
- Future growth must mainly come from labor productivity growth
• Can the transition from “made in China” to “innovated in China” happen?
If you want to look reasons to say no, you can find them
If you wish to look for optimistic examples, you can find them too.

**WeChat’s world**

<table>
<thead>
<tr>
<th>Time Travellers</th>
<th><strong>Features offered</strong></th>
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<tbody>
<tr>
<td>Messaging apps, monthly average users</td>
<td></td>
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<tr>
<td>Q1 2016, m</td>
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<tr>
<td>WhatsApp</td>
<td>🟢</td>
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<tr>
<td>Facebook Messenger</td>
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<tr>
<td>WeChat</td>
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<tr>
<td>Mobile revenue, $m</td>
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<tr>
<td>WhatsApp</td>
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<tr>
<td>Facebook Messenger</td>
<td>nil</td>
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<tr>
<td>WeChat</td>
<td>1,800</td>
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<table>
<thead>
<tr>
<th>WeChat Timeline</th>
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<tbody>
<tr>
<td>January 2011</td>
</tr>
<tr>
<td>April 2012</td>
</tr>
<tr>
<td>Summer 2012</td>
</tr>
<tr>
<td>August 2013</td>
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<tr>
<td>January 2014</td>
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<tr>
<td>February 2014</td>
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<tr>
<td>September 2014</td>
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<tr>
<td>January 2015</td>
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*End-2015*
Uber gives app

The days of free-riding
China, ride-hailing*

Market share
%

<table>
<thead>
<tr>
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<th>Q4 2015</th>
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<tbody>
<tr>
<td>Uber</td>
<td>100</td>
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<tr>
<td>Didi</td>
<td>0</td>
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<tr>
<td>Others</td>
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</table>

Fares†
Yuan bn

<table>
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<tr>
<th></th>
<th>Q1 2015</th>
<th>Q2 2015</th>
<th>Q3 2015</th>
<th>Q4 2015</th>
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<tbody>
<tr>
<td></td>
<td>0</td>
<td>5</td>
<td>10</td>
<td>15</td>
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</tbody>
</table>

Source: Analysys
*Includes chauffeur-driven cars but not taxis
†Shared by drivers and ride-hailing firm

Economist.com
What do the systematic data say?

- What is the actual growth of innovation of China’s firms?

- What accounts for the relatively fast pace of innovation (as measured by patent applications and approvals) by Chinese firms?

- Is there possible resource misallocation in the innovation space?
R&D/GDP vs GDP per capita

Note: data for China are from 1995 to 2014, and data for all other countries are for 2014 or the latest year available. Source: OECD database and World Bank.
Number of Chinese patents has exploded

Chinese patent applications

Share to total

Invention (%)
Utility model (%)
Design (%)
Total domestic applications (RHS)

Thousands
0 500 1,000 1,500 2,000 2,500


Thousands

0% 20% 40% 60% 80% 100%
What explains China’s innovation growth

– Easy approval?
– Government subsidies?
– Taking advantage of expanding market opportunities
– Spurred by rising wages?
Patent approval rate is not unusually high

Patent Approval Rate in BRIC Countries, the Republic of Korea, and the U.S.
Invention patents in the US show a rising trend
Growing patent citations indicate quality improvements
• What drives the rising pace of innovation?

• Statistical analysis
Key results

• Firm size is (+) associated with # of patents
• Export firms are more innovative
• Lower (foreign) tariffs are good for innovation
• Invention patents respond (+) to subsidies
• High tax rate discourages innovation
• Higher cost of capital discourages innovation
• Robust (+) relationship between wages and innovation
The innovation gap with leading countries is still wide

Note: data for China are from 1995 to 2014, and data for all other countries are for 2014 or the latest year available. Source: OECD database and World Bank.
SOEs are granted more subsidies.

Ratio of Subsidies to Sales by Firm Ownership and Size

Subsidy rate

- All firms
- Small firms
- Medium firms
- Big firms
...but lag behind private firms in patent generation
SOE R&D resources not as efficiently spent

### Impact of R&D on Patent Output

<table>
<thead>
<tr>
<th>Variables</th>
<th>Total</th>
<th>Invention</th>
<th>Utility model</th>
<th>Design</th>
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<tbody>
<tr>
<td>R&amp;D (log)*FIE</td>
<td>-0.006</td>
<td>-0.006</td>
<td>0.002</td>
<td>-0.014**</td>
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<tr>
<td>R&amp;D (log)*SOE</td>
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<td>-0.017**</td>
<td>-0.004</td>
<td>-0.014</td>
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<tr>
<td>R&amp;D (log)</td>
<td>0.016***</td>
<td>0.016***</td>
<td>0.013***</td>
<td>0.013***</td>
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<tr>
<td>Sales (log)</td>
<td>0.278***</td>
<td>0.314***</td>
<td>0.259***</td>
<td>0.305***</td>
</tr>
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<td>Constant</td>
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<td>-7.135***</td>
<td>-4.979***</td>
<td>-6.414***</td>
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<td>YES</td>
<td>YES</td>
<td>YES</td>
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<tr>
<td>Year FE</td>
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<tr>
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Summary

• The fortune of the Chinese economy matters for the Americans and the world

• The Chinese economy fortune is at crossroads

• Can Chinese firms really innovate?
  – Patent application
  – Patent forward citations

• Drivers of firm innovation:
  – (i) world market opportunities; (ii) rising labor costs

• Gap with the US, Japan, and even Korea is still huge

• Possible misallocation
  – Subsidy allocation biased in favor of SOEs, but private firms innovate more
  – Structural reforms that level the playing field can accelerate innovations