Building Bridges to Innovation
Decoding the Big Slowdown; Assessing Progress on Innovation

Shanghai, October 20-21 2015

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Contents

2015 in the mirror

Decoding the big slowdown

Assessing progress on innovation
2015 in the mirror
Last year we introduced the concept of China’s potential “Bridges to Innovation”

1. **Broad bridge**
   - Mature drugs have lasting staying power and continue to grow beyond 2020
   - China delivers meaningful and broad step-up to reward of innovation

2. **Narrow bridge**
   - Mature drugs have staying power, but come under stronger pressure and plateau beyond 2020
   - China delivers meaningful but narrow reward for innovation, closely aligned with disease priorities

3. **Broken bridge**
   - Window for mature drugs starts closing rapidly by 2020, earlier for some drug categories
   - Innovation remains heavily constrained
   - Self-pay market becomes main viable segment

- Each potential scenario has profound implications on market outlook and attractiveness for participants
- It will take some time before we know for sure which bridge we are walking on
As of today, we would argue that we are on a Narrow bridge scenario

**Broad bridge**

**Narrow bridge**

**Broken bridge**

- CFDA reform
- 13th Five Year Plan
- CDI expansion
- Slowdown in Rx market (still growing though)
- Delay in NRDL update
- Pricing reform
2015 in the mirror – 8 key trends worth understanding

1. Economic slowdown
2. Anti-corruption drive
3. China innovation
4. China manufacturing 2025
5. CFDA reform
6. Cost containment
7. Deals
8. e-Health
Slowdown of the economy is impacting many sectors, some more dramatically than others

Construction

Automobile

Retail

Electricity consumption

Luxury goods

SOURCE: McKinsey
China’s new normal – China is transitioning to a new growth model with less rapid but higher quality growth (1/2)

**Old**

- **4x** Debt in 2014 vs. 2007
- **50%** Urban population (1978: 18%)

**Previous growth engine**

1. **Labor**
   - Large, low-cost, lower-skilled labor supply
   - $300 Monthly salary

2. **Consumption**
   - Cost-conscious with lower sophistication (supply-driven offerings)
   - 50% Household saving rate

3. **Business model**
   - Lower-value, low-productivity export business model with FDI

4. **Urbanization**
   - Inflow into cities with pollution, real estate inflation, etc.

5. **Investment/debt**
   - Debt-financed property and infrastructure investment

**Model not sustainable**

**Source:** McKinsey
China’s new normal – China is transitioning to a new growth model with less rapid but higher quality growth (2/2)

More emphasis on soft than hard infrastructure and deleveraging

Sustainable and equitable growth in smarter cities

More experienced, higher-wage work force, and more entrepreneurship and job creation

Consumption-driven growth with digitally informed and demanding customers

Higher-value adding activities (service and manufacturing) and mass innovation

The success of companies in China will depend on how quickly they adapt to the new normal

SOURCE: McKinsey
"China Manufacturing 2025" to promote Biomedicine and high-performance medical apparatus

Overview

- **China Manufacturing 2025** released in May, 2015 by State Council (similar to Germany industry 4.0)
  - First step of the bigger plan to upgrade manufacturing industry
- **Aim to transform the nation from a big manufacturer to a strong manufacturer**
  - Move up the global value chain from low value added manufacturing
  - Accelerate development in 10 priority areas including biopharmaceutical and medical products
- **Focus on the innovation and integration of information technology in manufacturing**
  - Enhance the adoption of Internet, cloud service and big data in traditional manufacturing

### 10 industrial sectors

- Information technology
- High-end numerical machinery and automation
- Aerospace and aviation equipment
- Maritime engineer equipment and high-tech vessel
- Rail equipment
- Electrical equipment
- Energy saving vehicles
- New material
- **Biomedicine and high-performance medical apparatus**
- Agriculture equipment

SOURCE: State Council announcement; lit search; McKinsey analysis
Deals – Another year of heavy activity
“Internet+” aims to further fuel economic growth by integrating Internet with traditional industries

<table>
<thead>
<tr>
<th>Policy description</th>
<th>Implication to healthcare stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Released in <strong>July 2015</strong></td>
<td><strong>Encourage online healthcare service</strong></td>
</tr>
<tr>
<td>Mapped out development targets in <strong>11 key sectors</strong> incl. <strong>healthcare</strong>, manufacturing, agriculture, energy, finance, logistics etc. by <strong>integrating mobile Internet, cloud computing, and big data technologies</strong></td>
<td>– Develop internet based healthcare services and information exchange centers across hospitals (e.g., EMR and imaging records)</td>
</tr>
<tr>
<td>Aims to build a new economic model and an important driving force for social innovation by <strong>2025</strong></td>
<td>– Promote online registration, result checking, drug distribution and BMI payment</td>
</tr>
<tr>
<td></td>
<td>– Improve treatment outcome by adopting precision treatment and disease prevention</td>
</tr>
<tr>
<td></td>
<td><strong>Promote digital elderly care</strong></td>
</tr>
<tr>
<td></td>
<td>– Set up digital community centers and enhance chronic disease management</td>
</tr>
<tr>
<td></td>
<td>– Adopt innovative products such as wearable devices and remote monitoring devices to monitor and track physical conditions</td>
</tr>
<tr>
<td></td>
<td><strong>Enhance e-commerce in healthcare</strong></td>
</tr>
<tr>
<td></td>
<td>– Improve operational efficiency and procurement process via e-commerce platform</td>
</tr>
</tbody>
</table>

**SOURCE:** Lit-search; Government website; McKinsey analysis
Many players – both small and large – are actively riding the e-Health wave

<table>
<thead>
<tr>
<th>Example of players</th>
<th>Digital giants</th>
<th>Entrepreneurs</th>
<th>Healthcare IT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessibility</td>
<td>🚘 Tencent</td>
<td>🏷️ eDoctor</td>
<td>🏳️‍🌈 Smart</td>
</tr>
<tr>
<td>Delivery</td>
<td>👩‍🚀 Alibaba.com</td>
<td>eDoctor</td>
<td>🌐 Wanda Information</td>
</tr>
<tr>
<td>Distribution</td>
<td>🏮 alijk.com</td>
<td>🏺 ReCare</td>
<td>🄯 Cerner</td>
</tr>
<tr>
<td>Community</td>
<td>📚 Tencent</td>
<td>🍌 CareVoice 🌟</td>
<td>🍃 GBi</td>
</tr>
<tr>
<td>Personal care</td>
<td>🌸 Baidu</td>
<td>🎣 Social Doc</td>
<td>🎉 Xiaomi</td>
</tr>
</tbody>
</table>
In this complex context, we aimed to tackle two key themes

1. “Decoding the big slowdown”
   - What is really happening?
   - What should we expect next?
   - What are the implications?

2. “Assessing progress on China innovation”
   - Are measures for real?
   - Who will pay for innovation?
   - What are the implications?

- Survey of 50 hospital directors
- CPA market data up to July 2015
- China Drug Innovation Index – survey of innovation leaders (BayHelix)
- Interviews with industry leaders
Decoding the big slowdown
Decoding the big slowdown – How we went about it

Sources of insights

Latest NHFPC statistics on patient flow across hospital segments

Hospital level prescriptions data from China Pharmaceutical Association (CPA) up to June 2015

Multiple discussions with senior executives in the pharma industry

Results from a survey of 50 hospital directors across city tiers

McKinsey market perspectives
China pharma market has experienced a marked slowdown in 2015.

YoY sales growth of CPA sampled Class III/II hospitals¹, 2012-15 Q2

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>16.4%</td>
</tr>
<tr>
<td>2013</td>
<td>12.0%</td>
</tr>
<tr>
<td>2014</td>
<td>12.4%</td>
</tr>
<tr>
<td>2015Q1</td>
<td>9.6%</td>
</tr>
<tr>
<td>2015Q2</td>
<td>6.3%</td>
</tr>
</tbody>
</table>

Outpatient YOY growth
Percent

- 2012: 9.8%
- 2013: 8.2%
- 2014: 5.6%
- 2015Q1: 3.9%
- 2015Q2: 1.8%²

¹ 679 sampled hospitals, including 468 Class III hospitals, 211 Class II hospitals
² 2015 April and May data

SOURCE: China Pharmaceutical Association (CPA); NHFPC
Majority of TAs and top MNC brands are affected by the slowdown

Growth comparison by TA (ranked by 2014 TA size)
CPA sampled hospitals

<table>
<thead>
<tr>
<th>Category</th>
<th>CPA Growth (2011-14 CAGR)</th>
<th>CPA Growth (2014H1-15H1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antineoplastic and Immunomodulating</td>
<td>9%</td>
<td>16%</td>
</tr>
<tr>
<td>AI</td>
<td>5%</td>
<td>6%</td>
</tr>
<tr>
<td>Alimentary Tract and Metabolism</td>
<td>9%</td>
<td>15%</td>
</tr>
<tr>
<td>Blood</td>
<td>7%</td>
<td>15%</td>
</tr>
<tr>
<td>CNS</td>
<td>8%</td>
<td>18%</td>
</tr>
<tr>
<td>CV</td>
<td>7%</td>
<td>15%</td>
</tr>
<tr>
<td>Respiratory</td>
<td>12%</td>
<td>19%</td>
</tr>
<tr>
<td>Musculo-Skeletal</td>
<td>8%</td>
<td>15%</td>
</tr>
<tr>
<td>Systemic Hormones</td>
<td>4%</td>
<td>13%</td>
</tr>
<tr>
<td>Genito-Urinary System And Sex Hormones</td>
<td>2%</td>
<td>14%</td>
</tr>
<tr>
<td>Sensory Organs</td>
<td>19%</td>
<td>19%</td>
</tr>
<tr>
<td>Dermatologicals</td>
<td>3%</td>
<td>12%</td>
</tr>
<tr>
<td>LIPITOR</td>
<td>18%</td>
<td>39%</td>
</tr>
<tr>
<td>PLAVIX</td>
<td>8%</td>
<td>18%</td>
</tr>
<tr>
<td>GLUCOBAY</td>
<td>7%</td>
<td>14%</td>
</tr>
<tr>
<td>NORVASC</td>
<td>8%</td>
<td>23%</td>
</tr>
<tr>
<td>ADALAT</td>
<td>14%</td>
<td>19%</td>
</tr>
<tr>
<td>PULMICORT</td>
<td>36%</td>
<td>43%</td>
</tr>
<tr>
<td>SULPERAZON</td>
<td>-7%</td>
<td>35%</td>
</tr>
<tr>
<td>BAYASPIRIN</td>
<td>8%</td>
<td>22%</td>
</tr>
<tr>
<td>BETALOC</td>
<td>15%</td>
<td>16%</td>
</tr>
<tr>
<td>NEXIUM</td>
<td>3%</td>
<td>28%</td>
</tr>
<tr>
<td>BARAACLEDU</td>
<td>12%</td>
<td>24%</td>
</tr>
<tr>
<td>DIOVAN</td>
<td>12%</td>
<td>13%</td>
</tr>
<tr>
<td>HERCEPTIN</td>
<td>27%</td>
<td>32%</td>
</tr>
<tr>
<td>LANTUS</td>
<td>15%</td>
<td>27%</td>
</tr>
<tr>
<td>CRESTOR</td>
<td>22%</td>
<td>78%</td>
</tr>
</tbody>
</table>

1,679 sampled hospitals, including 468 Class III hospitals, 213 Class II hospitals

SOURCE: China Pharmaceutical Association (CPA); RDPAC
Mature brands drive 78% of growth compared with 71% last year, suggesting an aging portfolio

**2013-14 growth breakdown by brands launch year**

<table>
<thead>
<tr>
<th>Brand</th>
<th>&gt;10 years</th>
<th>5-10 years</th>
<th>&lt;5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>MNC 1</td>
<td>75%</td>
<td>19%</td>
<td>6%</td>
</tr>
<tr>
<td>MNC 2</td>
<td>96%</td>
<td>0%</td>
<td>3%</td>
</tr>
<tr>
<td>MNC 3</td>
<td>85%</td>
<td>14%</td>
<td>1%</td>
</tr>
<tr>
<td>MNC 4</td>
<td>60%</td>
<td>19%</td>
<td>20%</td>
</tr>
<tr>
<td>MNC 5</td>
<td>-3%</td>
<td>53%</td>
<td>50%</td>
</tr>
<tr>
<td>MNC 6</td>
<td>78%</td>
<td>11%</td>
<td>11%</td>
</tr>
<tr>
<td>MNC 7</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
</tr>
</tbody>
</table>

**2015H1 sales contribution of top 3 brands**

<table>
<thead>
<tr>
<th>Brand</th>
<th>2015H1 sales contribution, %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

1 By year of registration

**2012-13 growth contribution from brands**

- >10 years was 71%, suggesting an aging portfolio

**Sources:** Industry association; McKinsey analysis
Not just a price effect – growth rate of patient flow has declined to its lowest point in 10 years

Patient flow\(^1\)-YOY growth

Percent

---

1 Include hospitals and grassroots facilities

SOURCE: NHFPC
### Many MNCs and locals feel the pain; some leaders continue to grow at double digits

<table>
<thead>
<tr>
<th>Pharma players</th>
<th>2015 H1 performance vs. 2014 H1, %</th>
<th>Quotes from Q2 releases</th>
<th>Pharma players</th>
<th>2015 H1 performance vs. 2014 H1, %</th>
<th>Quotes from Q2 releases</th>
</tr>
</thead>
<tbody>
<tr>
<td>MNC pharmaco 1</td>
<td>-5.4</td>
<td>&quot;Chinese government is putting a lot of pressure on off-patent originators. This will be a big challenge for us in the short term&quot;</td>
<td>Local pharmaco 3</td>
<td>+25</td>
<td>&quot;Despite the negative impact from the government, we have achieved rapid growth by adapting the strategy of innovation and internationalization&quot;</td>
</tr>
<tr>
<td>MNC pharmaco 2</td>
<td>+1</td>
<td>&quot;Sales of mature products were impacted by competition&quot;</td>
<td>MNC pharmaco 4</td>
<td>+19</td>
<td>&quot;Pricing pressure will be tight in China and we are trying to achieve significant volume reflex as a remedy for the price drop&quot;</td>
</tr>
<tr>
<td>MNC pharmaco 3</td>
<td>+3</td>
<td>&quot;A combination of government cost control on reimbursement, strict anti-graft campaigns, the rise of local player with cheaper products and the slowdown in distribution resulted in our slowdown&quot;</td>
<td>Local pharmaco 4</td>
<td>+16</td>
<td>&quot;Despite the slowdown of the overall pharmaceutical industry in China, the strategy of lean manufacturing and internet marketing has lead to success in 2015 1H&quot;</td>
</tr>
<tr>
<td>Local pharmaco 1</td>
<td>+6</td>
<td>&quot;Industry continues to slow … lowest in 10 years&quot;</td>
<td>Local pharmaco 5</td>
<td>+11</td>
<td>&quot;Facing a challenging environment, we have maintained moderately rapid growth through innovative marketing method, industrial resource consolidation, etc.&quot;</td>
</tr>
<tr>
<td>Local pharmaco 2</td>
<td>-5</td>
<td>&quot;Due to price control, increased production cost, and tender policy the whole industry is facing severe challenges&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SOURCE:** China Pharmaceutical Association (CPA); company financial reports; investor calls; literature search
Decoding the slowdown: Five key questions

Where have patients gone?

- What does this all mean for pharamacos?
- How low could prices go?
- What are the bright spots?
- Who’s capturing the volume?
WHERE HAVE THE PATIENTS GONE?

Growth of public hospital patient flow has experienced marked slowdown this year

Public hospital patient flow growth significantly slower than previous years

<table>
<thead>
<tr>
<th>Public hospital patient flow (January to May of each year)</th>
<th>Pharma executives hypotheses</th>
</tr>
</thead>
</table>
| YoY growth, %                                               | ![Budget control policies limiting hospital ability to treat patients](image1)
| Outpatient                                                  | ![Anti-graft campaign reducing unnecessary visits](image2) |
| Inpatient                                                   | ![More patients going to retail pharmacy for self-medication](image3) |
| ![8.5% 8.5%](image4)                                        | ![Hospitals reaching saturation](image5) |
| ![4.9%](image6)                                             | ![Patients getting medical advice through mobile apps](image7) |
| ![9.5%](image8)                                             | ![Fewer patients due to a warm winter](image9) |
| ![4.7%](image10)                                            | ![Reduced income for healthcare due to stock market crash](image11) |

SOURCE: NHFPC; interviews
WHERE HAVE THE PATIENTS GONE?
Effects of hospital related policies and constraints are seen as the primary driver to patient flow slowdown

Where have the patients gone?

Hospital related drivers most impactful to patient flow slowdown, suggesting no fundamental shift in underlying demand

How does YoY growth in outpatient flow compare between 2015 H1 and 2014 H1?
100% = 48 respondents

Faster
100% 100%

Same
21% 29%

Slower
50% 29%

Tier 1/2 city (N=24) Tier 3 and below/county (N=24)

What is driving reduced patient flow growth?
% of top 3 drivers among respondents seeing slower growth

Hospitals less focused on increasing scale and patient volume due to public hospital reform
Hospital capacity reaches saturation and has limited room to accommodate patient growth
Reduction of unnecessary return visits of patients
Patients are less inclined to go to hospitals due to reduced disposable income
Patients choose to self-medicate more by going to retail
Fewer people getting sick

Hospital related drivers most impactful to patient flow slowdown, suggesting no fundamental shift in underlying demand

SOURCE: 2015 McKinsey hospital director survey; McKinsey analysis
WHERE HAVE THE PATIENTS GONE?

Shift in hospital focus driven by BMI budget control and greater emphasis on service quality

- BMI budget control measures continue to expand both in breadth and depth
  - Most provinces have set targets for BMI control since 2012
  - Jiangsu plans to implement BMI budget control to all cities/counties
  - Coverage of budget control in Shanxi exceeds 80% among all Class II and III hospitals

- Hospital management focus switches from capacity expansion to service improvement
  - Multiple government announcements to prevent “unnecessary” capacity expansion
  - Hospitals make service quality improvement a top priority

Due to the BMI budget control policies, we are simply not able to treat more patients

- Deputy hospital director, Class III hospital in Kunming

Hospital expansion was very common in the past while recently central government no longer encourage large hospitals to continue to expand

- Government official in healthcare reform

We have no plans to add more beds in the next few years. Top priority is to enhance quality and service of selected departments and make them national leaders

- Director of BMI affairs, Class III hospital in Shanghai

SOURCE: Government website; expert Interview; McKinsey Analysis
**WHERE HAVE THE PATIENTS GONE?**

Respondents from lower tier cities are more optimistic on future outlook for patient flow growth.

### How would you predict patient flow growth in 2016 H1 vs 2015 H1?

100% = 48 respondents

<table>
<thead>
<tr>
<th></th>
<th>Tier 1/2 city (N=24)</th>
<th>Tier 3 and below/ county (N=24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faster</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Same</td>
<td>29%</td>
<td>29%</td>
</tr>
<tr>
<td>Slower</td>
<td>67%</td>
<td>42%</td>
</tr>
</tbody>
</table>

- **4%** Faster: Future *increase in hospital level patient flow will be driven by capacity expansion.*
  - When you look at the big picture, we expect a *relatively stable growth*.
  
    – Deputy hospital director, Class III, Weifang

- **29%** Same: Growth of patient flow will *continue to slow down* in 2016. Class III hospitals today *focus more on improving service quality*, rather than just attracting more patients.
  
    – Head of Reimbursement. Class III, Shanghai

*SOURCE: 2015 McKinsey hospital director survey; McKinsey analysis*
2015 has been a busy year on the pricing front

2015 highlights

- National retail price cap removed for most drugs
- NDRC retains price monitoring and investigation authority
- Price for patented drugs to be set through “multi-party negotiation mechanism”
- Reimbursement based pricing piloted
- Price point collection initiated for international price referencing
- Highly transparent price reference across the country
- Provinces demanding aggressive tender price cuts
- Independent price category for off-patent originators at risk
- Hospital/group level price negotiation pilots ongoing
- Expanding scale of pilots in 100+ cities
- Lack of volume guarantee
HOW LOW COULD PRICES GO?

Most provinces expected to initiate tender the near term, many early movers demanding aggressive price cuts

- **Tender hasn’t started**
- **Tender in progress**
- **Finished 2015 tender**

### Beijing
- First province to tender after Document No.7 and No.70 were published
- Introduced transparent purchasing (price negotiation)
- Reference national lowest price

### Jiangsu
- Draft version for tendering published in Sep. 2015
- Off-patent originators may potentially be in same category with first-to-market Gx

### Guangdong
- Third party online platform
- Monthly tendering
- 2 quality layers and set the 5 lowest average price as the cap
- Average price cut **5-10%**

### Anhui
- “Double envelope” process
- City level “price-volume” negotiation after provincial tendering
- Severe price cut across cities, e.g. average **17%** price cut in Bengbu

### Zhejiang
- Request **10-20%** price cut as pre-requisite for participation
- Reference national lowest price
- Separate groups for off-patent originators and Gx

### Hunan
- Two rounds of negotiation before another two rounds of bidding
- Less than 50% of drugs accepted negotiation
- Average price cut **10%-20%**

---

1. Includes provinces that have published tendering policies
2. Guangdong has finished 2015 tender for reimbursed drugs, while tendering for non-reimbursed drugs is in progress
3. No.7 document refers to <Guiding Opinion for Public Hospital Centralized Drug Procurement> issued by State council in Feb. 2015; No. 70 refers to <Opinion of Public Hospital Centralized Drug Procurement> issued by NHFPC in June 2015

SOURCE: Literature research; GBI; McKinsey analysis

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**HOW LOW COULD PRICES GO?**

*Downward tender price pressure likely to continue*

**2012-15 Indexed average provincial tendering price**

<table>
<thead>
<tr>
<th>Year</th>
<th>2012 price = 100</th>
<th>2015 average price</th>
<th>2015 lowest price</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>100</td>
<td>99</td>
<td>99</td>
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<td>2013</td>
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<td>99</td>
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<td>2014</td>
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<td>90</td>
<td>87</td>
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<tr>
<td></td>
<td></td>
<td>83</td>
<td>83</td>
</tr>
</tbody>
</table>

**EXAMPLES**

- Price trends vary across brands – selected brands chose to drop out of tender requesting fierce price drop, in the process sacrificing some volume
- Greater downward price pressure expected in 2016 due to
  - Increasing transparency in tender price reference system
  - More provinces expected to initiate tender

**SOURCE:** GBI
Secondary price negotiation continue to expand, adding further price pressure on manufacturers

Indexed price waterfall (tender price = 100)

- Zero-markup hospitals no longer enjoy 15% margin on drug sales
- Secondary price negotiation provides some margin relief

- 3 archetypes of secondary price negotiations emerging
  - **City level** volume based price negotiation for all public hospitals, e.g. Anhui, Liaoning, 21 cities in Sichuan
  - **Hospital group purchasing organization**, e.g., Ningbo, Shaoxing
  - **Individual hospital** negotiations, e.g., Tianjin, Shanxi, Hubei

- Zhejiang province took the lead to **pilot profit attribution scheme**, savings from price negotiation collected by local Bureau of Finance (BoF), and allocated to local hospitals

SOURCE: NHFPC; literature search; McKinsey analysis
HOW LOW COULD PRICES GO?

Several reimbursement pricing models being piloted

Policy Overview

- Pricing Bureau Chief conference on October 27, 2014 suggested reimbursement-based pricing be implemented in 2015
- No official national guideline published to date
- Pilots start to emerge in different provinces with different

Latest development in 2015

- Sanming Model
  - Set the lowest Gx price as price for reimbursement (piloted for select drugs)
  - The rest is out-of-pocket expense for patients
- Chongqing Model
  - Use average tendering price to set reimbursement price
  - Select top 300 drugs (based on 2014 trading volume) in the pilot
- Shaoxing Model
  - Use tendering price for each brand to set reimbursement price
  - Anhui and Zhejiang provinces adopt similar model in 2015

Reimbursement pricing expected to promote usage of Gx given greater discrepancy in out-of-pocket expense for patients using originators vs Gx

SOURCE: Literature search; McKinsey analysis
WHO IS CAPTURING THE VOLUME?

Volume growth has not been holding up for many top molecules

CPA sampled Class III/Class II hospitals

YoY growth by quarter of volume and price for Acarbose, 2012 Q1-2015 Q2
Growth rate by quarter, %

YoY growth by quarter of volume and price for Atorvastatin, 2012 Q1-2015 Q2
Growth rate by quarter, %

Drop in volume rather than price is partly caused by pharmacos’ decision to “walk away” from provinces with too aggressive pricing conditions

1 679 sampled hospitals, including 468 Class III hospitals, 211 Class II hospitals

SOURCE: China Pharmaceutical Association (CPA); McKinsey analysis
WHO IS CAPTURING THE VOLUME?

In the battle for share, both MNCs and locals are able to win

CPA sampled Class III/Class II hospitals

### MNC gaining volume share

<table>
<thead>
<tr>
<th>Amlodipine volume</th>
<th>CAGR 2011-14</th>
<th>Pemetrexed volume</th>
<th>CAGR 2011-14</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Local</td>
<td>52% 47% 41% 39% 39%</td>
<td>85% 88% 90% 91% 92%</td>
<td>41% 14%</td>
</tr>
<tr>
<td>MNC</td>
<td>48% 53% 59% 61% 61%</td>
<td>15% 12% 10% 9% 8%</td>
<td>14%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th># of Gx</th>
<th>Top 3 Gx Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>77</td>
<td>CR Saike, Yangtze River, Dawnrays Pharma</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th># of Gx</th>
<th>Top 3 Gx Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Shandong Qilu, Jiangsu Haosoh, Shanghai Chemo Wanbang</td>
</tr>
</tbody>
</table>

1 679 sampled hospitals, including 468 Class III hospitals, 211 Class II hospitals

SOURCE: China Pharmaceutical Association (CPA); McKinsey analysis
WHO IS CAPTURING THE VOLUME?

Product attributes and organizational capabilities are key to capturing volume

### Importance for preferred prescription

<table>
<thead>
<tr>
<th>Attribute</th>
<th>% of hospital directors list as top 3 reasons, N = 48</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good quality</td>
<td>81%</td>
</tr>
<tr>
<td>Convincing clinical data</td>
<td>81%</td>
</tr>
<tr>
<td>Low price/good reimbursement coverage policies</td>
<td>69%</td>
</tr>
<tr>
<td>Original drug with good brand image</td>
<td>31%</td>
</tr>
<tr>
<td>Strong support on drug/TA information</td>
<td>17%</td>
</tr>
<tr>
<td>Innovative communication</td>
<td>15%</td>
</tr>
<tr>
<td>New drug with patent</td>
<td>6%</td>
</tr>
</tbody>
</table>

### Organizational capabilities

- Market shaping capability
- Effective coverage and competitive share of voice
- Deep understanding of prescriber mindset and emotions
- Unique channel access, e.g., retail, digital
- Extensive external collaborations, e.g., distributor, government, ecosystem partners

Holistic offering key to volume capture

SOURCE: 2015 McKinsey hospital director survey; McKinsey analysis
Despite slowing growth, there are still bright spots in market:

- County hospital, fastest growing segment in hospital sector, achieved 28% CAGR 2011-2013
- CHC market achieved 30% CAGR 2011-2013
- Online OTC sales only USD 60 million in 2014 but regulation on online Rx sales would unlock significant upside
- County hospital, fastest growing segment in hospital sector, achieved 28% CAGR 2011-2013
- CHC market achieved 30% CAGR 2011-2013
- Online OTC sales only USD 60 million in 2014 but regulation on online Rx sales would unlock significant upside

E-health initiatives:
- Strong government endorsement on e-health e.g., Internet+ plan
- Digital provide new models to broaden accessibility, improve healthcare delivery quality, and strengthen physician and patient connections

High potential online channel:
- Online OTC sales only USD 60 million in 2014 but regulation on online Rx sales would unlock significant upside

Rising importance of retail channel:
- Brick-and-mortar retail channel kept ~9% growth in H1 2015, on par with H1 2014
- Retail pharmacies becoming an increasingly important channel given access hurdles to hospitals

New product launches:
- 20+ innovative drugs launched since 2013. Many with potential to change treatment paradigm and become future drivers of the market
- CFDA reform underway – “tsunami of launches” coming

Growth potential beyond large hospitals:
- Digital-health frenzy, beginning of a new S-curve
WHAT ARE THE BRIGHT SPOTS?

County hospital market experiencing strong growth momentum

Hospital western medicine expense, 2008-2013 (latest available data)
Billion RMB

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>CAGR</th>
<th>2011</th>
<th>CAGR</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>171</td>
<td>72%</td>
<td>271</td>
<td>70%</td>
<td>393</td>
</tr>
<tr>
<td>County</td>
<td>52</td>
<td>23%</td>
<td>89</td>
<td>25%</td>
<td>144</td>
</tr>
</tbody>
</table>

Accelerated growth in county hospitals further driven by government financial and policy support (e.g., MoF allocated $900+M to support county hospital reforms)

CHCs fast growth from a small base, important to target cities with concentrated market potential

SOURCE: MOH database; NHPFC yearbook
# Retail pharmacies becoming an increasingly important channel given access challenges

Retail channel has been growing significantly in the past few years

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue (Billion USD)</th>
<th>CAGR, 2010-13</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>32</td>
<td>-2%</td>
</tr>
<tr>
<td>2013</td>
<td>39</td>
<td>10%</td>
</tr>
</tbody>
</table>

**Pharmacy reimbursement coverage**

<table>
<thead>
<tr>
<th>Year</th>
<th># of pharmacies w/o reimbursement</th>
<th># of pharmacies w/ reimbursement</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>284</td>
<td>115</td>
</tr>
<tr>
<td>2011</td>
<td>288</td>
<td>136</td>
</tr>
<tr>
<td>2012</td>
<td>272</td>
<td>152</td>
</tr>
<tr>
<td>2013</td>
<td>265</td>
<td>168</td>
</tr>
</tbody>
</table>

**Source:** MOHRSS; MOC; expert interviews

---

**WHAT ARE THE BRIGHT SPOTS?**

Case example: Victoza effectively leverages pharmacy channel to drive growth

- **Initial prescription in hospitals**
- **Patient self-pick up from pharmacies**
- **Cold-chain delivery to home/hospital**

**Revenue (at retail price) of retail pharmacies in China**

- **+11% p.a.**

**Pharmacy reimbursement coverage**

- **+3% p.a.**

**CAGR, 2010-13**
Another breakthrough year for E-health in 2015

**Policy and Regulation**
- Healthcare information service provider authorization moved to provincial gvt
- State council issued **Internet Plus plan** in July 2015
- Moving one step further in **lifting the ban on online sale of Rx drugs**
- Linking **remote healthcare** to tiered treatment

**Business Model**
- Fosun Pharma cooperates with Guahao.com on **O2O strategy**
- Pfizer teams up with Yuwell Medical on **chronic disease management through online platform**
- Shanghai Pharma partners with Wonders and JD.com for **pharma e-commerce**
- Sanofi cooperates with Google life science to **treat diabetics**
- PingAn insurance enters into E-health with **PingAn Good Doctor**

**Investment**
- Guahao.com **USD 394mn** in series D financing
- 111.com **RMB 450mn** in series C financing
- Haodf.com **RMB 370mn** in series C financing
- Huakang **RMB 200mn** in series B financing

**BAT on the move**
- Baidu leverages big data capability, introduces **robot assistant “Duer”, “Baidu Brain”**
- Ali **Cloud Hospital** went online; cooperates with Carestream on setting up **online imaging platform**; partners with CPIC for online health insurance service
- Tencent releases **intelligent blood glucose meter**; publishes **smart pharmacy plan** to build **one-stop** online healthcare service platform through WeChat

**NOT EXHAUSTIVE**
Recently launched products and new launches should be an engine of growth

**WHAT ARE THE BRIGHT SPOTS?**

2011-2015 new launch products by RDPAC companies

- **Mn RMB**
  - 2011: 5
  - 2012: 140
  - 2013: 725
  - 2014: 1,360
  - 2015E: 2,425

**Examples of recently approved drugs**

- New approvals post MRCT rules interpretation
- Does not include several indication expansions, e.g. Xarelto (SPAF), Avastin (lung cancer)

**Examples**

- Onglyza® (exenatide)
- Lucentis® (ranibizumab)
- Xalkori® (crizotinib)
- Orgalutran®
- Galvus® (dasatinib)
- Sprycel® (dasatinib)
- Brilinta® (ticagrelor tablets)
- Revlimid® (thalidomide)
- Onbrez®
- Afinitor®
- Actemra® (tocilizumab)

All products launched since 2011 expected to account for only ~2% of MNC Rx sales in 2015

SOURCE: RDPAC; CFDA
Our perspectives on the big slowdown

While **price pressure and slowing volume growth** both contribute to recent market slowdown, the latter seems to have played a bigger role in 2015.

Slowing patient flow growth is not a result of changing underlying demand, but more likely reflects **shifting policies/incentives and constraints at hospital level**.

**Slowdown will likely continue in the near term** as more provincial tenders are announced and volume growth will take time to recover.

**Attractive areas still exist** (e.g., lower tier markets, retail channel, digital health, regulatory); those able to capture new opportunities will have a clear competitive advantage.

Changing market context has become a **catalyst for organizational changes**, e.g., dynamics between local and HQ, greater emphasis on resource efficiency and productivity.

**Future winners** will be those who can evolve their capabilities and strengths to fit the new market norm.
WHAT DOES THIS ALL MEAN FOR PHARMACOS?

Eight commercial imperatives for pharmacos

1. Through cycle mentality with “topline corridor”
2. Resource flexibility in face of uncertainties
3. Rigorous SFE fundamentals to drive productivity gain
4. Innovations to shape treatment paradigm and the market
5. External collaboration to shape regulatory framework
6. Dynamic pricing model to cope with pricing pressure
7. E-health initiatives to drive growth from new channels
8. Granular mining of data for better insights and decisions

WHAT DOES THIS ALL MEAN FOR PHARMACOS?
Assessing progress on innovation
McKinsey & Company

China Drug Innovation Index (CDII) is the first holistic assessment of China’s innovation ecosystem, to be tracked annually.

**Approach**

Assess 5 key dimensions of China innovation ecosystem

- Policy, Funding, Capability, Local innovation output, Level of integration into global

Calibrated against current U.S. levels (2014 US = 8 out of 10 points)

Aim to update annually to track progress

**Sources of insights**

Survey of ~70 members

10 quantitative metrics comparing U.S. and China on reported innovation indicators

**Output**

Holistic view of China innovation ecosystem relative to that of the U.S.
Where does China stand on drug innovation?
Momentum of China innovation accelerating over the last 12 months

Jan 2015

**Epidaza**, a global first selective HDAC inhibitor, launched in China by **Chipscreen**

March 2015

**AZ and Wuxi AppTec** JV filed clinical trials application for MEDI-5117

March 2015

**Innovent and Lilly** entered into a 10-year, ~$450M collaboration on biologics

June 2015

**J&J Innovation** and **WuXi AppTec** formed partnership to fund/incubate high quality start-ups

July 2015

**Beigene** compound BGB-283 received CFDA IND approval, and CTA approval

Mar-Aug 2015

**Zai Lab** secured 4 assets from deals with 3 MNCs – BMS, Sanofi, UCB

Sept 2015

**Hengrui** out-licensed ex-China rights of SHR-1210 to **Incyte** for up to ~$800M

Oct 2015

**Innovent and Lilly** deepened relationship with up to $1bn deal to develop 3 preclinical anti-PD-1-based antibodies

SOURCE: Press search
Our inaugural China Drug Innovation Index (CDII) survey confirms such positive trend

Momentum of drug innovation in China over the past year compared to previous year
N = 69

- 50% significantly accelerated
- 39% slightly accelerated
- 3% status quo
- 5% slightly slowed down
- 3% significantly slowed down

~90% of R&D leaders surveyed believe China drug innovation accelerated last year

SOURCE: 2015 CDII Survey
So where does China stand today across 5 key dimensions of innovation ecosystem?

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Min</th>
<th>Score</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy</td>
<td>0</td>
<td>3.1</td>
<td>8.0</td>
</tr>
<tr>
<td>Funding</td>
<td>0</td>
<td>5.4</td>
<td>8.0</td>
</tr>
<tr>
<td>Capabilities</td>
<td>0</td>
<td>4.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Local innovation</td>
<td>0</td>
<td>4.7</td>
<td>8.0</td>
</tr>
<tr>
<td>Integration with global</td>
<td>0</td>
<td>3.6</td>
<td>8.0</td>
</tr>
</tbody>
</table>

**Ave. China Score = 4.2**

**Key insights**

- **Policy**: Access to funding less of an issue
- **Funding**: Overall infrastructure perceived to be weaker than talent
- **Capabilities**: Novelty of innovation is lacking. On the bright side, # of Class 1.1 drug applications has increased at CAGR 18% since 2010
- **Local innovation**: Integration with global seen as a weak link in China’s innovation ecosystem
- **Integration with global**: Regulatory environment faces challenges but CFDA is planning unprecedented reforms. Lack of reimbursement continues to be a key challenge

**SOURCE**: 2015 CDII Survey
Drug review and approval process very lengthy and seen as a weak link for China

Effectiveness of drug review/approval process

Approval time for IND

<table>
<thead>
<tr>
<th>Year</th>
<th>China</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>11.6</td>
<td>1.0</td>
</tr>
<tr>
<td>12</td>
<td>9.6</td>
<td>1.0</td>
</tr>
<tr>
<td>13</td>
<td>11.6</td>
<td>1.0</td>
</tr>
<tr>
<td>2014</td>
<td>14.6</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Min: 1.0, Max: 14.6, Ave. China Score = 4.2

Approval time for NDA

<table>
<thead>
<tr>
<th>Year</th>
<th>China</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>18.0</td>
<td>9.6</td>
</tr>
<tr>
<td>12</td>
<td>19.0</td>
<td>10.0</td>
</tr>
<tr>
<td>13</td>
<td>21.0</td>
<td>11.0</td>
</tr>
<tr>
<td>2014</td>
<td>22.0</td>
<td>6.5</td>
</tr>
</tbody>
</table>

Min: 9.6, Max: 22.0, >3X

R&D leaders view regulatory process as a major barrier in current innovation ecosystem

SOURCE: 2015 CDII Survey; DXY Insight 2014; CDER 2014 update
Recently announced CFDA reform could potentially accelerate approval timeline and boost innovation.

5 pillars of Reform Review and Approval System for Drugs and Medical Devices

1. Improve quality of review and approval process
2. Eliminate review backlog
3. Improve quality of generics
4. Encourage innovation
5. Increase transparency of review and approval process

Application timeline

- Eliminate all backlog by 2016
- Achieve review time target set out in regulation by 2018

Innovative drug application process/requirement

- Dedicated innovative drugs review channel
- MRCT data will be accepted to support filing
- Pilot MAH scheme

Generics application

- Bio-equivalent testing changed from application to notification
- Potentially unified application process
- Enforce originator as reference

Reduce non-qualified applications

- Self-audit by applicants
- CROs inspection

Targeted results

Industry experts expect significant progress to be made in the next 2-3 years

SOURCE: State Council; CFDA; Industry expert interviews; McKinsey analysis
Pricing and reimbursement policy remains a major barrier in the China innovation ecosystem

Examples of MNC and local drugs not on NRDL

- SPRYCEL
- BRILINTA
- Tykerb
- Victoza
- Conmana
- Imrecoxib Tablets

It is very challenging for pharmacos to recoup R&D investment if innovative drugs cannot be listed on RDL. One of our cancer drugs is still not listed on NRDL 8 years after launch – SVP of a leading local pharmaco

- NRDL has not been updated since 2009, and no drug launched since is covered yet
- Going forward, pharmacos need to consider pricing/coverage tradeoffs, as government will not cover everything at any price

SOURCE: 2015 CDII Survey; GBI; expert interview
Access to funding not perceived as a major hurdle for pharmacos

Types of funding options for Chinese companies are limited, whereas in U.S. companies have access to broad ecosystem of angel investors, VCs etc., … with creative funding options

1 Established company with commercial presence

SOURCE: 2015 CDII Survey
Total R&D funding has been rapidly growing, although still at 1/8th of US investment level.

China R&D funding has grown at 27% CAGR in the past five years, and is expected to reach ~$25-30 Bn by 2025.

1 McKinsey Global Institute projection

SOURCE: 2015 CDII Survey; McKinsey Global Institute; China Investment 2015 – ChinaBio, STS.org; NSF annual report; NIH report; PWC Moneytree life science report; 2015 PhRMA industry profile
Funding raised by Chinese innovation companies has been growing in past 12 months; first wave of IPOs also coming up

### Growing fund raising in innovation

<table>
<thead>
<tr>
<th>Date</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct, 2015</td>
<td>$100M</td>
</tr>
<tr>
<td>Sep, 2015</td>
<td>$35M</td>
</tr>
<tr>
<td>Aug, 2015</td>
<td>$16M</td>
</tr>
<tr>
<td>May, 2015</td>
<td>$97M</td>
</tr>
<tr>
<td>May, 2015</td>
<td>$45M</td>
</tr>
<tr>
<td>Jan, 2015</td>
<td>$100M</td>
</tr>
<tr>
<td>Jan, 2015</td>
<td>$25M</td>
</tr>
<tr>
<td>Dec, 2014</td>
<td>$75M</td>
</tr>
<tr>
<td>Dec, 2014</td>
<td>$8M</td>
</tr>
<tr>
<td>Dec, 2014</td>
<td>$10M</td>
</tr>
</tbody>
</table>

### Recent IPOs from China Pharmacos

- **BeiGene**: Oct, 2015, $100M
- **NASDAQ**: Oct, 2015, $75M
- **CHI-MED**: Oct, 2015, $8M
- **3SBIO**: Jun, 2015, $10M
- **HKE**: Jan, 2015, $25M

**SOURCE:** Press search
Capabilites and infrastructure still lagging US benchmarks, but with some promising potential

How would you rate the quality of R&D talent available in China today?

How would you rate China’s overall infrastructure for drug innovation today?

SOURCE: 2015 CDII Survey
### Capabilities in basic research has gap to U.S., particularly in quality

- **China**
- **US**

#### Publications in international journals (‘000s)

<table>
<thead>
<tr>
<th>Year</th>
<th>China</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>35</td>
<td>242</td>
</tr>
<tr>
<td>2011</td>
<td>42</td>
<td>250</td>
</tr>
<tr>
<td>2012</td>
<td>52</td>
<td>268</td>
</tr>
<tr>
<td>2013</td>
<td>66</td>
<td>275</td>
</tr>
<tr>
<td>2014</td>
<td>73</td>
<td>269</td>
</tr>
</tbody>
</table>

- **Average citations (#)**

<table>
<thead>
<tr>
<th>Year</th>
<th>China</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>0.8</td>
<td>1.4</td>
</tr>
</tbody>
</table>

- China’s quantity of research is rapidly gaining momentum
- However, to improve quality, the academic community needs to clean up practices of mediocre/me-too publications and enhance data integrity

**SOURCE:** Thomson Reuters; InCite; Using Essential science indicators category (Immunology, Microbiology, Neuroscience & Behavior, Clinical medicine, molecular biology & genetics, Biology & biochemistry, Pharmacology & toxicology)
Chinese firms are building technology platforms to enable innovation – BGI and genomics / DNA sequencing example

Unique scale in genomics

- #1 in NGS field in China
- 16 Years in business
- 150 state of the art genetic sequencing machines
- Large database specific for Chinese patients
- Ranked by Nature in 2014 as:
  - 5th of Top institutions in Nature and Science
  - 15th of Top institutions

Managing director Wang Jun recently founded a startup ShenZhen Tanyuan Technology Ltd. focusing on healthcare big data

SOURCE: Company website; annual report; news release; expert interviews
Chinese firms also actively contributing to improving global drug innovation model – Wuxi AppTec example

**CAPABILITIES**

- **Traditional Gx companies trying to innovate**
  - Innovative engine
  - Man power: 10,000 employees globally, 4,000 synthetic, medicinal and process chemists

- **Innovative companies with capacity constraints**
  - Facility: 5 millions sq ft of R&D and manufacturing Space 21 sites

- **Start-up companies with great ideas**
  - Equipment: Key analytical equipment of over 50 percent measured by 24x7 utilization

**Large scale enabling 2,000 collaborators globally**

- **#1 CRO in Asia**

**1st in China:**

- CMC platform inspected by FDA
- cGMP biologics manufacturing facility compliant with US, EU and Chinese regulatory standards
- GLP preclinical laboratory double certified with an OECD country and CFDA
- GLP/GCP bio-analytical lab that passed FDA, OECD, and CFDA inspections
- CLIA-certified clinical genomics lab

**SOURCE:** Expert interview; company website
Novelty and quality of innovation still lagging

Today majority of Chinese companies are focusing on “me-too” and “me-better” targets in drug R&D with few exceptions, such phenomenon is probably driven by the fact that pharmacos need to establish credibility and demonstrate progress on innovation. Going forward I hope these companies will also invest in new MOAs and first-in-class as they build up R&D scale and capabilities

– China-based investor

SOURCE: 2015 CDII Survey; expert interview
Local PCT and IND applications are rapidly growing

China’s levels of PCT patent and IND applications still a fraction of that of U.S. (17% and 22% in 2014, respectively), however growth trajectory of both metrics has been strong.

PCT patents filed¹ (#)

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>504</td>
<td>974</td>
</tr>
<tr>
<td>Growth</td>
<td>+18% p.a.</td>
<td></td>
</tr>
</tbody>
</table>

IND applications² (#)

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>56</td>
<td>173</td>
</tr>
<tr>
<td>Growth</td>
<td>+33% p.a.</td>
<td></td>
</tr>
</tbody>
</table>

1 PCT: Patent Cooperation Treaty
2 Class 1 applications in China; Commercial IND applications in the US

SOURCE: 2015 CDII Survey; PatentScope; GBI; FDA
While cross-border collaboration is increasing, participation in global trials has been limited due to recent regulatory hurdles.

**Co-authorship with overseas researchers (‘000s)**

- **2010**: Min = 13, Max = 26, Ave. China Score = 4.2
- **2014**: Min = 27, Max = 76, +19% p.a.

**Cross-border deals on drug R&D (#)**

- **2010**: Min = 71, Max = 47, +30% p.a.
- **2014**: Min = 27, Max = 76

**# of global trials (#)**

- **2010**: Min = 71, Max = 47, -10% p.a.
- **2014**: Min = 27, Max = 76

**China contribution by the numbers**

- **2010**: Min = 13, Max = 26
- **2014**: Min = 27, Max = 76

**INTEGRATION WITH GLOBAL**

**Ave. China Score = 4.2**

*SOURCE: 2015 CDII Survey; China Investment 2015 – ChinaBio; Thomson Reuters*
Overall, survey participants believe that the outlook for China innovation is promising

What role will China play in global drug innovation by 2025?

- **29%**: Top 3 global contributor
- **62%**: Solid 2nd tier player
- **9%**: Struggling, focused on incremental innovation

% of surveyed, N = 69

What are China’s biggest advantages in drug innovation?

- **Strong government support**, evidenced by recently announced changes to accelerate drug registration and approval
- **Sizable Chinese market** attracts R&D investments from both MNCs and locals
- **Proximity** to leading drug R&D service providers in China including CROs, CMOs etc.
- **Highly motivated Chinese companies** eager to learn and play in global market

Majority of R&D leaders believe China could become a top-3 contributor or a solid 2nd tier player in global drug innovation by 2025
## Making the leap – what it could take

<table>
<thead>
<tr>
<th>Key hurdles / challenges</th>
<th>Opportunities for key ecosystem participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Challenging regulatory environment</td>
<td>▪ Incorporate value evidence in clinical development plans</td>
</tr>
<tr>
<td>▪ Lack of mechanisms to reward innovation</td>
<td>▪ Consider trade-off between pricing and reimbursement</td>
</tr>
<tr>
<td>▪ Limited types of funding options for start-ups</td>
<td>▪ Allocate a proportion of government pension fund or sovereign wealth fund to VCs focusing on life science</td>
</tr>
<tr>
<td></td>
<td>▪ Partner with promising startups in early stages</td>
</tr>
<tr>
<td>▪ Large talent pool with mixed level of capabilities</td>
<td>▪ Attract and develop high-quality R&amp;D talent</td>
</tr>
<tr>
<td></td>
<td>▪ Encourage academic-private collaboration; urge academic to train “industry-ready” graduates</td>
</tr>
<tr>
<td>▪ Pipeline novelty and quality of R&amp;D can be enhanced</td>
<td>▪ Incentivize high-quality basic research (especially in Biology) to build cutting-edge expertise in select areas</td>
</tr>
<tr>
<td>▪ Inclusion in global trials has declined</td>
<td>▪ Invest in innovative solutions that address China-prevalent disease areas (e.g., Lung cancer, liver cancer)</td>
</tr>
<tr>
<td></td>
<td>▪ Leverage new CFDA reforms to integrate China early on into global development planning</td>
</tr>
</tbody>
</table>
Finding the funds for innovation
“Finding the funds for innovation” becoming increasingly relevant

**Research & development**
- Growth of mature drugs slowing down further exacerbates importance of innovative drugs
- Wave of new drugs expected to reach China
  - MNCs launching waves of new drugs with high expectations on uptake
  - China innovation ecosystem has been improving, leading locals begun to develop and launch new drugs
  - CFDA reform expected to accelerate review and approval of new drugs in coming years
- Patients increasingly demand access to new drugs as affordability and awareness of options improve

**Registration**

**Market access & commercialization**
- Market rewards for innovative drugs remain limited
  - Fragmented and inefficient listing & tendering processes
  - Infrequent RDL/PRDL updates with narrow coverage
- Government spending on healthcare remains constrained and focuses on providing basic coverage
- Private health insurance still at nascent stage

“Who will pay for innovation” becomes an increasingly relevant question for pharma industry, payors, policy makers and ultimately patients
Large number of innovative drugs expected to hit the market in coming years

Strong innovative pipeline … … with multiple planned new launches (examples)

<table>
<thead>
<tr>
<th>Pre-clinical¹</th>
<th>IND¹</th>
<th>NDA²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>131</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>129</td>
<td></td>
<td>284</td>
</tr>
<tr>
<td></td>
<td>367</td>
<td>83</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MNC</th>
<th>Local</th>
</tr>
</thead>
<tbody>
<tr>
<td>129</td>
<td>367</td>
</tr>
<tr>
<td>2</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Brand / product</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zytiga</td>
<td>Johnson &amp; Johnson</td>
</tr>
<tr>
<td>Xolair Omalizumab</td>
<td>Novartis</td>
</tr>
<tr>
<td>Torisel</td>
<td>Pfizer</td>
</tr>
<tr>
<td>Tresiba</td>
<td>Novo Nordisk</td>
</tr>
<tr>
<td>Cadrofloxacin</td>
<td>聚维酮江</td>
</tr>
<tr>
<td>Hemporfin</td>
<td>奥美拉唑</td>
</tr>
<tr>
<td>Nolatrexed</td>
<td>北京康辰药业股份有限公司</td>
</tr>
</tbody>
</table>

1 Class 1.1 Chemical drugs and Class 1 biologics in CFDA
2 Drugs in NDA review and drugs approved for NDA but not marketed (Jan 1st, 2011-Oct 13th, 2015), including drugs in category chem-1.1, chem-3.1, and innovative biologics

SOURCE: GBI; lit search
China faces clear constraints when considering rewards for innovation

Despite strong growth in past decade, China per capita healthcare spend still significantly lagging behind developed countries

Reward for innovation will be selective – government unlikely to support all innovative treatments equally

**Per capita health expenditure USD**

<table>
<thead>
<tr>
<th>Country</th>
<th>Per capita</th>
<th>Total</th>
<th>Health expenditure as % of GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>9,150</td>
<td>2,870</td>
<td>17.1%</td>
</tr>
<tr>
<td>Japan</td>
<td>3,965</td>
<td>505</td>
<td>10.3%</td>
</tr>
<tr>
<td>UK</td>
<td>3,600</td>
<td>230</td>
<td>9.1%</td>
</tr>
<tr>
<td>China</td>
<td>370</td>
<td>510</td>
<td>5.6%</td>
</tr>
</tbody>
</table>

SOURCE: WHO; World Bank
A set of levers could be considered to bridge the funding gap and reward innovation

### China healthcare spend by funding source

<table>
<thead>
<tr>
<th>Year</th>
<th>Government</th>
<th>Social</th>
<th>Out-of-pocket</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>25</td>
<td>35</td>
<td>40</td>
</tr>
<tr>
<td>2013</td>
<td>30</td>
<td>36</td>
<td>34</td>
</tr>
<tr>
<td>2020</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>

$ Bn, percentage

### On-going levers

1. **Government reimbursement**
   - NRDL and CDI
   - Selected local reimbursement

2. **Development of private health insurance (PHI)**

3. **Patient Assistance Programs (PAPs)**

4. **Self-pay market**

5. **Direct increased public spend on innovation**

6. **Redeployment of savings from price cuts of mature drugs**

7. **Outcome/value-based negotiation**

### Future possibilities?

---

1 NRDL: national reimbursement drug list; CDI: critical disease insurance

SOURCE: NHFPC Yearbook; McKinsey Analysis
Local governments have provided reimbursement scheme to a subset of innovative drugs – select examples

<table>
<thead>
<tr>
<th>Disease area</th>
<th># of provinces with PRDL</th>
<th>Locally negotiated reimbursement scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-small cell lung cancer</td>
<td>12</td>
<td>• 2 provinces (Jiangxi and Zhejiang)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Zhuhai</td>
</tr>
<tr>
<td>Rheumatoid arthritis</td>
<td>11</td>
<td>• Zhejiang</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Qingdao</td>
</tr>
<tr>
<td>Non-small cell lung cancer</td>
<td>4</td>
<td>• Zhejiang</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 3 cities (Qingdao, Zhuhai and Shenzhen)</td>
</tr>
<tr>
<td>Breast cancer</td>
<td>2</td>
<td>• 3 provinces (Zhejiang, Inner Mongolia, and Jiangxi)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 8 cities</td>
</tr>
<tr>
<td>Non-small cell lung cancer</td>
<td>2</td>
<td>• Qingdao</td>
</tr>
</tbody>
</table>

While more cities and provinces are starting to cover innovative drugs through PRDL or local negotiations, overall scale and scope of coverage remain limited

1 Chronic myelogenous leukemia
2 Gastrointestinal Stromal Tumor

SOURCE: GBI; literature research; McKinsey analysis
# Acceleration of roll-out of Critical Disease Insurance program

## Policy evolution

- **2007**
  - “Guidance and Definition of Critical Disease Insurance” issued by CIRC\(^1\) to set up a model policy of critical disease insurance

- **2012**
  - “Accelerate Development of CDI for Urban & Rural Resident” issued by the State Council, which encourage PHI to provide CDI services and establish evaluation and supervision system for expanding PHI coverage

- **2014**
  - “Opinions on Implementing Critical Disease Insurance for Urban and Rural Residents” jointly issued by MOH, MoLSS\(^2\), CIRC, etc. to encourage cooperation between government and PHIs

- **2015**
  - “Guideline on Full Implementation of CDI for Urban and Rural Residents” released by the State Council in Aug.
    - CDI should benefit all urban and rural residents covered in the nation's basic health insurance by the end of 2015
    - A relatively sound system for CDI will be established by 2017

## Impact to date

- **Piloted in all 31 provinces, covering ~700 million population** as of April 2015
- Actual reimbursement rate **no less than 50% for OOP**, and increases with OOP expense
- ESRD example: NRCMS cover the first 70% of expenses, then CDI covers 50% of remaining expenses
- CDI is now operated by private insurers in most regions

## Future outlook

- CDI programs should expand to the whole country by the end of 2015 to help financially challenged residents
  - Premier Li, Keqiang

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1 China Insurance Regulatory Commission
2 Ministry of Labor and Social Security

SOURCE: Government official website; lit research; McKinsey analysis
Private health insurance (PHI) is rapidly growing, providing supplementary funding source.

**Growth of China PHI market**

**USD, bn**

<table>
<thead>
<tr>
<th>Year</th>
<th>PHI (bn)</th>
<th>PHI as % of total HC spend</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>13.7</td>
<td>xx%</td>
</tr>
<tr>
<td>2013</td>
<td>18.2</td>
<td>+37%</td>
</tr>
<tr>
<td>2014</td>
<td>25.8</td>
<td>20.1</td>
</tr>
<tr>
<td>2015 H1</td>
<td>25.8</td>
<td>20.1</td>
</tr>
</tbody>
</table>

- **Private payors actively expanding presence**

  Private payors are exploring new ways to enhance access to data and improve risk assessment.
  - Collaborate with providers
  - Invest in mHealth
  - Invest in hospitals to become integrated managed care systems
  - Manage BMI for local government

- **Growth driven by favorable policies, e.g.,**
  - Increasing social capital
  - Tax benefits
- **PHI uptake still limited by**
  - Access to patient data
  - Demand generation of target population
  - Lack of bargaining power over providers
  - Capability and talent

SOURCE: CIRC; State Council; literature research; McKinsey analysis
### Patient Assistance Programs (PAPs) could help expand accessible patient pool

<table>
<thead>
<tr>
<th>Charity donation and clinical trials</th>
<th>Gleevec</th>
<th>Iressa</th>
<th>Nexavar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Donation to poorest 10% of CML &amp; GIST patients</td>
<td>Donation to poorest RCC and HCC patients</td>
<td>Donation to poorest 10% of CML &amp; GIST patients</td>
<td></td>
</tr>
<tr>
<td>Setup medical centers &amp; disease consulting hotline</td>
<td>Iressa Pan Asian Study (IPASS) clinical trials in 11 cities in China</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide medical assessment to patients</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Free for patients with basic living allowances</td>
<td>5-month cap for NSCLC patients, after which drugs are free for life</td>
<td>3-month cap, after which drugs are free for life with proven efficacy</td>
<td></td>
</tr>
<tr>
<td>3/6-month cap, after which free for rest of year</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Impact (by 2014)</th>
<th>~10%</th>
<th>&lt;5%</th>
<th>&lt;10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>39K patients</td>
<td>25K patients</td>
<td>20K patients</td>
<td></td>
</tr>
</tbody>
</table>

While beneficial to patients enrolled, PAPs only cover a subset of diseases and fraction of patients in need of innovative therapies; scaling up poses challenges.

SOURCE: China Charity Federation; literature search; McKinsey analysis
Self-pay segment could be further activated, leveraging learnings from other markets

Increasing patient affordability & willingness to pay

<table>
<thead>
<tr>
<th>Consumption of urban households – By annual income¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage, 100% = trillion USD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2020E</th>
<th>2025E</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Affluent</strong></td>
<td>2.7</td>
<td>4.2</td>
<td>6.2</td>
</tr>
<tr>
<td><strong>New Mainstream</strong></td>
<td>9.3</td>
<td>14.0</td>
<td>21.4</td>
</tr>
<tr>
<td><strong>Mass</strong></td>
<td>45.6</td>
<td>60.7</td>
<td>62.4</td>
</tr>
<tr>
<td><strong>Poor</strong></td>
<td>42.9</td>
<td>23.7</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Innovative ways to activate self-pay segment

- Partner with private banks and consumer financing companies to provide loans to patients
- Short-term installments to help patients manage cash flows
- Risk-sharing mechanisms to mitigate patients’ perceived risk (e.g. on product efficacy)

Learnings from other markets

Example

In India, Enbrel can be paid through installments of <$200 to minimize cash flow disruption for RA patients

Consumption of New Mainstream by category, 2015

1 Affluent (>36K USD annual household income), Mainstream (17-36K USD annual household income), Mass (10-17K USD annual household income), Poor (<10K USD annual household income)

2 Including all healthcare related spending across prevention, diagnosis, treatment and nutrition

SOURCE: National Bureau of Statistics; MGI; McKinsey analysis
Going forward, additional set of levers can also be explored

<table>
<thead>
<tr>
<th>Potential impact</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Increase public direct spending on innovative drugs</strong></td>
<td>▪ Current healthcare spending accounts for 5.6% of GDP, lower than many developed market ▪ Increasing healthcare spend on innovative drugs by 0.5% of GDP in 2025 could translate into ~$20 Bn opportunity for pharma industry</td>
</tr>
<tr>
<td><strong>Redeploy savings of price cuts on mature drugs</strong></td>
<td>▪ Cost saving from reducing price of mature drugs likely to be limited – <em>estimated</em> at $0.6-1.5 Bn per year</td>
</tr>
<tr>
<td><strong>Value-based negotiation between payors and pharmacos</strong></td>
<td>▪ Adopt Health Technology Assessment tools/framework, where drugs with compelling clinical benefits could gain more commercial upside</td>
</tr>
</tbody>
</table>

SOURCE: McKinsey analysis
In summary, narrowing the “paying for innovation” gap requires a multi-pronged effort.

- **Tap into multiple funding sources**, e.g.,
  - Increase government HC spend on innovative drugs
  - Unleash Private Health Insurance market
  - Further activate self-pay segment

- **Better articulate the total economic and social impact of rewarding innovation**, including addressing critical medical needs, creating a healthier society and cultivate an innovative and strong industry.

- **Not all innovation will be rewarded** – demonstrating the value of innovative drugs will be critical.

- **Creative cross-sector partnerships should be explored** (e.g., between private payors and pharmacos).
Implications for pharmacos

1. Engage regulatory bodies as an industry to help formulate policies that properly reward innovation

2. Incorporate demonstrating value of innovative drugs into clinical development and life cycle management plans

3. Invest in market shaping activities, including self-pay segment

4. Explore creative partnerships (e.g., with private payors, local government) to enhance patients’ access to innovative drugs

5. Explore price-volume trade-offs at launch time and regularly over brand life-cycle

6. Double-down innovation efforts in disease areas highly relevant to China and/or with strong government support
1. We are on a narrow bridge to innovation, with still a high degree of uncertainty on outlook.

2. The going gets tougher; however there are still tremendous opportunities to capture.

3. The time to drive real change in business and operating models is now.
For more on China healthcare …

Our China healthcare leadership team (Partners and Associate Partners)

<table>
<thead>
<tr>
<th>Industry insights</th>
<th>Collaboration with CPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>Data driven periodic reports</td>
</tr>
<tr>
<td>2014</td>
<td>TA specific deep-dive (e.g., oncology, immunology)</td>
</tr>
<tr>
<td>2013</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td></td>
</tr>
</tbody>
</table>

www.mckinseychina.com

iTunes Store – “McKinsey on China”

1. How sick is China’s pharmaceutical market?
2. Will market forces revolutionize Chinese healthcare?
3. What healthcare system can China afford?
4. Will the next medical equipment champion come from China?
5. Obesity – How big will China get?