

# China Healthcare Thematic

## Capturing the Upcoming Value Chain Shift

### ■ Industry Overview

- **Structural Changes Have Begun** — We believe the Chinese healthcare system is at the beginning of structural changes including: 1) Breakdown of the monopoly of public hospitals; 2) Emergence of commercial insurers into the medical insurance system; and 3) Freeing private practice by physicians. These changes may be gradual but could result in unlocking of value from hospitals and redistribution of the healthcare value chain, providing significant investment opportunities. *In this report we set out a roadmap of how we see the healthcare industry evolving in the coming years.*
- **Value Chain Shift** — We see excess capacity in pharma manufacturing but a lack of capacity in healthcare services. Our analysis of aggregate revenue and profits of healthcare universe from 2003-2011 suggests value shifted from API/chemical players to device/distributors. With the upcoming structural changes, we envision value could shift towards: 1) Innovative pharma companies with strong pipeline; 2) Device players providing substitutes to MNC products; 3) Dominant distributors and top retail pharmacies; 4) Rural market players. We also highlight the potential of an entire healthcare services sector emerging, alongside new business models.
- **Future System Could Be a Hybrid** — The current Chinese healthcare system faces a few structural issues: 1) Imbalance in resource allocation/patient flow in different class of hospitals; 2) An inflated, but also under-served, drug market; and 3) Low compensation to physicians. However, we expect the future healthcare system to better address these issues and to develop into a Western/China hybrid system, combining government control with private hospitals and commercial insurance.
- **Mapping the Universe** — We analyzed all 223 HK/US-listed/A-share Chinese healthcare companies by dissecting the entire healthcare universe, based on: 1) 2008-2011 CAGR in revenue/EBITDA; and 2) Share of total revenue/EBITDA of each subsector. We also benchmarked the key financial ratios of domestic players against global players to assess the competitiveness of the Chinese companies.
- **Long-Term Winners** — In our thesis of value chain shift amid Chinese healthcare industry restructuring, we see Sinopharm and Mindray as potential winners given their leading market positions and also products that can compete with the multinationals. In addition, Sino Biopharm (strong R&D capability) and China Medical Systems (unique CSO business model to capture demand with limited R&D investment) should be long-term winners.

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**Figure 1. National Healthcare Expenditure (NHE) CAGR Growth Scenarios**

NHE as % of GDP		6%	7%	8%	9%	10%
Target Year	2020	13.2%	15.1%	16.8%	18.4%	19.8%
	2025	12.0%	13.2%	14.3%	15.3%	16.2%

Source: Citi Research Estimates, Ministry of Health

### See Appendix A-1 for Analyst Certification, Important Disclosures and non-US research analyst disclosures.

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# Contents

<b>Investment Summary</b>	<b>3</b>
<b>What Will The Future of Chinese Healthcare System Look Like?</b>	<b>9</b>
<b>Expecting Reform to Drive Value Chain Shift</b>	<b>14</b>
<b>How to Benefit from the Value Chain Shift?</b>	<b>18</b>
<b>What's Next in Healthcare Reform?</b>	<b>25</b>
<b>What Can We Learn from the History of Others?</b>	<b>33</b>
<b>Key Risks to Ongoing Healthcare Reform</b>	<b>37</b>
<b>Mapping the Healthcare Market</b>	<b>39</b>
<b>Deep Dive into Chinese Healthcare System</b>	<b>46</b>
<b>Structural Issues Led to Imbalance and Inefficiency in Chinese Health System</b>	<b>54</b>
<b>Hospital Revenue Structure: Detailed Analysis</b>	<b>62</b>
<b>Closer Look at Key Upcoming Changes</b>	<b>69</b>
<b>Financial Performance of Chinese Players</b>	<b>73</b>
<b>How Are Chinese Companies Benchmarking Global Players?</b>	<b>76</b>
<b>Opportunities for Multinationals in the Chinese Healthcare Market</b>	<b>86</b>
<b>Appendix A-1</b>	<b>96</b>

## Investment Summary

We expect the Chinese healthcare system to undergo significant structural changes in the upcoming years. The current Chinese hospital system is dominated by public hospitals, and a substantial portion of the profits in the healthcare value chain is captured in these hospitals to compensate for the underpayments of physicians and insufficient government funding to the hospital system. Breaking down the dominance and monopolistic nature of the public hospital system could unlock the value from these hospitals to other parts of the healthcare value chain.

While we expect that the progress of these changes could be slow and choppy, the opening up of the hospital system will likely bring more competition, leading to changes in prescription behavior and hospital operation, including: 1) physicians increasingly likely to prescribe drugs that provide clinical benefits to the patients vs. current preference to prescribe drugs that carry more profit; and 2) hospitals will focus on operational efficiency and cost control, providing opportunities for healthcare services, i.e. hospital IT, third-party diagnosis, and HMO-like services. These changes imply the value unlocked from hospitals could shift to pharma companies, healthcare services providers, and other players in the healthcare value chain.

That said, pharma companies with strong R&D capabilities, leading players in the private hospital market, and other healthcare services businesses, are all likely to be beneficiaries in the upcoming healthcare value chain shift. Moreover, we would expect: 1) medical devices manufacturers with products to substitute those of MNC's, 2) dominant drug distributors, 3) legacy TCM names with healthcare consumer goods businesses, and 4) retail pharmacies, to be longer term winners.

Figure 2. Potential Beneficiaries of Value Chain Shift

Sectors	Investment Themes/Trends	Top names
Healthcare Services	Private hospitals emerge Growing demand for 3rd-party diagnosis Growing demand for hospital IT	Aier Eye Hospitals (爱尔眼科) D.A. Diangosis (迪安诊断) Neusoft (东软集团)
	Better profitability lead to innovation	Hengrui (恒瑞医药); Sino Biopharm (中国生物制药); CMS (康哲药业)
Pharmaceuticals	Unique product portfolio less impacted by reform Consolidation for large volume parentarel	Humanwell pharma (人福医药) Kelun Pharma (科伦药业); CR Double Crane (华润双鹤); Lijun (利君国际)
Active Pharmaceutical Ingridents (API)	Target high-end customized specialty API Consolidation for low -end API Strenghtend drug manufacturing business	Hisun Pharma (海正药业) United Labs (联邦制药) China Pharma (中国制药)
Traditional Chinese Medicines (TCM)	Brand recognition remains as key edge; healthcare consumers products	Yunnan Baiyao (云南白药), Tong Ren Tang (同仁堂), PienTzeHuang (片仔癀), Dong-E E-Jiao (东阿阿胶), Guangzhou Pharma (广州药业), Mayinglong (马应龙)
Medical devices	Hospital profit center shift to services to benefit leading players	Mindray (迈瑞)
Distribution	Consolidation, leaders becomging bigger	Sinopharm (国药控股), China Resources Pharma (华润医药)
Retail Pharmacies	Grow ing volume grow th from patient flow	China Resources 999 (华润三九)
Healthcare Consumer Goods	Leverage brand names to tap into comsumer goods market	Yunnan Baiyao (云南白药), Guangzhou Pharma (广州药业)

Source: Citi Research

## Chinese Healthcare System Poised for Structural Changes

With an aging population, changes in disease demographics, and better affordability of medical services for individuals with improved medical insurance coverage, we see the Chinese healthcare market as poised for sustainable growth in the years to come. Despite ~15% CAGR growth in the last 10 years, structural issues in the healthcare system, such as scattered political power for healthcare reform, inadequate government funding, imbalanced resources allocation, and overwhelming government control, have all resulted in a healthcare structure that is dominated by high-end urban hospitals, posing distortion in patient flow, inadequate treatment, and a bottleneck for healthcare services.

### Megatrends:

**1. Prescription mix could shift from drugs that offer more profits to hospitals/physicians to those that offer more clinical benefits to patients**

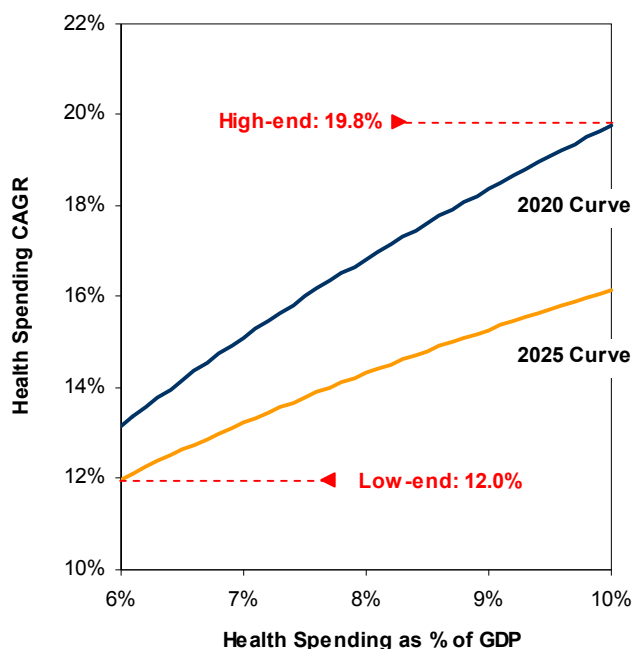
**2. Emerging healthcare services sector: private hospitals, hospital IT, third-party diagnostics, HMO-like services, etc.**

Based on our analysis of healthcare reform initiatives the government has started implementing, the Chinese healthcare sector is poised to undergo significant structural changes in the coming years and we believe the new government, under the leadership of Mr. Jinping Xi and Mr. Keqiang Li, will continue to support and facilitate this transition.

## Healthcare Industry Could Grow 12%-20% by 2025

In the recent healthcare blueprint “Healthy 2020” released by the Ministry of Health, the agency targets national healthcare expenditure as % of GDP to increase from the current level of 5.0% (2011) to 6.5%-7% by 2020. Our analysis of healthcare spending as % of GDP in 173 countries globally (see Figures 48 & 49) suggests global median healthcare spending of 6.6% and average spending of ~10%. We performed a scenario analysis for China by assuming national healthcare expenditure as % of GDP to reach 6%-10% by 2020 and by 2025, to estimate the potential range of annual growth. The results suggest low-end of the growth range is 12.0%, assuming 6% spending of GDP by 2025, and high-end of 19.8%, in the case of healthcare spending accounting for 10% of GDP by 2025.

Figure 3. Expected Growth Rate of National Health Expenditures: 2020 and 2025 Scenario



Source: Citi Research and Ministry of Health

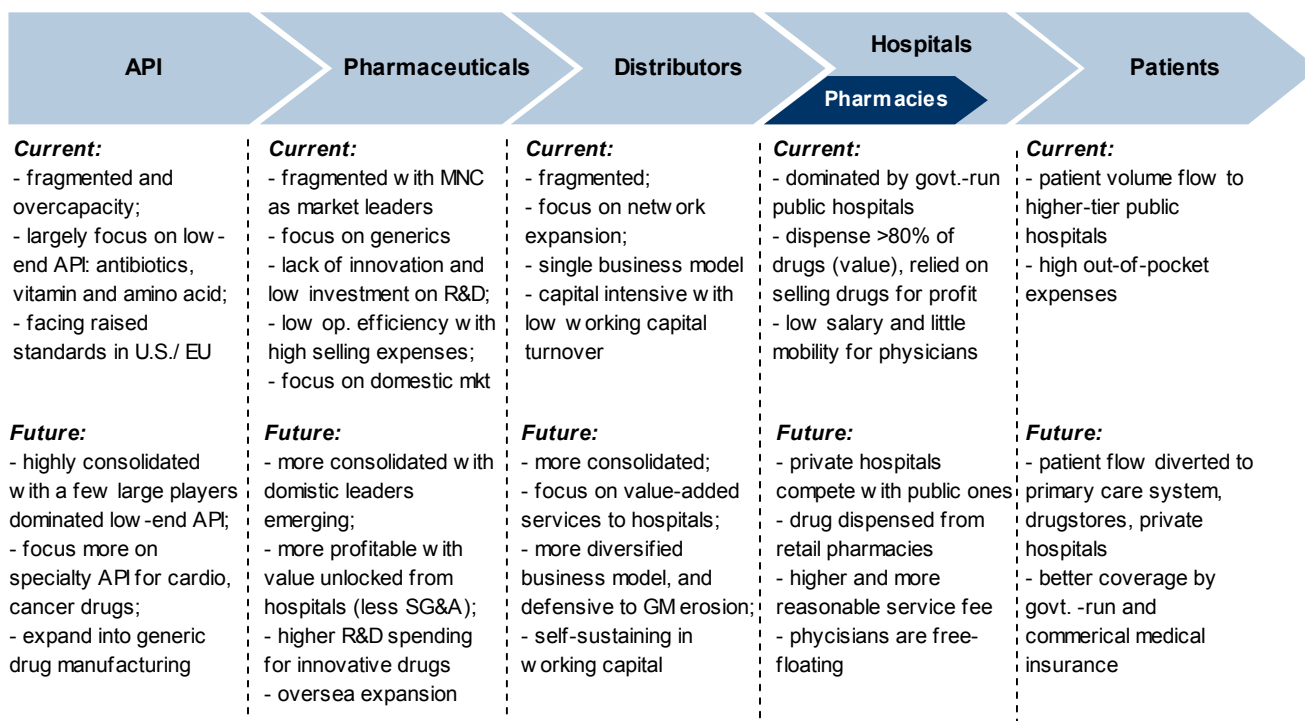
## Healthcare System at Early Stage of Value Chain Shift

Our extensive channel checks and discussions with senior government officials, industry experts, and hospital administrators, lead us to believe that large systematic changes of the healthcare system are likely to incur in the coming years. These potential changes include:

1. *Privatization of ~30% of the hospitals* (likely by 2015), thus breaking the monopoly of government controlled public hospitals and increasing competition;
2. *Opening of the commercial insurance market*, supplementing the government run medical insurance fund;
3. *Establishment of primary care system* by granting physicians multiple-sites practice and allowing private practice; and
4. *Growth of the retail pharmacy sector* with the potential separation of hospital pharmacies from hospitals in the lower-tier hospitals.

We believe that these changes have profound implications to the entire healthcare value chain, driving a major value chain shift over the next 5-10 years.

Figure 4. Value Chain of Chinese Pharmaceutical Industry: Current vs. Future



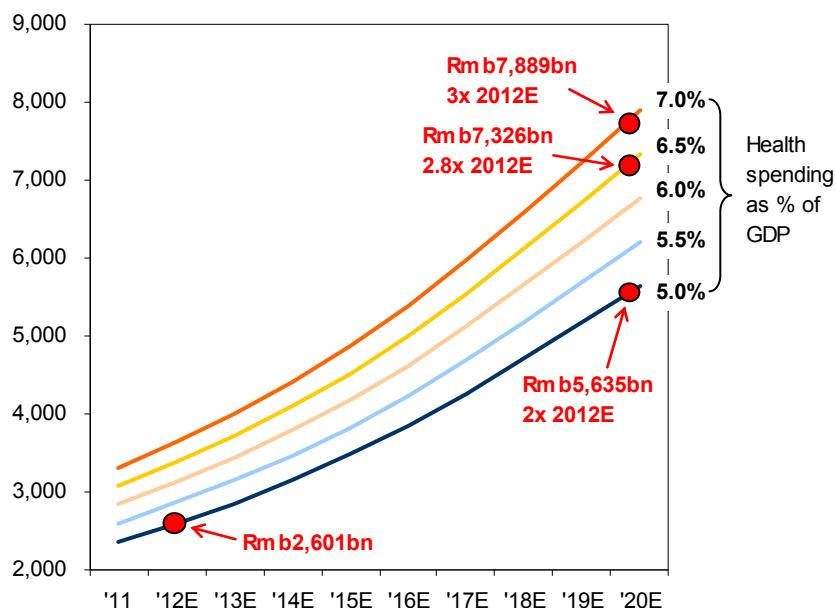
Source: Citi Research

The upcoming changes have been reflected in recent government policies, including supporting the development of private hospitals, introduction of commercial insurers into the medical insurance system, initiation of multi-site practice for physicians, and the "Healthy China 2020" strategy for more funding to health industry. While these changes are still at the preliminary stage, pending more detailed and systematic policies to be laid out, we expect the China healthcare sector to benefit and to emerge as a long-term growth sector.

## National Healthcare Expenditures Could Triple by 2020

According to the Ministry of Health, national healthcare expenditure accounted for ~5.0% of domestic GDP in 2010. Assuming expenditure remains at 5% in 2011 and 2012, we forecast national healthcare expenditure to reach RMB2,601bn (US\$413bn) in 2012.

Figure 5. China National Healthcare Expenditure\*



\* Based on GDP Forecast Model of Citi Economist Minggao Shen  
Source: Ministry of Health, Citi Research Estimates

Using Citi Chief China Economist Minggao Shen's GDP forecast model, assuming a GDP growth rate of 7.7% in 2012 and 6.2% by 2020, and national healthcare expenditure as % GDP to reach the "Health 2020" target of 6.5%, we estimate that national healthcare expenditure could reach RMB7,326bn (US\$1,280bn) by 2020, nearly tripling the current size of national healthcare spending. In a scenario where healthcare expenditure remains at ~5% of domestic GDP, we estimate national healthcare expenditure would still reach RMB5,635bn (US\$984bn) by 2020.

Figure 6. National Healthcare Expenditure as % of GDP Growth\*

Health Spending as % of GDP	National Healthcare Spending (Rmb Billions)									
	2011	2012E	2013E	2014E	2015E	2016E	2017E	2018E	2019E	2020E
5.0%	2,364	2,601	2,859	3,157	3,476	3,848	4,269	4,712	5,169	5,635
5.5%	2,601	2,861	3,145	3,473	3,824	4,232	4,695	5,183	5,686	6,199
6.0%	2,837	3,122	3,431	3,788	4,171	4,617	5,122	5,655	6,203	6,762
6.5%	3,074	3,382	3,717	4,104	4,519	5,002	5,549	6,126	6,720	7,326
7.0%	3,310	3,642	4,003	4,420	4,867	5,387	5,976	6,597	7,237	7,889
7.5%	3,547	3,902	4,288	4,735	5,214	5,771	6,403	7,068	7,754	8,453
8.0%	3,783	4,162	4,574	5,051	5,562	6,156	6,830	7,540	8,271	9,016
8.5%	4,019	4,422	4,860	5,367	5,910	6,541	7,256	8,011	8,788	9,580
GDP Growth	9.3%	7.7%	7.8%	7.3%	7.0%	7.5%	7.3%	7.0%	6.6%	6.2%

\* Based on GDP Forecast Model of Citi Economist Minggao Shen  
Source: Ministry of Health, Citi Research Estimates

## Proprietary Model Suggests Government Spending the Key Volume Driver

To better understand the impact of an improvement in government funding on the pharmaceutical market, and with the help of the Citi Research China Economics and Equity Strategy Team (Dr. Minggao Shen and Mr. Ben Wei), we built a simplified price-volume model which incorporates:

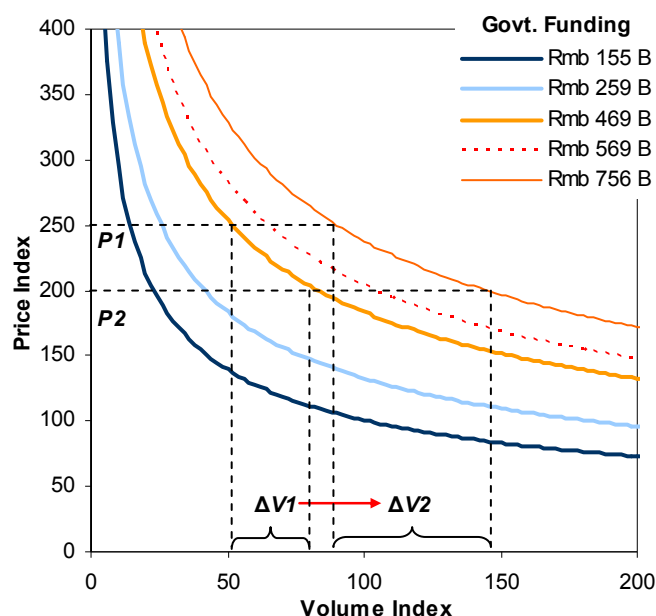
- Average hospital purchase price for drugs and total drug volume from 418 sample hospitals in 22 major cities from 2005-2011; and
- Government spending on health from 2005-2011.

We conducted a multiple linear regression for the three variants (volume, price and government funding) to derive a linear formula:

Government Funding =  
 $\text{Exp}(C) \cdot (\text{Price}^{1.84}) \cdot (\text{Volume}^{0.86})$   
with constant C of -7.85.

Our proprietary model suggests that improvement in government funding could: 1) Drive volume growth; 2) Lead to better margins for pharma companies; and 3) Make the price regulation more efficient. For every additional funding of RMB100bn, the same magnitude of price cuts could lead to ~25% additional volume increase.

Figure 7. Potential Impact of Improvement in Government Funding (Price/Volume Change)



Source: Citi Research, Pharma Database, Ministry of Finance, Ministry of Health

## Demand Is Inflated.... And Underserved

We believe that part of pharmaceutical sales in China came from inflated demand, which was largely driven by: 1) over-prescription, including use of drugs with limited clinical benefits, and 2) inflated drug prices. On the other hand, real demand has not been fully covered, as the diagnosis/treatment rate remains low for some major chronic diseases (<10% early-stage diagnosis for cancers, <30% for diabetes).

We compared pharma expenses as % of GDP in China to the OECD average to assess the inflated demand. In addition, we analyzed the gap in average doctor consultation per capita to derive the uncovered real demand.

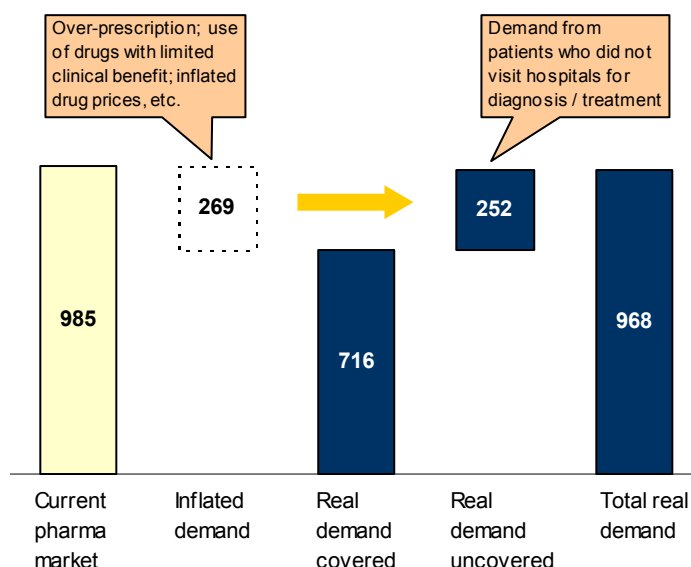
We considered the drug spending level and doctor consultation frequency in OECD member countries are reasonable, and could be good benchmarks.

Results of our analysis suggest Rmb269bn inflated demand vs. Rmb252bn drug demand that was not covered/reimbursed.

Our analysis suggests that:

- Out of the RMB985bn pharma sales in China in 2011, RMB269bn (27.3%) was inflated demand, while RMB716bn was from real demand;
- Additional demand of RMB252bn still uncovered, as some patients did not visit hospitals for diagnosis or treatment, due to financial constraints, low self-awareness of the diseases, among other reasons.
- The spending on inflated demand could be better utilized to cover real demand, if physicians' prescription behavior is changed to focus more on clinical benefit rather than profits.

Figure 8. Dissecting the Chinese Pharma Market: Inflated vs. Real Demand (RMB Billions)



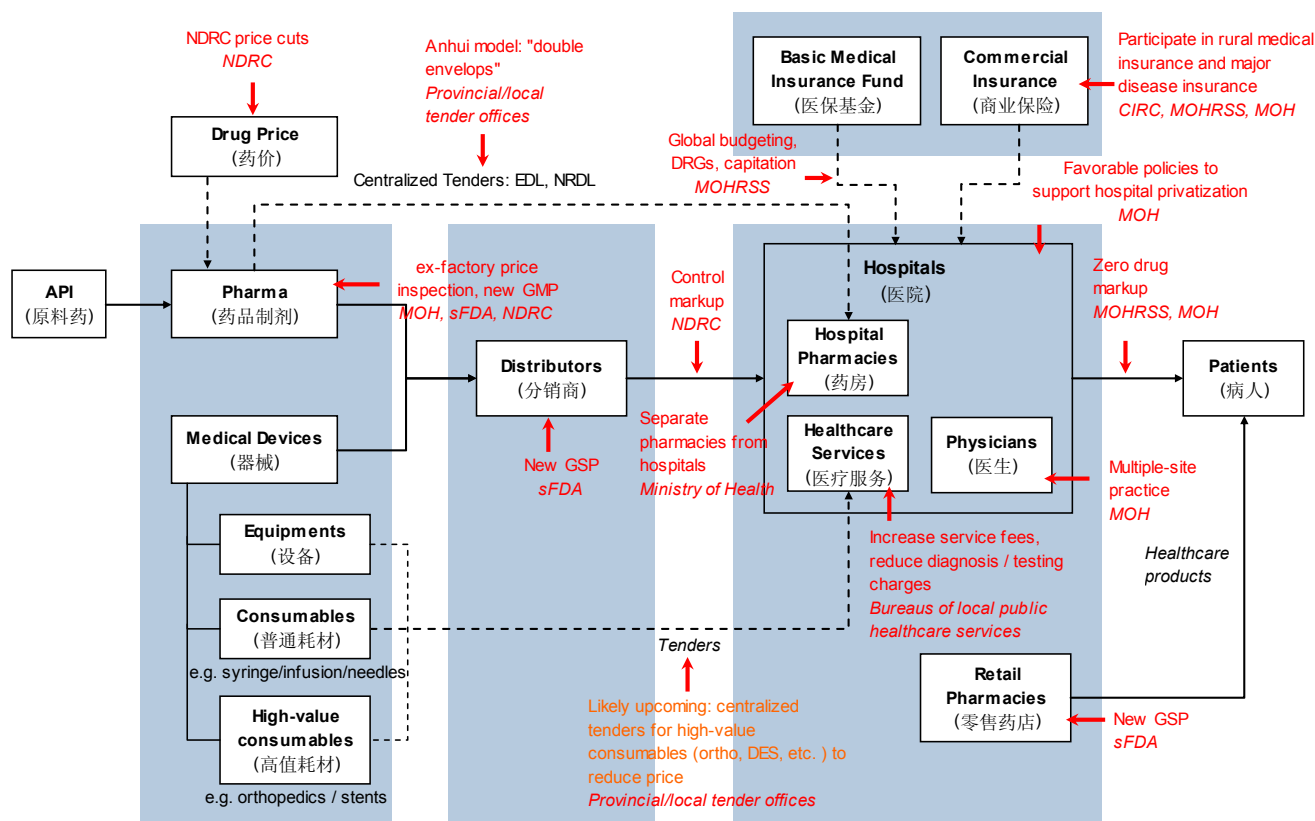
Source: Citi Research, Ministry of Health, OECD



## What Will The Future of Chinese Healthcare System Look Like?

While the upstream pharmaceuticals and medical devices manufacturing is largely market-oriented, the current Chinese hospital system is under strict government control. Every entry into hospitals, including selling drugs & medical devices to hospitals through tenders and also medical insurance payments to hospitals, are highly regulated by government.

Figure 9. Current Chinese Healthcare Value Chain and Key Policy Regulators



Source: Ministry of Health (MOH), Ministry of Human Resource and Social Security (MOHRSS), sFDA, NDRC, CIRC, Citi Research

### Issue 1: Operational Inefficiency in Hospital System

To ensure control over the hospital system, additional procedures were introduced by the government, including centralized tenders, which: 1) slowed the process for drug makers to gain market access (tenders could take several months or over one year for drugs or medical devices to enter hospitals), and 2) required additional resources from both local government (staff working on tenders) and companies (additional effort on government relations).

### Issue 2: Underpayment Drives “Prescribe for Profit”

While compensation and practice license of physicians have been controlled by the government, the market value of physicians could not be well reflected in their income. Thus, physicians turned to rebates, drug mark-ups, and expensive

diagnosis for profit, leading to inflated demand and overspending of the medical insurance fund.

### Issue 3: Government Fiscal Burden to Fund Healthcare Reform

Hospital reform initiatives, including elimination of drug mark-ups, improving medical insurance reimbursement level, and construction of county-level hospitals/primary care system, require strong financial support. Without alternative funding sources, the fiscal burden for both central and local government is becoming a sizable strain, potentially hindering the progress of healthcare reform in China.

#### Three key structural imbalances in the Chinese hospital system:

- 1) 90% of Chinese hospitals are public but for-profit hospitals;
- 2) Bed utilization is close to 90% in Class 2 hospitals and exceeds 100% in Class 3 hospitals, but is below 60% in Class 1 hospitals;
- 3) Physicians are underpaid vs. global standard.

### Future System to Have Western Elements but Chinese Characters

Unlike the US healthcare system, which is dominated by private hospitals and health insurance, or the UK system which features a government-run national health insurance, we view that the Chinese healthcare system in 10 years could be a hybrid that combines government control supplemented by private hospitals and medical insurance.

In public/private hospitals, physicians' compensation will still come from salaries. However, as physicians will have the right to choose working for a public hospital, a private one, or to practice independently, the salary could better reflect their market value and will likely be much higher than the current level.

For medical insurance, in addition to the government-run national health program that covers basic medical insurance, commercial insurance will provide additional coverage. With trials of different payment mechanisms ongoing, the reimbursement to hospitals could transition from fee-for-services to a combined model with global budgeting, DRGs, per diem payment, and capitation.

Figure 10. Comparison of Chinese Healthcare System vs. Developed Markets

	China (Current)	China (Future)	United States	Great Britain	Germany	Japan
Type	Three schemes of medical insurance	Uniformed national health insurance + commercial insurance	Pluralistic	National health insurance	Socialized health insurance	Employees' health insurance + National health insurance
Ownership	Public	Public/ Private	Private	Public	Private	Public / Private
Financing	Employer-employee (mandated payroll contributions, and general taxes), contribution from urban / rural residents	Multipayer system (general tax, employer-employee, residents, premiums)	Voluntary, multipayer system (premiums or general taxes)	Single-payer (general taxes)	Employer-employee (mandated payroll contributions, and general taxes)	Premium shared by employer & employee, general tax (govt. subsidies)
Reimbursement (hospital)	Fee-for-service	Global budgets, DRGs, per diem and capitation	Varies (DRGs, negotiated fee-for-service, per diem, capitation)	Global budgets	Per diem payments	Per diem payments
Reimbursement (physician)	Salaries	Salaries and capitation payments, fee-for-service	RBRVS*, fee-for-service	Salaries and capitation payments	Negotiated fee-for-service	Salaries (hospitals), fee-for-service (self-owned clinics)
Consumer Copayment	Varies: less for urban employee, more for urban residents and highest for rural population	Small to significant, depends on insurance programs	Small to significant	Negligible	Negligible	10%~30%

\* DRG: diagnosis-related groups; RBRVS, resource-based relative value scale

Source: Citi Research

## Integrated Insurance System Supplemented by Commercial insurance

The China medical insurance system is largely run by the government, with commercial medical insurance contributing only ~5.6% of total medical insurance outflow and ~2.1% of inflow. In addition, the coverage and reimbursement levels of medical insurance are different for the urban and rural population with three basic medical insurance schemes and one medical aid program in effect, and could vary significantly geographically, as the medical insurance fund is managed at city-level or even county-level.

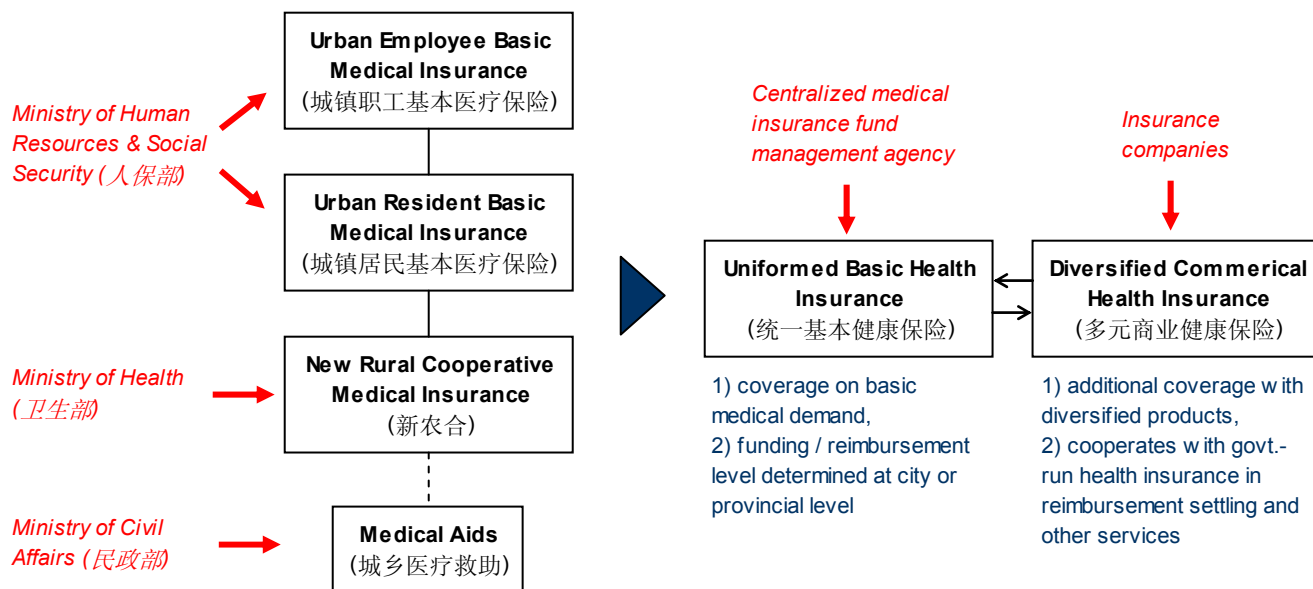
### Three key issues the new government is facing in healthcare reform:

- 1) Power scattered among different ministries and local governments;
- 2) Insufficient funding that was too reliant on local governments;
- 3) Financial conflicts between policy makers and interested parties.

We believe that the medical insurance market is at early stage of opening. The National Development and Reform Commission (NDRC), Ministry of Health (MOH), Ministry of Finance (MOF), Ministry of Human Resource and Social Security (MOHRSS), Ministry of Civil Affairs, and Chinese Insurance Regulation Commission (CIRC) jointly released the guideline for initiating a major disease insurance program for urban and rural residents in August 2012, to provide additional coverage for high-cost treatment for urban and rural residents. The new insurance scheme is to introduce commercial insurers into the medical insurance system to improve both operational efficiency and service quality.

While the trial limits the profitability for commercial insurers (保本微利), the initiative marks a significant step towards a more marketized medical insurance system, which could lead to: 1) better control on over-prescription as commercial insurers are likely to scrutinize the medical expenses to control costs (similar to HMOs in the US); 2) more diversified insurance product offering for patients; and 3) less fiscal burden for government to fund the medical insurance fund.

Figure 11. Potential Change in Medical Insurance Schemes



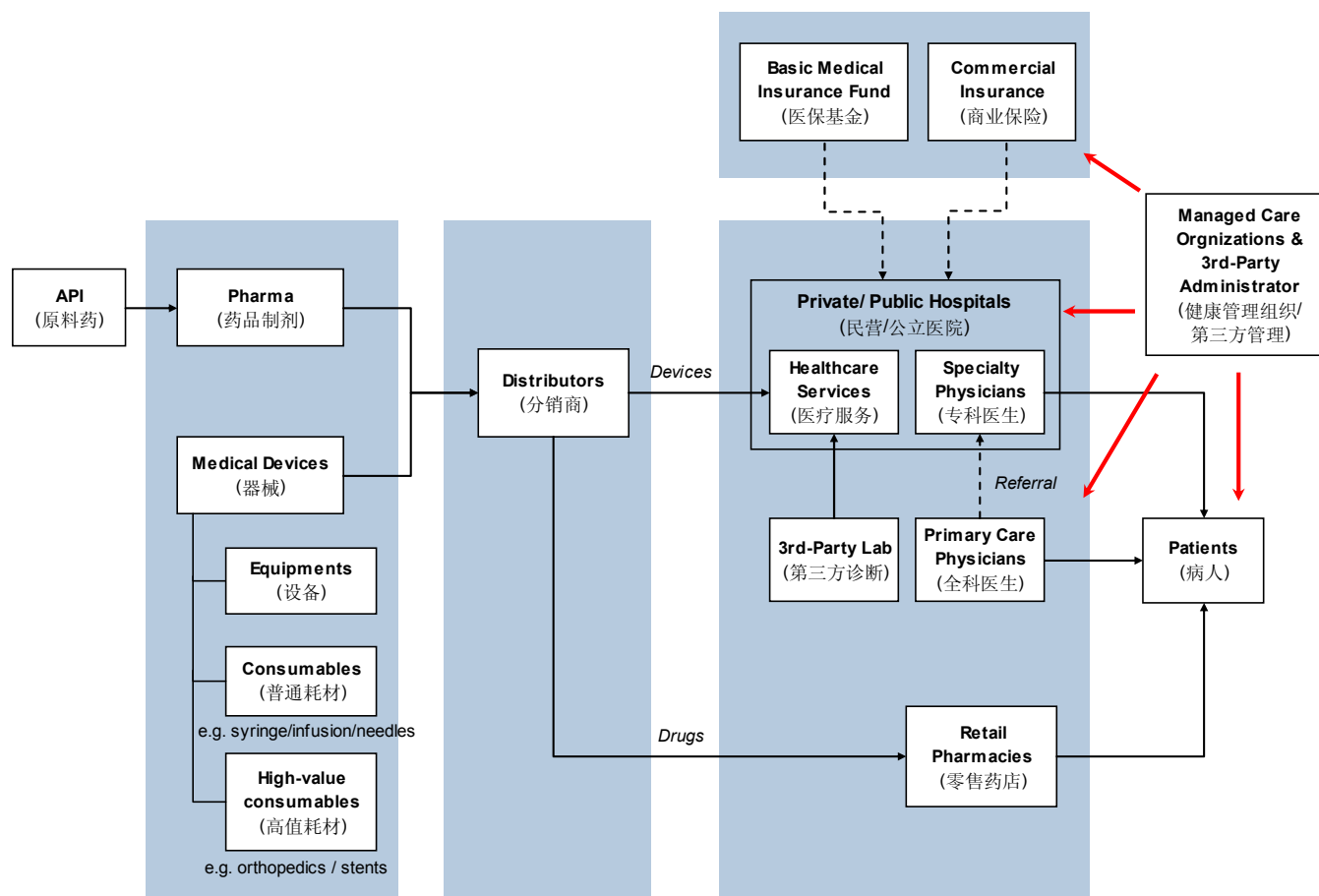
Source: Citi Research

Moreover, we expect consolidation for basic medical insurance in China on:

- **Medical Insurance Schemes** – Uniformed basic health insurance across the country, vs. currently three major schemes for urban employees, urban residents, and rural population, supplemented by a medical aid program.
- **Fund Management Agencies** – Centralized management authority vs. currently three ministries (MOH, MOHRSS, and Ministry of Civil Affairs supervising urban, rural and medical aids, respectively).

Consolidation could improve the information sharing and reduce operational costs of the basic medical insurance fund, strengthening spending control and leading to better fund utilization in future. As the government is opening up the health system in China, we expect the system to become more competitive and market-oriented.

Figure 12. Chinese Health Value Chain in the Future



Source: Citi Research

## Expecting Reform to Drive Value Chain Shift

The Chinese healthcare value chain is imbalanced as: 1) Majority of drug profits have been seized by hospitals and physicians, since hospitals relied on drug mark-ups to support daily operation without sufficient government funding, and physicians eyed drug rebates to compensate their low income; 2) The drug manufacturers' profits were squeezed by intense competition and government pricing control.

It could take time to break the monopoly of public hospitals in the value chain, and to address the physicians' compensation issue, which we believe are key to making real changes to the current health system. Nevertheless, we see some encouraging government initiatives in the ongoing healthcare reform, including: 1) potential power centralization; 2) increase in government spending on health; 3) cultivating private hospitals; 4) introducing commercial insurers into the medical insurance system; and 5) liberating physician's practice licenses. While still at very early stage, we believe those policies signal that the government is to open up the health system, which could drive the value chain shift from hospitals to upstream and new business.

## How Has the Value Chain Changed In the Last Decade?

We break down the total revenue and EBITDA of 223 A-share and HK/US-listed Chinese healthcare companies by subsector to analyze the value chain shift in the last decade. Our analysis suggests that:

- API and chemical drugs used to be major profit contributors in the industry, but the value chain was shifting from the subsectors;
- TCM segment was stable in terms of EBITDA share, given relatively less exposure to policy changes and stable growth in major TCM names with well-recognized brands;
- Drug distribution segment has become a major profit contributor in the public-listed China healthcare universe, largely due to the big players growing bigger with the industry consolidation trend;
- While the scale remained small when comparing with the pharma segment, biological products, medical devices, and the healthcare services segments have been emerging as new growth legs in Chinese healthcare markets

The value chain shift has also been recognized in capital market, as the market cap of each segment experienced a similar trend (see Figures 16 & 17).

Figure 13. EBITDA Breakdown of Listed China Healthcare Companies By Subsector

Subsector	2003	2004	2005	2006	2007	2008	2009	2010	2011	Trend
API	23.3%	16.6%	15.9%	16.9%	15.5%	19.6%	17.2%	15.9%	13.5%	▼
Chemical drugs	35.1%	35.8%	36.6%	29.1%	31.5%	29.3%	29.7%	28.6%	26.3%	▼
TCM	27.0%	22.7%	23.4%	24.7%	24.0%	20.4%	22.5%	22.2%	24.6%	▼
Biologics	7.1%	8.8%	4.4%	7.1%	6.0%	5.5%	6.2%	7.6%	7.5%	▲
Medical devices	3.1%	3.6%	5.3%	5.3%	5.2%	5.2%	6.0%	6.5%	6.6%	▲
Distribution / retail	3.2%	10.9%	12.7%	14.6%	15.1%	16.4%	15.2%	16.1%	17.9%	▲
Healthcare services	1.2%	1.6%	1.9%	2.4%	2.8%	3.5%	3.3%	3.1%	3.6%	▲

Source: Citi Research, Wind, Bloomberg

## Likely System Changes in the Future

With the establishment of: 1) a more complete primary care system, 2) a more competitive hospital system, and 3) a more developed commercial medical insurance system, we see opportunities for integrated healthcare services models similar to HMO to emerge in the Chinese market.

- **Private Hospital as Major Medical Service Provider:** We expect the private hospitals could become major players to compete with public hospitals. In the near-term, competition could remain weak, as private hospitals may act as niche players in minor departments (Aier Eye Hospital) or targeting affluent population (United Family Healthcare 和睦家). However, the competition will shift to major departments and mass population down the road, as long as: 1) the favorable policies that public hospitals are benefiting from are offered to private hospitals; and 2) physicians' practice license is liberated and compensation issue, including the much lower pension for physicians working for non-public hospitals (非事业编制医生), is addressed.
- **Strong Primary Care to Support Referral System:** We expect a more complete primary care system to be established, consisting of: 1) existing primary care institutions (township hospitals, community service centers and village clinics) with better medial resources; and 2) upcoming network of primary care physicians, who operate independently as family doctors and general practitioners. Moreover, a mandatory referral system could be enforced and patient need referrals from primary care physicians to get access to higher-tier hospitals.
- **Retail Pharmacies to Become Major Drug Dispensers:** We expect retail pharmacies could eventually take over the job of dispensing drugs. While hospitals in-house pharmacies might be maintained at smaller scale to provide first-aid medicines or some basic drugs, the daily operation, including drug procurement, inventory management, and dispensing, could be taken care of by drug retailers through trusteeship. Two major issues should be addressed to materialize the change: 1) funding source for hospitals to maintain daily operation without income from drugs; and 2) ramp-up of retail pharmacies' capacity for drug dispensing.

## Implications of Changes on the Healthcare Industry

### HMO-like Healthcare Services Model Could Emerge

We believe growth potential for the business model is attractive in the longer-term, as it is consistent with the goal of healthcare reform, i.e. improving hospital operational efficiency, affordability of medical services to patients, and overspending control, and could benefit patients, commercial insurers and government agencies of medical insurance fund, hospitals and primary care physicians at the same time.

- **For Physicians:** By joining HMO, they could enjoy lower charges for medical services covered by the program. Meanwhile, as HMO aims to control the spending, it will try to maintain the health of members by offering preventive care service at low cost or free and assigning case managers to help members suffering from chronic diseases to manage their disease progress.
- **For Medical Insurance Fund:** Cost control could remain as a focus for both commercial insurers and the government agency that manages the medical insurance fund to balance the co-payment from insurers/fund outflow with the growing medical demand from patients. HMO-like business could act as third-party administrators to monitor the overspending by cross-checking the service performed by different physicians, and help to diagnose disease at early stage or event prevent them, thus reducing potential high costs after disease progression.

- **For Hospitals and Primary Care Physicians:** In HMO, a primary care physician, such as family doctor and general practitioner, was selected by members as a gatekeeper, and patients needed referral from the gatekeepers to get access to specialty physicians or other doctors. The mandatory referral system could: 1) provide steady patient stream to primary care physicians or institutions, which accounted for 96.2% of the total number of medical institutions, but only captured 60.7% of outpatient flow and 24.7% of inpatient flow in China in 2011; and 2) improve the operational efficiency in higher-end hospitals by diverting patients with minor illness to primary care institutions. With more reasonable patient flow distribution, the quality of medical services, patient experience, as well as medical resource allocation, could also be improved along the way.

### **Better Profitability for Pharma Companies to Boost R&D**

A more marketized hospital system could lead to some major changes in the pharmaceutical manufacturing segment:

- **Better Profitability for Pharma** – As the hospital market is getting more competitive, the bargaining power of hospitals to pharma companies could become lower, leading to a decrease in pharma companies' selling expenses and higher profitability.
- **Drugs with Clinical Benefits Preferred** – To attract patient volume, physicians' prescription behavior is likely to shift from profit-driven to patient-oriented. Thus, drugs with major clinical benefit could have stronger growth vs. currently drugs offering more profit to hospitals/physicians that are mostly prescribed.

With more cash on hand and stronger demand for innovative drugs with better efficacy in the market, pharma companies would be better motivated to invest in drug R&D. However, it takes many steps and time for the value unlocked from hospital to be reflected in improvement in overall R&D capability of the pharma industry:

- **Step 1:** Competitive landscape in hospitals changes.
- **Step 2:** Rebalance of bargaining power between hospitals and pharma companies.
- **Step 3:** Pharma companies shift investment focus from sales/marketing to R&D.
- **Step 4:** R&D capability to improve with more funding.

Changes in the health system could also drive consolidation in the drug manufacturing industry, as importance of product quality and distribution network increase. The trend is also reflected in regulators' intention to improve the drug quality standards in China to become more comparable to international standards, as highlighted in the 12th Five-Year Plan for drug safety, and substandard manufacturers could be wiped out with the industry bar being raised.



### Consolidation and Specialization in API Manufacturing

We expect the potential consolidation and innovation trend in the pharmaceutical manufacturing industry could change the landscape in the API market:

- For commodity API products, such as 6-APA, 7-ACA, Vitamin E, the consolidation trend could continue, and only leading players benefiting from economies of scale and advanced manufacturing technology to control the cost could survive the low-margin business;
- We expect more API manufacturers to shift their business focus from low-end API to more specialized products used in producing specialty drugs, including anti-cancer drugs and cardiovascular drugs. Leaders in this category could further develop tailored services for multinationals and emerging domestic innovative drugs manufacturers to produce customized API products;
- Major API manufacturers could go downstream to pick up generic drug manufacturing business by: 1) self-development, which could be challenging and with less likelihood of success; and 2) partnering with or acquiring existing generic manufacturers to obtain promising products or pipeline.

### Drug Distributors Could Face Business Model Transition

Similar to what the US drug distribution industry has experienced, drug distributors in China have been facing increasing competition and margin erosion during recent years. Given the decreasing profitability trend the distribution business is heading towards, we expect distributors to transform from wholesalers to a more integrated healthcare service provider in an attempt to build a more sustainable business model. The transition could include:

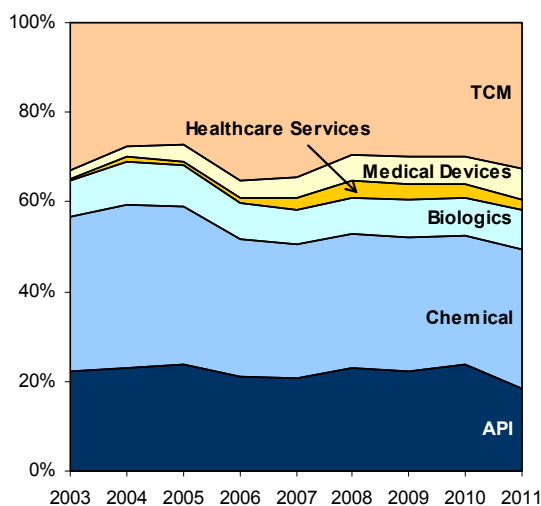
- **Deeper Integration with Hospital Supply Chain** – With the more intense competition, hospitals will likely demand a more efficient supply chain management for cost saving and streamlined procurement. Distributors could participate in hospital supply chain management with inter-compatible IT system, providing more value added services, such as instant inventory monitoring, in-time delivery, bridging the supply chain of hospitals with suppliers and warehousing services. Jointown is one of the pioneers in the area, and cooperated with several hospitals in Beijing and Jiangsu.
- **Go Upstream** – Manufacturing business is more lucrative than distribution, and leading distributors, such as Sinopharm, Shanghai Pharma and China Resources Pharma, already operate in the business and don't have to start from scratch. As we expect the pharma manufacturing industry could benefit from the value unlock from hospital in mid-term, the manufacturing-distribution model could become more promising in the future.
- **Go Downstream** – Expecting the potential separation of pharmacies from hospitals could benefit the growth of retail pharmacies. As such, we see good reasons for leading distributors to reinforce their drugstore business.
- **Cooperation with 3rd-Party Administrators** – We believe the extensive distribution network of leading distributors is under-utilized. With the emergence of HMO/PPO-like business, which focus on establishing a healthcare service network by linking medical insurance and patients with a group of hospitals, distributors such as Sinopharm are the ideal partners for them to get hospital access quickly.

## How to Benefit from the Value Chain Shift?

### Value Shifted to Distributors and Devices from 2003-2011

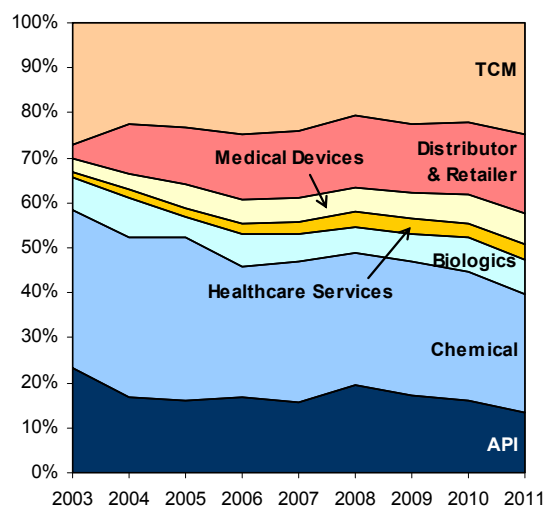
We performed a detailed value shift analysis where we systematically categorized and analyzed the market cap, revenues and EBITDA of all 223 publically traded China healthcare companies listed in China (A-shares), Hong Kong (H-shares) and US listed.

Figure 14. % of Revenue of Total Healthcare Market by Subsectors



Source: Citi Research

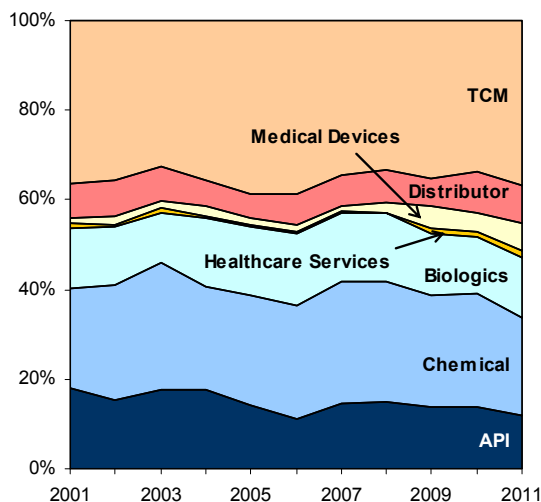
Figure 15. % of EBITDA of Total Healthcare Market by Subsectors



Source: Citi Research

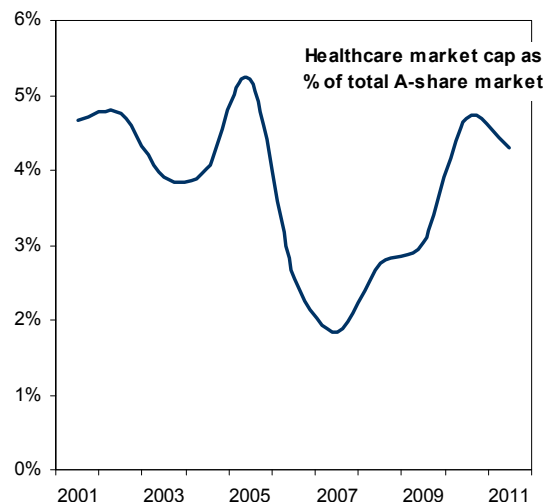
Our analysis suggests that the EBITDA profits shifted from API, chemical drugs and TCM, to biologics, devices, and distributors & pharmacies from 2003 to 2011.

Figure 16. Healthcare Stocks Market Cap Breakdown



Source: Citi Research, Bloomberg

Figure 17. Market Cap Breakdown vs. EBITDA Breakdown



Source: Citi Research, Bloomberg

## Potential Winners from Upcoming Value Chain Shift

We see ample growth opportunities in the upcoming value chain shift in short-term, mid-term and longer-run, as it could take multiple steps for healthcare reform to change from the current healthcare system.

### Near-Term Leaders: Pharma/Biotech Companies with First-to-Market Generics

There are some random successes in drug innovation in China at the current stage, but in general R&D capacity of domestic pharma companies remains at a low level. Considering the long cycle to develop innovative drugs and the ramp-up time for domestic pharma on R&D capability, we expect the pharma market could gravitate towards those companies with a strong R&D platform and good track record for developing high quality generics or first-to-market generic drugs (首仿药) in mid-term, such as Hengrui and Sino Biopharm.

Moreover, for low-end generics suppliers, the industry consolidation could force out a number of small to mid sized players, and only those with extensive sales network and large product portfolio may survive the consolidation, covering the basic medical demand in lower-tier market (i.e. Yangtze River Pharma for generic drugs, Kelun Pharma/Double Crane/Lijun for intravenous infusion solution).

### Medium-Term Beneficiaries: Private Hospitals and Services Providers

Existing leading private hospitals, such as Aier Eye Hospitals, are likely to benefit from the value chain shift in the mid/long-term, as we expect a gradual progress in opening-up of the hospital system rather than overnight changes. Moreover, we expect new hospital groups to emerge in the longer-run, focusing more on the general hospital model (综合医院) with comparable service packages to public hospitals, vs. currently most private hospitals that only dig into niche specialty markets.

We also expect value-added service to hospitals, including hospital IT, supply chain management, and third-party diagnosis, could benefit in the medium-term as hospitals have to improve operating efficiency to survive the more competitive environment. The frontrunners in those areas, such as D.A. Diagnostics and Neusoft are well positioned to capture the opportunities.

### Long-Term Beneficiaries: Emerging Healthcare Services Models

We expect more fundamental changes to the Chinese healthcare system in the longer run:

- Adopt general practitioner and family physician system to provide primary care service to households;
- Hospitals become more competitive with government's role changing from administrator to regulator;
- Retail pharmacies take over job of dispensing drugs, which is currently dominated by hospitals' in-house pharmacies; (医药分开)
- Commercial medical insurance ramps up to provide a meaningful portion of the total medical insurance funding; and
- Health spending control shifts from preliminary global budgeting model to DRGs for inpatient expenses and capitation for outpatient expenses.

With all those changes, we expect some new healthcare services models to emerge as third-party administration is needed to supplement the government's role in managing the hospital network, referral system, and expense control. While it remains unclear which kind of business model will fit into the future healthcare system, we believe some models in the US, such as HMO (Health Maintenance Organization), PPO (Preferred Provider Organization), and PBM (Pharmacy Benefit Management) would be good models to start with.

### **Retail Pharmacy Channel Driven by Volume Growth**

As the ongoing healthcare reform largely focuses on public hospitals and control related entrance and exit channels, retail pharmacies have less exposure to the changing policies, such as drug tenders and mark-up control. Meanwhile, our survey of township hospitals and community service centers suggests that patient volume has flowed to retail pharmacies, after the implementation of EDL policies. The patient volume growth could be further boosted with the trials of separating pharmacies from hospitals to be adopted in larger scope.

While the retail pharmacies, such as Nepstar, are still facing pressure from growing land costs and challenges from the zero-mark up policies in hospitals, strong volume growth in the retail channel could benefit pharma companies with products distributed through the retail pharmacy, such as legacy TCM brands (Tong Ren Tang, Yunnan Baiyao, Pien Tze Huang, Guangzhou Pharma, Dong-E E-Jiao, etc.) and leading OTC drug makers (China Resources Sanjiu 华润三九, Jiangzhong Group 江中集团, Renhe Medicine 仁和药业, etc.).

### **“Healthcare Consumer Products” – New Opportunities for TCM Players**

Different from chemical/biotech pharma companies, for which drug innovation is the key long-term growth driver, brand reputation is one of the most critical assets and competitive edges for TCM players. Some leading players have started to tap into “healthcare consumer products (健康消费品)” business, which largely consists of functional beverage (功能性饮料), cosmeceutical (药妆) and personal care products (toothpaste, shampoo, shower gel, etc.). We believe this could become a winning model for TCM manufacturers to: 1) offset the margin pressure in the pharma business; and 2) better utilize brand strength for new growth opportunities. Key players in this segment include Yunnan Baiyao (toothpaste and some cosmeceutical products), Mayinglong (cosmeceuticals), and Guangzhou Pharma (Wanglaoji herbal tea).

Major challenges to this business model come from channels, as retail channels for consumer goods are quite different to those for drugs in profit sharing, price sensitivity, and channel diversification. Meanwhile, a dedicated sales team should be in place to support the healthcare consumer goods business.

Figure 18. Best Performers (A-Share, HK/US-listed) in Chinese Healthcare Market

Subsector	Characteristics of Winners	Top Performers	Ticker	Revenue CAGR		Earnings CAGR		
				'08-'11	'11-'13E	'08-'11	'11-'13E	
API 原料药	- high-end customized API; - large scale; - production technology upgrade	Hisun Pharm United Labs China Pharma Group Zhejiang Medicine	海正药业 联邦制药 中国制药 浙江医药	600267.SH 3933.HK 1093.HK 600216.SH	17.5% 19.5% 2.6% 8.7%	18.1% 12.4% 10.2% 9.0%	37.2% -37.6% -37.2% 1.3%	12.7% 38.1% N/A 10.9%
Chemical Drugs 化学药	- innovative/high-end branded generic drug portfolio; - focus on fast-grow ing therapeutic areas (cancer, hepatitis, cardiovascular, CNS); - large scale for low -end niche market (large volume parentarel)	Hengrui Medicine Sino Biopharm China Medical System Kelun Pharma Double Crane Humanw ell	恒瑞医药 中国生物制药 康哲药业 科伦药业 华润双鹤 人福医药	600276.SH 1177.HK 867.HK 002422.SZ 600062.SH 600079.SH	23.9% 36.3% 42.6% 25.2% 8.8% 52.3%	22.0% 20.5% 30.1% 24.6% 14.6% 30.2%	27.5% 15.9% 60.9% 46.1% 11.6% 56.6%	24.5% 21.5% 26.9% 23.7% 16.8% 30.9%
TCM 中成药/中药饮片	- w ell-recognized brands or unique products; - strong channels (OTC, rural market, etc); - tap into "Great Health" (大健康) business	Yunnan Baiyao Beijing Tong Ren Tang Tong Ren Tang Tech Guangzhou Pharma Dong-E E-Jiao Huarun 999 Tasly China Shinew ay Kangmei	云南白药 同仁堂 同仁堂科技 广州药业 东阿阿胶 华润三九 天士力 神威药业 康美药业	000538.SZ 600085.SH 1666.HK 874.HK/ 600332.SH 000423.SZ 000999.SZ 600535.SH 2877.HK 600518.SH	25.5% 27.6% 16.9% 15.5% 17.8% 8.6% 24.1% 15.9% 52.1%	16.9% 22.7% 21.3% 26.6% 16.6% 21.3% 24.9% 12.7% 45.2%	37.5% 19.2% 16.6% 16.4% 43.9% 15.0% 33.6% 23.8% 50.5%	26.3% 25.9% 25.1% 19.0% 24.5% 26.3% 24.5% 13.3% 37.8%
Biological products 生物药/生物制品	- leaders in market segments (blood products, vaccine, in vitro diagnostic reagents, EPO, etc.)	3S Bio Hualan Bio Kehua Bio Valvax	三生制药 华兰生物 科华生物 沃森生物	SSRX.O 002007.SZ 002022.SZ 300142.SZ	34.1% 26.5% 21.5% 37.1%	18.6% 15.5% 16.9% 29.1%	43.9% 25.6% 10.9% 81.5%	12.4% 23.5% 16.2% 25.4%
Medical Devices 医疗器械	- strong market penetration; - comprehensive product offering; - comparable product quality to MNC w ith low er price	Mindray Yuyue Medical Tofflon	迈瑞 鱼跃医疗 东富龙	MR.N 002223.SZ 300171.SZ	17.2% 42.9% 44.2%	18.5% 27.0% 31.4%	12.0% 54.1% 59.7%	17.3% 24.2% 28.8%
Distribution 医药流通	- national / regional leaders; - side business to offset margin erosion in drug distribution	Sinopharm Shanghai Pharma East China Pharm	国药控股 上海医药 华东医药	1099.HK 2607.HK/ 601607.SH 000963.SZ	38.8% 49.1% 22.8%	21.8% 17.1% 23.8%	38.6% 192.1% 31.3%	24.3% 10.8% 26.9%
Healthcare Services 医疗服务	- first-mover; - supplementary to (rather than compete w ith) public hospitals	Aier Eye Hospital D.A. Diagnostic	爱尔眼科 迪安诊断	300015.SZ 300244.SZ	44.0% 39.4%	32.5% 36.9%	41.0% 85.7%	33.5% 33.2%

Source: Citi Research, Bloomberg, Wind

As the value is unlocked from the hospital system, the more directly the players in the Chinese healthcare industry are connected with hospital system, the sooner they are likely to benefit from the value chain shift.

- **Healthcare Services** – We see leading private hospitals, such as Aier Eye Hospitals (爱尔眼科, 300015.SZ), as better positioned to be one of the early beneficiaries of the opening up the hospital system. In addition, first-movers in third-party diagnosis territory, such as D.A. Diagnostics (迪安诊断, 300244.SZ), could capture the growing demand for outsourcing of laboratory services in hospitals as they becoming more cost-sensitive and efficiency-focused.
- **Pharma** – With a consolidation and innovation trend in the pharma manufacturing sector, market leaders with well-established R&D platform for first-to-market generic drugs (首仿药) and innovative drugs are well-positioned to benefit from the value chain shift, including Hengrui Medicine (恒瑞医药, 600276.SH), Sino Biopharm (中国生物制药, 1177.HK), and non-listed Qilu Pharma (齐鲁制药). Meanwhile, leading CSO's (contracted sales organization), such as CMS (康哲药业, 0876.HK), could also ride on the trend with its capability to source for innovative imported drugs. While players in niche markets, such as Humanwell Pharma (人福医药, 600079.SH) for anesthesia drugs, are likely to be less impacted by the trend, front-runners in those areas could continue to leverage the uniqueness of their product portfolio for high growth and sustainable margin. For large volume parenterals (LVP 大输液), we believe the new GMP effective by YE13 could boost the industry consolidation, and that market leaders such as Kelun Pharma (科伦药业, 002422.SZ), China Resources Double Crane (华润双鹤, 600062.SH) and Lijun (利君国际, 2005.HK), could continue to gain market share from smaller players.
- **API** – We expect the future winners in API business could be either: 1) those with large scale to achieve lower costs (such as United Labs (联邦制药, 3933.HK) and China Pharma (中国制药, 1093.HK)), thus likely to survive the low-margin business model for commodity APIs; or 2) those focusing on specialty API and providing customized API manufacturing services to multinationals or leading domestic pharma companies, such as Hisun Pharma (海正药业, 600267.SH).
- **TCM** – TCM players, particularly those focused on retail channels for distribution, could be less impacted by healthcare reform, with brand reputation and product quality remaining as key competitive edges in this space. Leading players in the industry include Yunnan Baiyao (云南白药, 000538.SZ), Tong Ren Tang (同仁堂, 600085.SH (and its subsidiary Tong Ren Tang Technologies, 同仁堂科技, 1666.HK)), Dong-E E-Jiao (东阿阿胶, 000423.SZ), Huarun 999 (华润三九, 000999.SZ), and Guangzhou Pharma (广州药业, 874.HK / 601332.SH).
- **Retail Channel** – As healthcare reform is focusing on changing the hospital system, retail pharmacies face less policy uncertainties and appear to be a safe harbor for OTC products. Meanwhile, the upcoming separation of hospital pharmacies from hospitals could increase customer traffic significantly, benefiting the volume growth for products focusing on retail channels (TCM names above fall in this category). Meanwhile, we see new opportunities in “healthcare consumer goods” for legacy brands that can leverage their reputation in the healthcare industry for closely-related consumer business, including functional beverage (功能性饮料), cosmeceutical (药妆), and personal care products. Guangzhou Pharma (Wanglaoji herbal tea), Yunnan Baiyao (toothpaste and other personal care products) and Mayinglong (马应龙, 600993.SH, cosmeceutical) have been pioneers in exploring this new territory.

- **Drug Distribution** – As the distribution business model is capital-intensive and heavily relies on logistic capacity and distribution network for growth, the No.1 distributor in China, Sinopharm (国药控股, 1099.HK), remain as our top-pick for this sector. In the transformation from regional players to national players, China Resources Pharma (华润医药) has been more aggressive and making faster progress in tapping into new provincial markets through acquisitions than its peer Shanghai Pharma (上海医药, 2607.HK/601607.SH).

Figure 19. Summary of Financial Matrix Comparison Between Chinese Players vs. Global Peers

	GM	OPM	Gearing	CCC	Comments on Chinese players
<i>China vs. US/JP/EU</i>					
Pharma	▼	▼	▲		Largely focus on manufacturing of low er-end products, leading to low er GM vs. global peers in the developed markets
Generics	=	=	▲		
Biotech	▼	=	▲		
Medical Devices	▼	=	▲		
Distribution	▲	▲	▲	▲	Higher blended GM/OPM as the major players ow ned sizable manufacturing business; long payment collection reflected in high CCC
<i>China vs. KR/TW/EM</i>					
Generics	=	▲	▲		Chinese players are competitive vs. the peers in Korea, Taiwan and other emerging markets, but the gearing ratio is notably higher
Biotech	=	▲	▲		
Medical Devices	▲	▲	▲		

▼ : lower than global peers; ▲ : higher than global peers; = : in-line with global peers

\*GM : gross margin, OPM : operating margin, Gearing: debt/asset ratio, CCC: cash conversion cycle (distribution only)

\*\* : KR: South Korea, TW: Taiwan, EM : other emerging markets

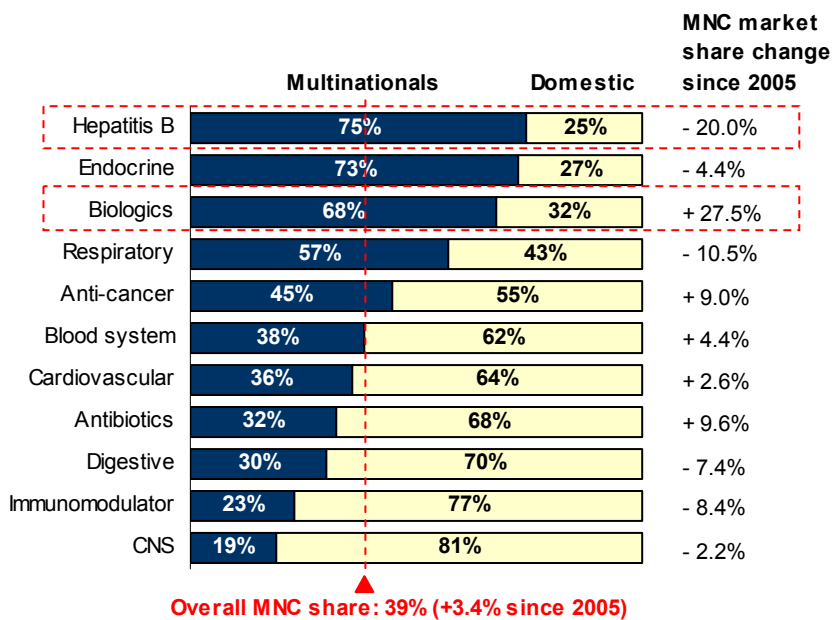
Source: Citi Research

## Multinationals Could Also Benefit from Value Chain Shift

Facing slow growth in the developed market, multinationals have strengthened their operations in emerging markets to provide a new growth leg, and China has become one of the most attractive markets for multinationals given the large population base and fast-growing medical demand. Meanwhile, the government also aims to leverage the R&D capability, advanced technology, and management skills of multinationals, to boost the healthcare industry upgrade in China. The mutual interest has resulted in growing footprints of multinationals in China, and top global pharma and medical devices companies have successfully established leading positions in the Chinese healthcare market during past decades.

As structural changes in the hospitals system could favor growth of: 1) high-quality drugs with major clinical benefits and 2) medical devices that could improve the efficiency, we believe multinationals are well-positioned to capture opportunities in the value chain shift with more innovative product portfolios. For pharma companies facing patent cliff, they could launch the first-in-market generic version of their own innovative drugs for less price erosion, and partner with domestic players to leverage distribution network in mid/lower-end market. For medical devices manufacturers, we believe they could maintain their dominant position in the high-end market and sophisticated equipments given the technology barrier, while also tapping into the mid-tier market with more tailored products for new growth.

Figure 20. Market Share of MNC and Domestic Players in Chinese Pharma Market



Source: Citi Research, Pharma Database



## What's Next in Healthcare Reform?

### Expecting Centralized Power to Oversee Reform

The regulation system for the Chinese healthcare market is not centralized, as: 1) each segment of the healthcare value chain is regulated by different government agencies and ministries; and 2) policies issued by central government could be modified at the local level. The decentralized power has led to a slow decision-making process and inconsistency and uncertainty of policies.

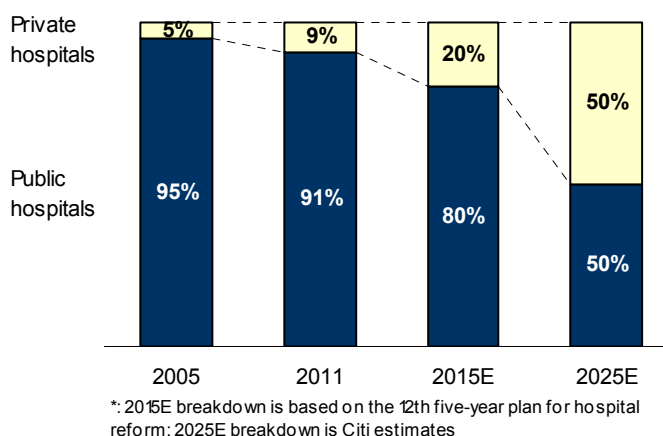
The Minister of Health, Mr. Zhu Chen, raised the concept of "Ministry of Greater Health (大卫生部)" in August 2012, aiming to consolidate the regulation and supervision of all healthcare-related affairs and enhance the collaboration among policymaking process regarding medical insurance fund, pharmaceutical industry and medical services system in China. With the new government taking control, we could see more power consolidation either through a more powerful Ministry of Health or the Office of National Healthcare Reform at the State Council (国务院医改办公室), directly reporting to the widely expected new premier Mr. Keqiang Li.

The power centralization could face significant push back from ministries/departments to be consolidated or with power diluted, and the negotiation progress is likely to be time-consuming. However, we believe the change is inevitable in the longer-run, as the current regulation system has led to some major issues in the health system, such as large disparities between urban and rural medical insurance schemes, and the conflict between drug innovation and strict price control.

### Breaking Down the Monopoly of Public Hospitals

Private hospitals currently only share <10% of patient volume in China and the government targets this to increase to 20% by 2015. The government has been encouraging investment in private hospitals since the beginning of the ongoing healthcare reform and recently followed up with a series of guidelines to push the progress. We believe the moves aim to increase competition in the hospitals system, improve efficiency, and eliminate resource allocation imbalance in the system.

Figure 21. Patient Flow Breakdown By Private Hospitals and Public Hospitals

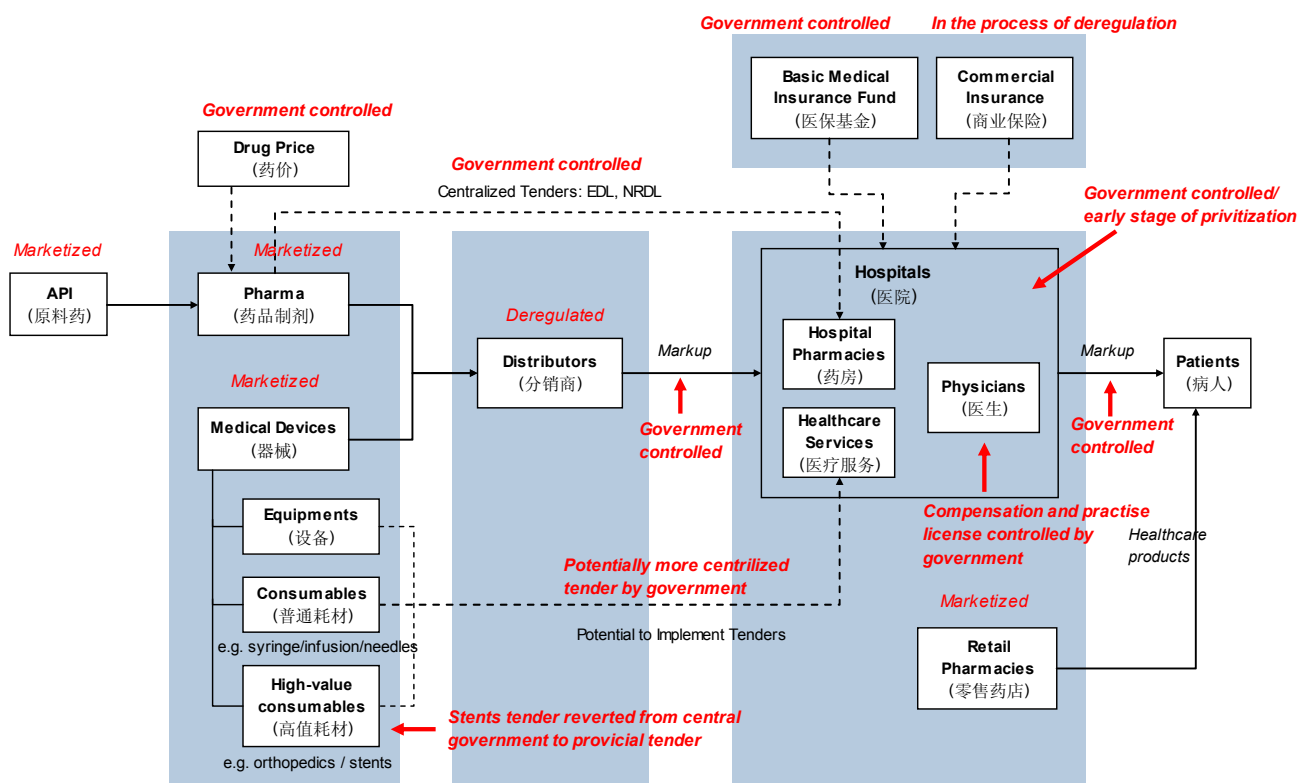


Source: Citi Research, Ministry of Health

- The competition landscape in the private hospital market could change significantly with large multinational hospital groups (like Columbia Medical Group in the US and Parkway Pantai in Asia) tapping into China and major domestic medical groups emerging to consolidate the highly fragmented market;
- The profit center of private hospitals could shift from minor departments, such as cosmetics, anorectal, obstetrics and gynecology, ophthalmology and dentistry, to more critical and lucrative business, including cancer and cardiology, which has been dominated by public hospitals.

More importantly, the government could lose control over public hospitals, starting with the trials of separating administration and operation of hospitals (管办分开), and testing corporate governance in public hospitals.

**Figure 22. Subsectors in the Healthcare Value China: Marketized vs. Government Controlled**

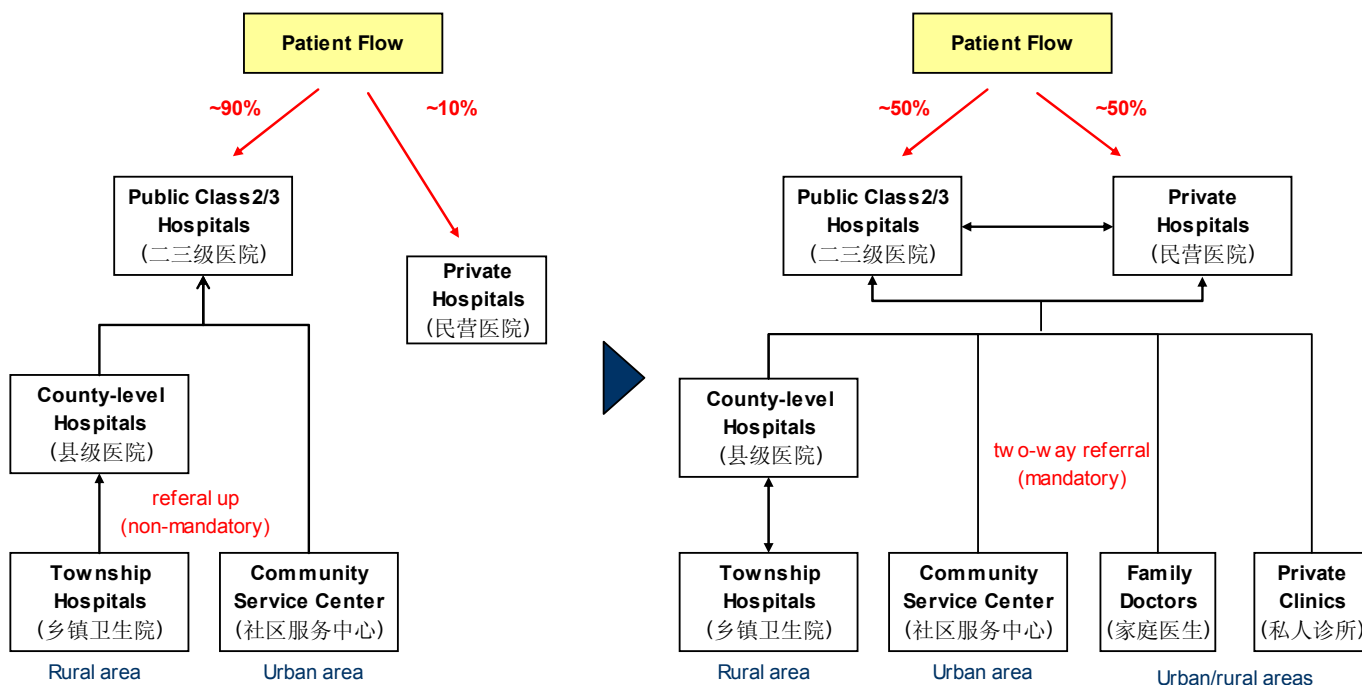


Source: Citi Research

## Expected Structural Changes in the Hospital System

We expect the current public hospital focused system could undergo three major changes: 1) emergence of private hospitals, which will compete with public hospitals on general/specialty medical services, and we expect the private sector could eventually capture ~50% of patient flow; 2) more diversified and assessable primary care system, including family doctors and private clinics set up by certificated physicians; and 3) establishment of a mandatory two-way referral system to improve the efficiency and also optimize the medical resources allocation among all medical institutions in China.

Figure 23. Hospital System: Current vs. Future



Source: Citi Research, Ministry of Health

## Government Funding to Health System to Improve

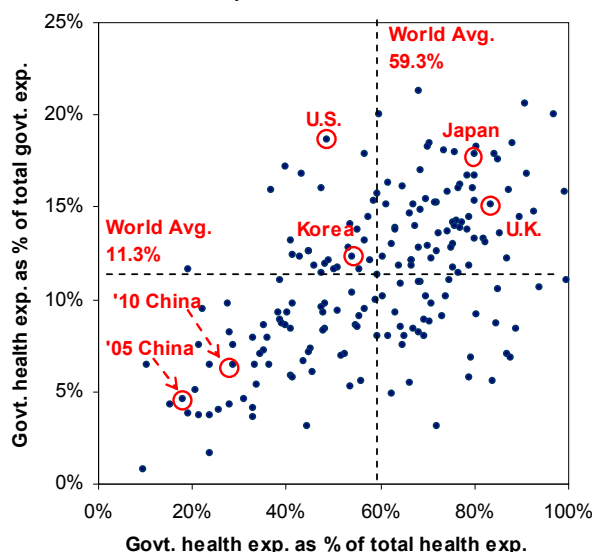
We expect the current health system could go through the process of marketization to be partially relieved from government control, and key upcoming changes likely include: 1) emergence of private hospital to break the monopoly of public hospitals; 2) consolidation of current segmented medical insurance schemes to form a unified government-run medical insurance, which will be supplemented by diversified commercial health insurance products; 3) multiple-site practice for physicians to cultivate the general practitioner and private clinics, which will help to form a more complete primary care system. Besides, the hospitals income structure could shift from drugs to services, and prescription behavior of physicians could focus more on clinical benefit for patients, vs. currently preferring drugs that offer more profits to hospitals and physicians.

- Government funding in China has increased in past years, both in terms of its contribution to total health spending and the % of total government fiscal expenditure. However, it remains amongst the lowest around the world, and we expect further improvement over the next 5-10 years.
- Assuming that total national health spending as % of GDP could reach 6%~10% by 2020 or 2025, the annual growth rate of health spending could range from 12%-19.8%, which would be largely consistent with industry growth.
- On top of all the reform policies and potential changes in the healthcare system, we expect power centralization to be one of the most critical changes to improve: 1) efficiency in decision-making; and 2) consistency of healthcare reform policies.

Government funding accounted for ~28.6% of total national health expenditure (NHE) in China in 2010, vs. out-of-pocket spending 35.5%, which was actually even higher if taking into account the individual contribution to medical insurance fund (currently booked as social society funding). We saw some improvement in government funding from 2005-2011 as: 1) government health expenditure as % of NHE increased from 17.9% to 30.4%; and 2) government spending on health as % of total fiscal spending grew from 4.6% to 6.4%. However, comparing with developed markets in the US, UK, Japan, Korea, and the world average, government funding on health in China remains inadequate.

China remains among the lowest in terms of national healthcare expenditure in government funding among 173 countries.

Figure 24. Government Role in Health Expenditure

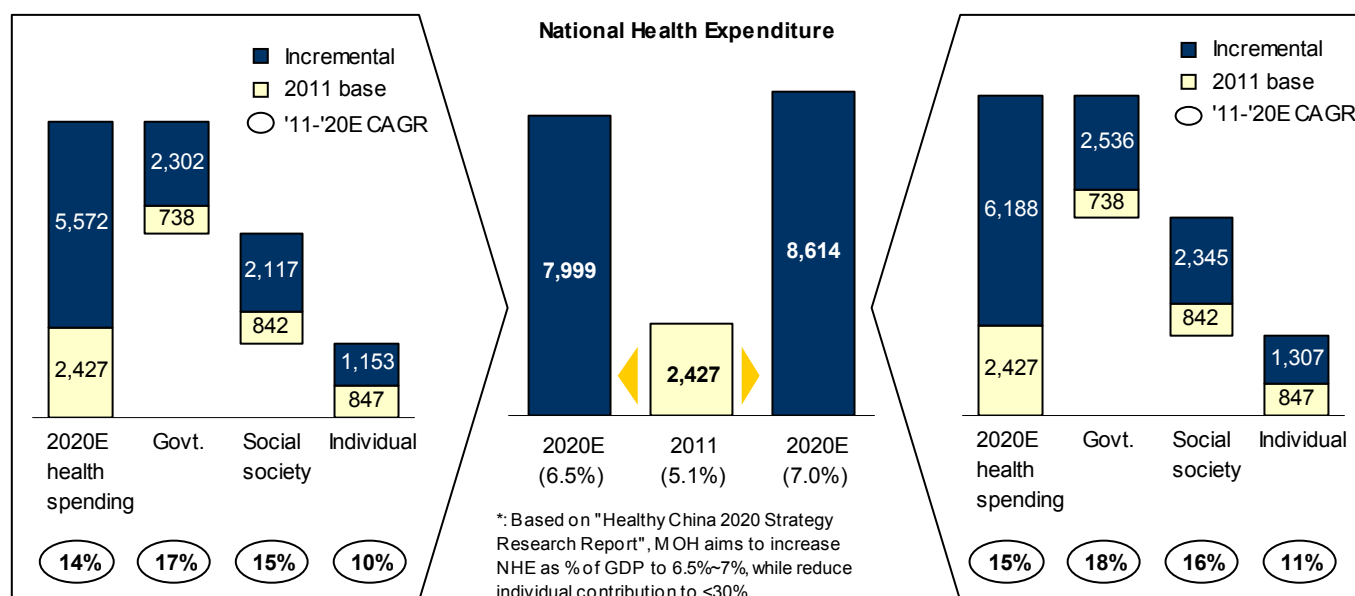


Source: Citi Research, Ministry of Health, World Health Organization

The Ministry of Health addressed the issue of insufficient funding to the health system in the "Healthy China 2020 Strategy Research Report" ("健康中国 2020" 战略研究报告) published in August 2012, aiming to improve the total health expenditure as % of GDP from 5.1% in 2011 to 6.5%~7% by 2020, implying additional spending of RMB5,549bn~RMB6,164bn from 2012-2020.

Assuming: 1) the individual contribution to health spending decreases to 25% in 2020 (vs. government aims to control the rate below 30% by 2015); 2) the contribution from social society increases slightly from 36% to 37% with more private hospital investment and potential higher contribution from employer to medical insurance fund; and 3) the government accounted for 39% of total spending (vs. current ~31%), then additional fiscal spending from the government could be RMB2,302bn (~41% of total incremental spending on health) or RMB2,536bn (~40%), if health expenditure accounts for 6.5% or 7% of GDP, respectively.

Figure 25. "Healthy China 2020" Target: NHE as % of GDP increases to 6.5%~7%



Source: Citi Research, Ministry of Health

## Multi-Site License Could Free Physician Private Practice

Chinese public hospitals are public sector organizations (事业单位) affiliated to the government, and certificated physicians employed by public hospitals were not allowed to practice in multiple hospitals nor operate independently previously. Meanwhile, the payrolls of physicians were also paid by government, and as such have been unable to reflect physician's market value vs. peers in developed markets. The low compensation for physicians has resulted in several consequences: 1) profit-driven prescription behavior; 2) less motivation to improve service quality; 3) aggravating shortage in physicians, with increasing attrition rate and fewer graduates that major in medicine becoming physicians. Furthermore, the restriction on physician practice also poses a bottleneck to the development of private hospitals.

The government has started the trial version of multiple-site practice (多点执业) for physicians since late 2009, as an important initiative to loosen up the control over physicians' practice licenses, improve the mobility of experienced medical professionals among hospitals and lower-tier medical institutions, thus enhancing the overall medical service quality. While still at the early stage, the upcoming free-float practice (自由执业) model for physicians, in our opinion, could lead to the booming of high-quality private clinics, which will be established by individual physicians or a small group of physicians to provide real primary care services or general practitioner services (全科医生服务) to households and residents. The private clinics could lock in a large number of patients with minor illness, and relieve the capacity constraints in Class 2/3 hospitals.

Meanwhile, with the establishment of free-float practice model and private hospital system, physicians' market value could be better reflected in their compensation, reducing the incentives for them to gain profit from drugs or expensive diagnostics.

### Another Look at Cost Control Policies: Long-Term Trend at Transitional Phase

Cost and reimbursement control is Citi's global healthcare theme (use link to view Citi's Global Pharma Initiation, 27 Nov):

Pharma: I Pay, You Pay, He Pays, Won't Pay? – Global Pharma - An Unlikely Survivor. Buy

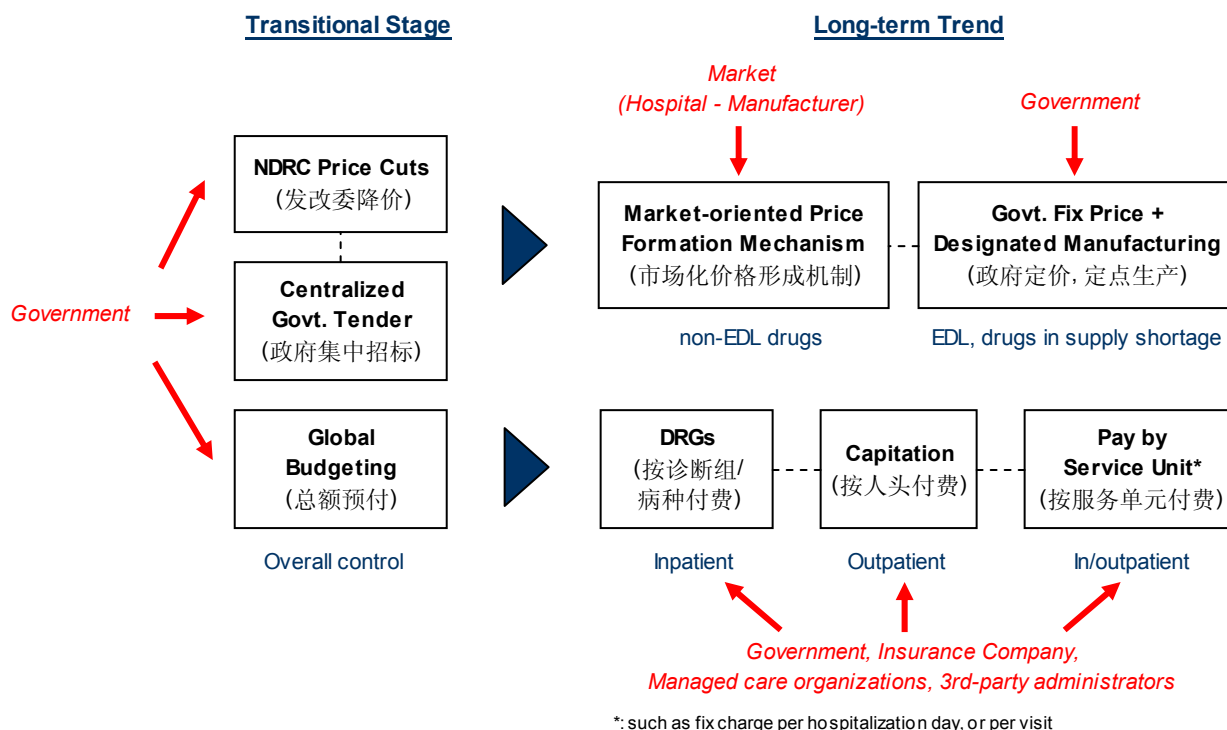
Among the number of healthcare reform policies released or to be released, we expect cost control could be a long-term trend in China, as the balance between spending on health and meeting the medical demand of patients is critical to maintain a stable health system and sustainable growth of the healthcare industry. However, under the value chain shift, we believe the ongoing cost control measures, including price cuts, centralized drug tenders, and global budgeting for medical insurance fund, are likely transitional policies at the current stage, and we expect the cost control framework – addressing 1) how we do it and 2) who will do it – will also experience some changes.

- **Price cuts** - Largely targets drugs in the national reimbursement drug list (NRDL 医保目录) and announced by NDRC periodically. There have been six major rounds of price cuts since 2009, with average magnitude of 12%~21%, starting with essential drug list (EDL 基本药物) and then focusing on specific therapeutic categories of NRDL drugs.
- **Centralized drug tenders** - Centralized at the provincial level since 2010, with the price-focused Anhui model for EDL drug tender spread to almost each province in China. The “double-envelop 双信封” model picked the bidders offering lowest prices as tender winners, driving down the drug price significantly.
- **Global budgeting for medical insurance fund** – Global budgeting (总额预付) refers to when local medical insurance agencies set an overall reimbursement rate increase target for a fiscal year and negotiate with each hospital at the beginning of the year to determine the total reimbursement from the fund to the hospitals using the prior year's total reimbursement as a base. Hospitals need to take a majority share of the overspending. The model was firstly trialed in Shanghai since 2004, and the government plans to launch a full-scale implementation in the near future.

While we expect cost control could remain as one of the focus to balance the growing medical demand, affordability of patients, and capacity of medical insurance fund, the ways to manage the costs and the administrators could change:

- Price regulation could focus more on EDL drugs, which are expected to cover basic medical demand for the majority of the population. But for non-EDL drugs, a market-oriented price formation mechanism, i.e. through hospital tender or negotiation between hospitals and manufacturers, could be better adopted down the road. The current tender system and price cuts are inefficient in reducing medical burden for patients, since physicians could choose higher-priced alternatives in prescription, but compress pharma companies' profitability notably.
- For managing the medical insurance fund outflow, we expect more fine-tuned and targeted models, i.e. DRGs for inpatient expenses and capitation for outpatient expenses could replace global budgeting, which is effective in reducing the cost but also results in some unexpected consequences, including prescription of non-NRDL drugs and hospitals refusing patients with major diseases to control the overspending. It could take time for the transition, as the implementation of DRGs and capitation requires well-established clinical pathway system (临床路径) and primary care/family doctor system, respectively.
- Government's role of monitoring the costs will be gradually shared by insurance companies, managed care organizations (HMO/PPO-like), and third-party prescription drug administrators (such as PBM), with the emergence of commercial health insurance and healthcare services providers.

Figure 26. Potential Changes in Cost Control Framework and Administrator



Source: Citi Research

## Impact of Value Chain Shift on Healthcare Subsectors

When the value currently captured in the hospitals is unlocked, with the increased competition among hospitals and free-floating physicians practice we expect the Chinese healthcare value chain shift to accelerate, which will have a deep impact on the current business models of pharmaceutical/medical device manufacturers and distributors in China, creating space for new business:

- **Creating a Whole New Industry for Healthcare Services:** We expect health system reform itself could open a new space for healthcare services, including: 1) private hospitals, which could emerge to compete with public hospitals; 2) providers of outsource services for hospitals, such as third-party laboratory for diagnosis to improve the operational efficiency and reduce the cost for hospitals in a more competitive and cost-sensitive market; 3) new services models that are similar to HMO (Health Maintenance Organization), PPO (Preferred Provider Organization), or PBM (Pharmacy Benefit Management), which could reduce the patients' medical expense, provide steady patient flow to primary care institutions/physicians, divert excessive patient flow from higher tier hospitals in China, and closely monitor physicians' practice to control overspending for medical insurance fund and commercial insurance.
- **More Profits for Pharma Manufacturing to Drive Innovation:** A more marketized hospital system could lead to two major changes: 1) lower hospital bargaining power to suppliers, resulting in less selling expenses and higher profitability for pharma companies; 2) prescription behavior could become more patient-oriented vs. currently profit-driven, focusing on drugs with real clinical benefits. We expect investment on R&D could increase, as pharma manufacturing will become more profitable and the demand for better quality drugs will increase. Meanwhile, the innovation trend could facilitate consolidation in the pharma manufacturing industry, as substandard players and those focusing on low-value added products could come under significant pressure.
- **Further Consolidation and Specialization in API:** The innovation and consolidation trend could drive upstream API manufacturers towards two directions: 1) for commodity products, the market will continue to gravitate towards a few leading players with dominating capacity and advanced cost control technology; and 2) more API manufacturers could quit the commodity API business to seek opportunities in specialty API, the demand of which will increase with the growing volume of specialty innovative drugs. Moreover, we expect some API manufacturers could tap downstream drug-marking business through acquisition or cooperation with generic companies.
- **Hospital Revenue Structure Change to Drive Medical Devices:** Our analysis of the medical expenses data suggests that the drug spending as % of total medical expenses was declining, slightly for outpatients and more notably for inpatients, while diagnosis/treatment fee's contribution is growing to compensate the decrease in drug mark-up. With the government's effort to reduce hospital's dependency on selling drugs by implementing zero mark-up, we expect the hospital revenue structure to shift from drugs to diagnosis fees and other general services fees, creating growth opportunities for medical device manufacturers.



- **Business Model Change in Drug Distribution:** With the growing bargaining power of upstream suppliers, as the pharma companies head to high quality and innovative products, margin pressure for the drug distribution business could continue. We expect the business model of distributors, particularly leading players, to transform from single logistics service to a more diversified service platform, by: 1) deeper partnership with hospitals to provide value-added services and solidified relations; 2) going upstream or downstream for higher-margin manufacturing and drug retail business; 3) leveraging extensive network for side-business.

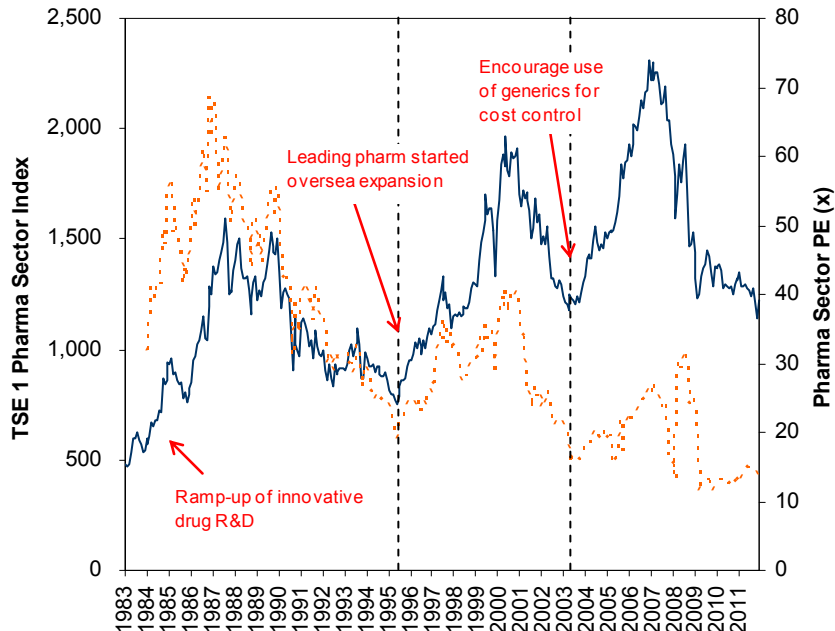
## What Can We Learn from the History of Others?

### Case 1: Industry Development in US and Japan

#### R&D and Overseas Expansion Drove the Two Major Cycles of the Japanese Pharma Industry

The emergence history of the Japanese pharma industry could be good proxy to assess the road ahead for Chinese pharma companies. The current healthcare market in China is comparable to that of Japan in the 1980s~1990s, given similarities in: 1) aging population; 2) hospital/physician income structure (rely on drug mark-up or “yakkasa” in Japan); and 3) reimbursement mechanism.

Figure 27. Historic Japanese Pharma Sector Index and P/E



Source: Citi Research, FactSet

Our analysis of TSE 1 pharma sector index and P/E of Japanese pharmaceutical companies from the 1980s to 2011 suggests that the Japanese pharma industry has gone through three major cycles, and that what the Chinese market is undergoing now is similar to the first two cycles in Japan from early 1980s to ~2000, i.e. at the early stages of R&D ramp-up and overseas expansion.

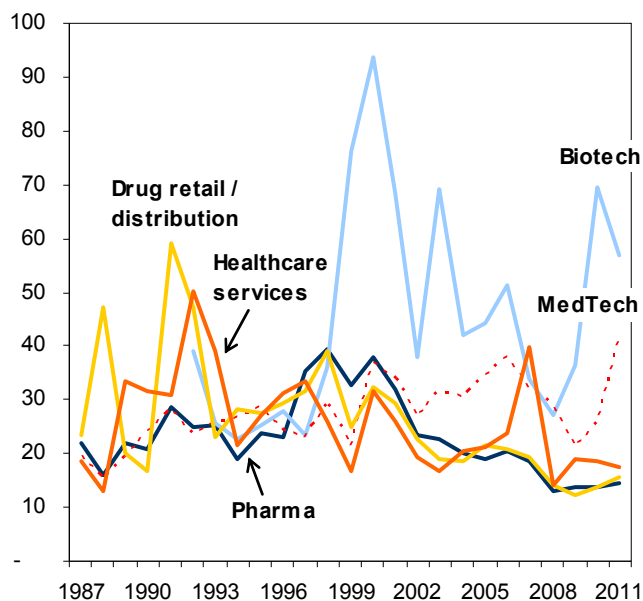
- **R&D Drove Cycle 1 (early 1980 ~ mid 1990s):** The up cycle is largely driven by innovative drug R&D, as the new drug patent law improved the intellectual property protection for innovative drugs, leading to increase in number of NCEs (13 in 1970 vs. 25 in 1987). Meanwhile, the industry standards were significantly enhanced with the implementation of GMP, quality control campaign, GLP (good laboratory practice), GCP (good clinical practice), and a post-marketing surveillance system since the mid-1970s. The down cycle started when the government initiated a series of cost control policies since 1984, including price cuts, separating prescribing and dispensing, reducing mark-up, and replacing fee-for-service payment with flat-sum payment.
- **Overseas Expansion Drove Cycle 2 (mid 1990s ~ early 2000s):** Facing cost containment in the domestic market, leading Japanese pharmaceutical companies, such as Takeda, started to tap into the overseas market for new growth opportunities since the mid 1990s. With innovative products and comparable drug quality to those in the US and EU, Japanese pharma has ramped up quickly in the global market, and currently account for over 40% of total revenue in leading players. (Top 5 players by 2011 total revenue: Takeda: 51%, Astella: 42%, Otsuka: 50%, Eisai: 40%, Daiichi Sankyo: 51%).
- **Generics Drugs Drove Cycle 3 (early 2000s ~ present):** As a measure to control costs, the Japanese government started to encourage the use of generic drugs as alternatives to expensive innovative drugs since 2002, leading to the ramp-up of major generic drug makers, such as Nippon Chemiphar and Sawai Pharma.

### Drivers Shifted from Services to Biotech in US Healthcare Industry

We analyzed the historical PE and market cap of the 975 public-listed US-based healthcare companies from 1985-2011, and the analysis suggests that:

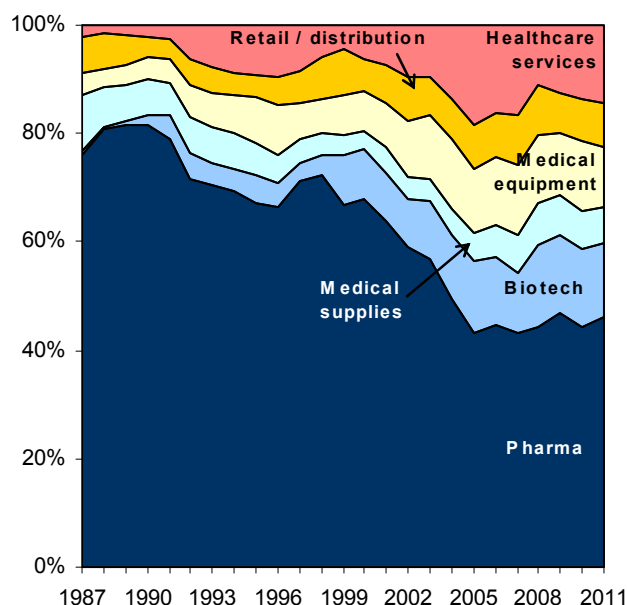
- 1) Healthcare services and drug retail/distribution services led the valuation expansion from mid-1980s to early 1990s, while biotech became the major driver since 2000;
- 2) In terms of market cap, which reflects the size and market recognition of the potential of the subsectors, medical equipment, biotech and healthcare services have been the major gainers during the past three decades.

Figure 28. Historical PE of US Healthcare Players



Source: Citi Research, Bloomberg

Figure 29. Historical Market Cap Breakdown of US Healthcare Sector



Source: Citi Research, Bloomberg

## Case 2: Separation of Hospital Pharmacies from Hospitals in South Korea – Not an Easy Task

To better understand the potential consequence of the pharmacy separation policy on health spending and the healthcare market, we take the healthcare reform in South Korea as a proxy, as a similar policy has been implemented since 2000.

Our analysis suggests that separation of hospital pharmacy from hospitals did not necessarily result in lower costs in South Korea. On the contrary, the policy led to: 1) strikes (less likely in China), which forced the government to raise service fees and salaries significantly; and 2) more prescription of multinational drugs.

### Background of Healthcare Reform in South Korea

In East Asian countries such as Japan, Taiwan, South Korea and China, where the traditional roles of physicians and pharmacists had not been differentiated, physicians were both involved in prescribing and dispensing drugs. Prior to the healthcare reform, in countries such as South Korea, where pharmacies were not separated, dispensing drugs was more profitable for physicians as medical service fees were strictly regulated. From 1977 to 1989, South Korea's healthcare insurance system transitioned from private voluntary health insurance program to the government mandated universal coverage. Despite rapid expansion of the healthcare coverage, public financing accounted for less than ~50% of national healthcare spending and healthcare providers are reimbursed based on a fee for service basis, driving the profit maximizing behaviors for these providers.

In the 1980's, similar to that of China, the government set the prices for drugs in the reimbursement list based on the prices that pharmaceutical and wholesalers reported. Physicians were able to purchase the insured drugs at costs much lower than the reimbursed prices, generating hefty profits for prescribing drugs. Thus the physicians tended to prescribe drugs not based on efficacy but on financial

incentives. Physicians often preferred to prescribe drugs that pharma companies offered deeper discounts below the reimbursement prices to generate higher margins and profits. It was estimated by the Korean government that drug revenues accounted for as much as ~45% of hospital revenues in most of the general hospitals and that the profit driving nature of drug prescription became a significant source of physician income. As a result, in 1996 the drug spending as % of total healthcare spending for South Korea was ~30%, about ~10% higher than the OECD country average of ~20%.

The financial incentives heavily influenced physician prescription behavior. This was reflected by a severe over-prescription of drug classes such as antibiotics and consumption of the antibiotics led to an increase in antibiotic resistance. This cultivated an uncompetitive pharmaceutical industry where most of the players focused on developing sales scheme and generic & OTC drugs that can offer higher margin to the physicians.

### **Pharmacy Separation Failed to Bring Down Costs**

**The mandatory separation of hospital pharmacies from hospitals in Korea in 2000 led to the following:**

- 1. Physicians' strikes, followed by 5 times increase in physicians' salaries;**
- 2. Escalation of drug costs as % of healthcare spending (31% vs. ~20% OECD average);**
- 3. High-price drugs increased from 59% to 73% in large general hospitals;**
- 4. Market share of multinationals gained significantly, while domestic generic manufacturers lost market share;**
- 5. Notable increase in national healthcare spending.**

To alleviate the problem of profit nature of physician prescription behavior driving up the national healthcare spending, on 1 July 2000, after multi-years of debate and political maneuvering by various political parties and interest groups, the South Korea government mandated the implementation of hospital pharmacy separation from the hospitals. The mandatory policy applied to all outpatient care units and hospital outpatient pharmacies were closed. The healthcare reform marked a structural change in South Korea's healthcare system and significantly impacted all parties of the healthcare value chain, with some unexpected consequences:

**Pharmaceutical Industry** – The pharmacy separation resulted in a major restructuring of the pharmaceutical industry. Prior to the healthcare reform, there were about 450 pharmaceutical manufacturers in South Korea, about two-thirds were small players were dependent on offering higher margin rather than higher quality of the drugs to the physicians. Post the pharmacy separation, as physician prescriptions were not driven by the same financial incentives as before, smaller players with little R&D capabilities exited the pharmaceutical market and thus the market share of multinational pharma companies significantly increased. Moreover, reimbursement cuts by the National Health Insurance (NHI) affected South Korean domestic companies more than multinational companies as reimbursement cuts led to lower margins for domestic players and physicians had no incentives to choose lower margin drugs. As a result, drug spending escalated. In 2006, drug spending as % of total healthcare spending reached 31%, significantly higher than ~20% in OECD countries.

**Physician Fees and Compensation** – As separation of the drug prescription and drug dispensing significantly lowered physician income by eliminating physician's profit from selling drugs, several organized national strikes by physicians paralyzed the national healthcare system. The strikes successfully pushed the South Korean government to increase the medical service fees and average salaries by 5x.

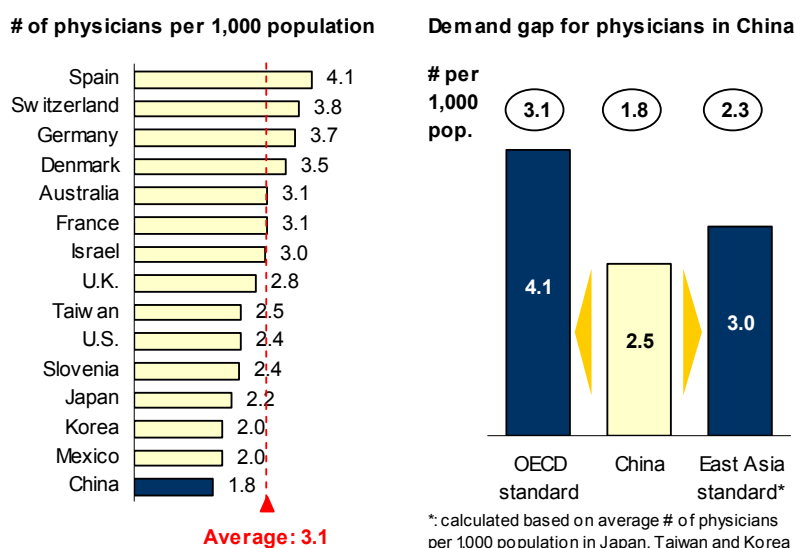
**Physician Prescription Behavior** – Post the healthcare reform, with multinational companies offering sizable non cash benefits to physicians, physicians preferred to prescribe more expensive brand names vs. cheaper domestic products. Within 12 months after the implantation of the healthcare reform, the % of high-priced prescriptions for outpatient setting increased from 26% to 34% at physician clinics and from 59% to 73% in the large general hospitals.

## Key Risks to Ongoing Healthcare Reform

The setting of healthcare reform and recent policy trends suggest that the reform is heading in the right direction to materialize a more competitive and efficient health system, as well as a healthcare market with more sustainable growth. However, we also see some potential risks, which could hinder the progress of the ongoing healthcare reform or lead to unexpected consequences.

- **Shortage in Physicians:** Comparing with OECD members and Taiwan, the number of physicians in China appears insufficient to meet growing medical demand. Given the imbalance in medical resources allocation, the shortage is even more serious in rural areas, as our proprietary survey of township hospitals in 2011 suggests (92.2% of respondents noted that their institutions are short of medical professionals and 52.8% specified the shortage was in physicians). We also see challenges in increasing the number of physicians quickly in the short-term, as the occupation has become less attractive for graduates given: 1) low compensation; 2) high workload; and 3) growing conflicts between physicians and patients.

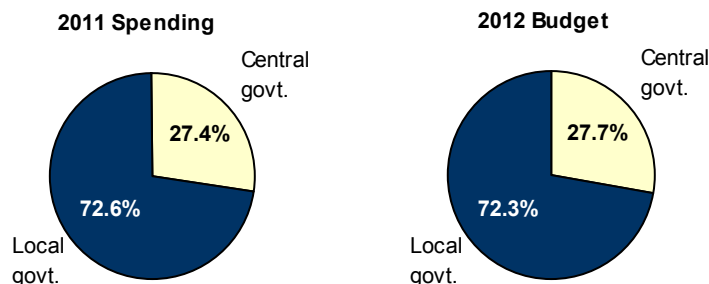
Figure 30. Shortage of Physicians in China



Source: Citi Research, OECD, Ministry of Health, Taiwan Department of Health

- **Fiscal Burden for Local Government:** Government spending on health was funded by both central and local governments, and our analysis of government fiscal reports from the Ministry of Finance suggest local governments accounted for ~72.6% of funding on health in 2011 vs. 27.4% by central government, and the ratio is likely to be similar in 2012. As the government aims to increase health spending significantly over the next 10 years, to account 6.5%~7% of GDP by 2020, as well as reduce the contribution from out-of-pocket expenses, the fiscal burden could be a major challenge for local government. Failure in providing sufficient government funding could lead to stagnation in policy implementation, such as zero markup on drugs, thus the process and effect of value chain shift could be delayed.

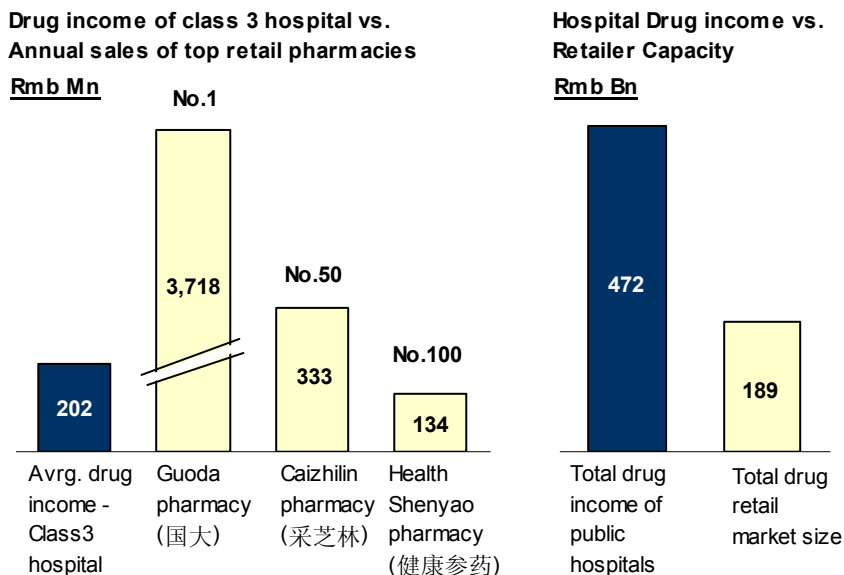
Figure 31. Health Spending Breakdown By Central and Local Government



Source: Citi Research, Ministry of Finance

- Uncertainties in Separation of Pharmacies from Hospitals:** As one of the most critical issues with overhaul of the hospital system, separation of pharmacies from hospitals could alter the hospital income structure and break the dominance of hospitals in the value chain. We see some uncertainties in both implantation and consequences of the policy: 1) the current capacity in retail pharmacies might be too small to take over the role of dispensing drugs for hospitals, as the total drug retail market size was only ~40% of total drug income of public hospitals; 2) our analysis of Korea, where a similar policy was enforced in 2000, suggests that the separation of hospital pharmacies from hospitals has not resulted in lower costs, but instead has driven up the service fee and physician's salaries, as well as the use of multinational drugs.

Figure 32. Capacity Constraints of Drug Retailers in Taking Over Hospital Pharmacies



Source: Citi Research, Ministry of Commerce

## Mapping the Healthcare Market

We performed analysis of 223 public-listed Chinese healthcare companies, based on: 1) revenue and EBITDA growth momentum; 2) business scale of individual companies (evaluated by share of total revenue/EBITDA in each subsector); and 3) market position in each segment.

We believe product mix, channels, and management team, are the three key pillars to build a winner in the Chinese healthcare market:

**Unique Products Offerings** – The uniqueness of product portfolio include: 1) advanced technology, such as innovative drugs or branded generics with some technical barriers, 2) reputable brands, particularly for TCM products, OTC drugs and “Great Health” products (大健康产品), or 3) niche markets or segments at primitive stage with less competition, such as highly government-regulated anesthesia drugs, lyophilizers (冻干机), third-party laboratory, private hospitals, etc. For companies targeting generic/commoditized products, scale and production technology are critical competitive edges.

**Extensive and Targeted Channels** – Channel strength in the Chinese healthcare market is particularly important given: 1) the market is largely generic-focused (generic drugs: ~80% of total pharma sales; mid to low-end products: ~75% of total medical device market), and most products are commoditized; and 2) the strong bargaining power of hospitals (or physicians) in the value chain. It might not be necessary to cover all sales channels, and a targeted network could also work to support the selling of well-positioned products, e.g. rural areas coverage, mid-tier market, retail channels, etc.

**Experienced and Stable Management** – A farsighted management team with strong execution capability is one of the keys to success for Chinese healthcare companies, as the industry is undergoing major changes with an overwhelming number of government policies. Besides, stability of management team could also contribute to achieving consistent strategies for a company's mid to long-term growth.

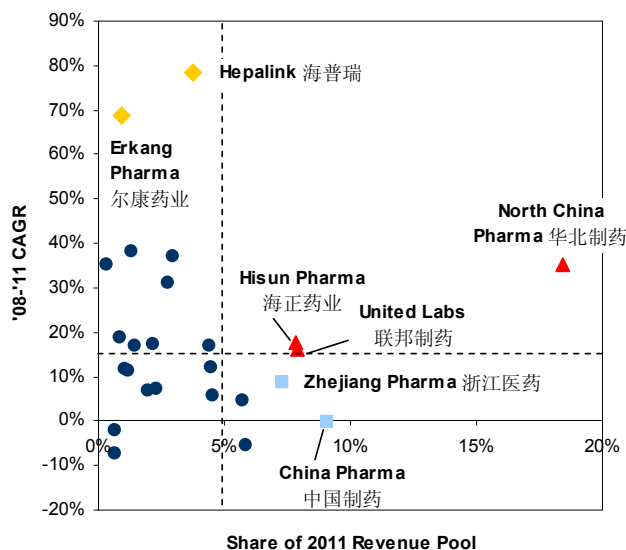
## API Players: Likely Winners All Have Skills or Scale

With total production capacity of ~2M tons for API (>20% of total global capacity), China has become the largest API supplier around the world, and Chinese API sales reached RMB305bn in 2011, based on data from the State Bureau of Statistics. API manufacturers in China are facing some bottlenecks due to: 1) overcapacity, particularly for penicillin and Vitamin C/E; 2) focus on low-end products; 3) heavy reliance on export sales with raising international standards; and 4) competition from Indian peers.

Hisun Pharma (海正药业, 600267.SH) has been a pioneer in the subsector in exploring higher-end API business to bypass those major constraints. The company has: 1) focused on high-end APIs, providing customized API products and manufacturing services to leading multinational pharma companies; 2) tapped into lucrative downstream drug manufacturing business (~1/3 of total sales), partnering with Pfizer on generic drugs in September 2012.

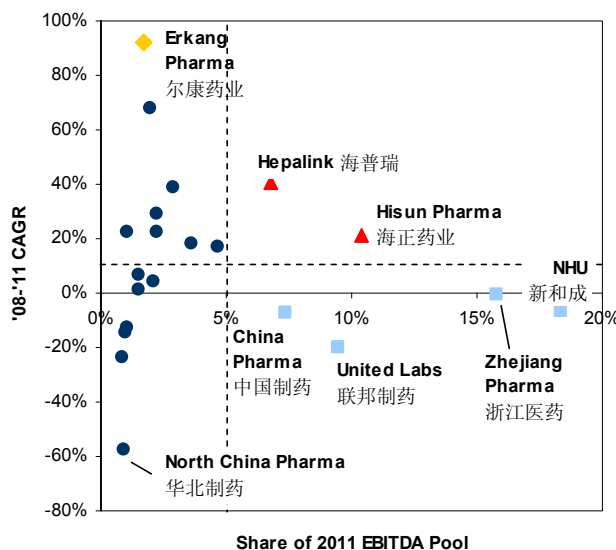
For low-end API business, the leading players, such as United Labs (联邦制药, 3933.HK), China Pharma Group (中国制药, 1093.HK), and Zhejiang Pharma (浙江医药, 600216.SH), look well positioned given their large capacity and upgraded production procedure to reduce manufacturing costs.

Figure 33. API: Revenue Share vs. Growth



Source: Citi Research, Wind, Bloomberg

Figure 34. API: EBITDA Share vs. Growth



Source: Citi Research, Wind, Bloomberg



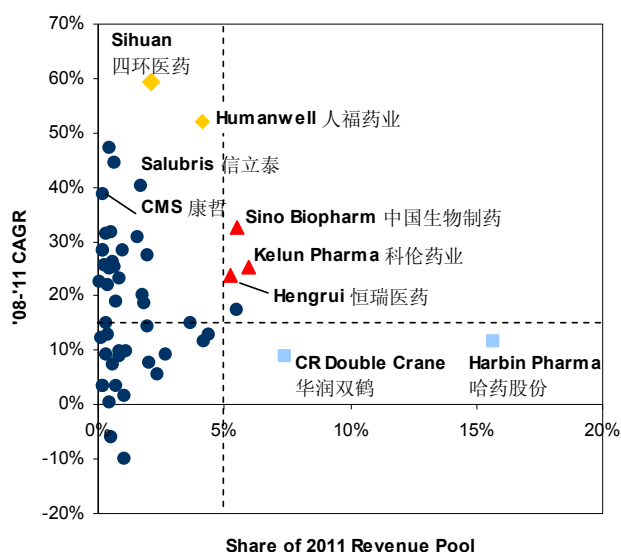
## Chemical Drugs: All Roads Lead to Innovation

While there could be some random occasion for “from scratch” innovative drugs with significant clinical benefit to be developed by domestic players, such as Zhejiang Beta Pharma’s Icotinib (浙江贝达, 埃克替尼), we are not expecting an R&D-driven era in the near-future for the Chinese pharma industry, given compressing profitability with the government’s stringent regulation on drug prices through price cuts and drug tenders. However, demand for innovative drugs with better efficacy and safety is growing among Chinese patients, particularly given the increasing incidence of major diseases and also improved affordability of medical services with higher insurance coverage.

Domestic pharma companies, such as Hengrui Medicine (恒瑞医药, 600276.SH) and Sino Biopharm (中国生物制药, 1177.HK), stand out with: 1) first-into-market generic versions of multinationals’ blockbusters (docetaxel, adefovir, entecavir), and 2) innovative derivatives to high-demanding products (isoglycyrrhizinate magnesium 异甘草酸镁), capturing market opportunities in the fastest-growing therapeutic areas.

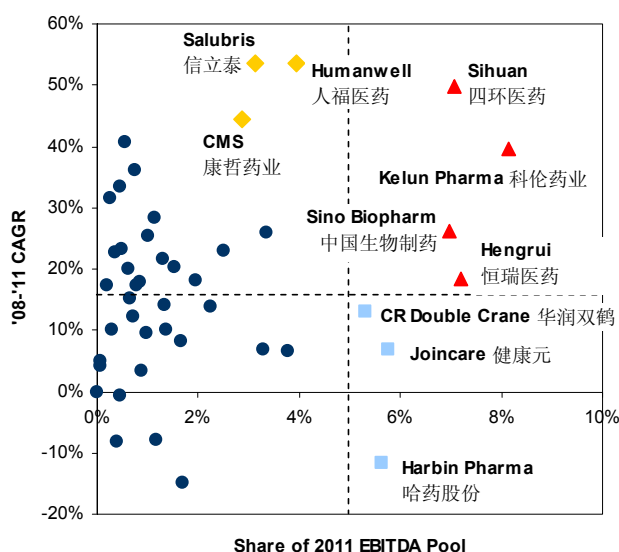
Using a unique CSO (contracted sales organization) business model, CMS (康哲药业, 0876.HK) is introducing innovative drugs from overseas markets to meet the growing needs in China without risks of R&D, including high investment, long cycle, and high failure rate.

Figure 35. Chemical Drugs: Revenue Share vs. Growth



Source: Citi Research, Wind, Bloomberg

Figure 36. Chemical Drugs: EBITDA Share vs. Growth



Source: Citi Research, Wind, Bloomberg

Similar to API, the scale and manufacturing efficiency also work for LVP (large volume parenteral 大输液) business. Kelun Pharma (科伦药业, 002422.SZ) and China Resources Double Crane (华润双鹤, 600062.SH) maintain leading positions in this market.

Humanwell Pharma (人福医药, 600079.SH) is an emerging niche player in the pharma market. It has a focus on the highly-regulated anesthesia drug market with >50% market share in fentanyl (芬太尼) and 69% market share in Sufentanil (舒芬太尼), and also has an integrated manufacturing platform for API and finished products of anesthesia drugs.

## TCM: Eye on Branding of Consumer Products

We believe OTC TCM names, particularly those with strong brand recognition and stickiness, such as Yunnan Baiyao (云南白药, 000538.SZ), Tong Ren Tang (同仁堂, 600085.SH, and its subsidiary Tong Ren Tang Technologies, 同仁堂科技, 1666.HK), Dong-E E-Jiao (东阿阿胶, 000423.SZ), Huarun 999 (华润三九, 000999.SZ), and a portfolio of TCM legacy brands in Guangzhou Pharma (广州药业, 0874.HK/601332.SH), are in a strong position in the Chinese healthcare market, given:

- Solid growth in patient flow to retail pharmacies, diverted from high-end hospitals and primary care institutions implementing EDL policies (in our proprietary survey in 2011, >50% sample township hospitals and community service centers noted that patients were flowing to retail pharmacies, since EDL drugs are insufficient to meet their medical needs);
- Little price pressure or potential price increase (Dong-E raised E-Jiao price by ~50% in 2010, ~60% in 2011, and 10% in early 2012, while Tong Ren Tang raised the price for E-Jiao in 2011 and Angong Niu Huang Pills 安宫牛黄丸 in 2012);

Moreover, Yunnan Baiyao and Guangzhou Pharma also entered the FMCG (fast moving consumer goods) market by launching toothpaste/band-aids and regaining red-can Wanglaoji (王老吉) herbal tea business, respectively, which brought in new growth opportunities. Players focusing on TCM in modernized formulation (such as TCM injection) and TCM herbs cultivation and distribution could also benefit from the booming TCM industry, including: 1) Tasly (天士力, 600535.SH) with flagship angina drug Compound Danshen Dripping Pill (复方丹参滴丸); 2) Shineway (神威药业, 2877.HK) with strong rural market penetration for Qingkailing (清开灵); and 3) Kangmei Pharma (康美药业, 600518.SH), which is the largest TCM herbs provider in China.

Figure 37. TCM: Revenue Share vs. Growth

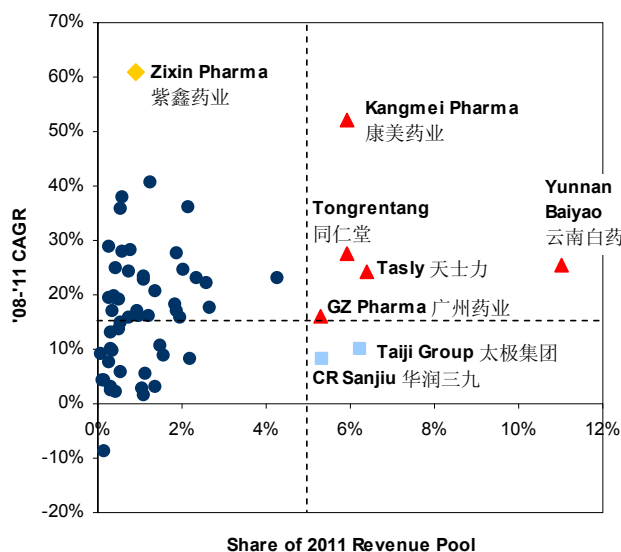
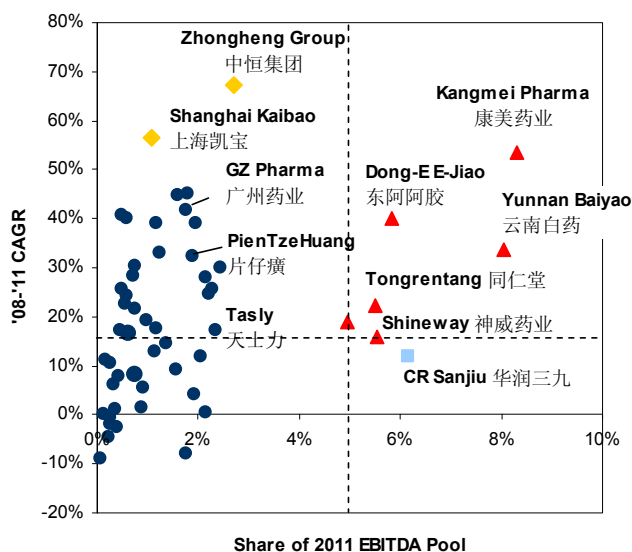


Figure 38. TCM: EBITDA Share vs. Growth



Source: Citi Research, Wind, Bloomberg

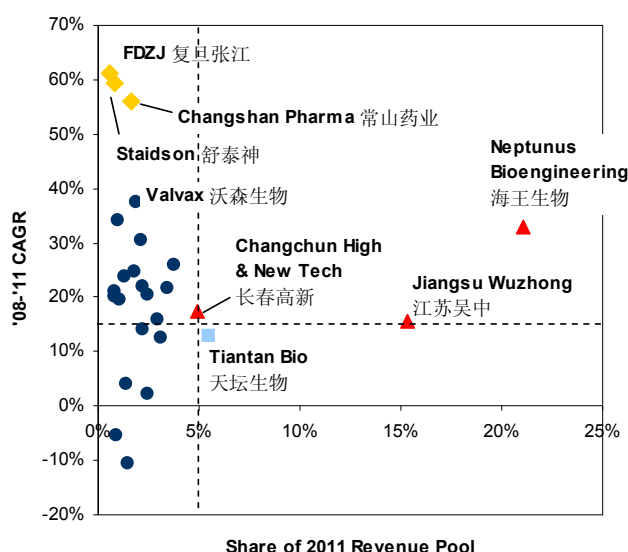
Source: Citi Research, Wind, Bloomberg

## Biological Products: Poised for Sustainable Growth

While biological products and biotech drugs are still a small fraction of the total healthcare market, government support on biologics and strong end-user demand could continue to drive growth in the segment.

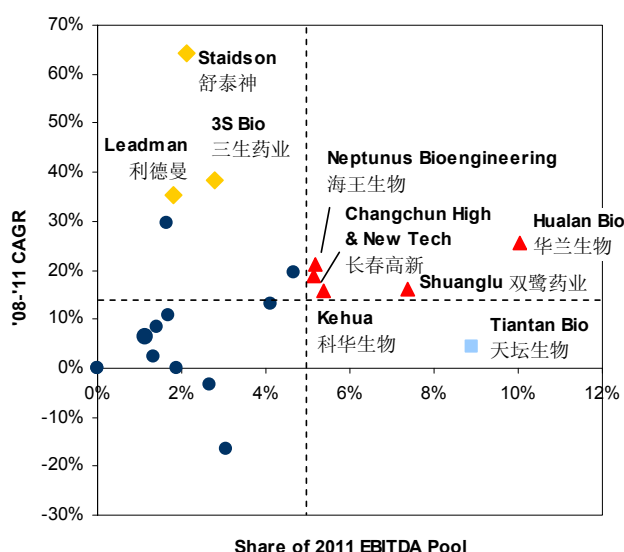
Leaders in this space include: 1) Hualan Bio (华兰生物, 002007.SZ) with most complete blood products offering in China, 2) Kehua Bioengineering (科华生物, 002022.SZ), the leading vitro diagnostic agent manufacturer in China, 3) 3S Bio (三生制药, SSRX.O), the largest domestic EPO market player, and 4) Walvax (沃森生物, 300142.SZ), one of the major vaccine manufacturers in China.

Figure 39. Biologics: Revenue Share vs. Growth



Source: Citi Research, Wind, Bloomberg

Figure 40. Biologics: EBITDA Share vs. Growth



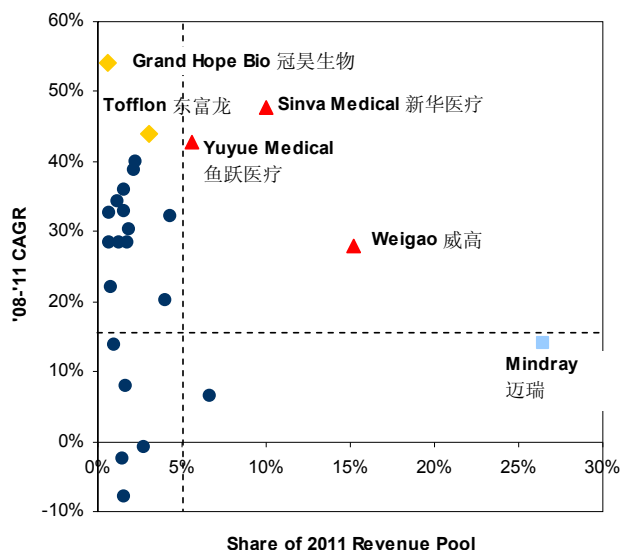
Source: Citi Research, Wind, Bloomberg

## Medical Devices: Import Substitutions for Equipments

The Chinese medical equipment market is still largely dominated by multinational players, and our proprietary Chinese hospital survey in 2011 suggested that multinationals' market share ranged from 77% to 98% for the 10 major equipments. Mindray (迈瑞, MR.N) is a pioneer in import substitution (进口替代) in the market, seizing the No.1 position in the Chinese patient monitor market (44% market share, based on our survey), and ramp up in vitro diagnostic and medical imaging segment in the mid-tier market.

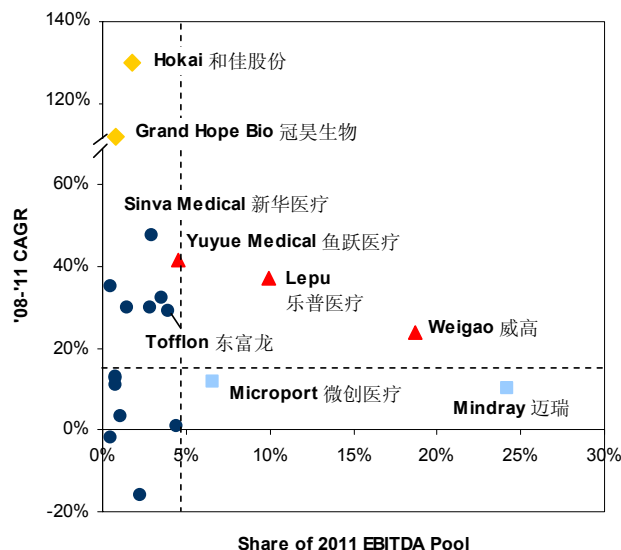
Other major players include: 1) Yuyue Medical (鱼跃医疗, 002223.SZ), which is the market leader in rehab care instruments (such as sphygmomanometer, wheelchair) and medical oxygen devices, and 2) Tofflon (东富龙, 300171.SZ), a niche player that leads the lyophilizer (冻干机) market and to benefit from growing demand for its product during the facility upgrade cycle for the new GMP to be effective in 2013.

Figure 41. Medical Devices: Revenue Share vs. Growth



Source: Citi Research, Wind, Bloomberg

Figure 42. Medical Devices: EBITDA Share vs. Growth

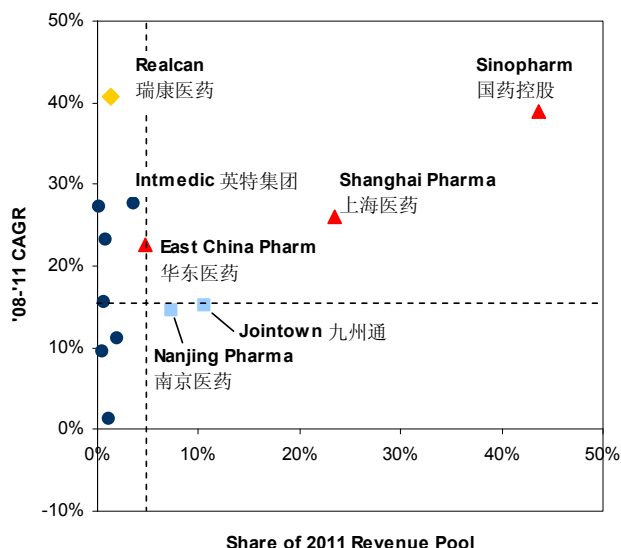


Source: Citi Research, Wind, Bloomberg

## Distribution: Bigger Is Better

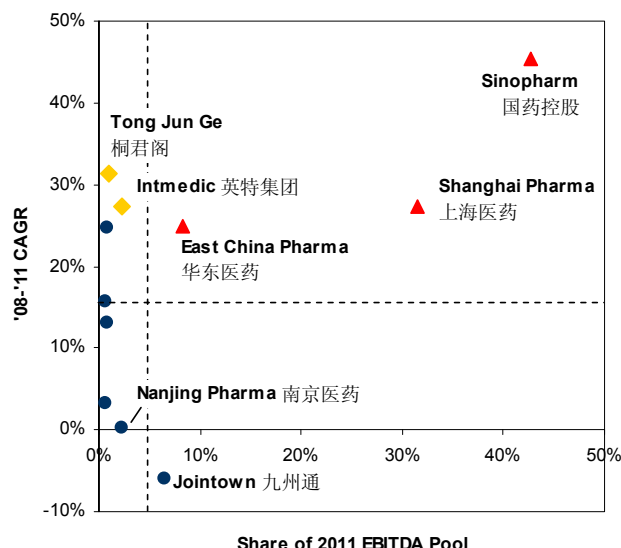
We believe big players could become bigger in Chinese drug distribution business with the ongoing industry consolidation trend, and large scale remains a key competitive edge in the market given: 1) favorable government support to national/regional leaders; 2) stronger bargaining power to suppliers; 3) better funding accessibility to survive the tough environment, including price regulation and lengthy account receivable days; 4) extensive network can be leveraged to develop new business and capture opportunities along the value chain. We pick Sinopharm as a top performer in this segment.

Figure 43. Distribution: Revenue Share vs. Growth



Source: Citi Research, Wind, Bloomberg

Figure 44. Distribution: EBITDA Share vs. Growth



Source: Citi Research, Wind, Bloomberg

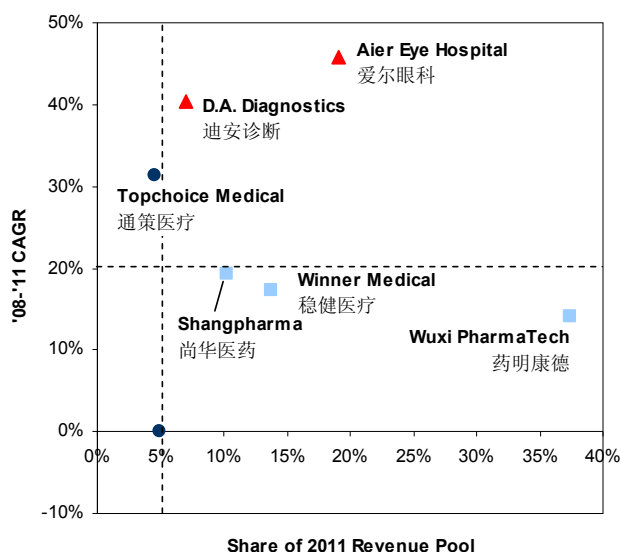
## Healthcare Services: First-Mover Advantages

The healthcare services market in China is still at the primitive stage, and only a few companies are publicly listed. Given that, we expect first-movers in emerging segments, such as private hospitals, third-party diagnostics, and hospital IT, will be better positioned to capture early-stage opportunities and become top performers when the market becomes more scalable and profitable.

Aier Eye Hospital (爱尔眼科, 300015.SZ) is one of a few private hospitals that has established a national presence and in our view could maintain its leadership in the emerging private hospital market, as: 1) the government is opening up the hospital system to encourage private players to take more patient flow; 2) ophthalmology is not the core profit center for public hospitals, thus competition is less intense; and 3) the three-layer chain hospital model (三级连锁) is efficient in achieving deep coverage with consistent service quality.

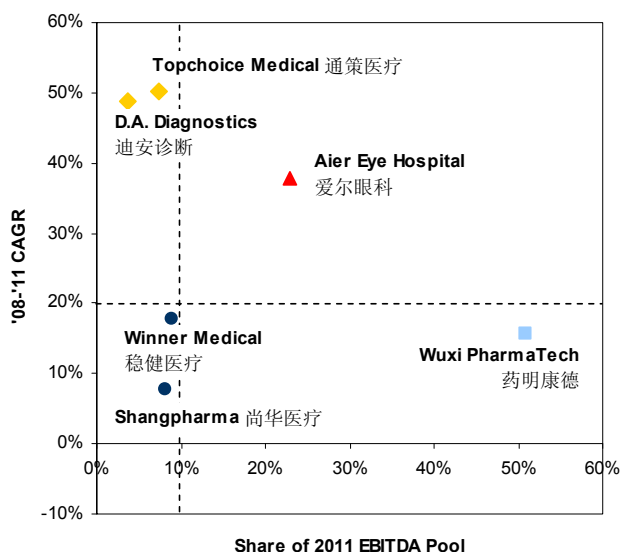
D.A. Diagnostics (迪安诊断, 300244.SZ) is one of the leading third-party diagnostics laboratories in China. Growth could be driven by increasing demand in public hospitals to outsource diagnostic testing, since the hospitals are facing capacity constraints in handling the fast-growing patient visits.

Figure 45. Healthcare Services: Revenue Share vs. Growth



Source: Citi Research, Wind, Bloomberg

Figure 46. Healthcare Services: EBITDA Share vs. Growth



Source: Citi Research, Wind, Bloomberg

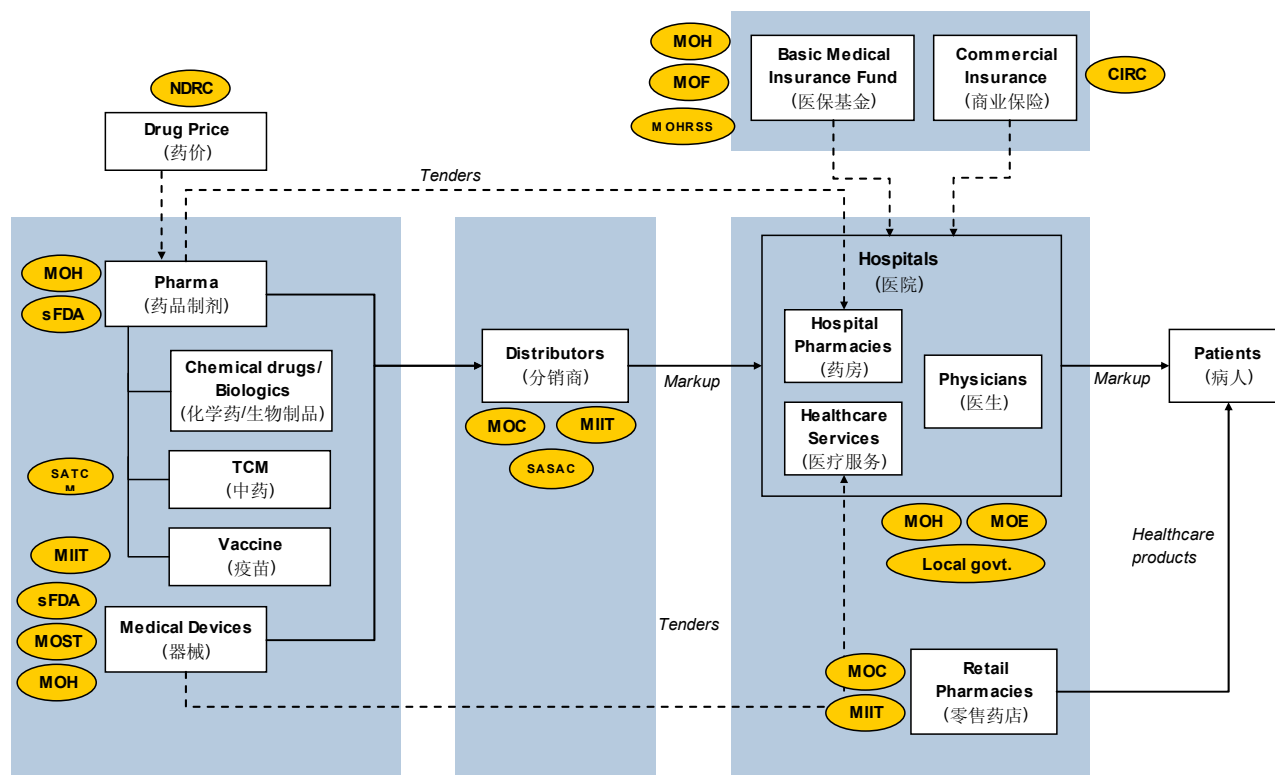
# Deep Dive into Chinese Healthcare System

## Power for Healthcare Reform is not Centralized

The regulation system for the Chinese healthcare market is not centralized, as: 1) each segment of the healthcare value chain is regulated by different government agencies and ministries; and 2) policies issued by central government could be modified at the local level. The decentralized power has led to:

- **Slow Policy-Making Process:** The policy-making is based on negotiation among each of the regulators involved, and the process can be time-consuming as each party attempts to protect their own interest. Moreover, it can also be slow for local governments to localize the policies, if the deadline of implementation is not strictly defined and monitored.
- **Inconsistent and Uncertain Policies:** Since each regulator focuses on their own segment, and given lack of efficient coordination among policymakers, policy inconsistency has been common. This has resulted in inefficient implementation and policy uncertainties for the healthcare industry. For example, Ministry of Industry and Information Technology (MIIT) released the 12th Five-Year Plan for the pharma industry to encourage innovation. However, the profitability of pharma companies was squeezed by NDRC price regulation (price cuts, Anhui model), and companies are less motivated to invest on R&D.

Figure 47. Key Regulators for Each Segment of Healthcare Value Chain

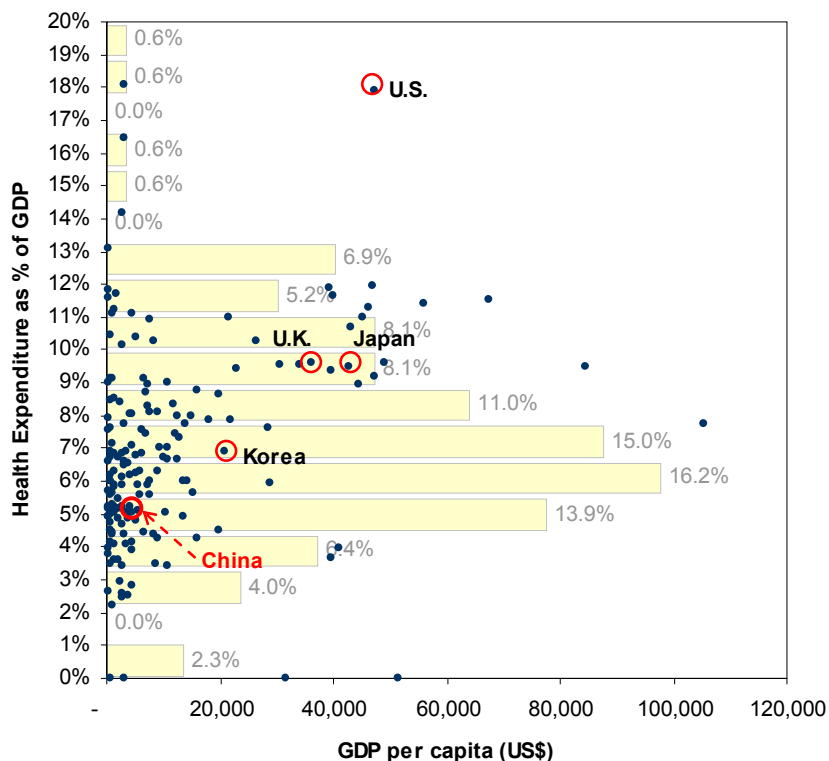


Source: Citi Research

## Healthcare System Is Inadequately Funded

Total national health expenditure in China accounted for ~5% of GDP in 2010. Comparing with 173 countries around the world, China was at the lower end of the range in health spending, implying that the healthcare system and healthcare market are inadequately funded.

Figure 48. Distribution of Health Expenditure as % of GDP in 173 Countries (2010)



Source: Citi Research, World Bank, WHO

Our analysis of health spending level in countries with GDP per capita in-line with that in China suggests that the average healthcare expenditure as % of GDP was 5.9% in 2010 in those comparable peers (vs. 5.1% in China). We believe the ideal ratio could be ~6%-6.5%, in-line with world median.

Figure 49. Health Expenditure as % of GDP: China vs. Global Peers

Country	GDP/Capita (2010, US\$)	Health Expenditure as % of GDP							
		1995	2000	2005	2006	2007	2008	2009	2010
<b>China</b>	<b>4,428.5</b>	<b>3.5%</b>	<b>4.6%</b>	<b>4.7%</b>	<b>4.6%</b>	<b>4.4%</b>	<b>4.6%</b>	<b>5.1%</b>	<b>5.1%</b>
<b>Countries with Similar GDP/capita (±US\$500)</b>									
Thailand	4,608.1	3.5%	3.4%	3.5%	3.5%	3.6%	4.0%	4.2%	3.9%
Jordan	4,559.9	8.3%	9.7%	8.9%	8.2%	8.4%	8.5%	9.6%	8.0%
Algeria	4,494.9	4.2%	3.5%	3.5%	3.1%	3.5%	3.7%	4.6%	4.2%
Macedonia, FYR	4,459.7	8.5%	8.7%	8.1%	7.8%	6.9%	6.8%	6.9%	7.1%
Angola	4,422.5	3.8%	2.4%	2.0%	2.4%	2.5%	3.2%	4.9%	2.9%
Bosnia and Herzegovina	4,408.8	10.6%	7.1%	9.1%	9.3%	9.8%	10.3%	10.9%	11.1%
Tunisia	4,198.5	6.1%	6.0%	6.2%	6.2%	6.2%	6.2%	6.4%	6.2%
Belize	4,064.4	3.9%	3.7%	3.5%	4.4%	4.8%	4.8%	5.5%	5.2%
Ecuador	4,008.2	4.1%	4.2%	5.2%	6.7%	7.0%	7.0%	8.8%	8.1%
Turkmenistan	3,966.8	3.1%	4.0%	3.2%	2.7%	2.5%	1.9%	2.5%	2.5%
<b>Average</b>	<b>4,319.2</b>	<b>5.6%</b>	<b>5.3%</b>	<b>5.3%</b>	<b>5.4%</b>	<b>5.5%</b>	<b>5.6%</b>	<b>6.4%</b>	<b>5.9%</b>
<b>Median</b>	<b>4,415.7</b>	<b>4.1%</b>	<b>4.1%</b>	<b>4.4%</b>	<b>5.3%</b>	<b>5.5%</b>	<b>5.5%</b>	<b>5.9%</b>	<b>5.7%</b>
<b>Developed Countries/Regions</b>									
United States	47,198.5	13.6%	13.4%	14.7%	15.9%	16.1%	16.5%	17.6%	17.9%
United Kingdom	36,143.9	6.8%	7.0%	8.3%	8.5%	8.4%	8.9%	9.8%	9.6%
Japan	42,831.0	6.9%	7.7%	8.2%	8.2%	8.2%	8.5%	9.5%	9.5%
Korea, Rep.	20,756.7	3.9%	4.8%	5.7%	6.0%	6.3%	6.5%	6.9%	6.9%
Taiwan	18,276.7	5.3%	5.5%	6.2%	6.3%	6.2%	6.5%	6.9%	6.6%
<b>Geographic Benchmarks</b>									
North America	47,111.4	13.2%	13.1%	14.3%	15.3%	15.5%	15.9%	17.1%	17.2%
Euro area	36,618.2	9.1%	9.1%	9.9%	9.9%	9.8%	10.0%	10.9%	10.8%
European Union	32,310.7	8.7%	8.6%	9.4%	9.4%	9.3%	9.6%	10.5%	10.4%
Europe & Central Asia	22,526.8	8.5%	8.4%	9.1%	9.0%	8.9%	9.1%	10.0%	9.8%
Europe & Central Asia (developing only)	7,551.4	4.8%	5.3%	5.5%	5.6%	5.7%	5.4%	6.1%	5.8%
Latin America & Caribbean	8,822.3	6.5%	6.6%	6.9%	7.0%	7.2%	7.2%	7.8%	7.7%
Latin America & Caribbean (developing only)	8,552.1	6.5%	6.6%	6.9%	7.0%	7.2%	7.2%	7.8%	7.7%
East Asia & Pacific	7,351.5	6.0%	6.6%	6.7%	6.5%	6.3%	6.5%	7.0%	6.9%
East Asia & Pacific (developing only)	3,890.0	3.3%	4.2%	4.4%	4.3%	4.1%	4.4%	4.8%	4.8%
Arab World	5,424.4	4.0%	4.2%	3.8%	3.7%	3.8%	3.7%	4.7%	4.3%
Middle East & North Africa	6,448.3	4.5%	4.6%	4.4%	4.2%	4.3%	4.2%	5.1%	4.6%
South Asia	1,323.5	4.1%	4.3%	3.9%	3.9%	3.8%	3.8%	3.9%	3.9%
Sub-Saharan Africa	1,301.7	5.8%	6.0%	6.6%	6.3%	6.3%	6.2%	6.8%	6.5%
Sub-Saharan Africa (developing only)	1,286.2	5.8%	6.0%	6.7%	6.4%	6.4%	6.3%	6.9%	6.5%
Least developed countries: UN classification	726.4	4.2%	4.1%	4.5%	4.9%	4.8%	5.0%	5.5%	5.1%
Heavily indebted poor countries (HIPC)	673.5	4.7%	5.0%	5.4%	5.5%	5.8%	5.9%	6.1%	6.0%
<b>Income Group Benchmarks</b>									
High income	38,208.2	9.6%	10.1%	10.9%	11.3%	11.3%	11.5%	12.6%	12.5%
High income: OECD	39,521.1	9.7%	10.2%	11.1%	11.6%	11.5%	11.8%	12.8%	12.9%
Upper middle income	6,245.7	5.3%	5.7%	5.8%	5.7%	5.7%	5.7%	6.2%	6.1%
Middle income	3,992.3	5.0%	5.3%	5.4%	5.4%	5.4%	5.4%	5.8%	5.7%
Lower middle income	1,749.6	3.9%	4.2%	4.3%	4.2%	4.3%	4.3%	4.4%	4.3%
Low & middle income	3,512.8	5.0%	5.3%	5.4%	5.4%	5.4%	5.4%	5.8%	5.7%
Low income	523.1	4.0%	4.0%	4.8%	5.3%	5.1%	5.0%	5.3%	5.3%
<b>World - Median</b>	<b>4,408.8</b>	<b>5.3%</b>	<b>5.7%</b>	<b>6.1%</b>	<b>6.2%</b>	<b>6.1%</b>	<b>6.0%</b>	<b>6.6%</b>	<b>6.6%</b>
<b>World</b>	<b>9,228.0</b>	<b>8.8%</b>	<b>9.2%</b>	<b>9.7%</b>	<b>9.9%</b>	<b>9.8%</b>	<b>9.8%</b>	<b>10.6%</b>	<b>10.4%</b>

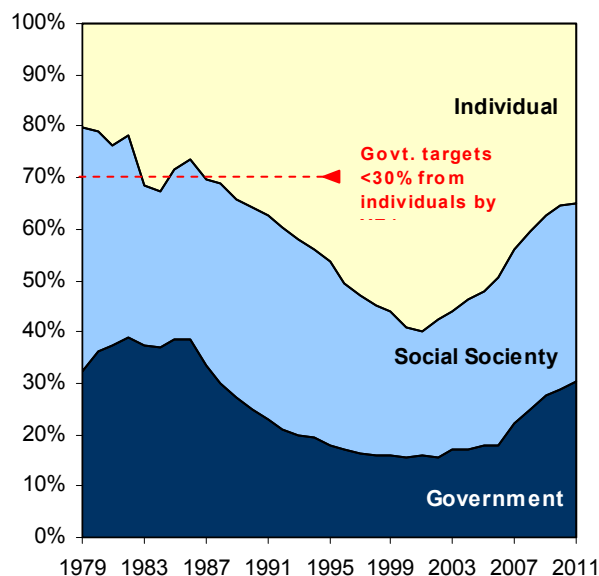
Source: Citi Research, World Bank, OECD, IMF



## Government Funding is Inadequate

Government funding only accounted for ~30.4% of total national health expenditure (NHE) in China in 2011. Comparing with the world average of 59.3%, it appears that the Chinese government should play a more important role in funding the health system.

Figure 50. Breakdown of Health Expenditure By Contributor (1979-2011)



Source: Citi Research, Citi Research, Ministry of Health

## Price-Volume Model: Assess the Impact of Government Funding Improvement

To better understand the impact of improvement in government funding on the pharmaceutical market we modeled a simplified price-volume curve based on: 1) average hospital purchase price for drugs and total drug volume from 418 sample hospitals in 22 major cities from 2005-2011, and 2) government spending on health from 2005-2011.

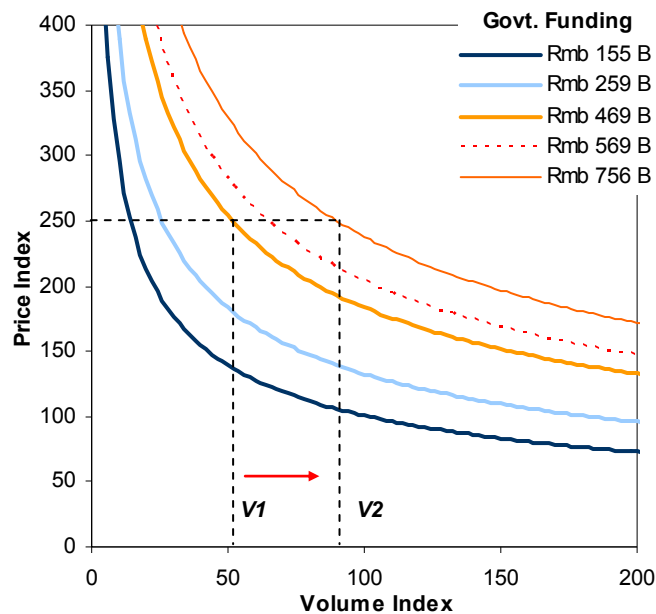
**Formula: Government Funding =  $\text{Exp}(C) * (\text{Price}^{1.84}) * (\text{Volume}^{0.86})$**

**with  $C = -7.85$**

Based on our analysis:

- Improvement in government funding could drive drug volume, while the drug price maintained, implying that medical demands from patients could be better served without compromising pharma companies' profitability (Figure 51);

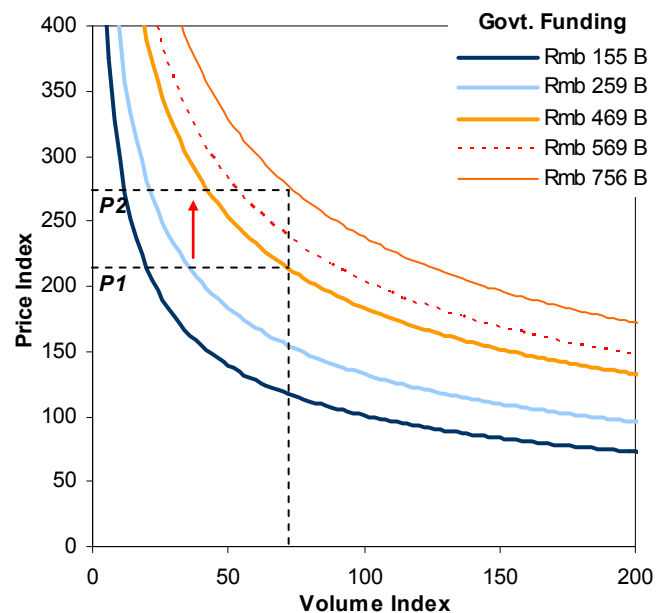
Figure 51. Impact of Improvement in Government Funding (Volume)



Source: Citi Research, Pharma Database, Ministry of Finance, Ministry of Health

- While the drug volume stays the same, higher government funding could lead to higher drug prices, implying that pharma companies could capture more profit and be better motivated to develop innovative drugs, as higher-priced drugs become more affordable with better government funding (Figure 52);

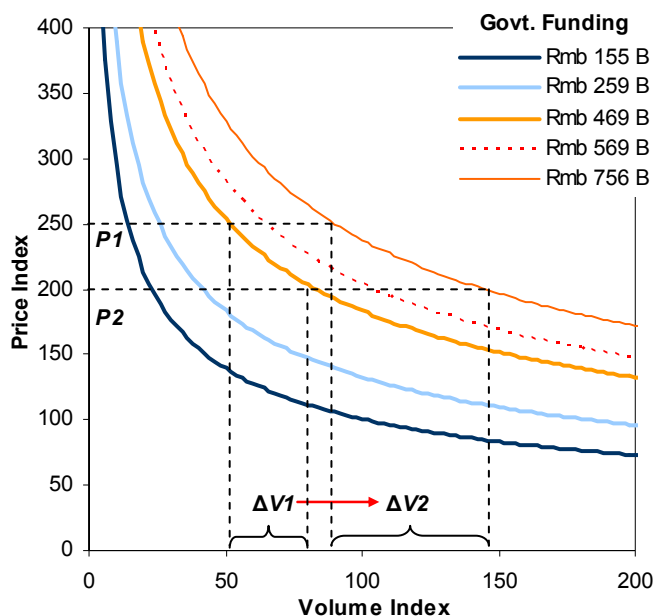
Figure 52. Impact of Improvement in Government Funding (Volume)



Source: Citi Research, Pharma Database, Ministry of Finance, Ministry of Health

- Furthermore, the government price regulation could be more effective given that for every additional funding of RMB100bn, the same magnitude of price cuts could lead to ~25% additional volume increase (Figure 53).

Figure 53. Impact of Improvement in Government Funding (Price/Volume Change)

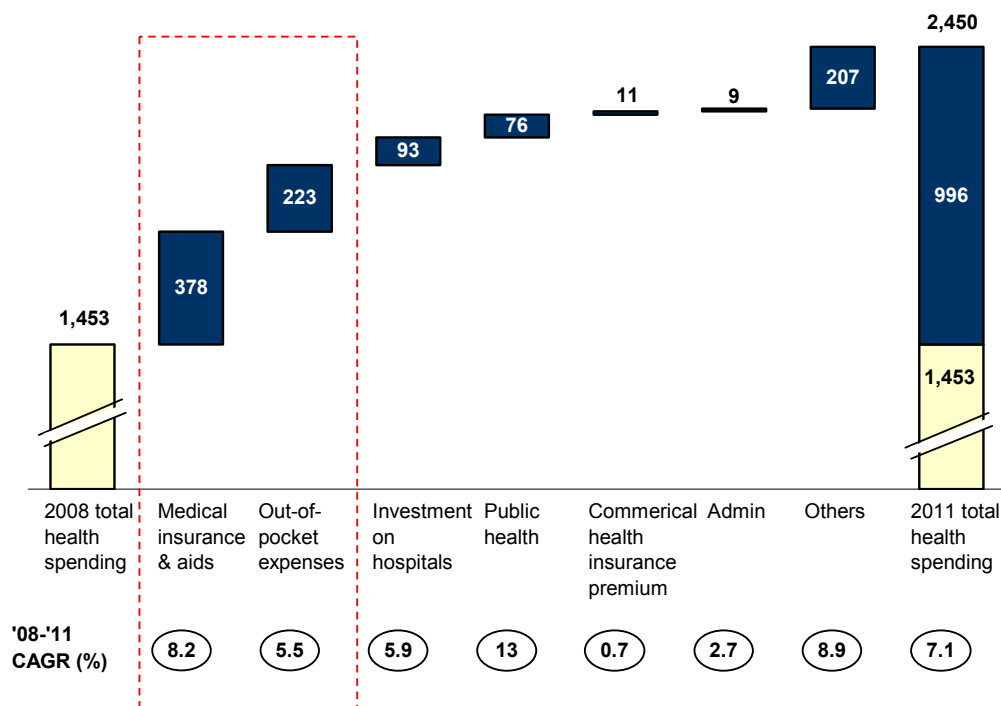


Source: Citi Research, Pharma Database, Ministry of Finance, Ministry of Health

### Out-of-Pocket Expenses Remained as One of the Major Drivers for Healthcare Spending

We break down the incremental growth of health spending from 2008-2011, and our analysis suggests that while the increase in funding to medical insurance and medical aid was the major driver for health spending growth during the first three years of the ongoing healthcare reform, the out-of-pocket expense remained as one of the major contributor to health system (~22% of total incremental health spending from 2008-2011).

Figure 54. Growth in National Health Spending 2008-2011 (RMB Billion)



Source: Citi Research, Ministry of Health

### Government Funding Targeted Rural Medical Insurance

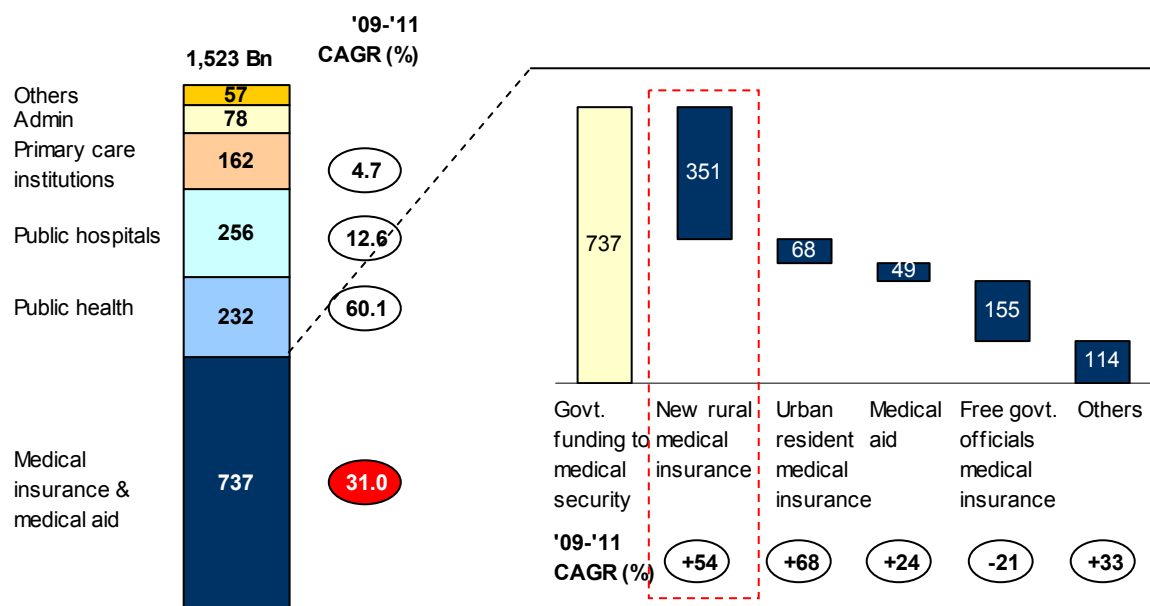
Total government fiscal spending on health during the past three years was RMB1,523bn, higher than the investment of RMB850bn promised by the government for the 3-year healthcare reform. Medical insurance and medical aid is the focus of government funding (~48% of total funding) and the rural population is the major beneficiary of the improvement in government funding. The new rural cooperative medical insurance scheme (NRCMI 新农合) is the single largest funding target, attracting 23% of total government funding from 2009-2011.

While the focus of future government funding remains unclear, we expect medical insurance fund and county-level hospitals upgrade are two key aspects to be covered, since:

- Medical insurance fund is facing some challenges: 1) small size (RMB723bn) vs. large population (>1.3bn); 2) stronger growth in outflow (28.2% 2008-2011 CAGR) than in inflow (23.6%); and 3) funding for increasing reimbursement level and medical service fees;
- County-level hospitals are a critical component of the Chinese hospital system, connecting higher-tier hospitals and lower-tier primary care institutions. However, the service level remains low at county-level hospitals, driving patient volume to higher-tier hospitals and resulting in significant imbalance in the health system.

By sizing up the medical insurance fund and improving the service quality at county-level hospitals, the growing medical demand could be better addressed with higher efficiency.

Figure 55. Government Spending Breakdown (2009-2011) (RMB Billion)



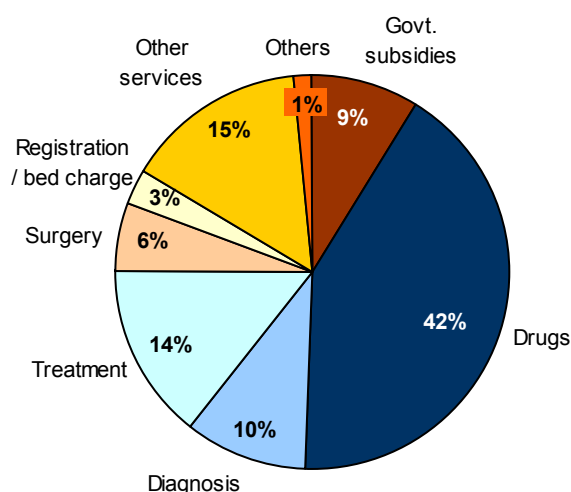
Source: Citi Research and Ministry of Finance

## Structural Issues Led to Imbalance and Inefficiency in Chinese Health System

### Hospitals Heavily Rely on Drug Mark-up for Profit

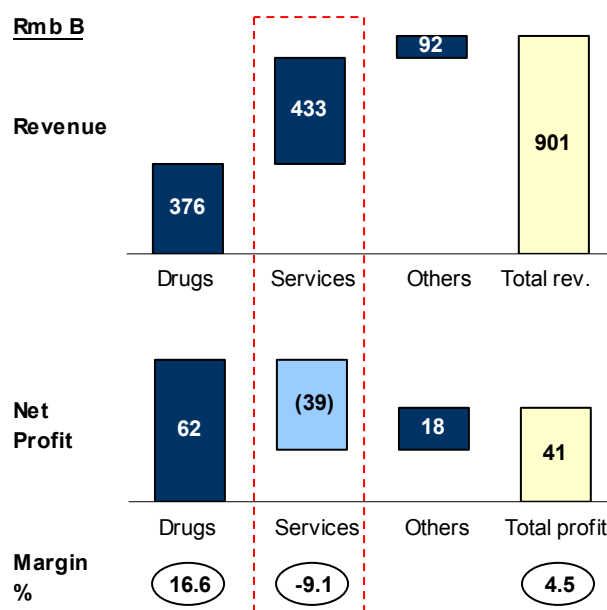
Hospitals revenue in China consists of: 1) drug sales; 2) medical services fees; and 3) government subsidies. Our analysis of hospital revenue structure suggests that drug sales are major revenue and profit contributor to hospitals, with drugs accounting for 42% of total public hospital revenue in 2010, and part of the drug mark-ups are used to cover the loss from medical services.

Figure 56. Breakdown of Hospital Revenue, 2010



Source: Citi Research and Ministry of Health

Figure 57. Revenue and Profit of Chinese Public Hospitals, 2010



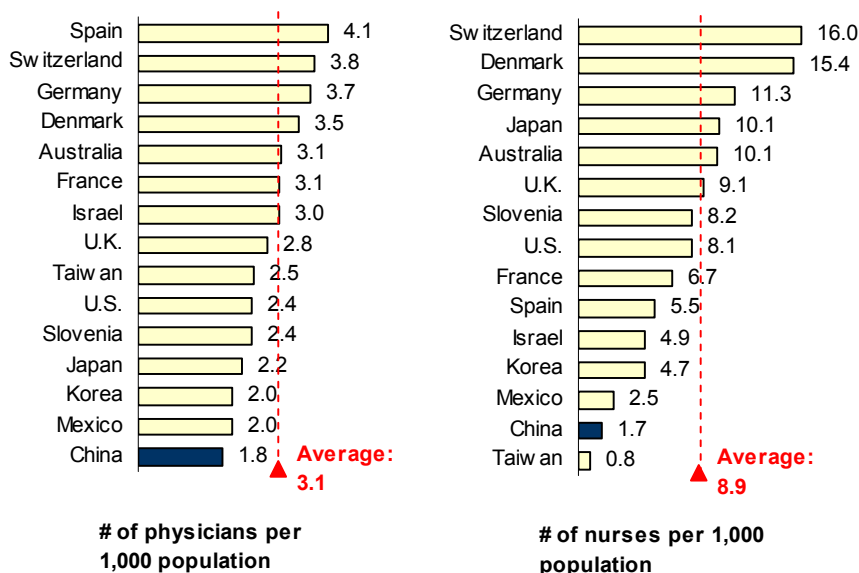
Source: Citi Research and Ministry of Health

### Shortage in Medical Resources: Physicians, Nurses and Hospital Beds

The most critical medical resources in hospitals include physicians, nurses and hospital beds, which define hospitals' capacity. The capacity constraints, i.e. the supply shortage of key resources, could decouple the growth in medical demand and the healthcare market.

The number of physicians and nurses per 1,000 head of population in China is well below the OECD average, leading to: 1) lower accessibility of medical services, 2) more workload for physicians and nurses, and 3) potentially poorer quality of medical services.

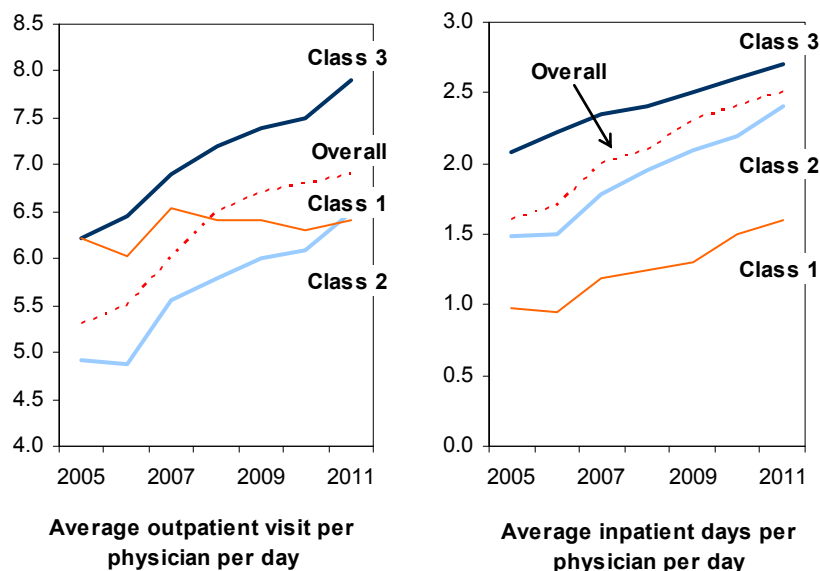
Figure 58. Medical Staff Density Per 1000 Population: China vs. OECD Members



Source: Citi Research, OECD, Ministry of Health, Taiwan Department of Health

The supply shortage of physicians is also reflected in the increase in physician workload, as the each one has to take care of 6.9 outpatient visits (vs. 5.5 in 2006) and 2.5 inpatient days (vs. 1.7 in 2006) every day, representing growth of 25.5% and 47.1% during the past five years, respectively.

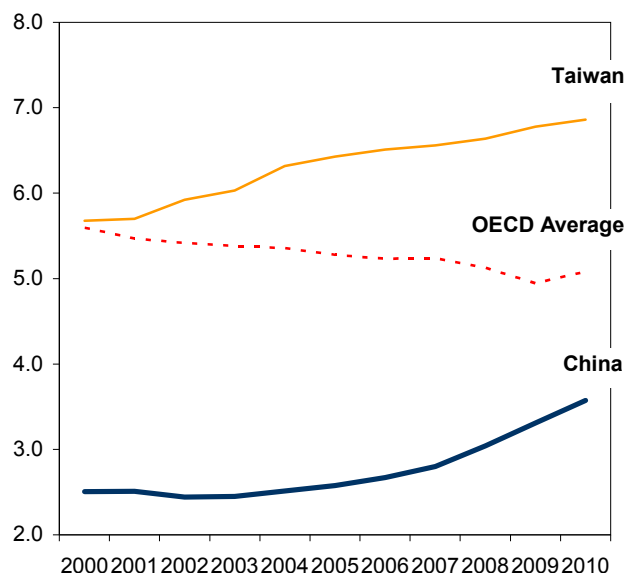
Figure 59. Physician Workload in Chinese Hospitals



Source: Citi Research, Ministry of Health

Hospital beds are also insufficient to meet the growing medical demand in China. The number of hospital beds per 1,000 head of population has improved from 2.5 in 2000 to 3.8 in 2011 with active hospital constructions and expansion; however, it remains below the OECD average of 5.1 and also 6.9 in Taiwan.

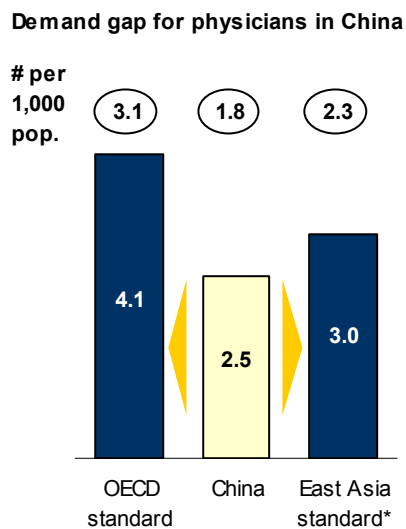
Figure 60. Beds Per 1000 Population: China vs. OECD Average & Taiwan



Source: Citi Research, Ministry of Health, OECD, Taiwan Department of Health (DOH)

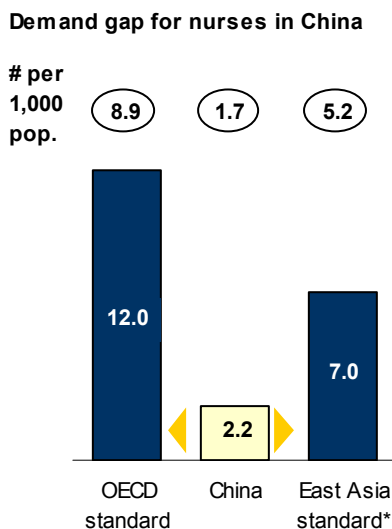
We use the OECD average and also the average of Japan, South Korea and Taiwan as benchmarks to assess the demand gap for physicians, nurses and hospital beds in China. Our analysis suggests that: 1) to catch up with OECD standards, a total of 1.6 million physicians, 9.8 million nurses, and 2 million hospital beds need added into the system; and 2) to be in-line with the service level in East Asia regions, China needs another 0.5 million physicians, 4.8 million nurses, and 8.3 million hospitals beds to be recruited or built.

Figure 61. Demand Gap for Physicians in China



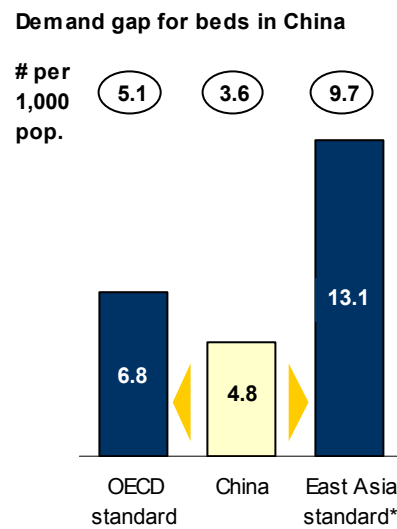
\*: calculated based on average # of physicians per 1,000 population in Japan, Taiwan and Korea

Figure 62. Demand Gap for Nurses in China



\*: calculated based on average # of nurses per 1,000 population in Japan, Taiwan and Korea

Figure 63. Demand Gap for Hospital Beds



\*: calculated based on average # of hospital beds per 1,000 population in Japan, Taiwan and Korea

Source: Citi Research, OECD, Taiwan DOH

Source: Citi Research, OECD, Taiwan DOH

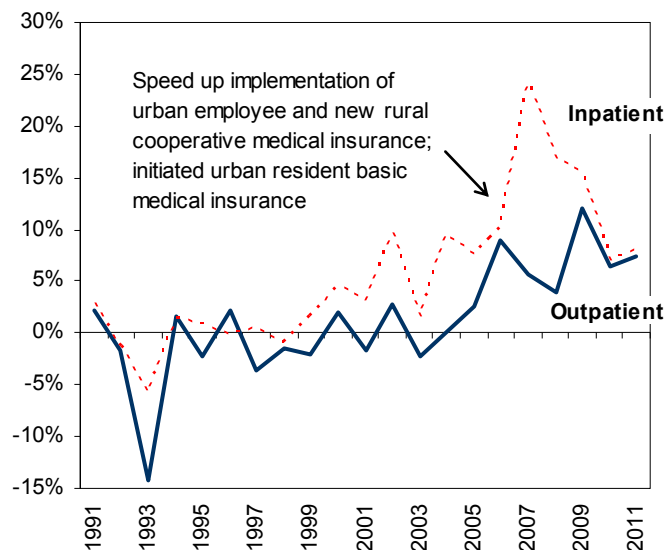
Source: Citi Research, OECD, Taiwan DOH



## Higher-Tier Hospitals Attract Too Much Patient Flow

Improvement in medical insurance coverage has driven up the growth in patient flow in 2006-2009, particularly in inpatient visits, which were more costly and unaffordable for some patients without reimbursement. The rate was moderate in 2010 and 2011, as the coverage is near-complete.

Figure 64. Patient Flow Growth (1991-2011)

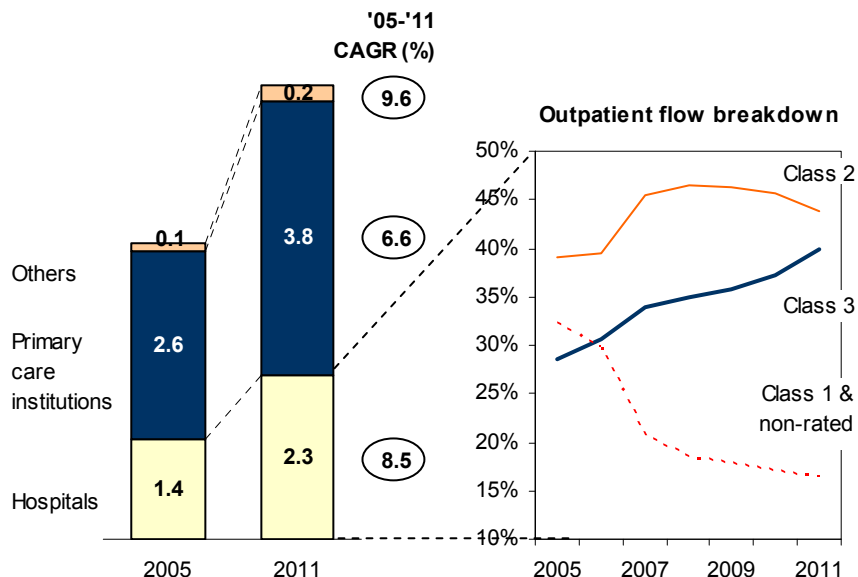


Source: Citi Research, Ministry of Health

The government aimed to increase the patient flow to primary care institutions and lower-tier hospitals, and the initiation of a new rural cooperative medical insurance program (NRCMI) improved patient flow to primary care institutions from 2005-2008 (27.9% CAGR for inpatient visit). However, growth in patient flow to Class 3 hospitals, particularly more lucrative inpatient volume, picked up since 2008 (14.4% in 2008, 14.7% in 2009, 16.1% in 2010 and 20% in 2011).

The primary care institutions attracted 60.8% of outpatient flow in 2011 vs. 63.3% in 2005. In the hospital system, the market share of Class 3 hospitals increased from 9.7% in 2005 to 14.4% in 2011, while that of Class 2 hospitals and below declined slightly since 2007.

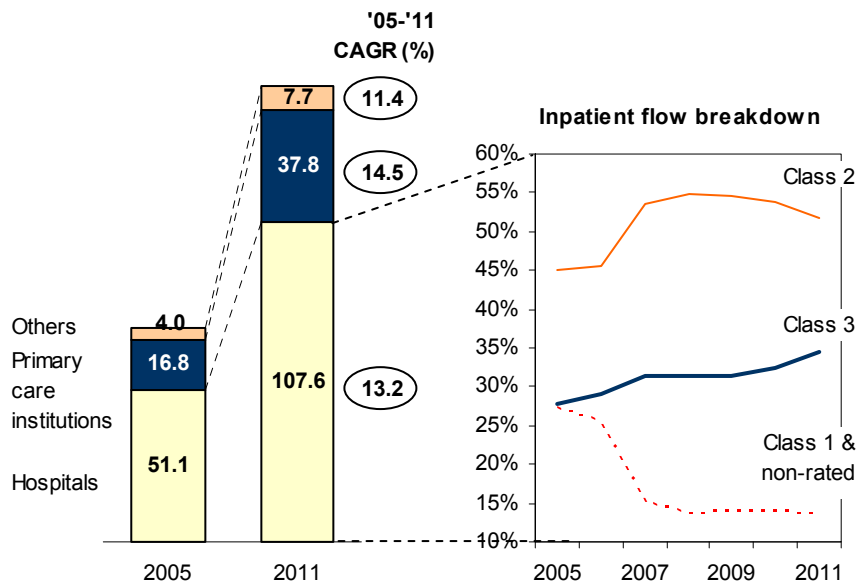
Figure 65. Breakdown of Outpatient Flow (Billion)



Source: Citi Research, Ministry of Health

Inpatient care is more lucrative, and a total of 70.3% of inpatient flow was captured by hospitals. Similarly, Class 3 hospitals led the growth of inpatient flow, accounting for 20% of total inpatient volume in 2011 vs. 13.9% in 2005.

Figure 66. Breakdown of Inpatient Flow (Million)



Source: Citi Research, Ministry of Health

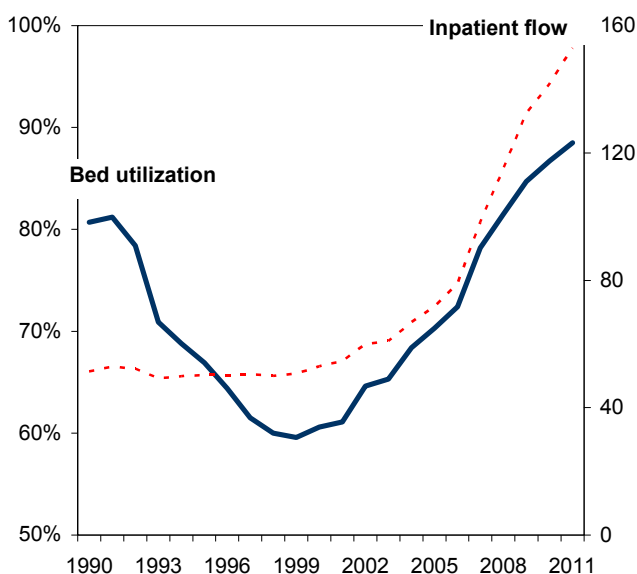
We believe hospital visiting behavior of patients was largely due to:

- **Lack of mandatory referral system** – Chinese patients are not required to visit primary care institutions or consult with general practitioners before being referred to higher-tier hospitals. Thus, patients with minor ailments also visit Class 2/3 hospitals for diagnosis and treatment.
- **Imbalance in resources allocation** – The best medical resources were allocated to higher-tier hospitals, including the most experienced and reputable physicians, well-established infrastructure, and sufficient funding.
- **EDL policies implemented in primary care institutions** – 1) EDL drugs are insufficient to meet patients' demand; 2) zero mark-up on EDL drugs delinked physicians' profit from drug sales, reducing the incentive for them to treat more patients. Our proprietary survey suggests that the patients flow in primary care institutions were diverted to either higher-tier hospitals (noted by 42.7% of respondents) or retail pharmacies (noted by 2.4% of respondents).
- **Better affordability with higher medical insurance coverage** – With the launch of NRCMI, the affordability of medical services to rural population has significantly improved, with average reimbursement rate for inpatient reaching ~40%-50% by 2011.

## Bed Utilization is Inefficient and Imbalanced

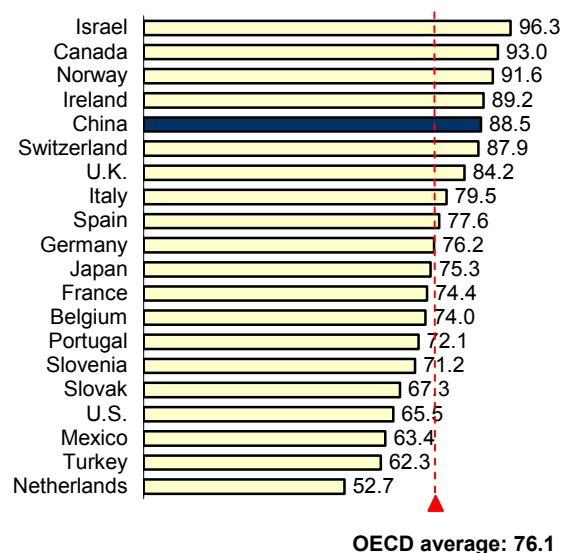
The bed utilization in China increased from ~60% in 2000 to 88.5% in 2011, driven by strong growth in inpatient flow. Comparing OECD members, the bed utilization rate in China was above the OECD average of 76.1%, and higher than that in US, Japan and UK.

Figure 67. Hospital Bed Utilization vs. Inpatient Flow



Source: Citi Research and Ministry of Health

Figure 68. Hospital Bed Utilization in China vs. OECD



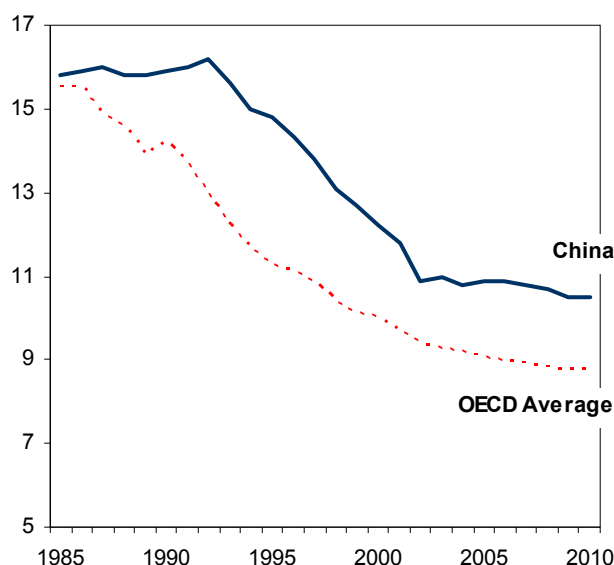
Source: Citi Research, Ministry of Health, OECD

### Long Hospitalization Resulted in Inefficient Bed Utilization

Lengthy hospital stay is one of the major reasons driving the bed utilization rate in China. The average days for an inpatient staying in hospital in 2010 was 10.5 days, notably improved from over 15 days in 1990 but still higher than OECD average of 8.8 days. Long hospital stays are largely due to: 1) lack of referral system to refer patients at rehabilitation stage to primary care institutions; 2) lack of mandatory discharge mechanism; and 3) low daily bed charge.

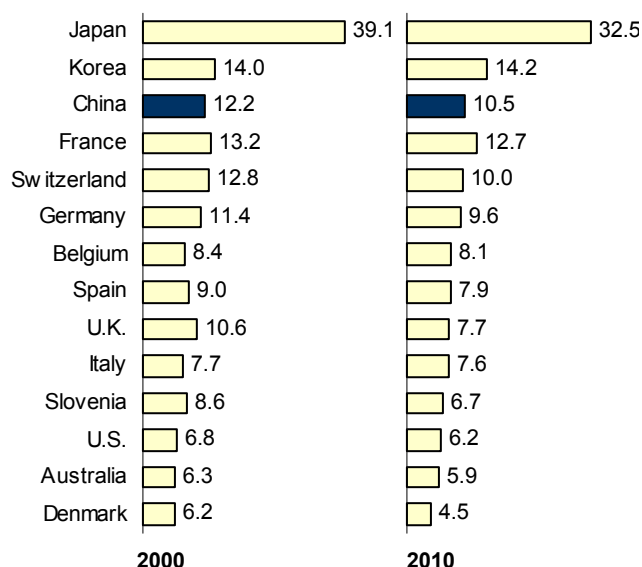
It is worth noting that the high hospital stay in Japan is due to: 1) the number include patients with mental disorder and tuberculosis, which requires much longer period of inpatient care; and 2) similarly, there is no mandatory discharge system in Japan, thus patients that might not be able to receive appropriate daily care after discharge could stay in hospitals for rehabilitation.

Figure 69. Average Length of Hospital Stay



Source: Citi Research, Ministry of Health, OECD

Figure 70. Average Length of Hospital Stay: China vs. OECD Members

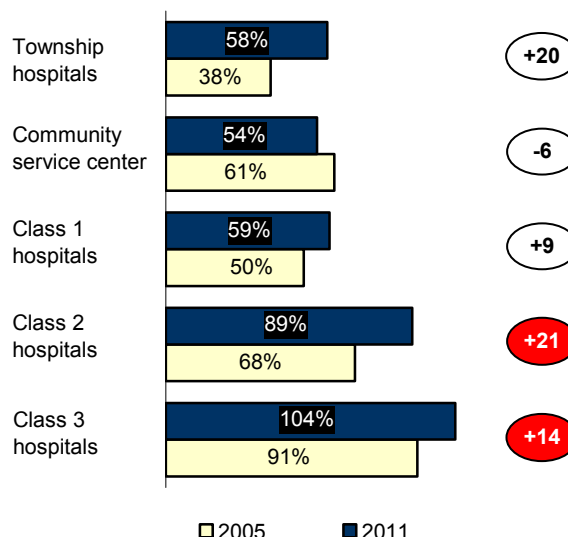


Source: Citi Research, Ministry of Health, OECD

### Large Disparities Remain Among Different Classes of Medical Institutions

Looking into different medical institutions, while the higher-tier hospitals are overloaded with bed utilization rate reaching 104% in Class 3 hospitals and 89% in Class 2 hospitals, the bed utilization in Class 1 hospitals and primary care institutions remains low at 50%-60%. The disparity in bed utilization was due to the imbalance in inpatient flow, as patients still prefer Class 2/3 hospitals.

Figure 71. Change of Hospital Bed Utilization in Hospitals and Primary Care Institutions

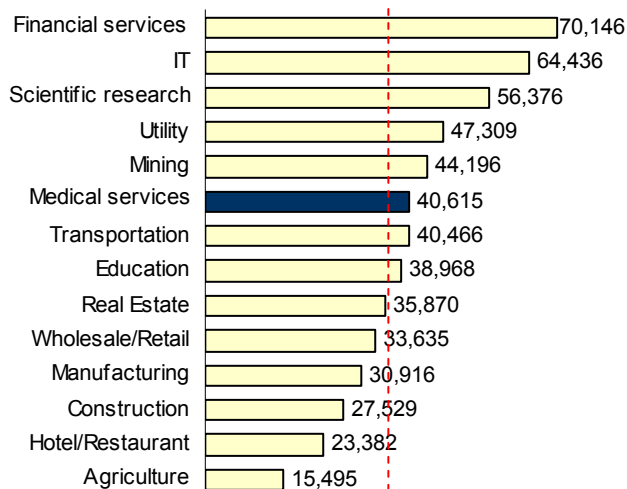


Source: Citi Research and Ministry of Health

## Physicians Relatively Underpaid in China

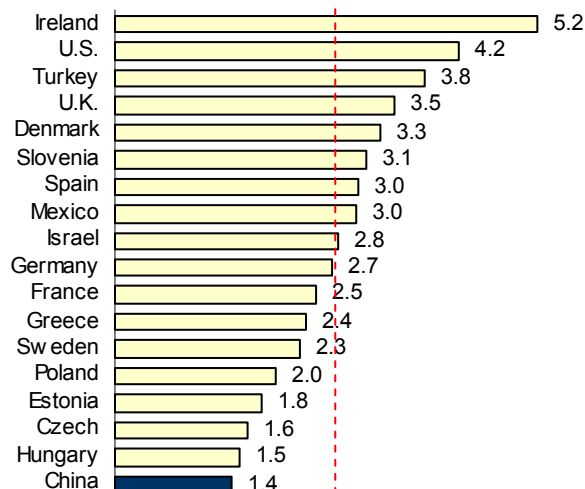
The physicians' salary/GDP per capita ratio in China was 1.4, much lower than the OECD average of 2.8 and that in developed markets (US: 4.2, UK: 3.5, Germany: 2.7). Comparing with employees in other industries in China, medical services are not among the best-paid jobs, and the average income of medical professionals was only 11.2% higher than the average employee income in China, vs. employees of IT and financial services companies that were paid at 76.4% and 92% premium to the national average, respectively.

Figure 72. Cross-Industry Salary Comparison



Average: 36,529

Figure 73. Physicians' Salary / GDP Per Capita in China vs. OECD



OECD average: 2.8

Source: Citi Research, Ministry of Human Resources and Social Security

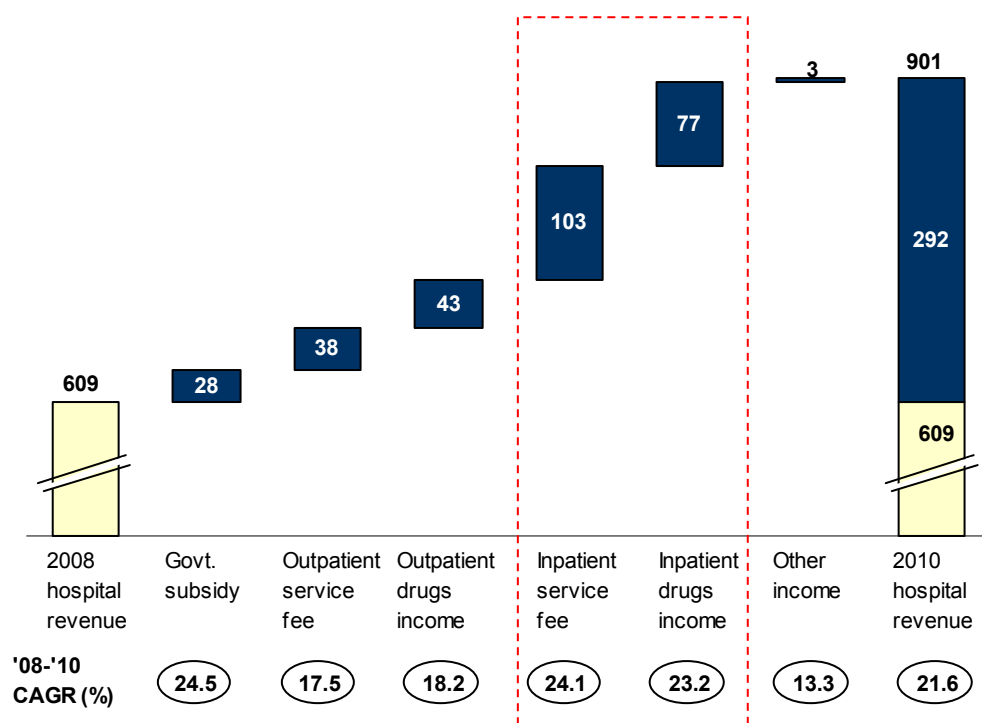
Source: Citi Research, OECD, Ministry of Human Resources and Social Security

## Hospital Revenue Structure: Detailed Analysis

### Inpatient Care Is the Revenue Driver for Hospitals

Total revenue of public hospitals in China increased from RMB609bn in 2008 to RMB901bn in 2010 (21.6% CAGR). Our analysis shows that inpatient service fee and drug spending were the fastest-growing components of hospital revenue (CAGR's of 24.1% and 23.2%, respectively), accounting for 35.4% and 26.3% of the incremental hospital revenue from 2008-2010, respectively. The growth in government subsidies to hospitals was strong during the first two years of the ongoing healthcare reform, but the contribution to total hospital revenue remains small.

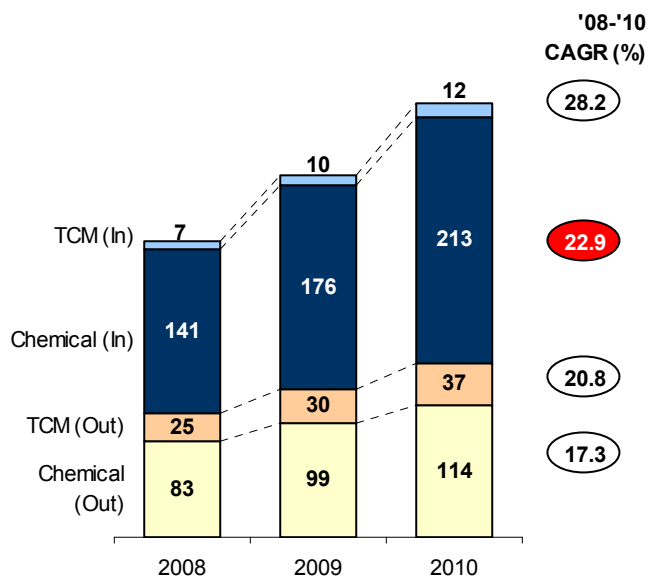
Figure 74. Dissecting Growth in Hospital Revenue from 2008-2010 (RMB Billion)



Source: Citi Research, Ministry of Health

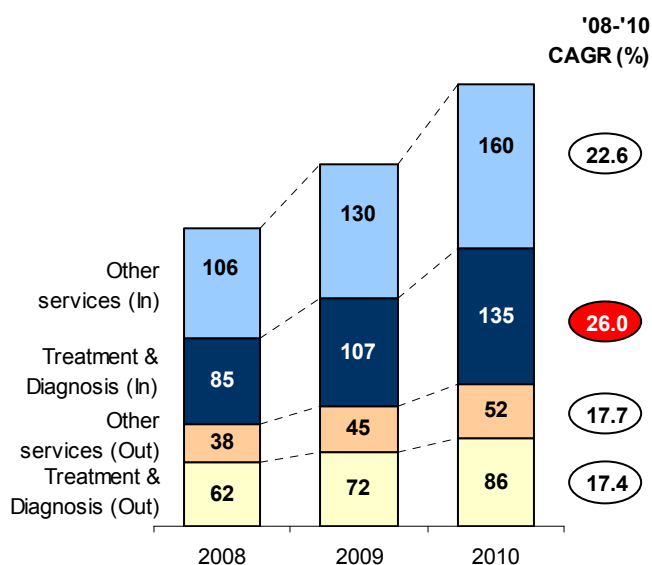
The breakdown of drug income and service charge further suggests that: 1) chemical drugs sales and 2) diagnosis/treatment services for inpatients are the most lucrative segments for hospitals, and have captured solid growth from 2008-2010.

Figure 75. Hospital Drug Income Breakdown 2008-2010 (RMB Billion)



Source: Citi Research, Ministry of Health

Figure 76. Hospital Service Charge Breakdown 2008-2010 (RMB Billion)

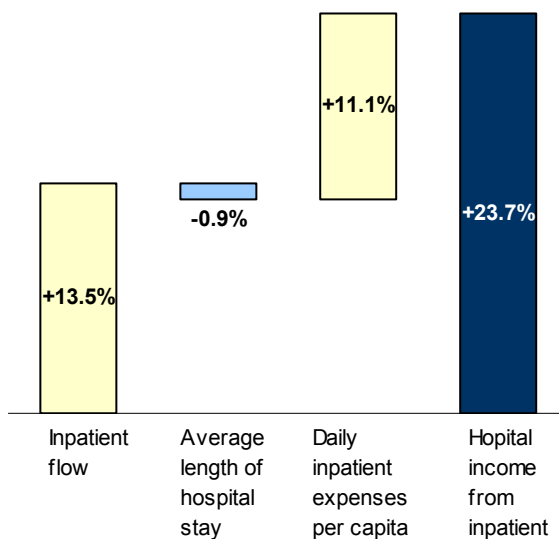


Source: Citi Research, Ministry of Health

## Dissecting Inpatient Expenses

Total hospital revenue generated from inpatients grew at 23.7% CAGR from 2008-2010, largely driven by: 1) growing inpatient flow (13.5%) and 2) increase in daily expenses per capita (11.1%), and partially offset by slightly shortened average hospital stay, which decreased from 10.7 days in 2008 to 10.5 days in 2010.

Figure 77. What Drives Revenue from Inpatient Care? (2008-2010 CAGR)

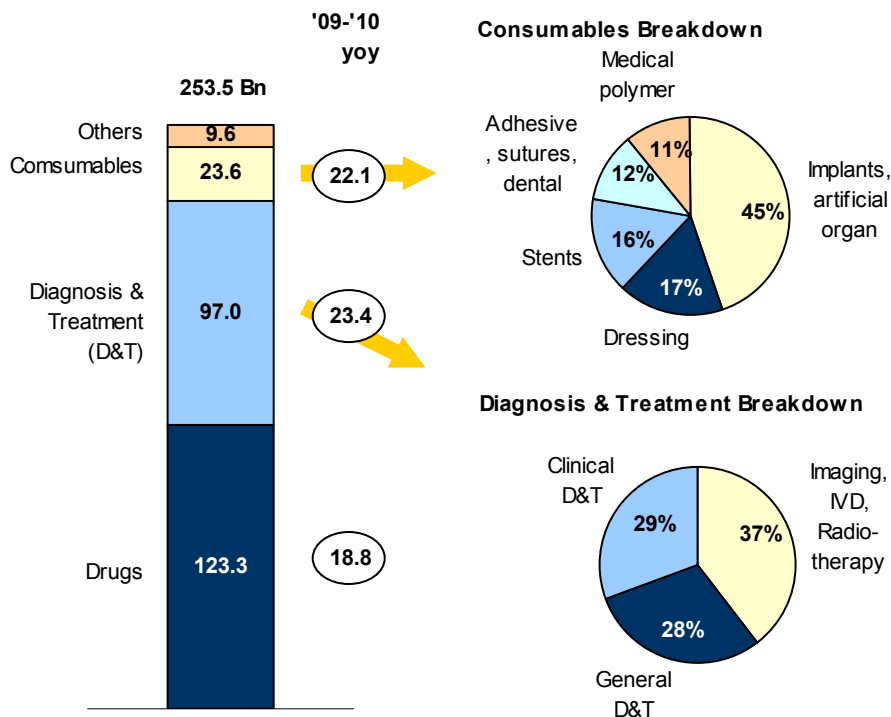


Source: Citi Research

We dissect inpatient expenses, the major revenue driver for hospitals, to determine which key components drove up the expenses. The China Health Insurance Research Association on inpatients medical expenses of insured population in 2010, and our analysis of the survey data suggests that the major revenue contributors include:

- **NRDL drugs** – The spending on drugs composed 48.6% of the inpatient expenses. While NRDL drugs only accounted for 36.6% of a total of 7,634 drugs prescribed, they contributed 63.8% of total drug expenses.
- **Imaging and IVD** – A diagnosis and treatment (D&T) service was the fastest-growing component, accounting for 38.3% of total inpatient expenses. The imaging and IVD testing were major D&T services (37% of share), and CT, MRI and color ultrasound were the Top 3 services prescribed.
- **Implants/Artificial Organs and Stents** – Among six major categories of medical consumables, implants/artificial organs (such as orthopedics and pacemakers) and stents are major revenue contributors, given the high costs (stent: over RMB10K, pacemaker/artificial heart: over RMB20K per unit). While medical polymer (such as infusion sets and syringes) and medical dressings are widely used, those traditional consumables are less profitable for hospitals.

Figure 78. Detailed Breakdown of Inpatient Expenses (2010)



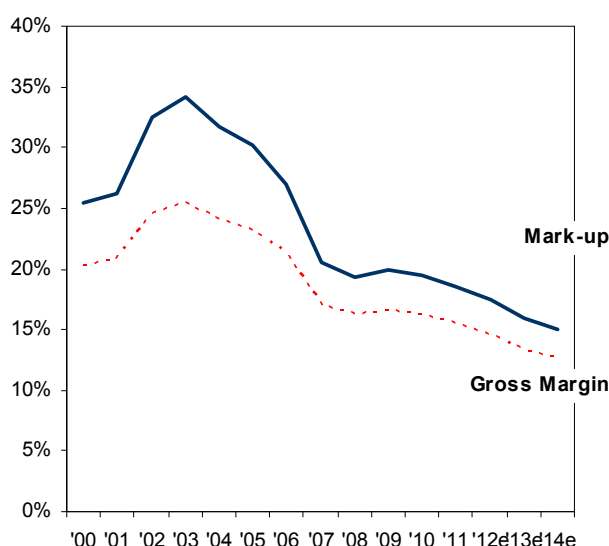
Source: Citi Research, China Health Insurance Research Association



## Drug Mark-up is Trending Down

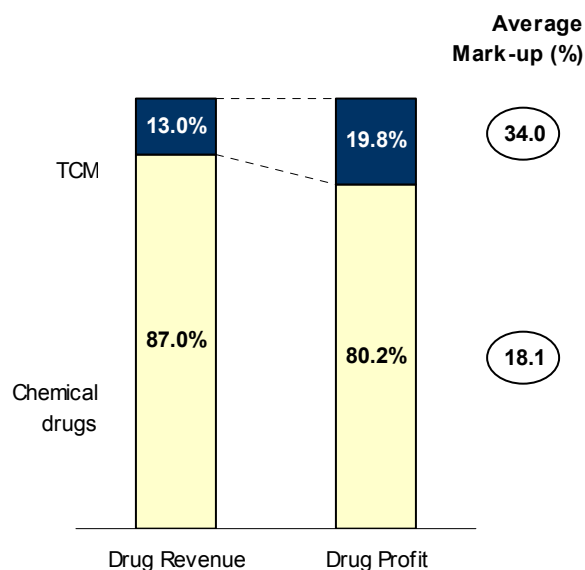
NDRC released a drug mark-up regulation in 2006, capping the mark-up on chemical/biologics drugs at 15% and TCM herbs at 25% in Chinese hospitals, and the blended drug mark-up in hospitals decreased from 34.2% in 2003 to 19.4% in 2010. The mark-up could continue to trend down in 2012 and beyond, since government initiated the trial version of eliminating drug mark-up in major cities, such as Beijing and Shenzhen, as well as in 311 counties across 18 provinces/cities, as a key step to take away hospital's dependency on selling drugs (以药养医) and pave the way to separate hospital pharmacies from hospitals. We expect more cities will adopt the trials in 2013 (e.g. Shanghai is planning for similar trial).

Figure 79. Drug Mark-up Trend



Source: Citi Research and Ministry of Health

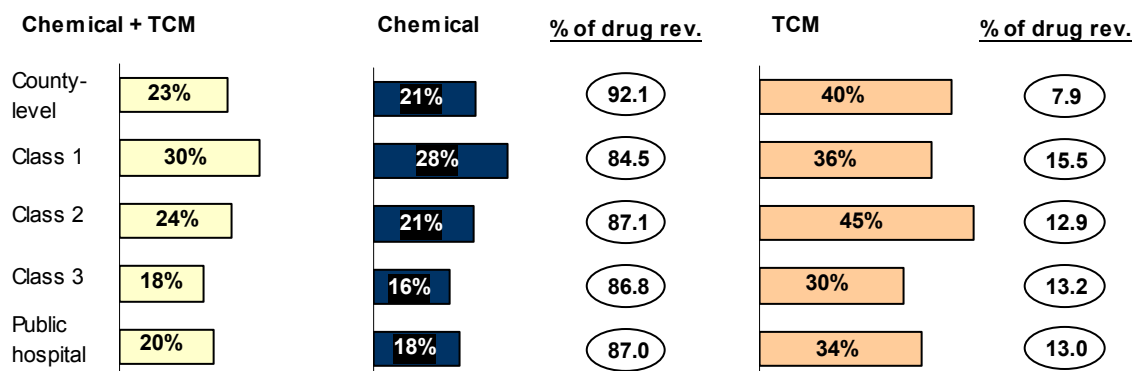
Figure 80. TCM is More Profitable



Source: Citi Research, Ministry of Health

In general, the average drug mark-up was lower in higher-tier hospitals, since: 1) they are more closely monitored by regulators; 2) they are in a better financial position; and 3) less use of TCM products, which have higher margin.

Figure 81. Drug Mark-up By Hospital Class

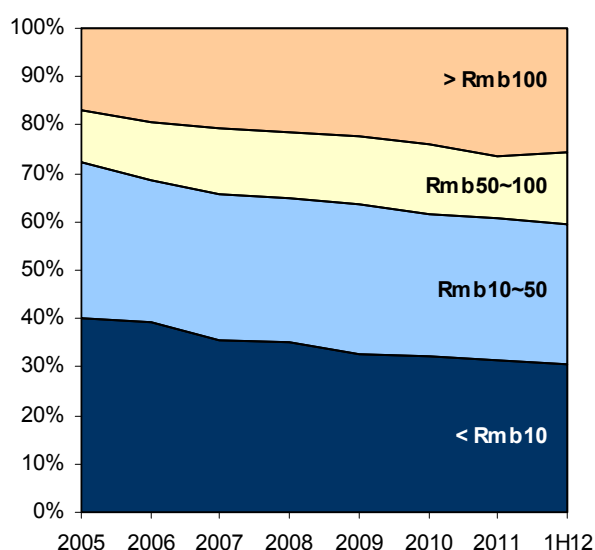


Source: Citi Research and Ministry of Health

## More Expensive Drugs Are Prescribed in Hospital

Despite the price erosion for individual drugs and mark-up decline in hospitals, drug expenses of patients have kept increasing. One of the major reasons is that the prescriptions are skewed to higher-priced drugs. Our analysis of prescription data from sample hospitals suggests that: 1) drugs with average hospitals purchase price of <Rmb10 per unit (e.g. one tablet/capsule/injection) accounted for ~30% of total drug sales in 1H12, vs. 40% in 2005; and 2) the market share of expensive drugs priced >Rmb100 per unit, such as antibodies and high-end anti-infective drugs, increased from 17% in 2005 to 26% in 1H12, due to disease demographic shift, higher income level of patients, and physicians intention to prescribe for profit.

Figure 82. Breakdown of Prescription Drug Sales By ASP ('05-'12)



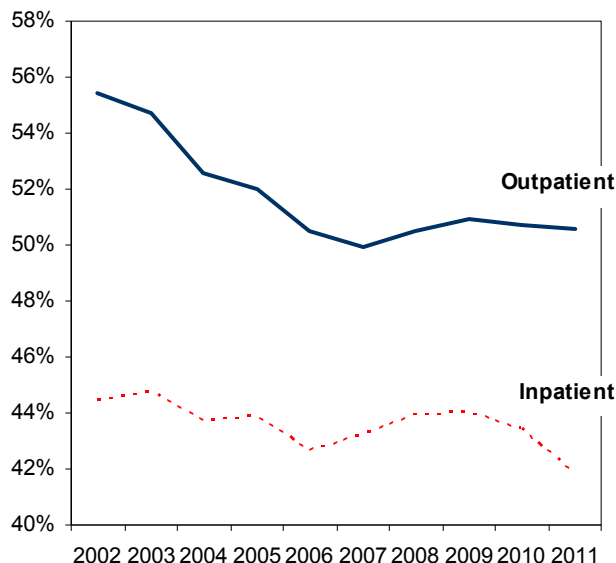
Source: Citi Research and Pharma Database

## Revenue Structure Shifting From Drugs to Diagnosis Fees

With the declining drug mark-up and government efforts to reduce hospital dependency on selling drugs, we expect the hospital revenue structure to shift to diagnosis fees and other general services fees.

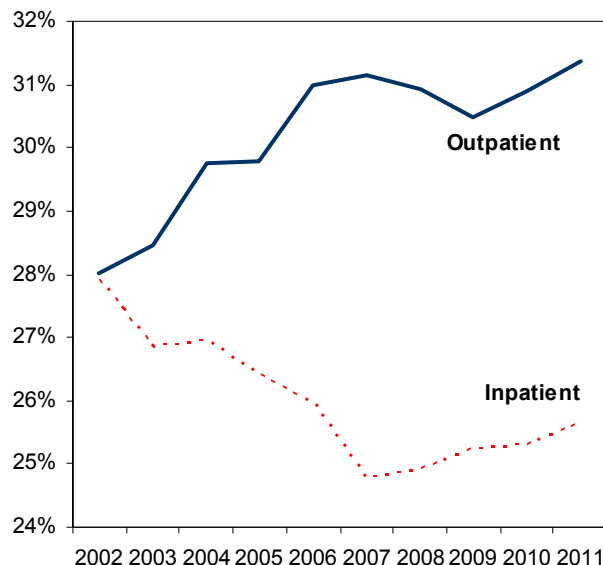
Our analysis of medical expenses data suggests that drug spending as % of total medical expenses was declining, slightly for outpatients and more notable for inpatients, while diagnosis/treatment fee contribution is growing to compensate the decrease in drug mark-up.

Figure 83. Drugs as % of Average Per Visit Expenses



Source: Citi Research, Ministry of Health

Figure 84. Diagnosis/Treatment Fee as % of Average Visit Expenses

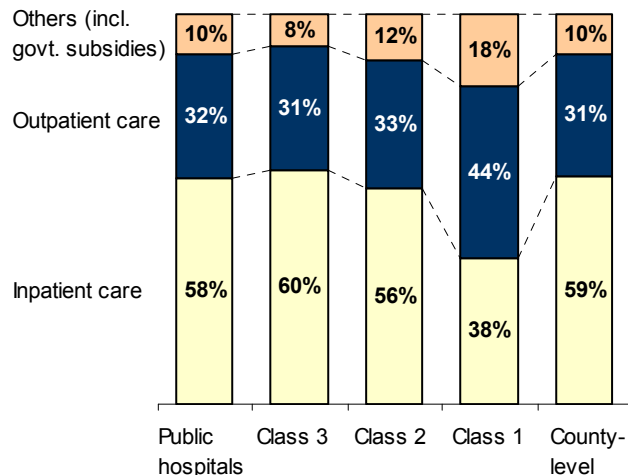


Source: Citi Research, Ministry of Health

The revenue structure is slightly different in Class 3/2/1 and county-level hospitals:

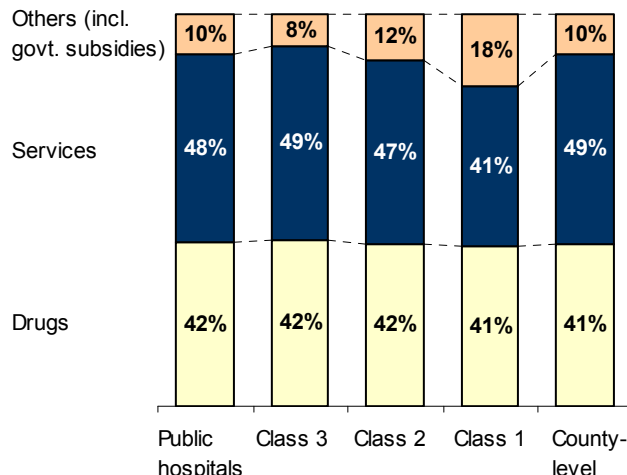
- Higher-tier hospitals capture more revenue from inpatient care, while lower-tier hospitals focus on outpatient care and rely more on government subsidies;
- While revenue contribution from drugs is consistent across all classes of hospitals, higher-tier hospitals are more capable of generating revenue from services, largely due to: 1) installment of more advanced equipment for higher-priced diagnosis and testing; 2) reputation and experience in treating major diseases, including conducting sophisticated surgeries, which are generally more costly; and 3) higher service fee standards preset by government.

Figure 85. Revenue Structure: Inpatient vs. Outpatient



Source: Citi Research, Ministry of Health

Figure 86. Revenue Structure: Drugs vs. Services

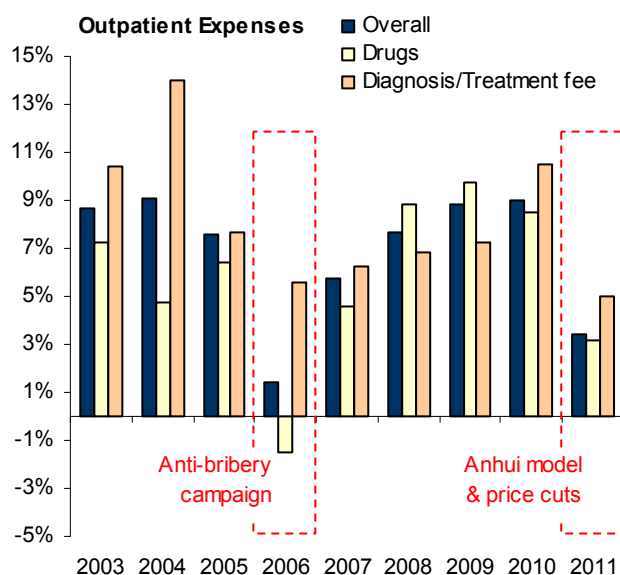


Source: Citi Research, Ministry of Health

## Policy Changes Impact On Medical Expense Growth

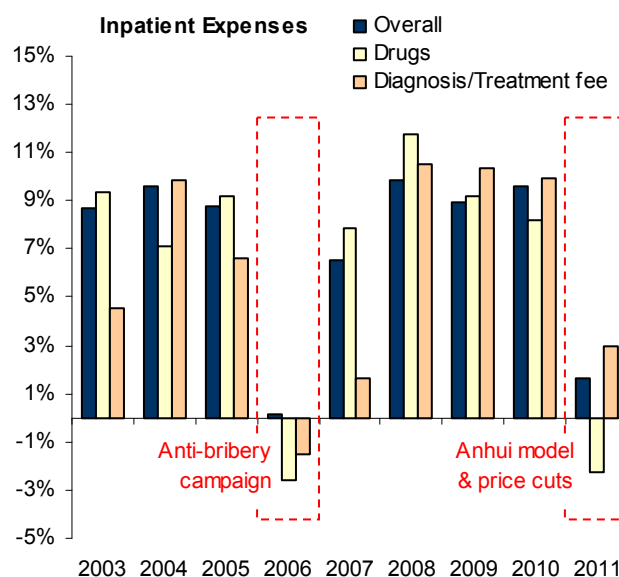
As drug mark-up and service fee standards were highly regulated by government, leaving little room for hospitals to adjust prices, policy changes could pose notable impact on medical expenses growth. The anti-bribery campaign across the Chinese health system and healthcare industry in 2006, and the implementation of EDL Anhui model and NDRC price cuts in 2011, have significantly slowed down the medical expenses growth, thus have impacted hospitals' revenue.

Figure 87. Growth of Outpatient Expenses Per Capita



Source: Citi Research, Ministry of Health

Figure 88. Growth of Inpatient Expenses Per Capita



Source: Citi Research, Ministry of Health

## Closer Look at Key Upcoming Changes

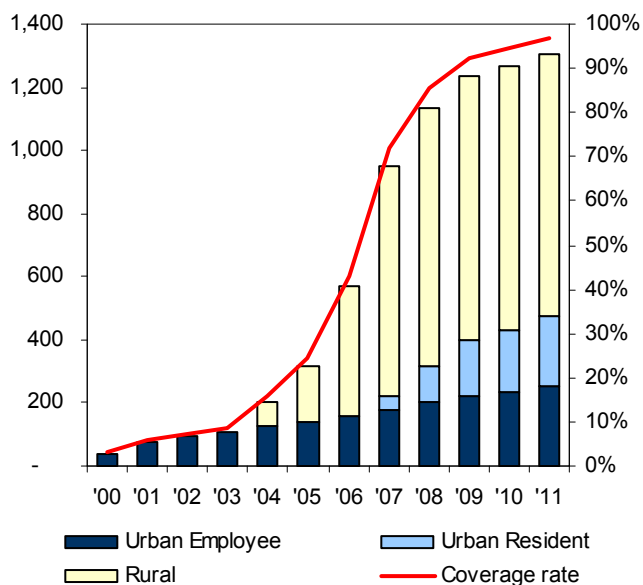
Among the numerous policies released and expected to be released in healthcare reform, we see reimbursement payment mechanism reform (医保支付方式改革) and separation of in-house pharmacies from hospitals (医药分开) as the two most critical initiatives that could potentially change the rules of the Chinese health system and the healthcare industry as well. Here we have tried to analyze the trend and potential consequence of both policies to provide some insight into the upcoming changes in the policy environment.

### Overspending Control – Reimbursement Payment Mechanism Reform

#### Spending Control Targets to Maintain a Sustainable Medical Insurance Fund Balance

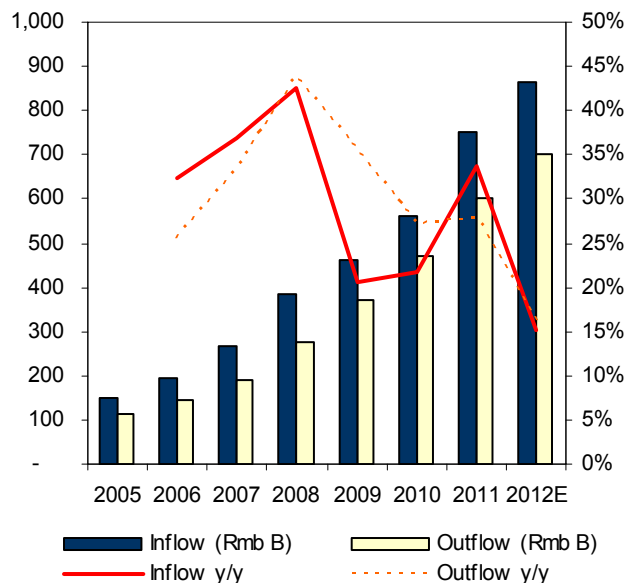
Spending control kicked in when the outflow of medical insurance fund grew consistently faster than inflow from 2008-2010 (outflow: 31.2% CAGR in 2008-2010 vs. inflow 21.2%) with the ramp-up of medical insurance coverage. While the strong growth in medical insurance fund flow reflected the growing demand for medical services in the Chinese population, as the services become more affordable, part of the growth was due to inflated demand, as physicians tend to prescribe more expensive drugs and overdosage for higher profit.

Figure 89. Medical Insurance Coverage



Source: Citi Research, MOH, MOHRSS

Figure 90. Medical Insurance Fund Inflow vs. Outflow



Source: Citi Research Estimates, MOH, MOHRSS

The faster growth in outflow has brought in the risk of deficit in medical insurance fund management. Our sensitivity analysis, by assuming inflow growth of 10%~25% and outflow growth of 10%~30% for the following years, suggests that the fund could run into deficit as early as 2015.

Figure 91. Timing for Potential Deficit of Urban Medical Insurance Fund

		Outflow				
		10%	15%	20%	25%	30%
Inflow	25%	-	-	-	-	2021
	20%	-	-	-	2021	2017
	15%	-	-	2021	2017	2016
	10%	-	2022	2018	2016	2015

Source: Citi Research, MOH, MOHRSS

### Global Budgeting Likely a Transitional Policy in Short-Term

Global budgeting (总额预付) refers to when local medical insurance agencies set an overall reimbursement rate increase target for a fiscal year (in the case of Shanghai, 10% in 2012) and negotiate with each hospital at the beginning of the year to determine the total reimbursement from the fund to the hospitals using the prior year's total reimbursement as a base. Hospitals need to take a majority share of the overspending.

Shanghai is the first city to initiate the trial of global budgeting in 2004, and the trial was expanded into ~42 cities in 2010. Recently, Ministry of Human Resources and Social Security (MOHRSS) announced a plan to further it to full-scale implementation to address the overspending of medical insurance fund and maintain a healthy fund balance. We expect that in the short-term, global budgeting could remain as the major reimbursement payment mechanism, while DRGs (诊断组付费/按病种付费) and capitation (按人头付费) stay at small-scope trials, given that: 1) it is relatively easy to implement, as only an annual lump-sum payment and y/y growth rate have to be determined, and 2) it is efficient in controlling the medical insurance fund outflow, as the reimbursement to hospitals were capped.

### Expecting DRGs to Take Over in Longer-Term

The global budgeting is a preliminary spending control framework, which could lead to some unintended consequences, including: 1) hospitals could refuse patients with major diseases, such as cancers, the treatment for which is more costly and account for higher portion of the reimbursement quota; and 2) physicians could persuade patients to use more high-end self-paid drugs, which were not controlled by global budgeting.

We expect the cost control framework could gradually transit to more fine-tuned schemes, such as DRGs, which defines the reimbursement for a diagnosis-related group based on patients' principal diagnosis, gender, age, treatment procedure, etc, and is a more reasonable cost control mechanism vs. global budgeting. However, it could take longer time to build the mechanism, as the DRG system should be developed in the first place to classify all the common diseases into different groups. The Ministry of Health has developed and released the clinical pathway for 331 diseases, part of which has been applied in the DRG payment trials in some cities, including Beijing.

Furthermore, with: 1) the establishment of primary care system and family physician system in China, and 2) better reimbursement coverage on outpatient expenses, we expect the capitation payment system could be better adopted for outpatient visits.

### **Spending Control Could Shift from Government to Commercial Insurers**

The government has begun introducing commercial insurance into the medical insurance system, starting with major disease insurance (大病医保). With the further involvement of commercial insurance in marketizing the system, we expect the overspending supervision could shift from government (local/central medical insurance fund agencies) to commercial insurers, and become more effective and efficient, as commercial insurers are likely to scrutinize the prescription to lower their costs and stay profitable.

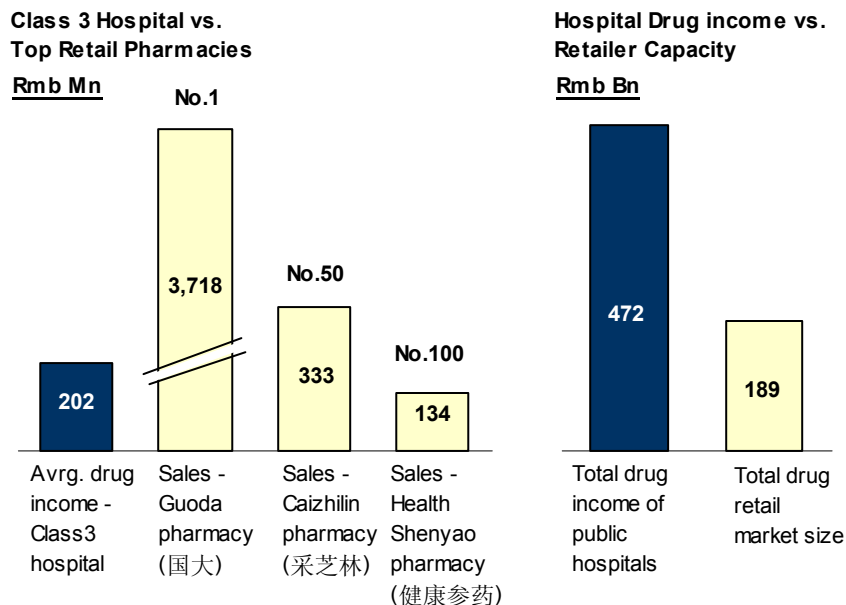
### **Can Government Achieve Successful Separation of Hospital Pharmacies from Hospitals?**

As one of the major goals of the ongoing healthcare reform, separation of hospital pharmacies from hospitals aims to take away hospitals' dependency on drugs for profit, which was the driver for physicians to prescribe expensive drugs. To pave the way, the government is testing elimination of drug mark up in 311 county-level hospitals and major public hospitals in Beijing and Shenzhen, and more cities are adopting the policy.

Despite that, we remain conservative on how soon the separation can be implemented on a full-scale, given that:

- **From Hospital Side:** Without profit from selling drugs, hospitals might not be able to maintain their daily operation. But to compensate the loss, the increase in government funding (directly or indirectly through injection to medical insurance fund, which will cover the raised medical service fee) could become a unaffordable financial burden for local/central government.
- **From Retail Pharmacies Side:** The Chinese drug retail market remains highly fragmented, and capacity of most drug retailers might not be sufficient to take over the hospital pharmacies' job of dispensing drugs in the short-term. Our analysis suggests that average revenue from selling drugs was ~RMB202m in one Class 3 hospital in 2011, and that is similar to the total 2011 sales of Sichuan Xingling Pharmaceutical Chainstore (四川杏林医药连锁), the 74th largest retail pharmacy in China (as ranked by Ministry of Commerce based on 2011 revenue).

Figure 92. Capacity Constraints in Drug Retailers to Take Over Hospital Pharmacies



Source: Citi Research, Ministry of Commerce, Ministry of Health

More importantly, without addressing physicians' compensation, which is much lower than global peers, we do not expect the prescription behavior will have significant change, as physicians could continue to prescribe higher margin drugs for more rebates.

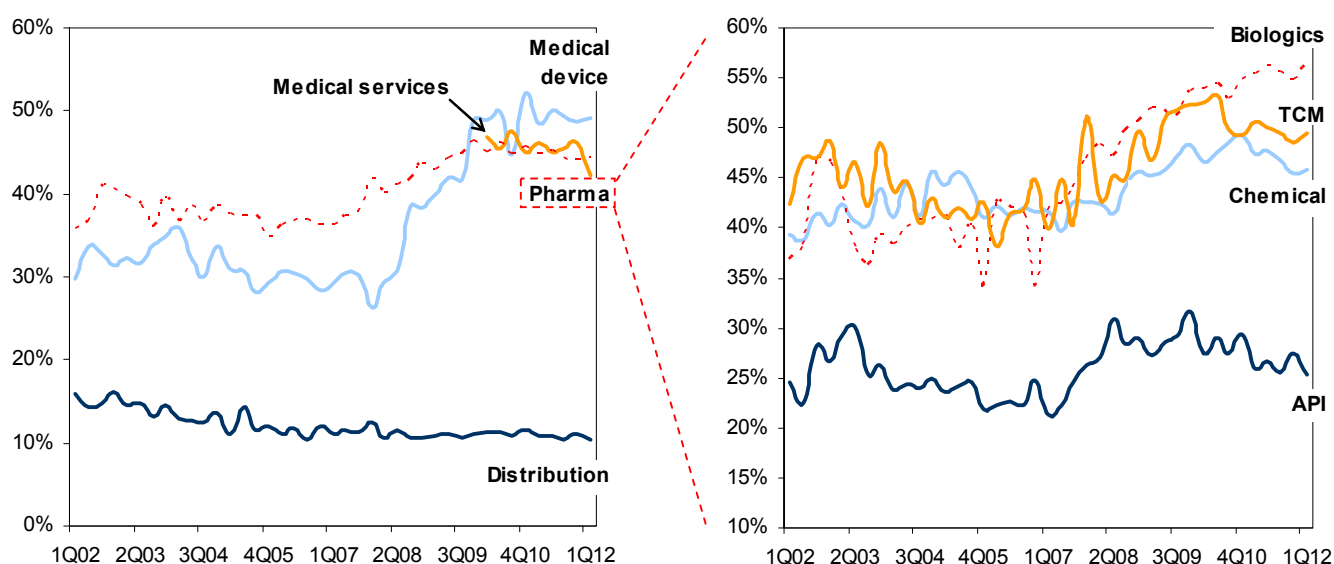


## Financial Performance of Chinese Players

### Profitability Has Been Improving

In general, the gross margin over the last decade has improved for pharma and medical devices manufacturers, but declined gradually for drug distribution business, as competition intensified. Looking into subsectors in the pharma market, the gross margin fluctuated over the time for API, and improved slightly for TCM and chemical drugs. We see notable increase in biologics margins, with the emergence of high-margin business, such as vaccines, neuron growth factor, and interferon.

Figure 93. Gross Margin for All Chinese Healthcare Companies

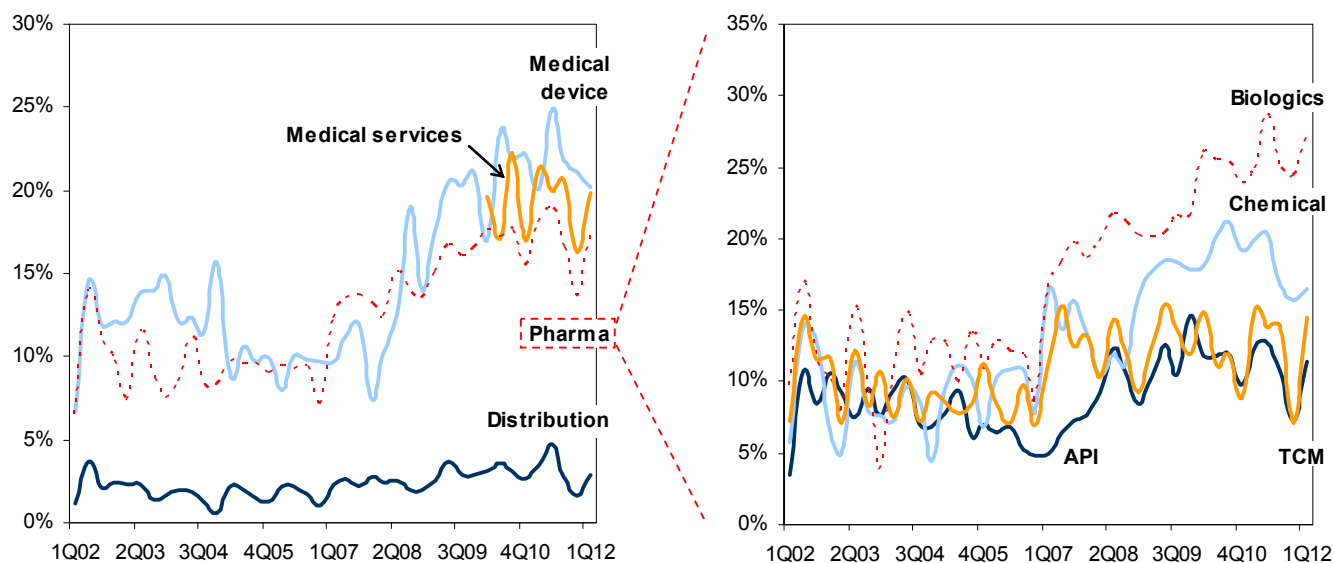


Source: Citi Research, Bloomberg, Wind

### Operating Margin & Net Margin

Operating margin and net margin are more volatile than gross margin on a quarterly basis, but the uptrend in device and pharma manufacturing is similar. While the gross margin of TCM products is higher than chemical drugs, operating margin and net margin were lower. Besides, we see some operating efficiency improvement in the API segment, as the operating margin increased while gross margin stayed flat comparing to 10 years ago.

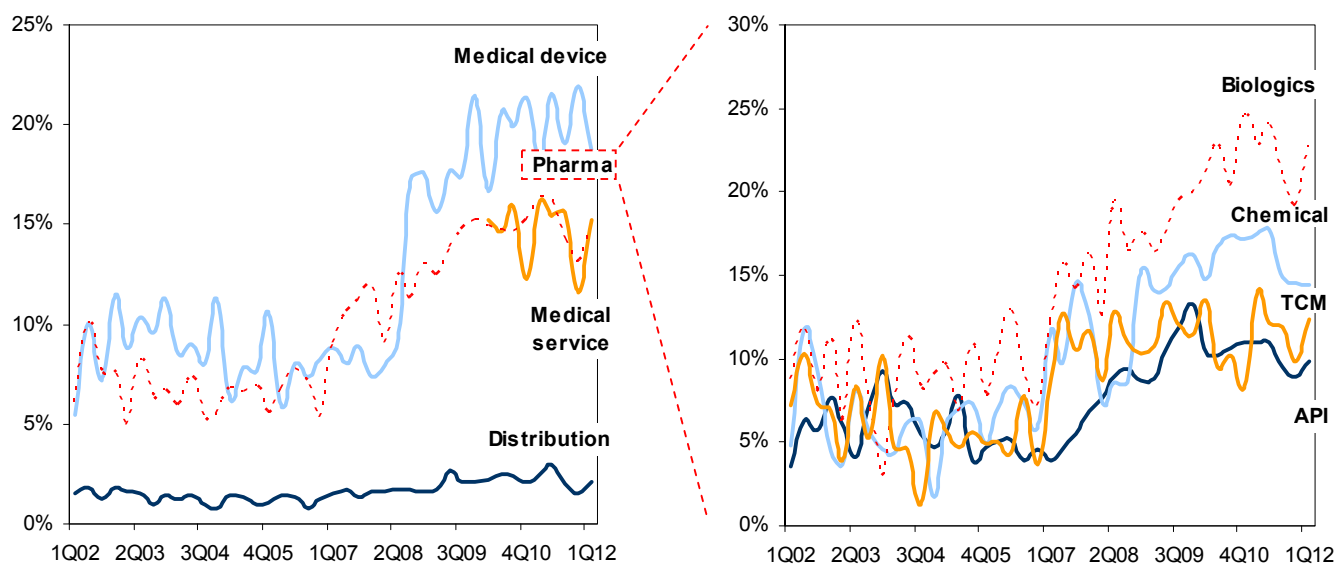
Figure 94. Operation Margin for All Chinese Healthcare Companies



Source: Citi Research, Bloomberg, Wind

Despite gross margin erosion, operating margin and net margin in the drug distribution business was improving, which could be due to: 1) better operating efficiency; and 2) more value-added services to hospitals.

Figure 95. Net Margin for All Chinese Healthcare Companies

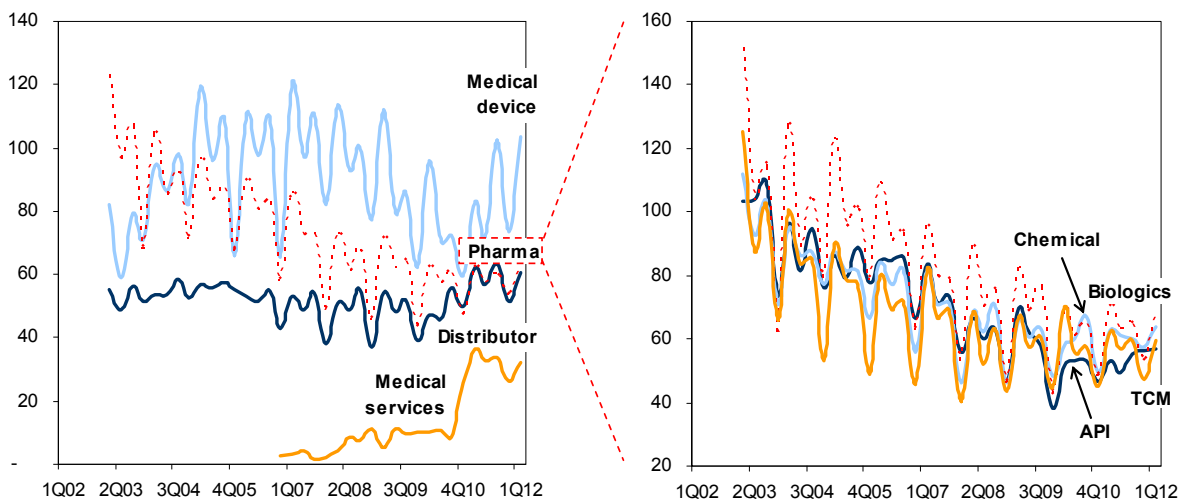


Source: Citi Research, Bloomberg, Wind

## Accounts Receivable Days

The A/R days in all sub-segments of pharma manufacturing industry have improved from an average >100 days in 2003 to ~60 days in 2011, as manufacturers are gaining bargaining power to distributors with growing scale. The A/R days were stable for drug distributors till 2010, when a new round of hospital construction led to lower cash position in hospitals, increasing the cash collections for distributors.

Figure 96. Accounts Receivable Days for All Chinese Healthcare Companies

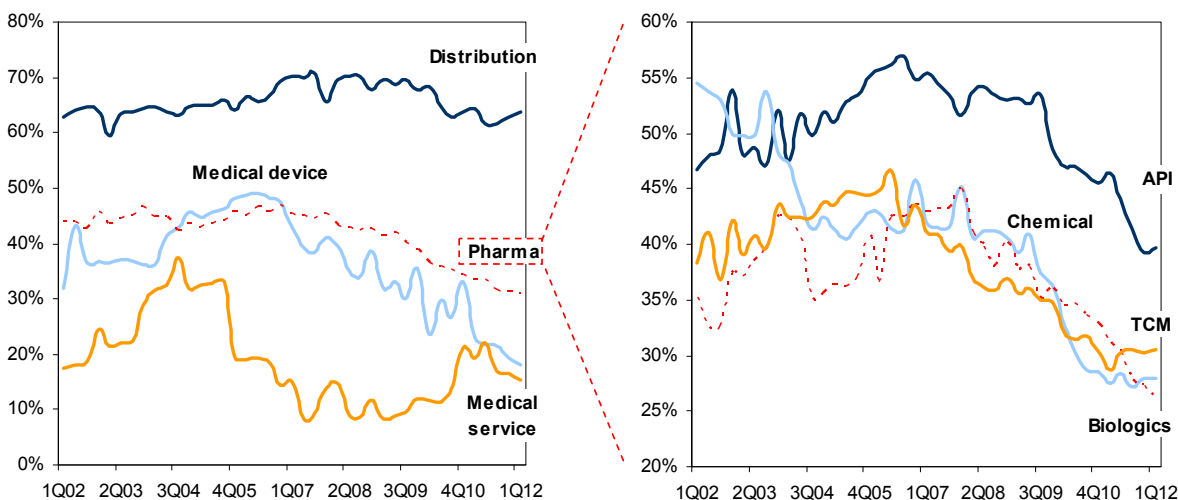


Source: Citi Research, Bloomberg, Wind

## Gearing Ratio

The debt/asset ratio declined remarkably in pharma and medical device manufacturing companies, but remained at a high level in drug distributors, given the growing needs to fund working capital.

Figure 97. Debt/Asset Ratio for All Chinese Healthcare Companies



Source: Citi Research, Bloomberg, Wind

## How Are Chinese Companies Benchmarking Global Players?

### Chinese Healthcare Companies Not Competitive Globally

#### Sectors Very Fragmented

Both the pharmaceutical manufacturing and distribution market in China remain highly fragmented as: 1) there are over 6,000 pharma companies with the top 10 players accounting for ~20% of market share vs. over 40% in Japan and >60% in the US; and 2) ~13,000 distributors, with the top 3 players accounting for ~20% of market share, vs. over 90% in the US and over 75% in Japan.

There are a large number of small sized pharma companies in the fragmented market, leading to several issues that impact the competitiveness of the Chinese pharma industry: 1) inferior product quality; 2) focusing on low-end generic products; 3) low operational efficiency without economies of scale; and 4) lack of innovation.

#### Lack of Innovation

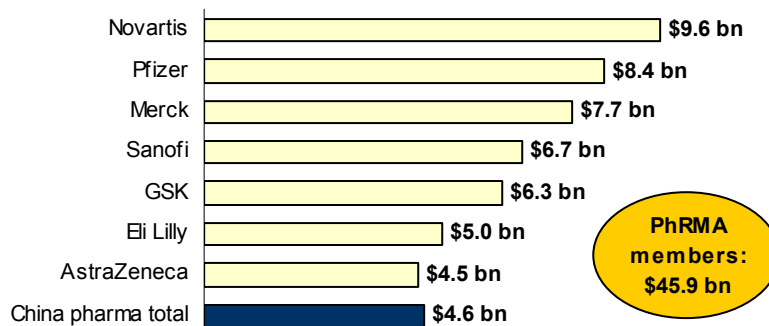
Out of 718 drugs approved by sFDA in 2011, only three are new molecules developed by domestic pharmaceutical companies (Iremod, rheumatoid arthritis drugs, Simcere; Icotinib, lung cancer drugs, Zhejiang Betapharm; and Imrecoxib, rheumatoid arthritis, Hengrui). There were nil new molecules approved in 2010 and only one antibiotic in 2009.

Given the dominant position of hospitals/physicians in the value chain, the best-selling drugs are not necessarily the innovative drugs, but could be those that provide more rebates to physicians or those with lower toxicity and insignificant clinical benefit, which is safer for overprescription. Moreover: 1) the stringent price control; 2) slow materialization of the market value of innovative drugs due to tender process and long cycle of national reimbursement drug list revision; and 3) challenges in cost saving with increase in staff salaries and raw material prices, all reduced the incentive for domestic pharma to invest on drug innovation.

#### Very Small R&D Budget

Assuming the average R&D expense accounted for 4% of total sales in chemical drug industry, 4.5% in biologics and 2% in TCM, we estimate total R&D spending of Chinese pharma companies was ~RMB30bn in 2011 (or US\$4.6bn), which was ~10% of the total R&D expenditure of US PhRMA members (US\$45.9bn), and lower than the annual R&D spending of a top global pharma. As one of the government's efforts to support drug innovation, the Ministry of Finance is to grant ~RMB1bn in subsidies to major R&D projects targeting protein biologics and branded generics, but without major change in the price regulation and value chain proposition, the R&D ramp-up in China could be slow.

Figure 98. R&D Spending in 2011: China vs. Top Global Pharma (US\$)

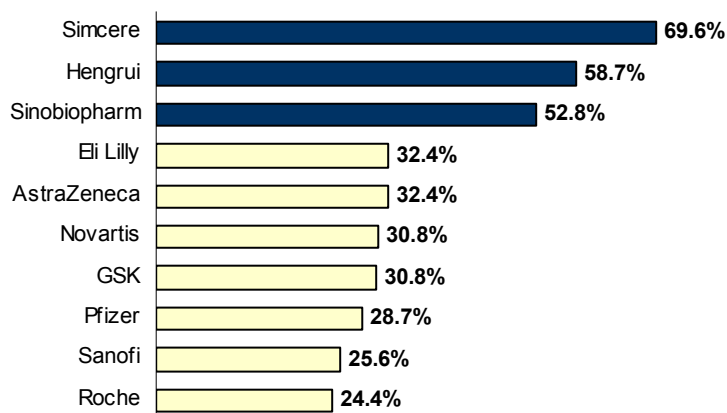


Source: Citi Research, Bloomberg, State Bureau of Statistics, PhRMA

### Low Operational Efficiencies

Many domestic pharma companies are exploiting an outsourced sales model (底价大包), which could artificially lower the SG&A expenses. However, if comparing the real operating expenses of direct sales, even the leading China domestic pharma companies' operational efficiencies were significantly below global peers.

Figure 99. SG&A as % of Sales: Leading Chinese Pharma vs. Top Global Pharma (2011)



Source: Citi Research, Reuters

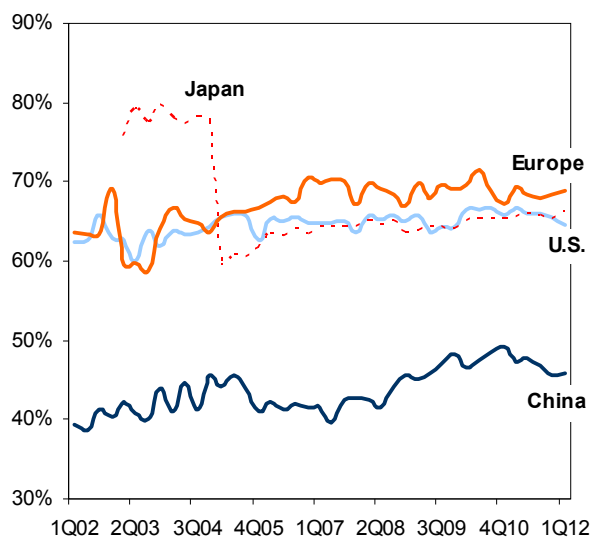
## Key Financial Matrix Comparison: China vs. Global Peers

We benchmark the key ratios of public-listed Chinese healthcare companies to global peers to assess the current stage the Chinese market is going through and potential future it could be heading into.

### Pharmaceutical Companies

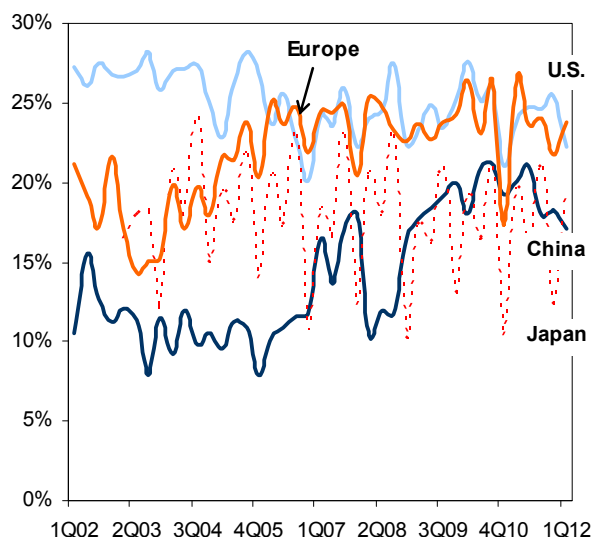
The average gross margin of Chinese pharma companies over the last decade was lower than US, European and Japanese players, since most Chinese players are focusing on generic drugs, which are lower margin products vs innovative drugs, and the wide use of outsourced sales model with low ex-factory price (底价大包). The gap maintained at ~20% in the past 10 years, implying little progress on drug innovation in China. The gap in operating margin was narrower (5%~10%), due to low level of selling expenses in “outsourced sales model” and lower labor costs.

Figure 100. Pharma Gross Margin: China vs. Developed Markets



Source: Citi Research, Bloomberg, Wind

Figure 101. Pharma Operating Margin: China vs. Developed Markets

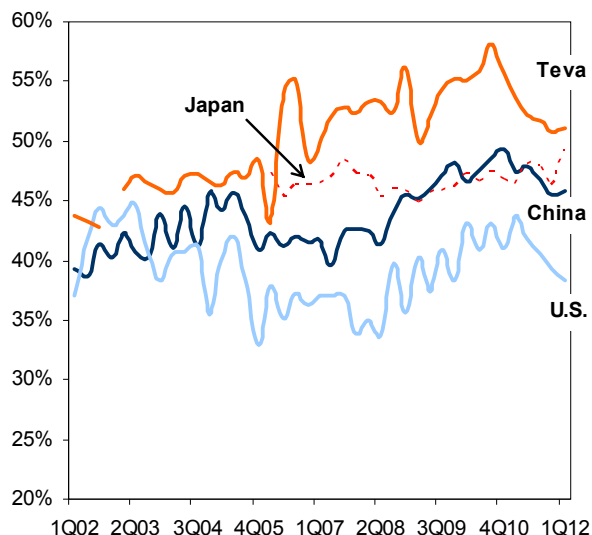


Source: Citi Research, Bloomberg, Wind

To have an apple-to-apple comparison, we also benchmarked the margins and gearing ratio of Chinese pharma companies to: 1) Teva, the largest global generic manufacturer, and 2) generic drug makers in the US, Japan, Korea, Taiwan, and other emerging markets.

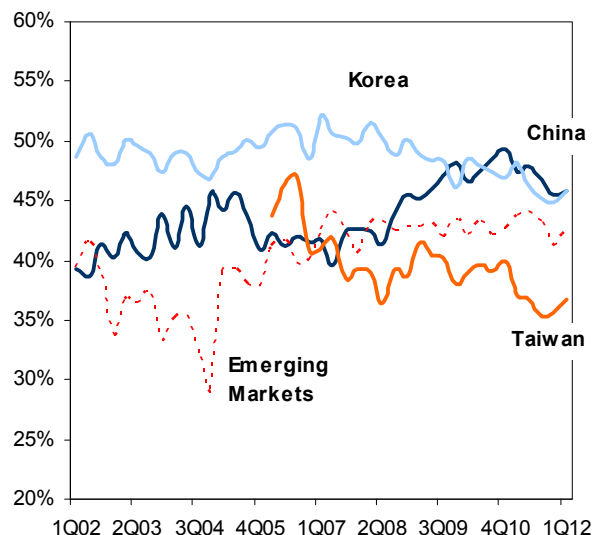
Our analysis suggests that the gross margin of generics in China was in-line with that in Japan and Korea, higher than that in the US, Taiwan, and emerging markets in Brazil and South East Asia, but lower than Teva, which largely targets generic version of blockbusters.

Figure 102. Generics GM: China vs. Developed Markets and Teva



Source: Citi Research, Bloomberg, Wind

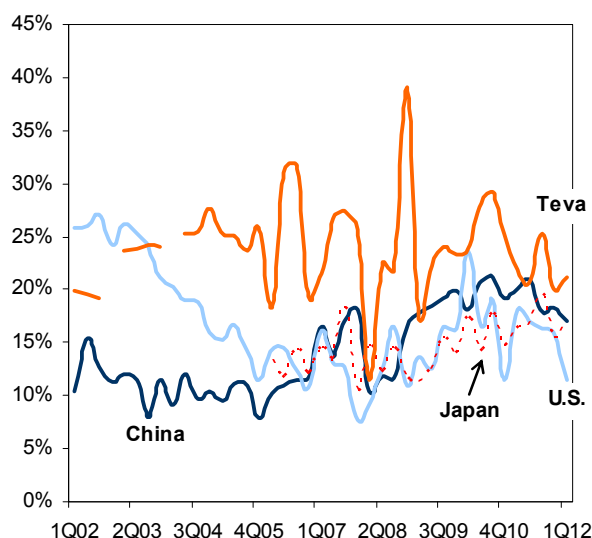
Figure 103. Generics GM: China vs. Taiwan / Korea / EM



Source: Citi Research, Bloomberg, Wind

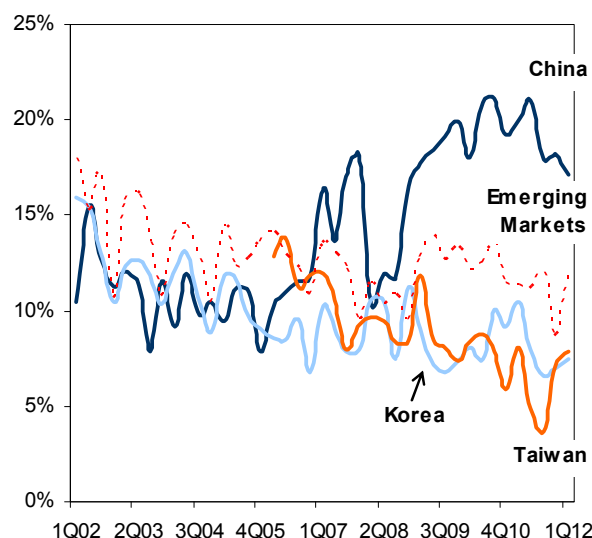
The lower labor costs and outsourced sales model benefits China generics' operating margin, however, as: 1) the Chinese government aims to narrow the markup between ex-factory and retail price of drugs, and more pharma companies in China are shifting to direct sales model or changing accounting method to include the selling expenses incurred in sales agents; and 2) increase in labor costs in China.

Figure 104. Generics OPM: China vs. Developed Markets and Teva



Source: Citi Research, Bloomberg, Wind

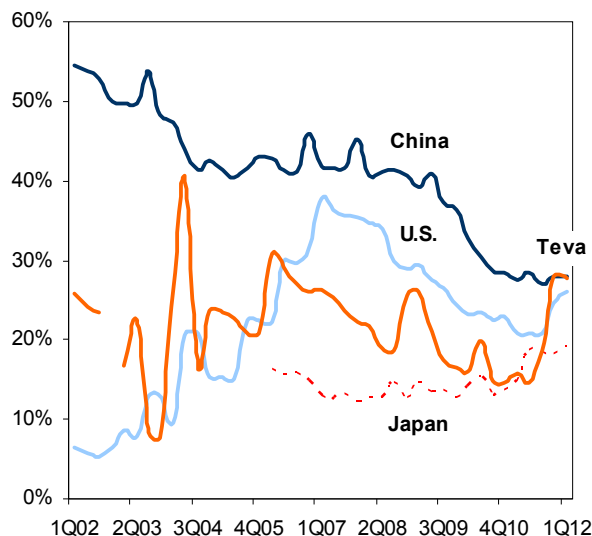
Figure 105. Generics OPM: China vs. Taiwan / Korea / EM



Source: Citi Research, Bloomberg, Wind

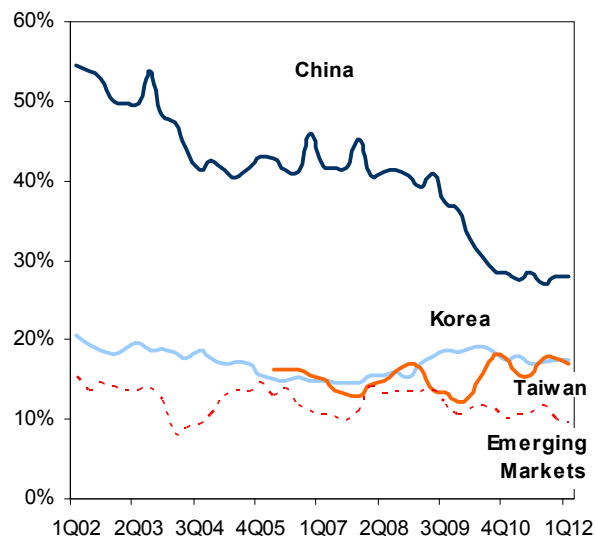
The debt/asset ratio in Chinese pharma companies was significantly higher than global peers, as companies are exploiting financial leverage to capture the strong growth driven by fast-growing medical demand in Chinese patients. The ratio decreased in 2011, given the tight lending policies.

Figure 106. Generics Gearing: China vs. Developed Markets and Teva



Source: Citi Research, Bloomberg, Wind

Figure 107. Generics Gearing: China vs. Taiwan / Korea / EM



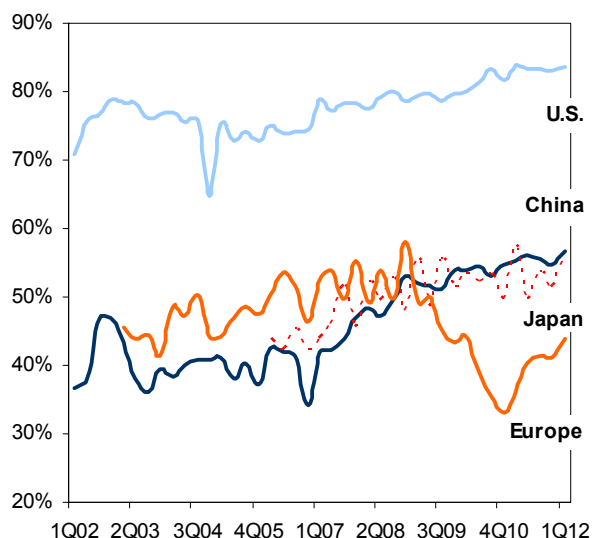
Source: Citi Research, Bloomberg, Wind

## Biologics

The gross margin of biologics manufacturers in China was significantly lower than that in the US, as leading global biotech companies in the US focus on high-margin innovative biotech drugs, such as monoclonal antibodies for cancer and immune system disease, while the Chinese players' product portfolio still consists of lower-end products, such as enzymes, heparins, peptide and collagen.

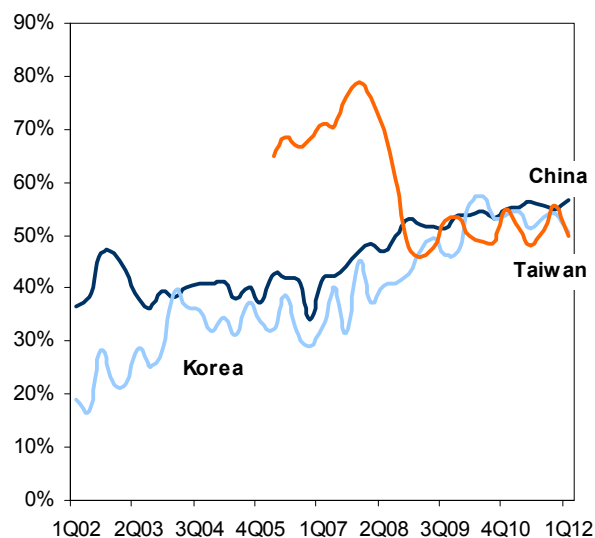
Encouragingly, the gap between biologics manufacturing in China and the US has been narrowing, from ~35% in 2002 to ~27% in 2012, with the ramp-up of leading domestic players with higher-margin products, such as Hualan Bio (GM of ~70% in 2011), Valvax (GM of ~91% in 2011), and 3S Bio (GM of ~90% in 2011).

Figure 108. Biotech GM: China vs. Developed Markets



Source: Citi Research, Bloomberg, Wind

Figure 109. Biotech GM: China vs. Taiwan / Korea / EM

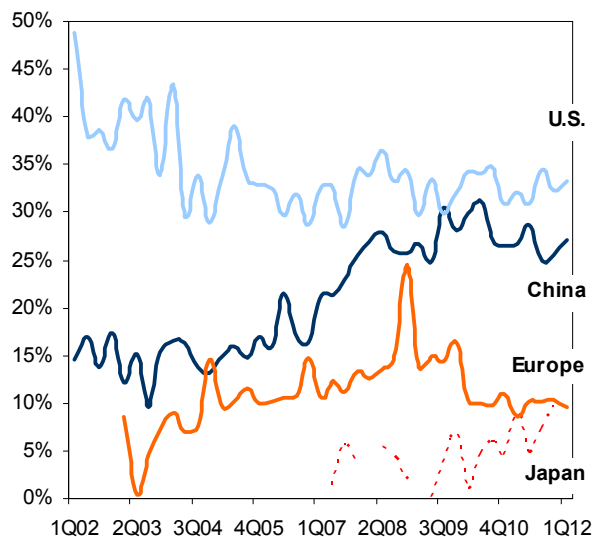


Source: Citi Research, Bloomberg, Wind



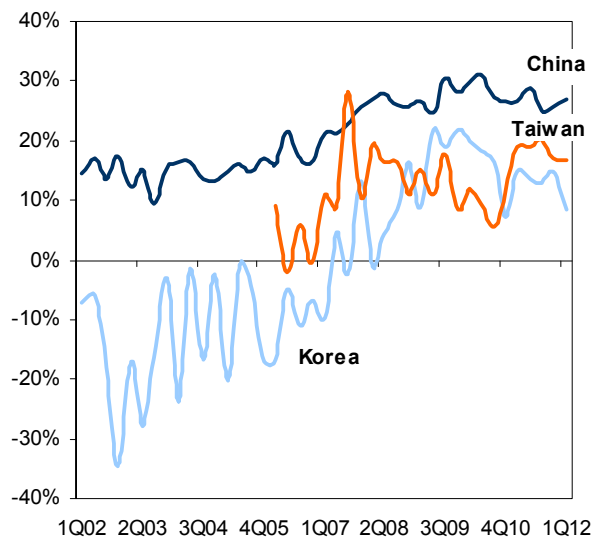
Similar to the margin pattern in the pharma segment, the gap in average operating margin of Chinese biologics companies and US peers was narrower than in gross margin, which could be due to lower selling expenses for low-end products (more commoditized and requires less promotions and less experienced sales team).

Figure 110. Biotech OPM: China vs. Developed Markets



Source: Citi Research, Bloomberg, Wind

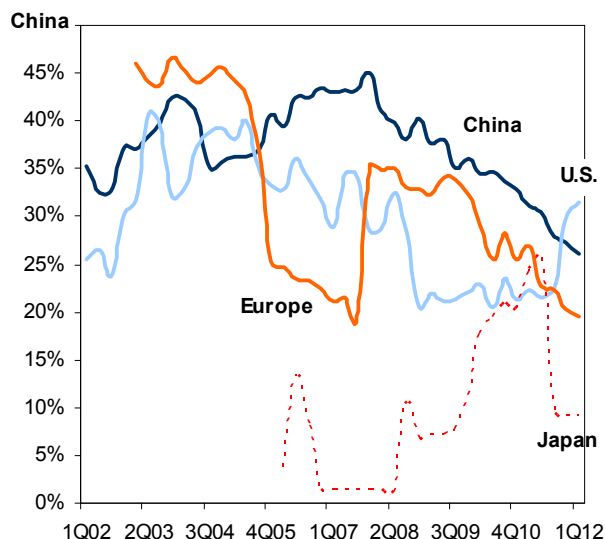
Figure 111. Biotech OPM: China vs. Taiwan / Korea / EM



Source: Citi Research, Bloomberg, Wind

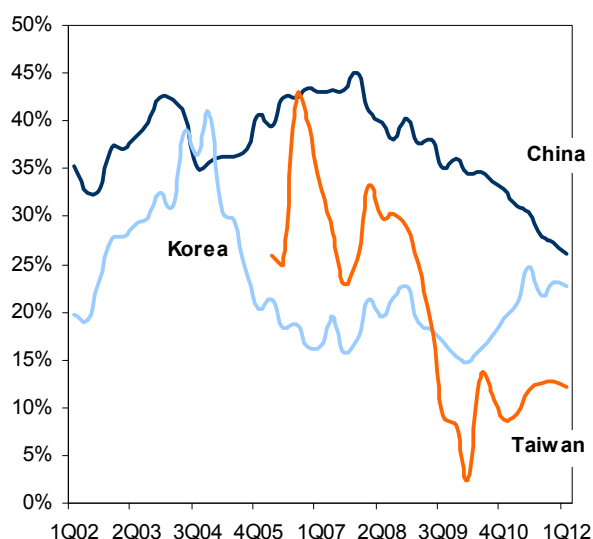
The average debt asset ratio of China biologics manufacturing is decreasing, as the industry is shifting from low-end to mid-/high-end products, which offer: 1) better profitability and 2) stronger bargaining power in payment collection for manufacturers, and thus reduce the demand for funding by bank borrowings. However, we do not expect further significant decline in the gearing ratio, as: 1) the level has become in-line with US peers, and 2) domestic players could use financial leverage for rapid expansion during the booming phase of biologics industry.

Figure 112. Biotech Gearing Ratio: China vs. Developed Markets



Source: Citi Research, Bloomberg, Wind

Figure 113. Biotech Gearing Ratio: China vs. Taiwan / Korea / EM

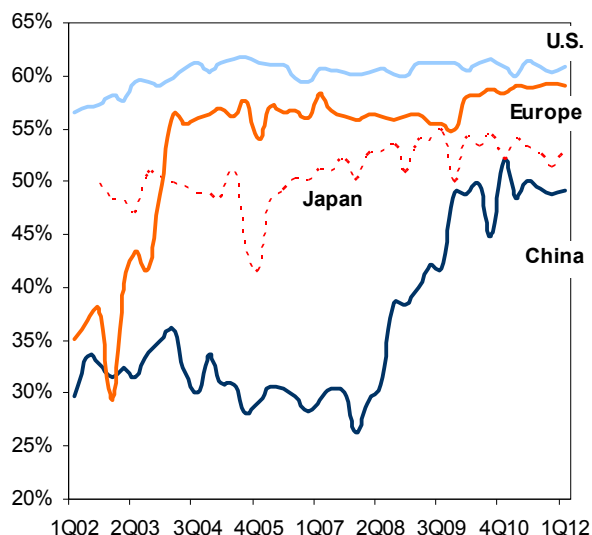


Source: Citi Research, Bloomberg, Wind

## Medical Devices

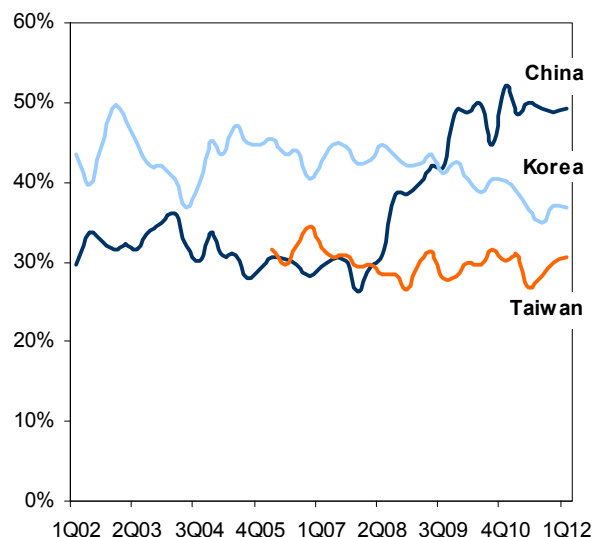
While the gross margin of China medical devices companies are still below peers in Japan, Europe and the US, given the technology advantage and premium price for those multinational players, we have seen significant improvement in gross margin since 2008, and manufacturers with high-margin products going public, such as Grand Hope Bio (冠昊生物, 300238.SZ), focusing on regenerative medical implants with GM over 90%, and Lepu Medical (乐普医疗, 300003.SZ) and MicroPort (微创医疗 853.HK), two top stent manufacturers in China with GM over 80%.

Figure 114. MedTech GM: China vs. Developed Markets



Source: Citi Research, Bloomberg, Wind

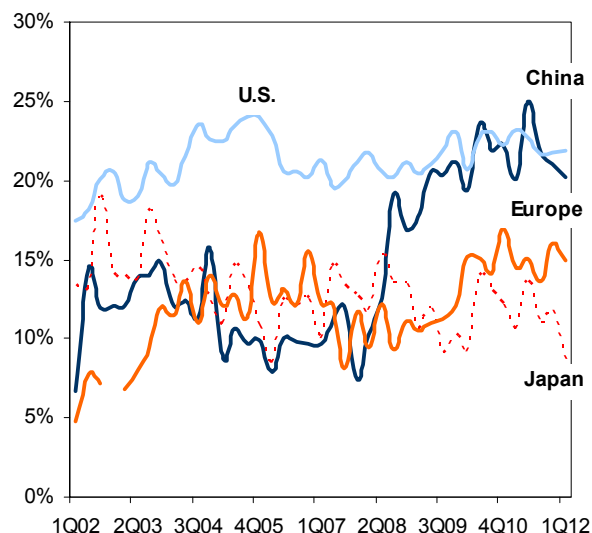
Figure 115. MedTech GM: China vs. Taiwan / Korea / EM



Source: Citi Research, Bloomberg, Wind

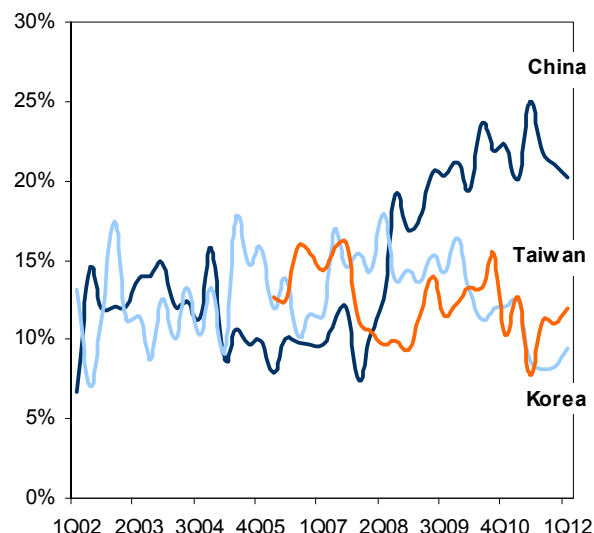
We believe the in-line operating margin of China domestic medical devices players vs. US players is due to lower labor costs. However, labor has been getting more expensive during recent years in China, and leading domestic players are deploying more automation facilities to reduce the costs.

Figure 116. MedTech OPM: China vs. Developed Markets



Source: Citi Research, Bloomberg, Wind

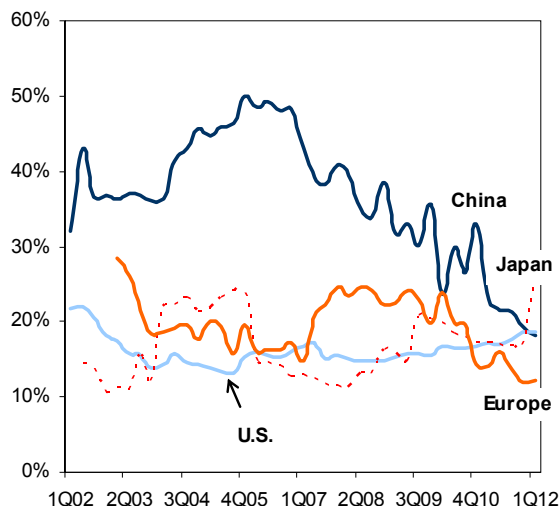
Figure 117. MedTech OPM: China vs. Taiwan / Korea / EM



Source: Citi Research, Bloomberg, Wind

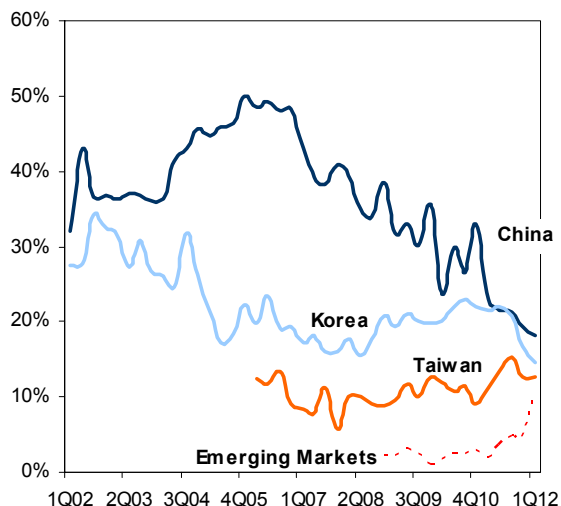
Similar to the trend of declining gearing in the pharma/biologics manufacturing industry, the debt asset ratio for medical devices players declined from ~37% in 2002 to ~21% in 2011.

Figure 118. MedTech Gearing Ratio: China vs. Developed Markets



Source: Citi Research, Bloomberg, Wind

Figure 119. MedTech Gearing Ratio: China vs. Taiwan / Korea / EM

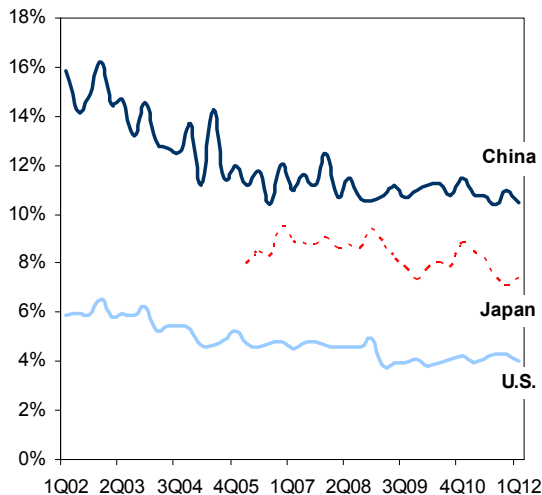


Source: Citi Research, Bloomberg, Wind

## Drug Distribution

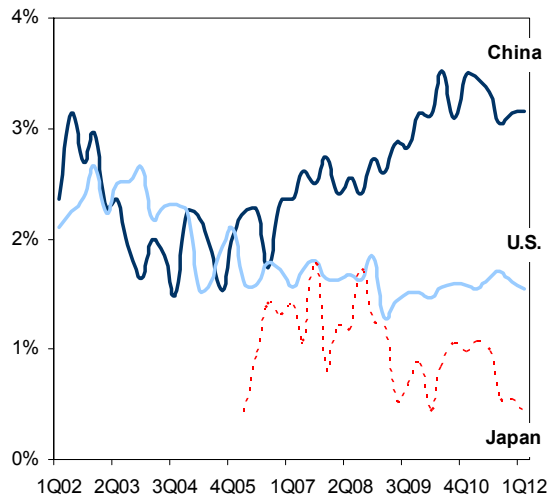
The blended gross margin and operating margin of major Chinese drug distributors is higher than peers in Japan and the US, largely due to the fact that major players, such as Shanghai Pharma (上海医药, 2607.HK/600607.SH), East China Pharm (华东医药, 000963.SZ), and Tong Jun Ge (桐君阁, 000591.SZ), also own sizable drug manufacturing business, which are more profitable than the distribution business, while leading players in the US and Japan generate over 90% of their revenue from distribution. The gross margin for distribution business is 6%~8% for major Chinese drug distributors, largely in-line with the players in the US and Japan, and we expect limited room for the gross margin to decline further. Meanwhile, major distributors are seeking lucrative side business, including value-added services to hospitals and retail pharmacies, to offset the margin erosion in the distribution segment.

Figure 120. Distribution GM: China vs. Developed Markets



Source: Citi Research, Bloomberg, Wind

Figure 121. Distribution OPM: China vs. Developed Markets

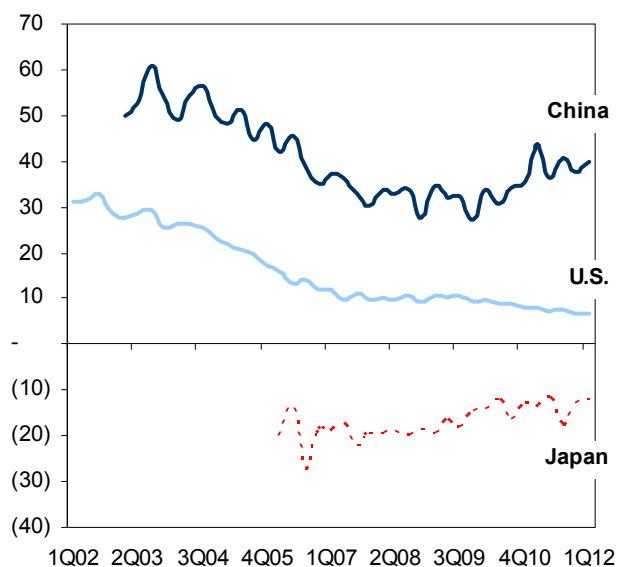


Source: Citi Research, Bloomberg, Wind

Comparing with peers in the US and Japan, efficiency of working capital utilization is lowest in China, as the cash conversion cycle was ~40 days vs. ~7.5 days in US and negative in Japan.

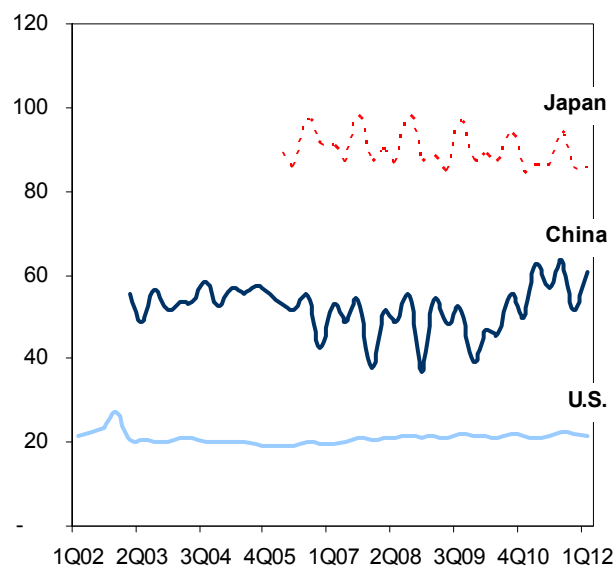
We also notice that distributors in Japan and US had stronger bargaining power in their pharma value chain, with A/R days generally shorter than A/P days (US: AR ~22 days vs. AP ~43 days; Japan: AR ~88 days vs. AP ~125 days), largely due to the high market concentration after the industry consolidation, while in China, both A/R days and A/P days averaged at ~58 days.

Figure 122. Distribution Cash Conversion: China vs. Developed Markets



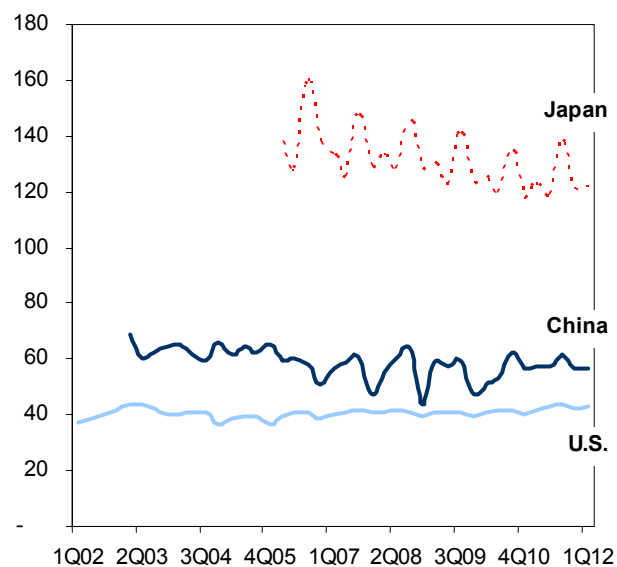
Source: Citi Research, Bloomberg, Wind

Figure 123. Distribution A/R Days: China vs. Developed Markets



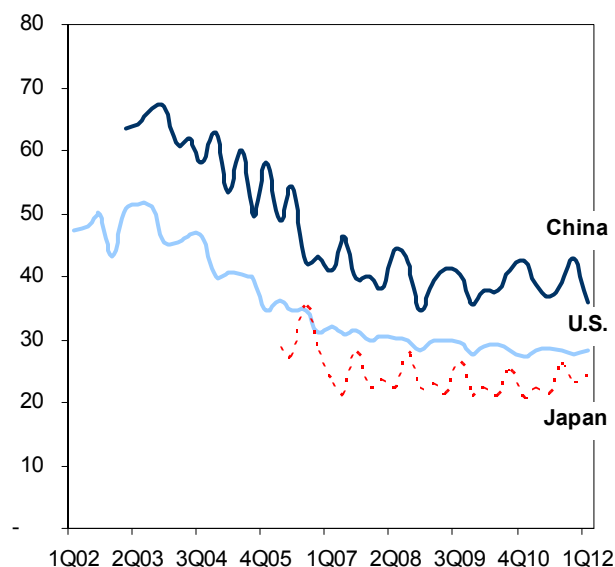
Source: Citi Research, Bloomberg, Wind

Figure 124. Distribution A/P Days: China vs. Developed Markets



Source: Citi Research, Bloomberg, Wind

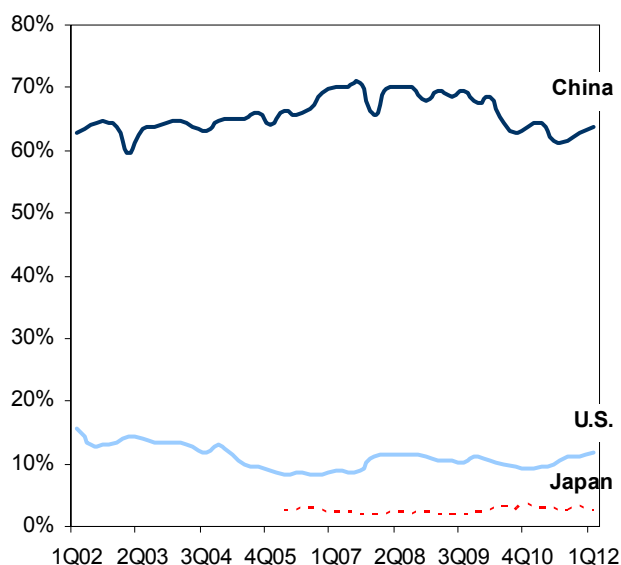
Figure 125. Distribution Inventory Days: China vs. Developed Markets



Source: Citi Research, Bloomberg, Wind

The average debt/asset ratio of drug distributors in China, the US, and Japan is consistent with the cash efficiency in corresponding countries, the longer the cash conversion cycle, the higher the gearing ratio. In China, the ratio maintained high at 63% in 2011, and we don't expect this to significantly improve in the near-term, since: 1) bargaining power could remain low for distributors, with slow progress in industry consolidation; 2) Chinese hospitals are still in the construction cycle, which requires high investment; and 3) upcoming healthcare reform policies, such as eliminating drug markups, could potentially deteriorate profitability of hospitals.

Figure 126. Distribution Gearing Ratio: China vs. Developed Markets



Source: Citi Research

## Opportunities for Multinationals in the Chinese Healthcare Market

### Leading Multinationals Are Ramping Up Presence in China

China has emerged as one of the most important markets for the global healthcare players and they are investing heavily on infrastructure in major cities to step up operational scale in China, as well as introducing more drugs, devices and services into the market to complete their product offerings.

Moreover, leading multinationals are adjusting their China strategy, allocating more resources to the emerging mid-tier market, such as generic drugs and medical devices for county-level hospitals and primary care institutions, while maintaining their competitive advantages in the high-end market.

Figure 127. Multinationals Activities in the Chinese Pharma Market Since June 2012

Companies	Invest	Activities
<b>Pharma</b>		
Eli Lilly	US\$60M	The 2nd manufacturing facility for insulin began operation;
	US\$20M	Increased its equity interest in Novast Laboratories;
	n/a	Opened its China R&D center in Shanghai
Sanofi	US\$90M*	Expanded production line for Lantus(R) began operation
	n/a	Partnered with Sinopharm on drug R&D for rare disease
AstraZeneca	US\$100m	Established its Asia Pacific headquarter in Shanghai
Daiichi Sankyo	n/a	Partners w/ Zhuhai Rundu Pharma to market Mevalotin in China
Takeda	n/a	Establish a R&D center (TSDC) in Shanghai
Novo Nordisk	US\$100m	Expand its China R&D center in Beijing
<b>MedTech</b>		
Covedien	US\$45m	To open China Technology Center R&D facility in Shanghai
GE	US\$70m	To build new manufacturing facility in Tianjing;
Karl Storz	Rmb600m	To set up a new headquarter in Shanghai
Siemens	n/a	To build new R&D and manufacturing facility for X-ray devices in Shanghai
Medtronic	US\$816m	To acquire Kanghui
	US\$46.6m	To acquire 19% of equity interest in LifeTech Scientific
<b>Distribution</b>		
Cardinal	US\$29.7M	Acquired 85% of equity interest on Zhejiang Dasheng Medic
<b>CRO</b>		
Quintile	US\$14M	To establish a regional headquarter in Shanghai

\* total investment for capacity expansion in China, the recorded activity is a part of the plan

Source: Company Information; Citi Research

### Multinationals Could Continue Market Share Gain in the Chinese Pharma Market

Multinational pharma companies are market share leaders in the China pharma market, seizing 11 positions out of the Top 20 and 8 out of the Top 10 in 2011. Based on our analysis of proprietary prescription data from 418 sample hospitals in 22 major cities, the total market share of all multinational pharma in China was 39% by 2011, up by 3.4%pt since 2005.

Figure 128. Top 20 Pharmaceutical Companies in China

Rank	厂商	Pharmaceutical Company	Market Share		
			2010	2011	Δ
1	辉瑞	Pfizer	2.99%	3.03%	▲
2	拜耳	Bayer	2.72%	2.69%	▼
3	罗氏	Roche	2.32%	2.49%	▲
4	赛诺菲	Sanofi	2.49%	2.48%	—
5	阿斯利康	Astrazeneca	2.55%	2.38%	▼
6	齐鲁制药	Qilu Pharma	1.84%	1.98%	▲
7	诺华制药	Novartis	1.86%	1.93%	▲
8	恒瑞医药	Hengrui Medicine	1.49%	1.48%	—
9	葛兰素史克	GlaxoSmithKline	1.39%	1.41%	▲
10	默沙东	Merck	1.36%	1.39%	▲
11	科伦药业	Kelun Pharma	1.22%	1.28%	▲
12	扬子江药业	Yangtze River Pharma	1.13%	1.16%	▲
13	礼来	Eli Lilly	1.08%	1.11%	▲
14	百时美施贵宝	Bristol-Myers Squibb	1.00%	0.98%	▼
15	双鹭药业	Beijing SL Pharma	0.88%	0.97%	▲
16	北京泰德制药	Tide Pharma	0.87%	0.97%	▲
17	哈药集团	Harbin Pharma Group	1.14%	0.95%	▼
18	诺和诺德	Novo Nordisk	0.80%	0.82%	▲
19	正大天晴	Sino Biopharm (excl. Tide Pharm)	0.58%	0.74%	▲
20	通用药业	Genertec Pharma	0.94%	0.72%	▼

Source: Citi Research, Pharma Database

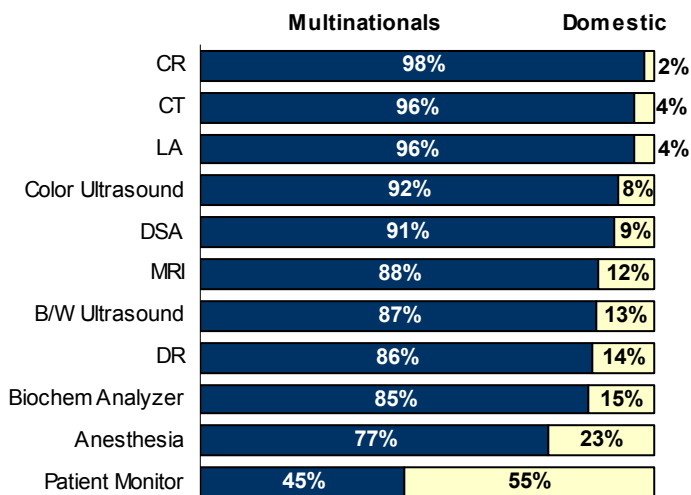
Despite government policy trend towards supporting domestic players, we remain confident on the growth prospect of multinationals in the evolving Chinese pharma market, due to:

- **Growing Demand for High-Quality Drugs** – Due to the improvement in medical insurance coverage and individual income, together with disease demographic shift in the Chinese population, demand for high-quality drugs keeps increasing;
- **Advantage in R&D Capability** – Given the low R&D capability of domestic pharma companies and slow progress in improving it, we expect multinationals could continue to hold significant competitive advantage over domestic competitors in drug innovation and efficacy, thus remain as major suppliers of high-quality drugs in the Chinese market over the next five years.
- **Favorable Pricing** – Despite the government aims to lower the price of multinational drugs to make them more comparable to their generic version in China, if there is any, the huge pricing gap is unlikely to be eliminated overnight, particularly for those patented or without generic competitors in China.
- **Capture First-in-Market Generics Opportunities** – Facing the patent cliff, multinationals are actively tapping into the Chinese generic drug market in cooperation with domestic leaders or local acquisitions, e.g. Merck with Simcere (先声), Pfizer with Hisun (海正), Novartis with Huahai Pharm (华海制药) and AstraZeneca acquired Guangdong Beikang (广东倍康). As first-to-market generics should continue to enjoy pricing privilege, the generic market could remain lucrative for multinationals.

## Expecting Dominance of Multinationals to Maintain in Medical Device Market

In the China medical device market, multinationals dominate almost all the major categories. Our proprietary survey in 2011 suggested that multinationals captured 77%~98% of market share in 10 out of 11 equipments included in our survey. Patient monitor is the only major category led by domestic player, Mindray.

Figure 129. Market Share of MNC and Domestic Players in Chinese Medical Device Market



Source: Citi Research (2011 Citi Proprietary Chinese Hospitals Survey)

While domestic players are ramping up in the medical devices market, the dominance of multinationals could maintain, due to:

- **Potential Income Structure Shift in Hospitals** – With government efforts to reduce hospitals dependence on drugs for profits, the drug mark-up is decreasing and could potentially be eliminated in all hospitals. However, government funding is less likely to fully compensate the loss from drug income, thus diagnosis and testing could become a major profit center for hospitals in the future. That implies more demand for more medical devices with higher processing speed and accuracy.
- **Advantages in Technology** – With global R&D research platform and high investment on new technology development, the technical barrier that multinationals set for domestic players is hard to break through in the short-term; Meanwhile, it is much easier for multinationals to tap into the mid to low-end market with tailored models and lower price to gain market share;
- **Construction Cycle Plus Hospital Preference** – Our hospital survey suggests that ~77% of Class 3 hospitals have construction plans over the next three years, and 92% of respondents from Class 3 hospitals prefer multinational brands for medical equipment, implying the market share of multinationals in the high-end market could remain or even improve.



Nevertheless, we also see some challenges for multinational medical devices manufacturers from the public hospital reform, as the government is cutting the charges for diagnosis and testing using sophisticated medical equipments, such as CT/MRI scan and ultrasound diagnosis, thus hospitals might tender to use some domestic products if available as replacement to improve the payback period. However, the transition period could be long, given the 7~10 years of useful life of medical equipments, physicians will probably prescribe more testing to offset the lower charge per testing.

## **Global Retailers and Distributors Could Emerge as Niche Players**

Global drug retailers and distributors have shown increasing interest in the Chinese market in recent years, and two pioneers, Cardinal and Alliance Boots, have demonstrated their aggressive China strategy through a series of partnerships and acquisitions:

- Cardinal, the second largest drug distributor in the US, acquired Zuellig China, the 15th largest drug distributors in China, in 2010 for US\$470m. After that, the company acquired local players in Sichuan and Jiangsu, and more recently, 85% equity interest in Zhejiang Dasheng (浙江大生), the second largest distributor in Ningbo, Zhejiang, to further expand its distribution network. Cardinal now owns a network covering Beijing, Shanghai, Zhejiang, Liaoning, Hubei, Chongqing, Sichuan and Jiangsu, and is closing in on the Top 10 list.
- Alliance Boots, Europe's largest drug retailers, have bought into China's fourth and fifth players in the distribution market (i.e. Guangzhou Pharma and Nanjing Pharma). The company set up a joint venture with Guangzhou Pharma in January 2007, and could launch more cooperation in drug/healthcare food retailing down the road. Moreover, the company recently announced the acquisition of a 12% stake in Nanjing Pharma, and the deal is pending Chinese regulators' approval.

We see opportunities for global distributors and retailers to ramp up in Chinese market, given: 1) their experience in drug retailing and distribution industry; and 2) the fragmented market offers significant buying opportunities. However, global players are likely to emerge as niche players in some specific markets, such as high-end drug distribution for multinational pharma, rather than overall market leaders in China, as major domestic players, such as Sinopharm, Shanghai Pharma, and China Resources Pharma, are well positioned given: 1) a better understanding of local practices; 2) well-established distribution networks, and 3) strong relations with hospitals and suppliers.

## New Opportunities in Healthcare Services

The ongoing healthcare reform is opening up the Chinese health system, which was previously strictly controlled by government. The government is encouraging establishment of private hospitals and opening of the hospital market to foreign investment to increase competition.

Meaningful changes in the competitive landscape for the Chinese hospital market could take time to materialize, particularly for multinational hospital groups to ramp up the market, as: 1) the approval procedure remains complicated (e.g. require over 150 official seals to get final approval) and involves multiple government departments, including (but not limited) to Ministry of Health (卫生部), Ministry of Commerce (商务部), Commission of Urban Planning (规划委), and Ministry of Housing and Urban-Rural Development (住建部); and 2) detailed local policies have to be laid out to introduce foreign investment in the hospital sector. However, we believe the introduction of foreign hospitals is essential for improving the operational efficiency of the Chinese hospital system, and that the market poses an attractive opportunity for multinationals in the longer-run.

Some major multinational hospital groups are planning to set foot in the emerging China healthcare market, starting with the high-end market, e.g. Parkway Pantai Limited, Asia's largest private healthcare provider, are to set up a 450-bed hospital in Shanghai (Shanghai International Medical Center) to provide services to the affluent population, and the hospital is expected to be operational in 2014.

**Figure 130. Opening Up of Hospital Market to Foreign Investment**

Year	Milestones
1989	Foreign physicians could practise in China
1997	Foreign invested hospital JV could be set up with stake of $\leq 30\%$
2000	Foreign invested hospital JV could be set up with stake of $\leq 70\%$
2008	HK, Macau, Taiwan invested hospitals could be set up in piloted cities
2010	Ministry of Health permitted the setup of foreign invest hospitals
2011	NDRC, Ministry of Commerce passed the setup of foreign invested hospitals
2012	The trial of HK/Macau-invested hospitals was expanded to more cities

Source: Citi Research, NDRC, Ministry of Health

## Valuation Comp for Major Chinese Healthcare Companies Listed in HK, US and A-Share Market

Figure 131. Valuation Comparison of HK / US-listed Chinese Healthcare Companies (as of December 4, 2012)

Ticker	Name		CY	Rating	Price	MKT	11-13 CAGR			Price/Earnings			PEG			EV/	EV/	FCF	EBIT	Div
							Cap	Sales %	EPS %	12E	13E	14E	12E	13E	14E	Sales	EBITDA	Yield	Margin	Yield
Hong Kong Listed																				
1099-HK	Sinopharm	国药控股	HKD	Buy	24.25	20,087	21.8	23.6	24.4	19.4	15.9	1.1	0.8	0.7	0.4	9.8	4.8	3.8	1.0	
1177-HK	Sino BioPharma	中国生物制药	HKD	Buy	3.71	18,333	20.8	22.5	23.5	18.7	15.7	0.3	0.7	0.8	2.3	9.6	2.5	21.3	1.1	
460-HK	Sihuan Pharma	四环医药	HKD	Neutral	3.15	16,301	23.2	19.0	13.7	11.4	9.7	0.8	0.6	0.5	3.5	8.0	6.4	43.5	0.0	
867-HK	China Medical System	康哲药业	HKD	Buy	5.31	12,822	28.9	29.1	19.0	15.2	11.4	0.6	0.6	0.3	6.1	17.1	3.1	33.1	1.7	
2607-HK	Shanghai Pharmas	上海医药	HKD	NR	14.60	11,182	17.0	10.6	15.6	14.2	12.8	0.6	1.4	1.2	0.4	6.5	3.9	4.6	1.3	
2877-HK	China Shineway Pharma	神威药业	HKD	NR	11.34	9,378	13.7	13.3	10.5	9.3	8.2	(2.3)	0.7	0.6	2.8	6.2	(0.3)	41.3	2.5	
853-HK	MicroPort Scientific	微创医疗	HKD	Buy	4.58	6,464	16.9	11.6	15.8	14.5	12.7	2.7	1.6	0.9	4.5	9.1	6.9	45.7	1.5	
2005-HK	Lijun International Pharma	利君国际	HKD	NR	2.11	6,182	12.8	17.4	23.4	19.9	17.0	0.5	1.1	1.0	2.7	35.1	2.1	1.8	1.6	
3933-HK	United Laboratories International	联邦制药	HKD	Buy	3.80	6,182	12.4	36.2	23.8	16.3	12.8	0.2	0.4	0.5	1.2	10.0	(36.3)	5.1	0.0	
1093-HK	China Pharma	中国医药	HKD	NR	2.11	5,751	10.2	47.8	35.2	20.9	16.1	(0.6)	0.3	0.5	0.7	(24.8)	(13.4)	(2.7)	11.4	
587-HK	Hua Han Bio-Pharma	华瀚生物	HKD	NR	2.30	5,590	n/a	n/a	13.5	9.2	n/a	(0.4)	0.2	n/a	2.8	4.6	5.1	57.1	1.5	
1666-HK	Tong Ren Tang Technologies	同仁堂科技	HKD	Buy	16.14	4,228	20.8	25.2	23.5	18.7	15.0	0.8	0.7	0.6	3.3	16.4	(0.1)	18.1	1.4	
325-HK	Trauson	创生控股	HKD	NR	4.23	3,275	16.9	16.4	15.1	12.6	11.1	0.6	0.6	0.9	4.5	8.9	(8.0)	46.4	5.1	
874-HK	Guangzhou Pharma	广州药业	HKD	Buy	12.64	2,780	31.2	17.3	23.2	19.2	16.9	1.0	0.9	1.3	1.2	15.3	6.3	7.9	1.0	
950-HK	Lee's Pharma	李氏大药厂	HKD	NR	5.15	2,683	28.4	28.1	20.6	16.1	12.6	0.5	0.6	0.4	4.5	17.8	1.5	25.5	0.9	
8058-HK	Shandong Luoxin Pharmacy	山东罗欣	HKD	NR	7.55	1,242	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.3	4.9	8.8	26.4	3.3	
2348-HK	Daw nrays Pharma	东瑞制药	HKD	NR	1.54	1,232	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.1	5.3	16.6	16.6	5.4	
503-HK	Lansen Pharma	朗生药业	HKD	NR	2.19	909	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.4	7.7	1.9	16.0	7.5	
Hong Kong-listed Average							19.8	22.6	20.4	16.0	13.7	0.5	0.8	0.7	2.7	9.2	0.5	26.7	2.6	
U.S. Listed																				
MR-US	Mindray Medical International	迈瑞	USD	Buy	33.40	2,876	18.0	16.0	19.7	16.8	14.6	1.0	1.0	1.0	3.4	13.8	5.7	21.0	1.9	
WX-US	WuXi PharmaTech	药明康德	USD	NR	16.02	1,121	14.8	11.9	12.1	10.9	9.7	0.6	1.0	0.8	2.2	10.4	1.9	21.3	0.0	
SCR-US	Sincere Pharma	先声药业	USD	Buy	8.19	433	9.6	14.5	26.3	21.3	20.0	(1.7)	0.9	3.1	1.7	29.7	(9.8)	5.8	0.0	
SSRX-US	3SBio	三生制药	USD	NR	13.43	297	18.7	8.7	13.9	13.0	11.8	0.5	1.8	1.2	1.8	8.3	5.3	21.5	0.0	
CCM-US	Concord Medical Services	泰和诚医疗	USD	NR	4.40	209	26.9	17.9	9.3	8.2	6.7	1.7	0.7	0.3	2.1	n/a	n/a	n/a	0.0	
NPD-US	China Nepstar Chain Drugstore	海王星辰	USD	NR	1.58	156	n/a	n/a	31.0	24.7	n/a	(2.1)	1.0	n/a	0.1	4.1	(12.4)	2.3	0.0	
SHP-US	ShangPharma	尚华医药	USD	Buy	8.05	150	14.5	16.9	11.4	9.5	8.3	(0.5)	0.5	0.6	0.9	17.0	(6.7)	5.2	0.0	
SVA-US	Sinovac Biotech	科兴生物	USD	NR	2.52	139	11.4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.4	(31.3)	(18.6)	(12.4)	0.0	
U.S.-listed Average							16.3	14.3	17.7	14.9	11.9	(0.1)	1.0	1.1	1.7	7.4	(4.9)	9.3	0.2	
A-Share Healthcare Average							22.8	25.5	24.7	19.4	15.4	0.6	0.7	0.8	3.7	58.0	(1.0)	17.1	1.2	

Source: Citi Research Estimates, FactSet for NR (Non-Rated) Companies

Figure 132. Valuation Comparison of A-Share Chinese Healthcare Companies (as of December 4, 2012) – API and Biologics

Ticker	Name	CY	Rating	Price	MKT	11-13 CAGR		Price/Earnings			PEG			EV/		EV/	FCF	EBIT	Div
						Cap	Sales %	EPS %	12E	13E	14E	12E	13E	14E	Sales	EBITDA	Yield	Margin	Yield
API (原料药)																			
002399-CN	Shenzhen Hepalink Pharma	海普瑞	CNY	NR	17.26	13,811	16.5	8.4	26.4	24.0	22.4	(1.7)	2.4	3.2	4.0	10.3	2.9	39.3	3.5
002001-CN	Zhejiang NHU	新和成	CNY	NR	16.91	12,276	11.0	6.5	9.2	9.1	8.1	0.6	5.5	0.7	2.8	8.9	2.7	32.0	3.5
600267-CN	Zhejiang Hisun Pharma	海正药业	CNY	NR	13.33	11,193	15.5	24.1	24.4	19.0	15.8	(2.3)	0.7	0.8	2.1	21.8	(8.6)	9.6	0.7
600216-CN	Zhejiang Medicine	浙江医药	CNY	NR	18.42	9,580	11.9	12.2	7.9	7.0	6.3	2.0	0.5	0.5	1.3	6.2	1.4	20.7	3.3
600380-CN	Joincare Pharma Industry	健康元	CNY	NR	3.88	5,998	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.3	15.9	2.2	8.4	0.0
600521-CN	Zhejiang Huahai Pharma	华海药业	CNY	NR	10.02	5,485	27.9	27.5	17.5	13.4	10.7	0.4	0.4	0.4	3.1	19.9	(4.0)	15.6	1.0
600812-CN	North China Pharma	华北制药	CNY	NR	4.84	6,672	9.7	n/a	n/a	44.0	19.4	0.3	n/a	0.2	1.1	44.1	(22.5)	2.5	0.0
300267-CN	Hunan Er-Kang Pharma	尔康制药	CNY	NR	15.90	3,803	37.8	38.3	20.8	14.8	10.9	0.4	0.4	0.3	3.1	13.3	(2.3)	23.1	1.5
000788-CN	Southwest Pharma	西南合成	CNY	NR	4.98	2,968	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.8	26.9	(13.1)	6.8	0.5
600488-CN	Tianjin Tianyao Pharma	天药股份	CNY	NR	4.49	2,438	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.7	23.5	(3.0)	7.4	0.7
002626-CN	Xiamen Kingdomway	金达威	CNY	NR	11.00	1,980	13.3	(8.1)	11.9	10.0	14.1	(9.3)	0.5	(0.5)	1.4	8.1	(0.8)	17.7	2.7
600253-CN	Henan Topfond Pharma	天方药业	CNY	NR	6.28	2,638	10.2	27.5	39.3	29.9	24.2	n/a	1.0	1.0	1.2	116.3	(1.7)	1.0	0.0
300261-CN	ABA Chems	雅本化学	CNY	NR	14.00	2,032	53.3	56.3	34.7	22.0	14.2	4.8	0.4	0.3	4.3	21.6	(1.5)	20.1	1.3
002675-CN	Yantai Dongcheng BioChems	东诚生化	CNY	NR	16.95	1,831	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.6	7.9	6.6	18.6	0.0
000739-CN	Apeloa	普洛股份	CNY	NR	7.77	1,995	7.2	14.9	31.1	25.9	23.5	n/a	1.3	2.4	1.7	28.9	(1.5)	5.7	0.3
000597-CN	Northeast Pharma	东北制药	CNY	NR	5.46	1,823	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.2	(92.8)	(9.1)	(1.3)	0.0
002099-CN	Zhejiang Hisoar Pharma	海翔药业	CNY	NR	5.20	1,687	13.4	36.9	15.4	11.4	8.2	4.2	0.3	0.2	1.7	19.0	(14.8)	8.7	2.9
000990-CN	Chengzhi	诚志股份	CNY	NR	5.67	1,684	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.6	20.9	16.2	3.1	0.7
600666-CN	Southwest Pharma	西南药业	CNY	NR	5.74	1,665	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.9	44.4	(2.9)	4.3	0.0
002365-CN	Qianjiang Yongan Pharma	永安药业	CNY	NR	8.26	1,545	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2.5	12.3	(0.3)	20.1	2.4
300233-CN	Shandong Jincheng Pharma & Chem	金城医药	CNY	NR	11.23	1,359	24.3	66.5	32.1	17.3	11.6	n/a	0.2	0.2	1.3	22.8	0.8	5.8	1.8
API Average							19.4	25.9	22.6	19.0	14.6	(0.0)	1.1	0.8	2.0	16.3	(2.4)	11.2	1.2
Biologics (生物制品/生物药)																			
002007-CN	Hualan Biological Engineering	华兰生物	CNY	NR	18.39	10,596	24.8	21.7	27.4	21.8	18.5	6.3	0.8	1.1	11.1	25.1	1.9	44.1	0.7
002038-CN	Beijing SL Pharma	双鹭药业	CNY	NR	33.70	12,830	29.5	29.1	26.8	20.7	16.1	(3.1)	0.7	0.6	15.0	24.3	1.4	61.5	0.6
300122-CN	Chongqing Zhifei Bio	智飞生物	CNY	NR	32.58	13,032	20.1	27.9	49.4	37.5	30.2	1.4	1.2	1.2	17.4	47.1	(0.6)	36.9	0.8
300146-CN	By-health	汤臣倍健	CNY	NR	51.89	11,349	46.2	38.8	34.0	21.8	17.7	0.4	0.4	0.8	10.1	30.1	0.4	33.4	1.0
600867-CN	Tonghua Dongbao Pharma	通化东宝	CNY	NR	8.39	6,512	n/a	n/a	45.6	30.4	n/a	(0.7)	0.6	n/a	6.9	56.7	(1.0)	12.2	2.4
600161-CN	Beijing Tiantan Bio	天坛生物	CNY	NR	11.16	5,753	12.2	11.0	20.2	18.4	16.4	0.9	1.9	1.3	5.0	22.5	(9.8)	22.3	0.9
300142-CN	Walvax BioTech	沃森生物	CNY	NR	32.87	5,990	22.1	19.4	22.9	18.8	16.0	0.9	0.9	0.9	7.5	14.7	(3.2)	51.0	1.5
000661-CN	Changchun High & New Tech Industries	长春高新	CNY	NR	55.05	7,230	25.3	36.2	33.2	24.1	17.9	0.3	0.6	0.5	4.7	19.2	0.9	24.3	0.0
300204-CN	Staidson (Beijing) BioPharmas	舒泰神	CNY	NR	40.80	5,443	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	10.1	20.2	0.9	49.9	0.6
002252-CN	Shanghai RAAS Blood Products	上海莱士	CNY	NR	12.30	6,022	11.7	11.5	27.6	24.3	22.2	3.2	1.8	2.4	9.4	23.8	0.3	39.4	2.3
002022-CN	Shanghai Kehua Bio-Engineering	科华生物	CNY	NR	9.39	4,622	19.6	13.7	17.1	14.4	13.2	0.9	0.8	1.5	4.1	13.9	2.7	29.6	4.3
300289-CN	Beijing Leadman Biochem	利德曼	CNY	NR	18.42	2,829	30.5	32.5	27.8	20.8	15.8	4.4	0.6	0.5	8.7	23.3	(3.0)	34.4	0.5
002030-CN	Da An Gene of Sun Yat-Sen University	达安基因	CNY	NR	6.38	2,654	26.4	29.4	31.4	25.6	18.8	1.5	1.1	0.5	4.9	28.0	(2.7)	17.6	0.3
600080-CN	Ginwa Enterprise	金花股份	CNY	NR	6.09	1,859	9.3	24.0	39.0	30.5	25.4	(0.5)	1.1	1.3	4.1	10.4	(1.4)	39.2	0.0
300294-CN	Jiangxi Boya Bio-Pharma	博雅生物	CNY	NR	23.95	1,815	n/a	n/a	22.5	18.6	n/a	n/a	0.9	n/a	6.7	13.6	3.3	40.9	1.0
300009-CN	Anhui Anke BioTech	安科生物	CNY	NR	10.40	1,966	31.7	30.7	25.4	19.6	14.9	1.2	0.7	0.5	5.3	21.3	(2.4)	25.0	1.9
Biologics Average							23.8	25.1	30.0	23.2	18.7	1.2	0.9	1.0	7.0	36.8	(0.4)	28.8	1.0

Source: Citi Research Estimates, FactSet for NR (Non-Rated) Companies

Figure 133. Valuation Comparison of A-Share Chinese Healthcare Companies (as of December 4, 2012) – Chemical Drugs

Ticker	Name		CY	Rating	Price	MKT	11-13 CAGR		Price/Earnings			PEG		EV/	EV/	FCF	EBIT	Div	
						Cap	Sales %	EPS %	12E	13E	14E	12E	13E	14E	Sales	EBITDA	Yield	Margin	Yield
Chemical Drugs (化学药)																			
600276-CN	Jiangsu Hengrui Medicine	恒瑞医药	CNY	NR	27.19	33,622	21.9	23.1	31.3	25.4	20.7	1.4	1.1	0.9	6.2	26.0	1.2	23.9	3.0
002422-CN	Sichuan Kelun Pharma	科伦药业	CNY	NR	51.35	24,648	23.8	24.7	21.5	18.4	13.8	1.2	1.1	0.4	4.1	18.0	(8.8)	22.7	0.5
600196-CN	Shanghai Fosun Pharma	复星医药	CNY	NR	9.10	17,330	n/a	n/a	13.2	12.1	n/a	1.0	1.4	n/a	2.7	9.2	(2.6)	29.2	1.1
600062-CN	China Resources Double-Crane Pharma	华润双鹤	CNY	NR	20.90	11,948	18.9	21.0	19.6	16.5	13.4	1.3	0.9	0.6	1.5	13.8	2.2	11.1	1.8
002653-CN	Xizang Haisco Pharma	海思科	CNY	NR	22.60	9,042	26.6	24.7	20.6	16.3	13.3	0.8	0.6	0.6	12.6	19.7	1.6	61.1	2.7
002294-CN	Shenzhen Salubris Pharmas	信立泰	CNY	NR	36.05	15,712	16.1	25.4	26.9	21.4	17.1	0.6	0.8	0.7	8.6	22.5	1.6	38.0	1.0
600664-CN	Harbin Pharma	哈药股份	CNY	NR	5.57	10,680	n/a	n/a	12.7	11.6	n/a	0.6	1.2	n/a	0.6	48.9	2.3	1.1	8.0
600079-CN	Wuhan Humanwell Healthcare	人福医药	CNY	NR	21.00	10,362	28.6	27.5	24.8	19.6	15.2	0.6	0.8	0.5	2.4	16.4	(4.1)	14.7	0.3
000522-CN	Guangzhou Baiyunshan Pharma	白云山A	CNY	NR	15.41	7,228	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.8	17.0	5.4	10.6	0.4
002004-CN	Chongqing Huapont Pharm.	华邦制药	CNY	NR	13.00	6,532	20.8	16.0	15.5	13.0	11.5	1.8	0.7	0.9	2.4	10.5	2.1	23.2	1.3
300026-CN	Tianjin Chase Sun Pharma	红日药业	CNY	NR	29.27	7,297	36.2	37.6	30.2	20.9	15.9	0.4	0.5	0.5	6.4	21.7	(1.8)	29.6	0.4
002262-CN	Jiangsu Nhw a Pharma	恩华药业	CNY	NR	25.09	5,871	22.2	37.1	40.3	28.8	21.5	1.1	0.7	0.6	3.1	35.2	0.2	8.9	0.2
002393-CN	Tianjin Lisheng Pharma	力生制药	CNY	NR	28.94	5,280	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3.7	9.7	1.3	38.1	3.1
000513-CN	Livzon Pharma	丽珠集团	CNY	NR	31.42	5,773	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2.3	16.2	0.2	13.9	1.6
000566-CN	Hainan Haiyao	海南海药	CNY	NR	7.74	3,833	n/a	n/a	28.1	22.0	n/a	1.1	0.8	n/a	3.8	46.9	(1.2)	8.1	0.6
002437-CN	Harbin Gloria Pharmas	誉衡药业	CNY	NR	16.85	4,718	n/a	n/a	30.6	23.7	n/a	1.0	0.8	n/a	5.3	19.9	1.8	26.4	0.0
002332-CN	Zhejiang Xianju Pharma	仙琚制药	CNY	NR	8.51	2,905	26.3	27.4	18.9	15.5	11.7	1.2	0.7	0.4	1.6	13.6	(10.4)	12.0	2.6
600420-CN	Shanghai Modern Pharma	现代制药	CNY	NR	11.84	3,407	n/a	n/a	23.7	17.9	n/a	1.2	0.6	n/a	1.8	17.0	(3.5)	10.5	0.8
300006-CN	Chongqing Lummy Pharma	莱美药业	CNY	NR	18.25	3,340	31.1	47.6	36.5	24.2	16.7	1.5	0.5	0.4	5.8	37.9	(3.5)	15.3	0.5
300199-CN	Hybio Pharma	翰宇药业	CNY	NR	11.78	2,356	36.1	29.0	22.9	17.9	13.8	1.2	0.6	0.5	6.9	13.2	(4.7)	52.1	2.1
300110-CN	Qingdao Huaren Pharma	华仁药业	CNY	NR	11.87	2,592	29.8	39.1	24.6	17.6	12.7	1.4	0.4	0.3	4.5	18.7	(8.4)	24.1	1.7
000915-CN	Shandong Shanda Wit Science & Tech	山大华特	CNY	NR	13.20	2,379	n/a	n/a	20.0	15.3	n/a	0.7	0.5	n/a	3.4	11.7	5.4	28.6	0.0
300194-CN	Chongqing Fuan Pharma	福安药业	CNY	NR	16.06	2,142	31.4	28.7	24.0	19.3	14.5	(2.0)	0.8	0.4	2.4	9.6	(2.0)	25.0	1.9
300016-CN	Beijing Beilu Pharma	北陆药业	CNY	NR	11.58	1,769	34.1	31.8	28.9	22.1	16.6	n/a	0.7	0.5	5.6	20.6	(2.5)	27.3	1.7
Chemical Drugs Average							26.9	29.4	24.5	19.0	15.2	0.9	0.8	0.5	3.6	19.7	(1.2)	18.4	1.5

Source: Citi Research Estimates, FactSet for NR (Non-Rated) Companies

Figure 134. Valuation Comparison of A-Share Chinese Healthcare Companies (as of December 4, 2012) – Traditional Chinese Medicine (TCM)

Ticker	Name		CY	Rating	Price	MKT		11-13 CAGR	Price/Earnings			PEG			EV/	EV/	FCF	EBIT	Div		
							Cap	Sales %	EPS %	12E	13E	14E	12E	13E	14E	Sales	EBITDA	Yield	Margin	Yield	
TCM (中药/中药材)																					
000538-CN	Yunnan Baiyao	云南白药	CNY	NR	63.16	43,850		16.0	25.0	28.4	22.5	18.2	1.0	0.9	0.8	3.3	25.3	0.6	13.0	0.3	
600518-CN	Kangmei Pharma	康美药业	CNY	NR	14.40	31,661		n/a	31.7	21.5	16.2	12.4	0.5	0.5	0.4	3.1	19.9	(2.9)	15.7	0.3	
600535-CN	Tasly Pharma .	天士力	CNY	NR	49.81	26,300		23.8	27.3	34.4	26.8	21.3	1.5	0.9	0.8	3.1	29.2	(0.4)	10.8	1.4	
000423-CN	Shandong Dong-E E-Jiao	东阿阿胶	CNY	NR	37.47	24,506		20.3	25.0	23.7	18.7	15.1	1.1	0.7	0.6	8.1	18.6	0.9	43.3	0.8	
600085-CN	Beijing Tongrentang	同仁堂	CNY	NR	16.57	21,575		22.0	26.9	39.6	31.9	24.6	1.6	1.3	0.8	2.6	19.7	1.5	13.0	0.9	
000999-CN	China Resources Sanjiu Medical	华润三九	CNY	NR	19.70	19,284		19.5	23.8	19.3	15.6	12.6	0.6	0.6	0.5	2.6	15.4	4.4	17.0	1.2	
002603-CN	Shijiazhuang Yiling Pharma	以岭药业	CNY	NR	21.09	11,652		21.0	19.4	25.2	19.6	17.7	(3.5)	0.7	1.7	5.5	24.1	(3.8)	22.9	0.4	
600436-CN	Zhangzhou Plentzehuang Pharma	片仔癀	CNY	NR	92.79	12,991		22.9	30.4	39.0	30.7	22.9	1.3	1.1	0.7	10.9	29.6	1.2	37.0	0.8	
600332-CN	Guangzhou Pharma	广州药业	CNY	NR	16.66	9,846		12.2	18.2	36.9	32.5	26.4	1.4	2.4	1.2	2.0	25.2	3.8	7.9	0.6	
600252-CN	Guangxi Wuzhou Zhongheng	中恒集团	CNY	NR	8.04	8,778		3.3	13.5	13.6	13.9	10.6	0.2	(8.2)	0.3	8.0	21.8	(0.3)	36.7	1.2	
002424-CN	Guizhou Bailing Pharma	贵州百灵	CNY	NR	14.17	6,666		23.2	23.9	26.0	20.4	16.9	1.1	0.8	0.8	5.0	24.4	(3.2)	20.5	1.4	
002275-CN	Guilin Sanjin Pharma	桂林三金	CNY	NR	12.05	7,112		n/a	n/a	19.5	15.6	n/a	0.8	0.6	n/a	4.7	14.8	(0.1)	31.5	3.3	
600557-CN	Jiangsu Kanion Pharma	康缘药业	CNY	NR	17.62	7,324		24.8	32.4	31.7	23.9	18.1	1.2	0.7	0.6	4.6	33.8	(0.1)	13.6	0.3	
600594-CN	Guizhou Yibai Pharma	益佰制药	CNY	NR	18.75	6,763		20.6	26.8	21.1	16.6	13.1	1.2	0.6	0.5	3.2	18.5	2.5	17.4	0.4	
600572-CN	Zhejiang Conba Pharma	康恩贝	CNY	NR	8.51	5,988		23.1	29.3	22.6	17.7	13.5	(3.9)	0.6	0.4	2.6	21.1	0.5	12.2	1.8	
002287-CN	Tibet Cheezheng Tibetan Medicine	奇正藏药	CNY	NR	12.59	5,112		n/a	n/a	26.2	22.1	n/a	n/a	1.2	n/a	5.3	20.8	0.4	25.5	2.2	
600750-CN	Jiangzhong Pharma	江中药业	CNY	NR	17.86	5,557		16.9	29.0	20.9	15.5	12.6	1.2	0.5	0.5	1.6	18.0	(1.3)	8.9	1.7	
300039-CN	Shanghai Kaibao Pharma	上海凯宝	CNY	NR	21.28	5,597		26.9	24.3	23.5	18.4	15.2	0.6	0.7	0.7	4.4	18.3	3.6	24.3	2.8	
000650-CN	Renhe Pharmacy	仁和药业	CNY	NR	4.34	4,300		20.0	27.8	11.2	8.5	6.9	0.5	0.3	0.3	1.8	10.5	(0.2)	17.1	0.9	
600329-CN	Tianjin Zhongxin Pharma	中新药业	CNY	NR	8.99	4,848		21.5	19.6	16.3	14.4	11.4	0.2	1.1	0.4	1.5	14.4	1.5	10.3	0.0	
600422-CN	Kunming Pharma	昆明制药	CNY	NR	17.38	5,460		22.4	33.2	29.7	22.0	16.7	0.7	0.6	0.5	1.8	25.9	2.6	7.1	1.2	
002317-CN	Guangdong Zhongsheng Pharma	众生药业	CNY	NR	38.44	6,919		n/a	n/a	38.1	31.0	n/a	1.8	1.4	n/a	7.1	30.8	0.4	23.2	1.0	
600993-CN	MaYinglong Pharma	马应龙	CNY	NR	12.31	4,082		17.2	26.8	20.6	16.2	12.8	0.5	0.6	0.5	2.4	21.6	2.3	11.2	0.9	
000989-CN	Jiuzhitang	九芝堂	CNY	NR	9.92	2,952		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2.0	10.1	0.5	20.1	4.0	
002118-CN	Jilin Zixin Pharma Industrial	紫鑫药业	CNY	NR	6.34	3,252		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5.3	18.2	(12.0)	29.0	0.0	
000919-CN	Jinling Pharma	金陵药业	CNY	NR	5.79	2,918		17.9	10.0	11.4	10.9	9.4	0.2	2.1	0.6	1.0	9.5	2.0	10.3	2.6	
600351-CN	Yabao Pharma	亚宝药业	CNY	NR	4.59	3,176		15.8	26.1	20.9	16.4	13.1	(0.8)	0.6	0.5	1.9	15.4	(8.7)	12.5	1.1	
600479-CN	Zhuzhou Qianjin Pharma	千金药业	CNY	NR	10.22	3,115		18.8	25.7	26.8	21.3	17.0	0.7	0.8	0.7	2.1	22.1	0.6	9.5	2.0	
600129-CN	Chongqing Taiji Industry	太极集团	CNY	NR	5.87	2,506		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.9	61.3	(8.8)	1.5	0.0	
002566-CN	Jilin Jian Yisheng Pharma	益盛药业	CNY	NR	14.43	3,184		22.0	17.2	28.3	24.9	20.6	1.7	1.8	1.0	3.6	17.9	(2.4)	19.9	0.7	
300147-CN	Xiangxue Pharma	香雪制药	CNY	NR	9.78	2,944		31.8	34.6	26.4	19.6	14.6	0.9	0.6	0.4	3.2	15.6	(8.7)	20.6	1.7	
600976-CN	Wuhan Jianmin Pharma s	武汉健民	CNY	NR	13.23	2,029		7.2	37.0	21.4	17.0	11.4	1.0	0.6	0.2	1.2	19.2	2.9	6.4	3.0	
000590-CN	Unisplendour Guhan	紫光古汉	CNY	NR	8.43	1,883		26.1	(11.5)	9.7	18.0	12.3	0.1	(0.4)	0.3	5.4	20.3	0.8	26.7	0.0	
002433-CN	Guangdong Taientang Pharma	太安堂	CNY	NR	26.37	2,637		30.6	31.3	25.6	19.2	14.9	n/a	0.6	0.5	5.5	26.2	(4.5)	21.2	0.0	
000606-CN	Qinghai Gelatin	青海明胶	CNY	NR	4.65	1,888		39.2	60.4	66.4	46.5	25.8	n/a	1.1	0.3	7.2	(90.8)	0.2	(8.0)	0.0	
600285-CN	Henan Lingrui Pharma	羚锐制药	CNY	NR	9.26	1,859		35.4	61.0	37.6	20.6	14.5	0.6	0.2	0.3	3.6	51.5	1.3	7.0	1.6	
002349-CN	Nantong Jinghua Pharma	精华制药	CNY	NR	8.25	1,650		25.4	9.5	23.6	21.2	19.6	0.5	1.9	2.6	2.2	18.6	(8.5)	11.6	0.6	
300181-CN	Zhejiang Jolly Pharma	佐力药业	CNY	NR	10.53	1,516		20.8	29.5	23.4	17.8	13.9	1.0	0.6	0.5	3.4	17.3	(0.8)	19.7	2.6	
TCM Average									21.6	26.4	26.0	20.7	15.8	0.5	0.6	0.7	4.4	123.6	(1.1)	15.3	1.0

Source: Citi Research Estimates, FactSet for NR (Non-Rated) Companies



Figure 135. Valuation Comparison of A-Share Chinese Healthcare Companies (as of December 4, 2012) – Distribution / Retail, Healthcare Services and Medical Devices

Ticker	Name	CY	Rating	Price	MKT	11-13 CAGR		Price/Earnings			PEG			EV/	EV/	FCF	EBIT	Div	
					Cap	Sales %	EPS %	12E	13E	14E	12E	13E	14E	Sales	EBITDA	Yield	Margin	Yield	
Distribution/Retail (医药流通)																			
601607-CN	Shanghai Pharmas	上海医药	CNY	NR	10.00	19,230	17.4	4.9	12.4	8.6	11.3	(2.7)	0.2	(0.5)	0.3	5.2	4.5	4.6	1.6
600998-CN	Jointow n Pharma	九州通	CNY	NR	10.68	15,171	9.1	15.0	34.3	27.1	26.0	1.8	1.0	6.0	0.7	35.7	(7.6)	1.8	0.0
000963-CN	Huadong Medicine	华东医药	CNY	NR	31.34	13,603	21.7	26.5	27.8	22.0	17.4	1.0	0.8	0.7	1.1	16.4	3.5	6.5	0.0
000028-CN	China National Accord Medicines	国药一致	CNY	NR	28.23	6,585	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.6	14.6	2.7	4.0	0.5
600511-CN	China National Medicines	国药股份	CNY	NR	12.84	6,148	19.2	17.9	18.8	15.9	13.5	0.9	0.9	0.8	0.7	15.7	3.4	4.5	0.5
600713-CN	Nanjing Pharma	南京医药	CNY	NR	4.19	2,906	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.3	(40.7)	(30.9)	(0.8)	0.5
002589-CN	Shandong Realcan Pharma	瑞康医药	CNY	NR	28.72	2,694	33.4	33.1	22.8	16.9	12.9	1.0	0.5	0.4	0.6	18.8	(16.8)	3.3	0.3
002462-CN	Cachet Pharma	嘉事堂	CNY	NR	6.84	1,642	42.6	23.4	21.7	16.5	14.3	1.2	0.5	0.9	0.5	11.7	(2.6)	4.4	2.2
000591-CN	Chongqing Tongjunge	桐君阁	CNY	NR	5.78	1,587	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.5	134.1	6.6	0.4	0.0
000705-CN	Zhejiang Zhenyuan Share	浙江震元	CNY	NR	11.76	1,965	15.1	28.3	30.1	22.6	18.3	0.5	0.7	0.8	0.9	29.2	3.6	3.0	0.0
600833-CN	Shanghai No. 1 Pharmacy	第一医药	CNY	NR	6.99	1,559	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.1	26.9	0.7	4.0	0.7
000411-CN	Zhejiang Int'l	英特集团	CNY	NR	7.27	1,508	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.2	8.0	2.0	2.6	0.0
Drug Distribution / Retail Average							22.6	21.3	24.0	18.5	16.2	0.5	0.7	1.3	0.6	23.0	(2.6)	3.2	0.5
Healthcare Services (医疗服务)																			
300015-CN	Aier Eye Hospital	爱尔眼科	CNY	Neutral	14.70	6,280	32.1	33.2	30.3	22.5	17.1	1.4	0.7	0.5	3.8	24.2	0.4	15.5	1.0
600763-CN	Topchoice Medical Investment	通策医疗	CNY	NR	19.26	3,088	29.6	30.3	33.2	25.1	19.6	1.0	0.8	0.7	7.9	24.0	2.5	32.7	0.0
300244-CN	Zhejiang DA Diagnostics	迪安诊断	CNY	NR	25.00	2,300	37.2	32.2	39.8	30.2	22.8	2.4	1.0	0.7	2.5	25.5	(2.2)	9.9	0.7
Healthcare Services Average							33.0	31.9	34.4	26.0	19.8	1.6	0.8	0.6	4.7	24.6	0.2	19.4	0.6
Medical Devices (医疗器械)																			
002223-CN	Jiangsu Yuyue Medical	鱼跃医疗	CNY	NR	13.29	7,065	23.6	23.0	24.0	19.0	15.9	0.8	0.7	0.8	5.2	24.5	0.0	21.4	0.6
300003-CN	Lepu Medical Tech (Beijing)	乐普医疗	CNY	NR	7.89	6,407	13.3	8.6	12.7	11.1	10.7	1.8	0.8	3.2	5.3	10.4	2.4	51.2	2.3
300171-CN	Shanghai Tofflon Science & Tech	东富龙	CNY	NR	25.86	5,379	31.2	26.8	20.1	14.7	12.5	1.0	0.4	0.7	5.0	13.5	3.3	37.5	1.8
600587-CN	Shinva Medical Instrument	新华医疗	CNY	NR	27.40	4,769	25.5	34.1	29.9	21.7	16.6	2.1	0.6	0.6	1.5	21.0	(3.3)	7.3	0.4
300298-CN	Sinocare Inc	三诺生物	CNY	NR	47.75	4,202	28.1	29.3	31.3	23.2	18.7	n/a	0.7	0.8	15.0	30.0	1.8	49.1	1.0
300273-CN	Zhuhai Hokai Medical Instruments	和佳股份	CNY	NR	13.92	2,784	35.9	35.6	23.8	17.2	12.9	1.4	0.5	0.4	3.1	14.4	22.5	20.1	2.4
300238-CN	Grandhope Biotech	冠昊生物	CNY	NR	13.62	1,664	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7.6	16.2	(1.0)	47.0	0.9
600529-CN	Shandong Pharma Glass	山东药玻	CNY	NR	7.66	1,972	9.4	15.3	16.3	14.3	12.3	(2.1)	1.0	0.7	1.6	14.4	(2.3)	10.9	1.3
300314-CN	Ningbo David Medical Device	戴维医疗	CNY	NR	22.88	1,830	22.1	25.4	22.4	17.5	14.3	n/a	0.6	0.6	6.5	17.4	3.3	32.8	0.0
600055-CN	China Resources Wandong Medical	华润万东	CNY	NR	6.86	1,485	16.9	18.3	33.5	28.8	23.9	2.9	1.8	1.2	2.5	31.2	(4.7)	8.0	1.0
300206-CN	Edan Instruments	理邦仪器	CNY	NR	15.32	1,532	23.0	36.2	24.7	17.8	13.3	(5.4)	0.5	0.4	0.9	5.1	2.3	18.3	2.6
300216-CN	Hunan China Sun Pharma Machinery	千山药机	CNY	NR	9.04	1,211	25.4	24.0	16.7	12.5	10.9	0.4	0.4	0.8	2.7	11.5	(13.0)	23.6	1.7
300030-CN	Guangzhou Improve Medical Instruments	阳普医疗	CNY	NR	7.16	1,060	31.1	32.0	23.1	17.0	13.3	0.8	0.5	0.5	2.7	16.0	(4.2)	16.6	0.8
300246-CN	Guangdong Biolight Meditech	宝莱特	CNY	NR	12.94	945	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3.1	12.4	2.0	24.6	2.1
Medical Devices Average							23.8	25.7	23.2	17.9	14.6	0.4	0.7	0.9	4.5	23.2	0.5	24.2	1.3

Source: Citi Research Estimates, FactSet for NR (Non-Rated) Companies

# Appendix A-1

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The research analyst(s) primarily responsible for the preparation and content of this research report are named in bold text in the author block at the front of the product except for those sections where an analyst's name appears in bold alongside content which is attributable to that analyst. Each of these analyst(s) certify, with respect to the section(s) of the report for which they are responsible, that the views expressed therein accurately reflect their personal views about each issuer and security referenced and were prepared in an independent manner, including with respect to Citigroup Global Markets Inc and its affiliates. No part of the research analyst's compensation was, is, or will be, directly or indirectly, related to the specific recommendation(s) or view(s) expressed by that research analyst in this report.

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