

Broadening the Bridge to Innovation

November 18th, 2020



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2020 in the mirror: Nine key trends



1 Post COVID-19 next normal



2 Splintered global economy



3 Deepening health system reform



4 Cost containment gathering pace



5 CHI: silver lining or silver bullet?



6 Digital health charging ahead



7 China innovation coming of age



8 Tsunami of value creation for China biotech

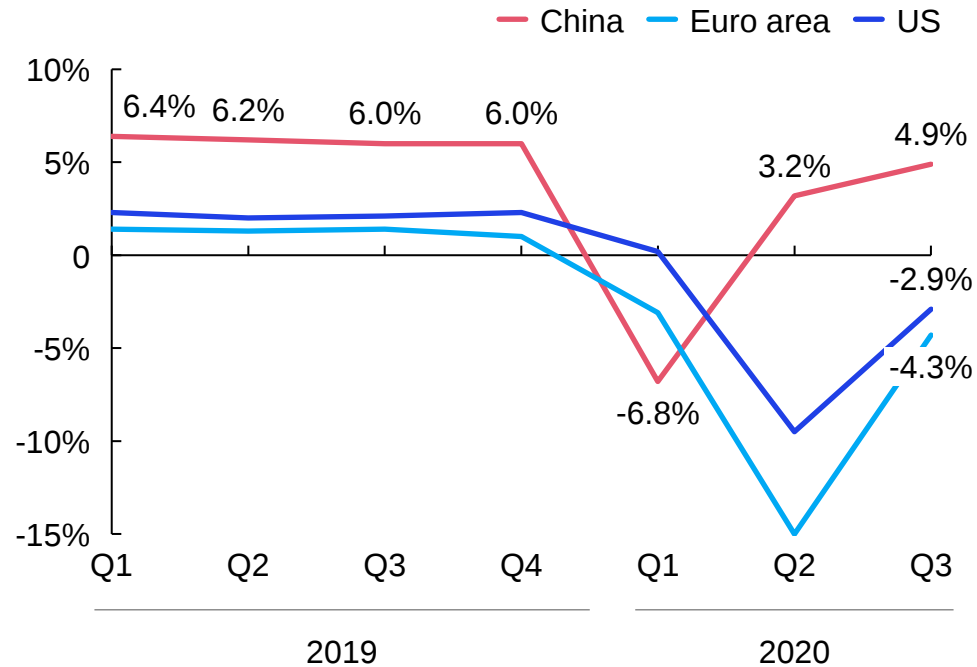


9 New era for biopharma deals

1: Next-normal emerges as China's economy recovers post COVID-19

China GDP showing signs of rapid recovery

Year on year GDP growth of major economies¹



Next normal emerges post-COVID



Sustained economic and geopolitical tensions

Deglobalization and challenging dynamics likely to persist post COVID



Dual circulation

Expand and upgrade consumption and encourage investment domestically, while deepening “opening up” policy



Localized supply chain

Large-scale nearshoring spurred by supply chain complexities



Rise of virtual demand

Rapid development in home-based services, remote work, and gig economy



Healthcare expenditure under pressure

Budget negatively impacted, with allocation shifting towards public health



Decentralized healthcare services

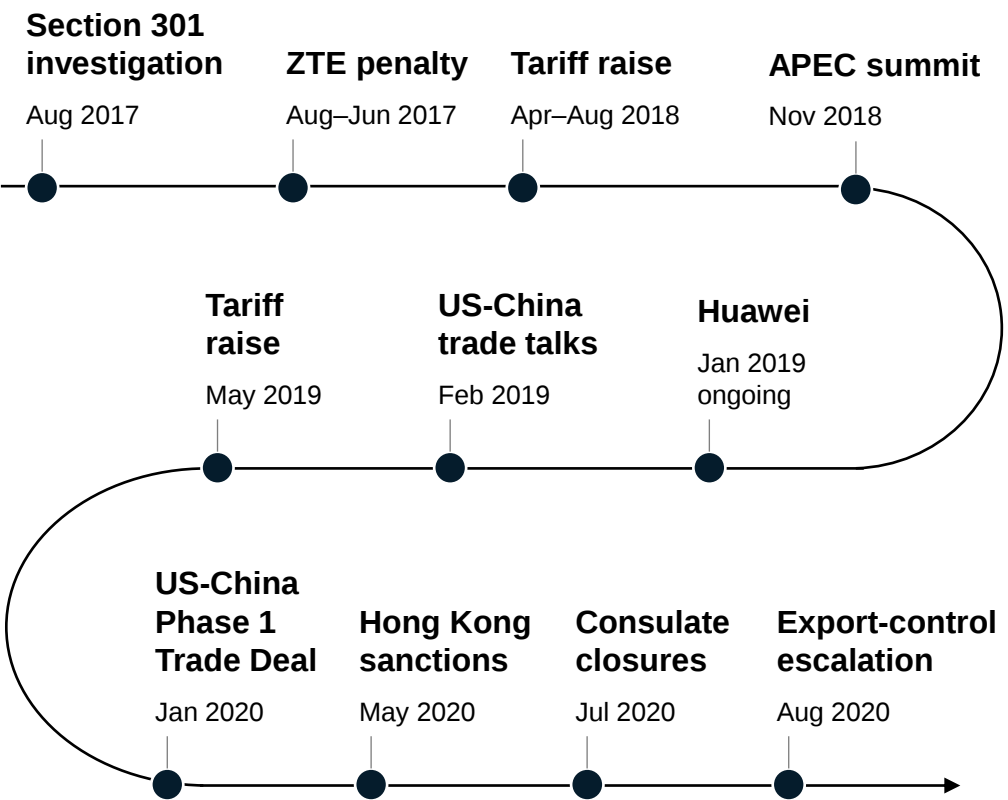
Community and remote care enabled by data and digital offerings

1. Percentage change, compared to same period previous year

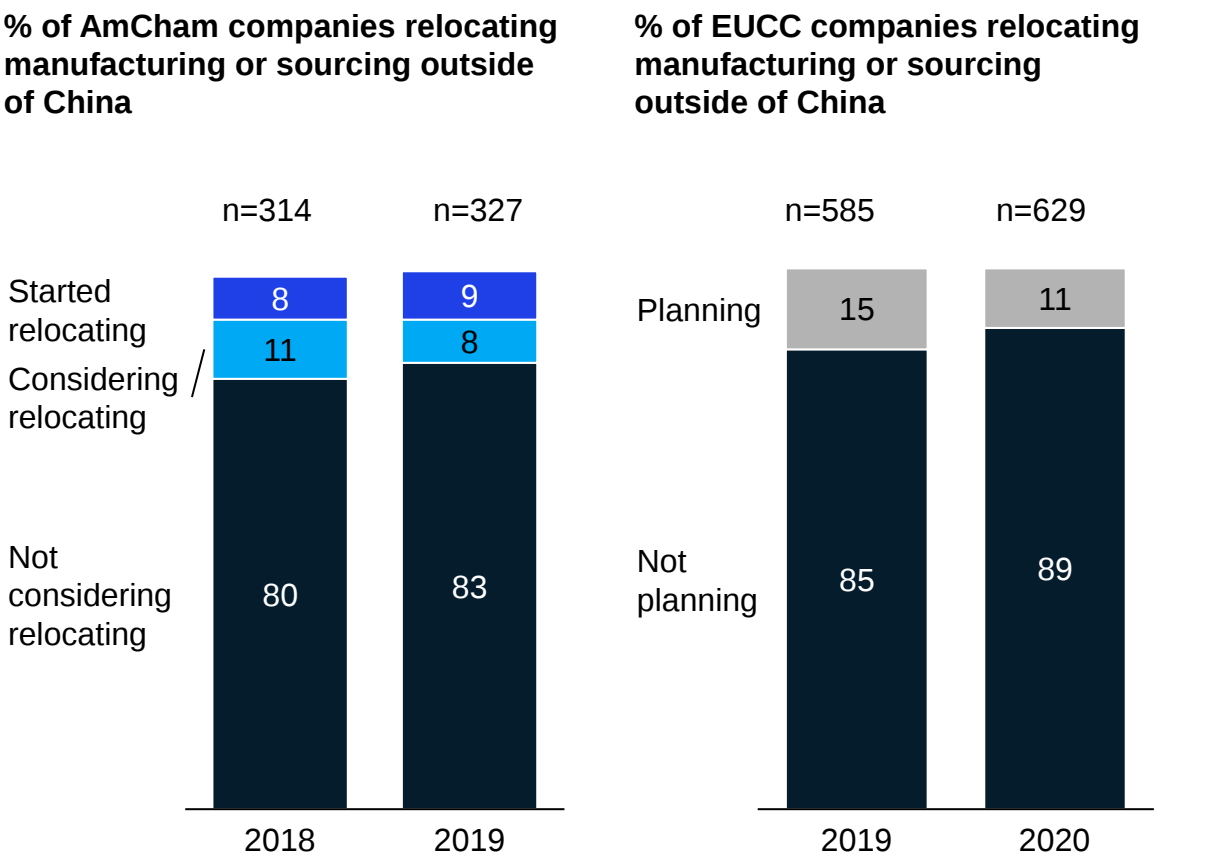
2: Despite splintering US-China relations, MNCs' confidence in China remains high

NON-EXHAUSTIVE

Splintering US-China relations with focus on technology and trades



Multinational companies (MNCs) remain committed to China



3: China public health system is evolving along three key themes

1

Strengthening disease-control capability

Strong emphasis from the central government

“By developing a strong public health system, improving the early warning and response mechanisms, comprehensively enhancing the capacity for prevention, control and treatment, weaving a tight prevention and control network, and consolidating the wall of quarantine, we can provide a strong guarantee for safeguarding public’s health.”

– President Xi, June 2, 2020

City-level implementation

Shanghai aspires to “become one of world's safest cities in public health by 2025”

2

Decentralizing functions and resources

Basic Healthcare and Health Promotion Law takes effect from June 1, 2020, with emphasis on empowering grassroots

3

Improving efficiency and reducing cost

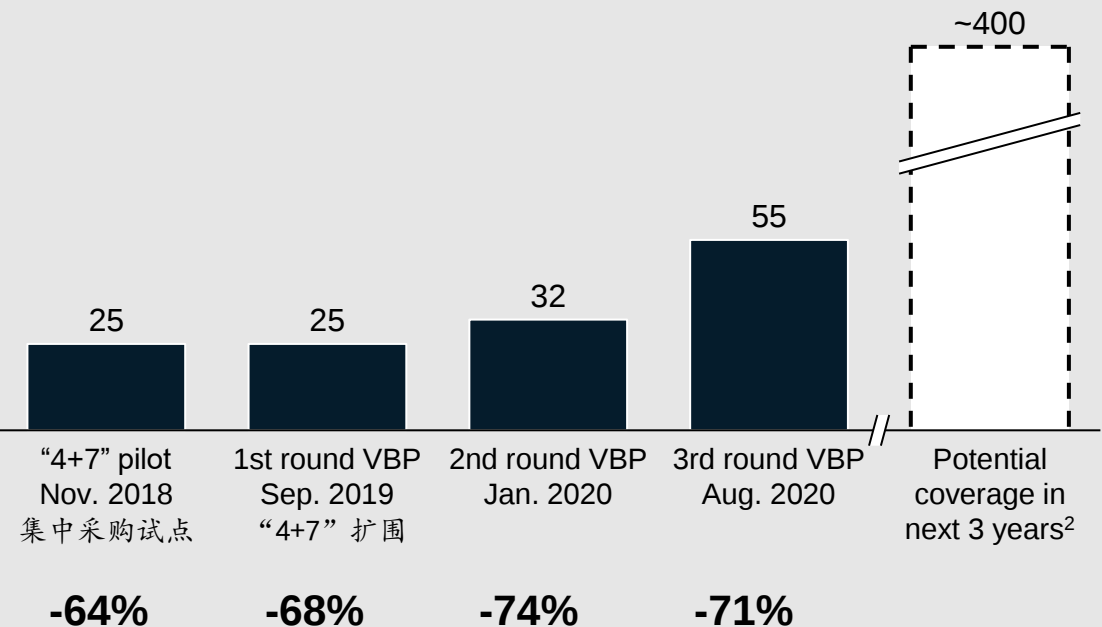
Diagnosis related groups (DRG) payment piloted in 30 cities in 2020 and set to start in 2021



4: Cost containment gathering pace

National volume-based procurement (VBP) continues to expand in scope with sharp price reductions

Number of molecules passed tendering and average price¹ cut
of molecules, % of price cut

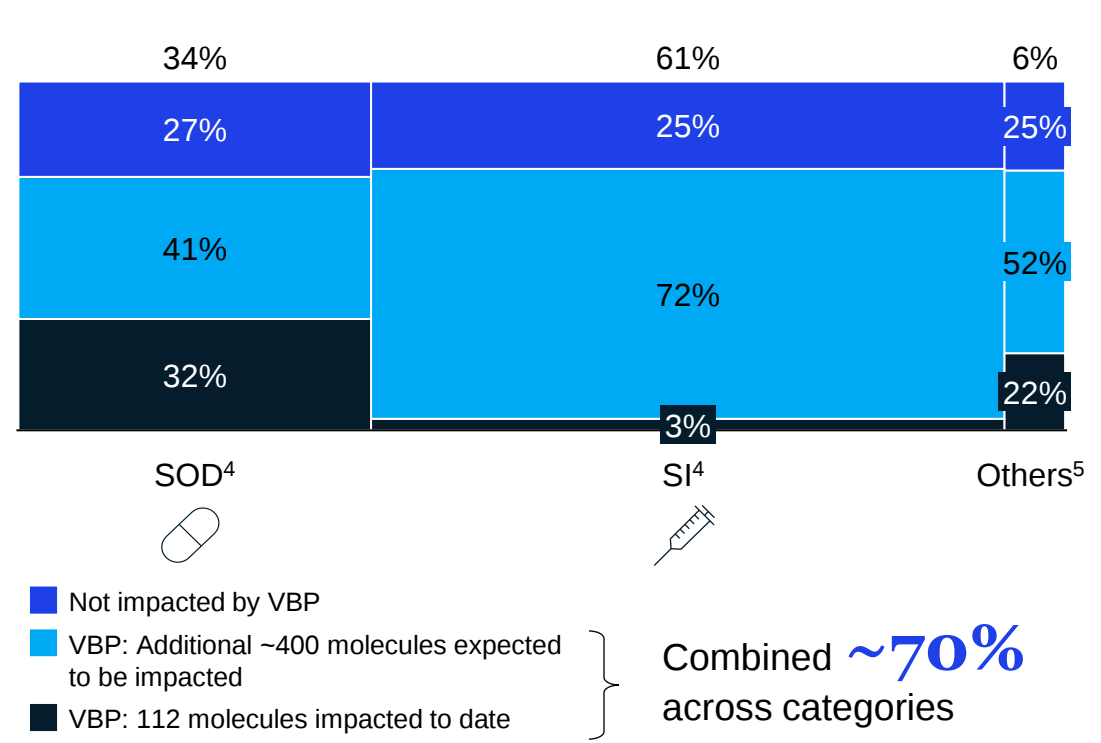


1. Simple average of tender winners, comparing VBP tender price to median tendering price in the previous year
2. Based on draft candidate list of VBP products
3. Based on the 680 hospitals (>60% Class III) from PDB database
4. SOD: Solid Oral Dosage; SI: Sterile Injectables. SI includes biologics and insulins
5. Others e.g. inhalers, eye drops, topical treatment

VBP could impact 70% of today's pharma market in 3 years

VBP expected to impact majority of today's pharma market in 3 years

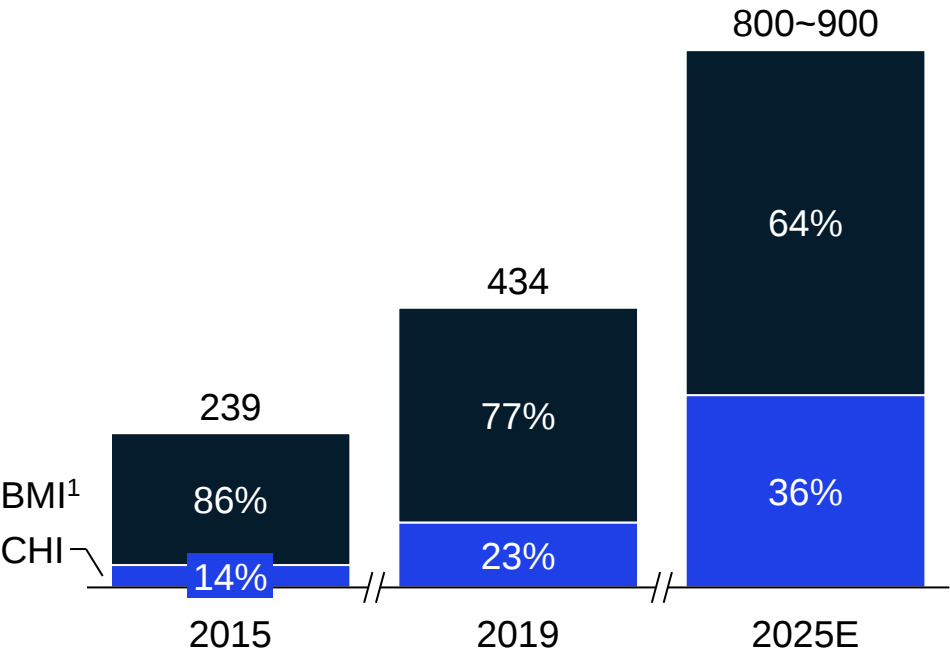
Estimated VBP impact on pharma sales by product category³
% of 2019 sales



5: Commercial health insurance (CHI) plays an important and growing supplemental role in China’s payor landscape

CHI premium growing rapidly, expected to reach ~US \$300 billion in 2025

Health insurance gross written premium
Billion USD, % of total



1. Basic Medical Insurance
2. As of Oct. 20, 2020

Emergence and growth of new forms of CHI

Since 2020



Example 惠民健康保

City supplementary insurance with specialty drug formulary including both NRDL and non-NRDL listed drugs

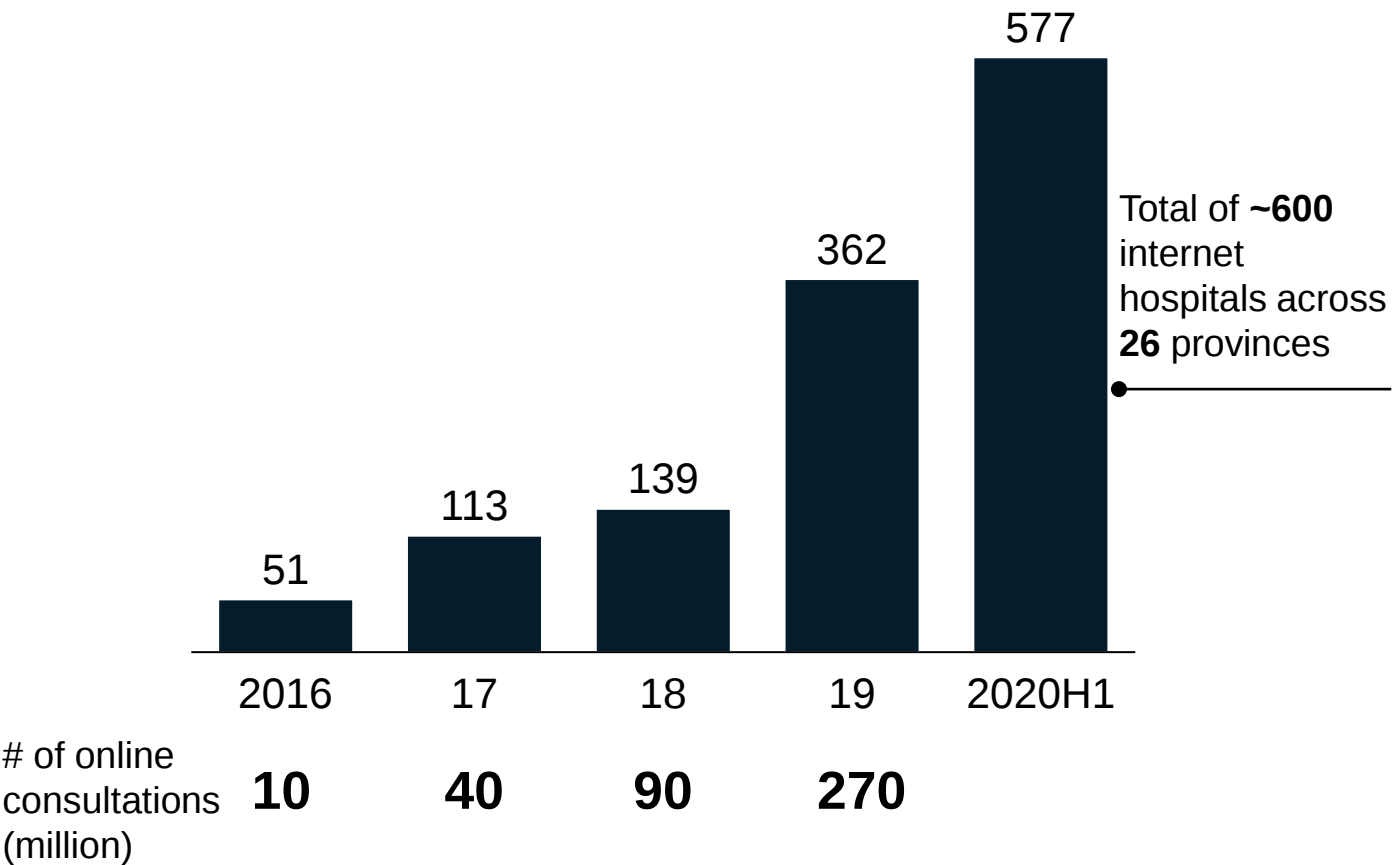
>20 cities and 8 provinces² launched city supplementary insurance since 2015, majority added in 2020

>20 Mn enrollees as of October 2020

100% foreign ownership in life insurers allowed starting January 1, 2020

6: Internet hospitals quadrupled in two years, with online consultations experiencing explosive growth

Registered internet hospitals and online consultations by year



Two main types of internet hospitals

70%

Hospital-led internet hospitals

30%

Tech player-led internet hospitals

Examples

Online Basic Medical insurance (BMI) settlement currently implemented in **71** internet hospitals, majority being hospital-led

6: Digital and analytics (D&A) a top agenda item for MNC pharmacos in China



Established digital innovation hub in Shanghai to build a digital innovative ecosystem with local startups

500 million RMB investment in Chengdu global research & operation center, focusing on digital innovation and big-data analytics



Initiated iHospital strategic project
Shanghai AI innovation center



“By combining big-data insights, new platform construction, and exploring more partnership, Merck will further facilitate the implementation of Healthy China 2030.”
– GM & MD of Merck KGaA Biopharma China



“Digitalization is an inevitable industry trend. We not only need to develop good products, but also to build a patient-centric ecosystem.”

– Pfizer China



In partnership with Tencent, launched “AI Nurse” intelligent platform in April 2020 supporting patients, physicians, and nurses to better manage heart disease

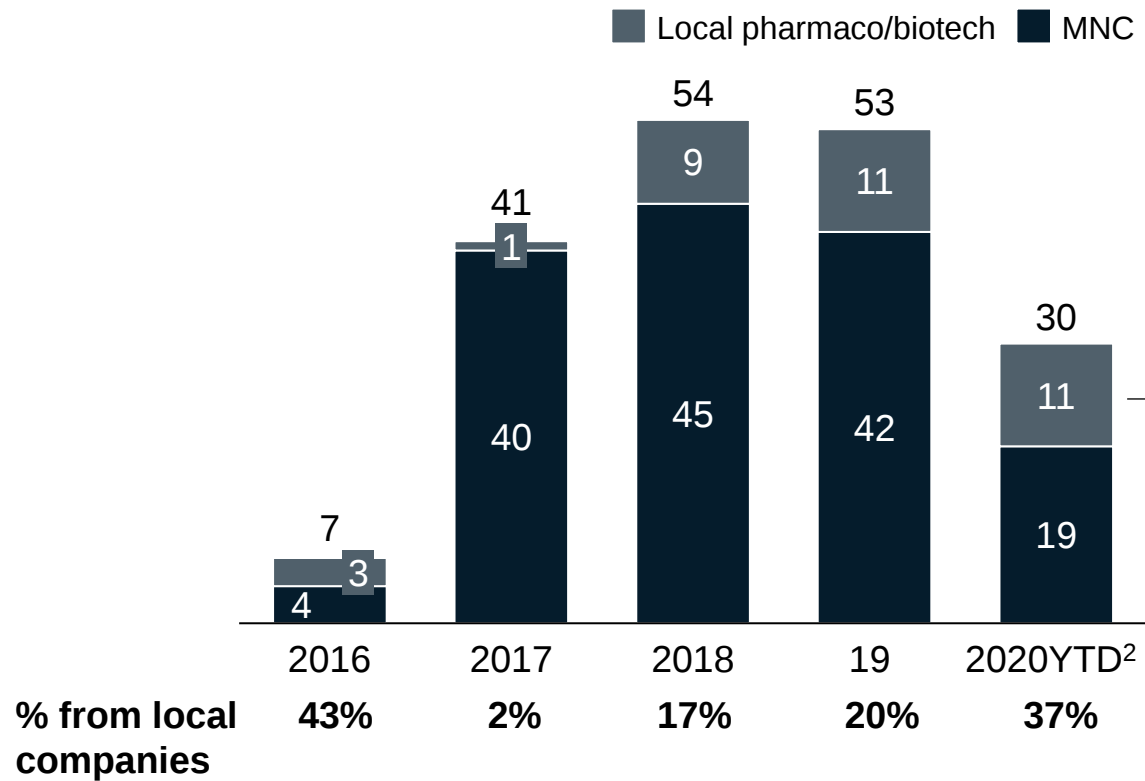


Set up all-round online diabetes care, including online consultation, Rx refilling, drug product racking, and disease management via multiple partnerships

Increasing emphasis on Digital & Analytics by MNCs in China

7: China innovation coming of age

NDA approvals for innovative drugs¹



1. Including both innovative chemical drugs and biologics
2. As of Oct 20, 2020
3. Antibody-dependent cellular cytotoxicity

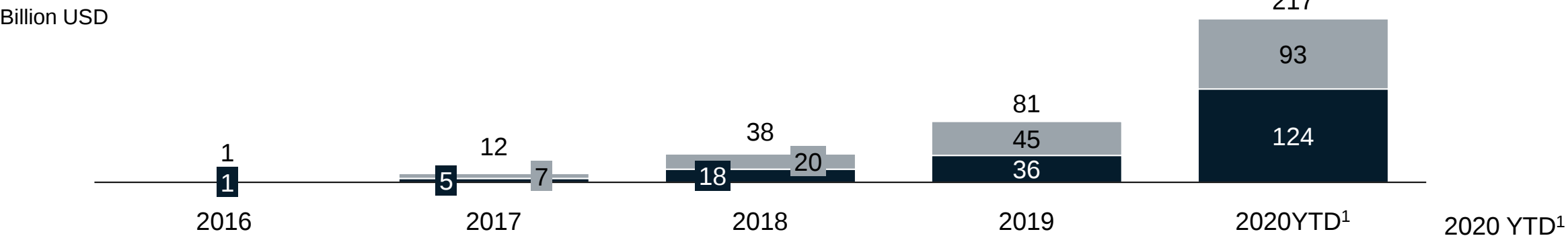
Source: GBI; company announcements

Select examples of local developed innovations in 2020

	Ameile	Third-generation EGFR-TKI
	BiLiTing	Nasal spray for allergic rhinitis
	Brukinsa	BTK inhibitor for adult MCL and CLL/SLL
	Coblopasvir	Second local innovative HCV drug
	Cipterbin	Anti HER2 with stronger ADCC ³
	YiKa (EC)	Fusion protein for TB diagnosis

8: Tsunami of value creation by China biotech and ecosystem players

Total market value¹ of listed innovative China biotechs and ecosystem players^{2,3} on major stock exchanges



of newly listed biotechs and ecosystem players

NASDAQ	1 	1 		2 	42
HKEX	1 	5 	10 	6 	145
STAR Board			3 	8 	30

1. Year-end or YTD value as of Nov 10, 2020
2. Biotechs and CRO/CDMOs focusing on innovative drug development
3. For companies listed in multiple stock markets, market cap value from the primary listing/largest market cap is used

9: New era for biopharma deals

20+

local to MNC out-licensing deals¹



60+

local from MNC in-licensing deals¹

New types of collaborations on innovation also emerging...



Selected examples



MNC-China biotech strategic partnership with equity investment



\$200 Mn equity investment
China rights of sugemalimab



MNC shaping innovative portfolio for China to de-risk VBP impact



Dorzagliatin
Clenil, Foster



MNC and China funds partner to foster innovation



MNC opening technology platform to China innovators



Universal CAR-T cell technology
2:1 T-cell bispecific antibody platform



China's innovation going global



Sintilimab
TJC4



1. As of Oct 20, 2020

China innovation momentum

01

Refreshed
perspective on
China innovation
ecosystem

02

Momentum of
China innovators



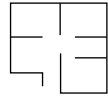
Regularly updated since 2015, our China Drug Innovation Index (CDII) helps to gauge progress of the China innovation ecosystem



Assessing China innovation ecosystem along 5 dimensions:



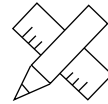
Policy environment



Funding for biotech



R&D capabilities



Local innovation output



Integration with global

Calibrated against current US levels

Assume US = 8 out of 10 points

Reflecting longitudinal trends of industry views

2015 → **2016** → **2018** → **2020**

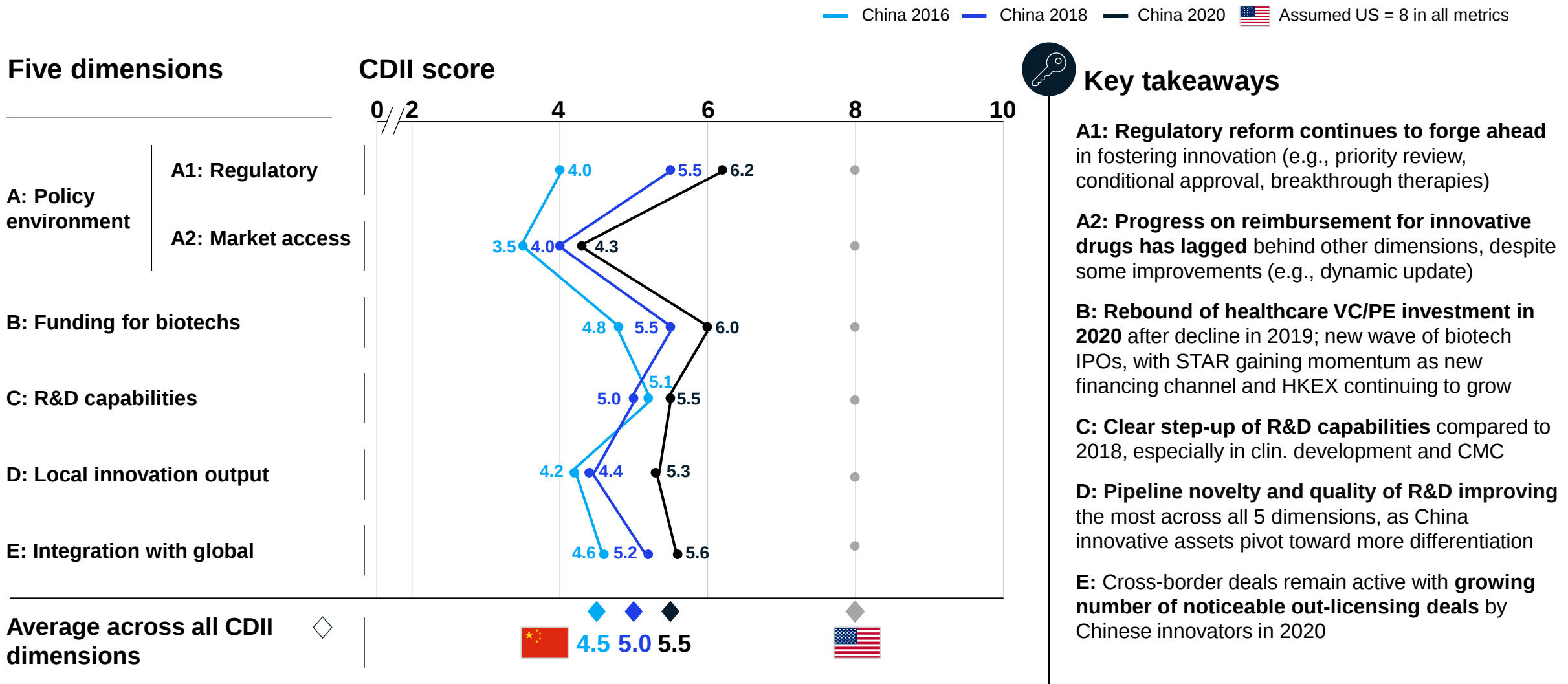
Highlights of 2020 survey participants

129 industry experts, of which...

66% are CEOs/senior executives

67% have 15+ years of industry experiences

“Fast and slow” evolution of China biopharma innovation ecosystem persists – 2016 to 2020 evolution



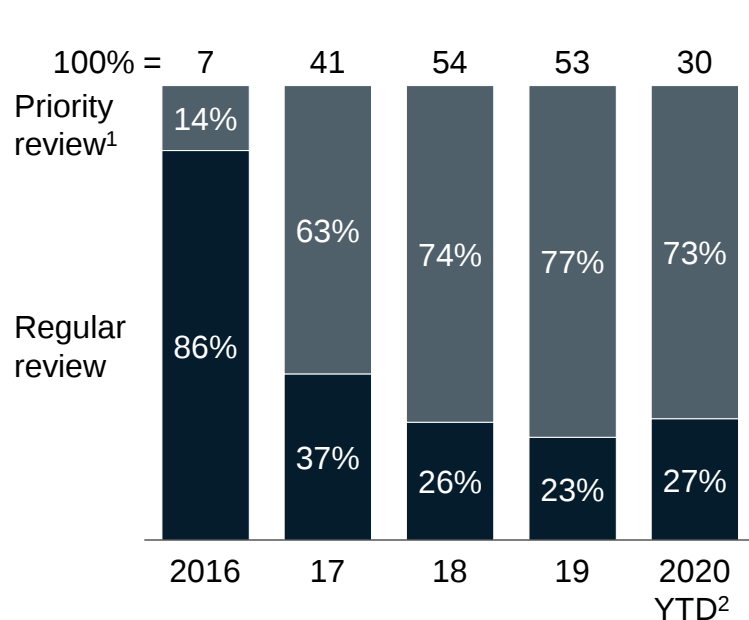
A1: Regulatory reform continues to forge ahead in fostering innovation in China



Priority review as the new norm...

Priority reviews¹ among NDA approvals of innovative drugs (2016–2020 YTD²)

of drugs, % of drugs



Conditional approval ramping up...

At least **13** innovative new launches with conditional approval³ since 2018



Designation of breakthrough therapy emerging...

4 innovative oncology assets granted designation since introduced by NMPA in July 2020



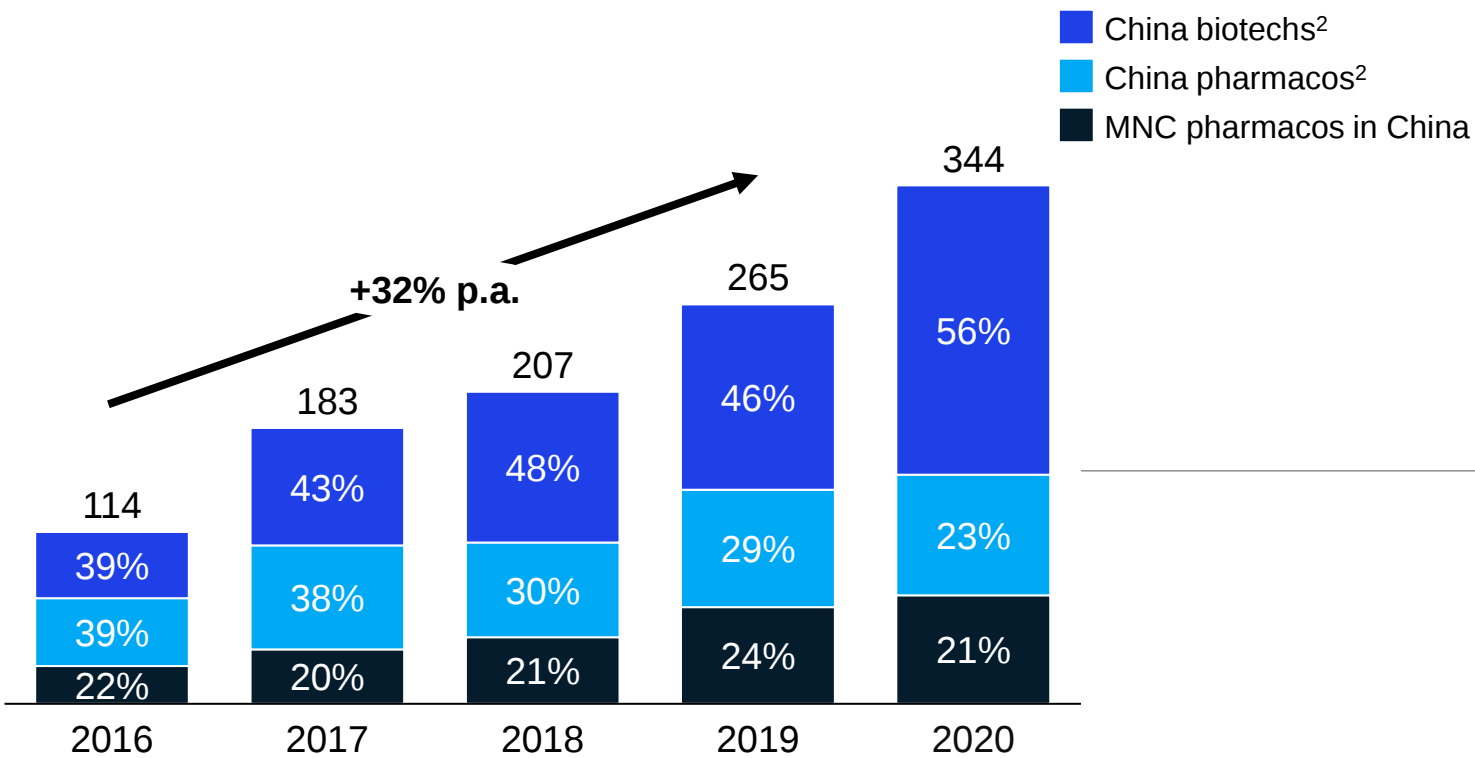
1. Including "Drugs of critical clinical needs," some not directly granted priority review status but expect accelerated review process

2. As of Oct 20, 2020

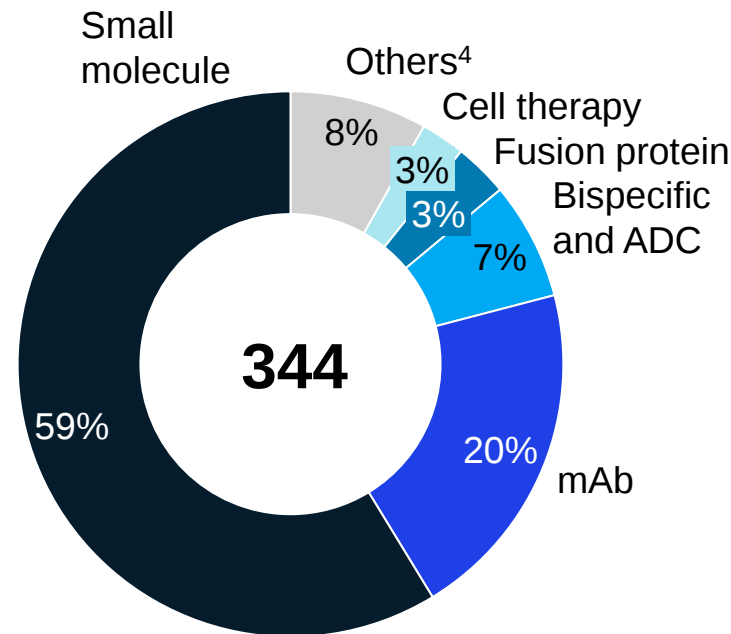
3. Conditional approval from CDE-published technical review documents and NMPA new release, non-exhaustive

A1. Steady growth of innovative pipeline, with local biotechs contributing more than half of all CTAs in 2020

of innovative molecules¹ for CTA in China by company type



of innovative molecules with CTA in China by modality, 2020

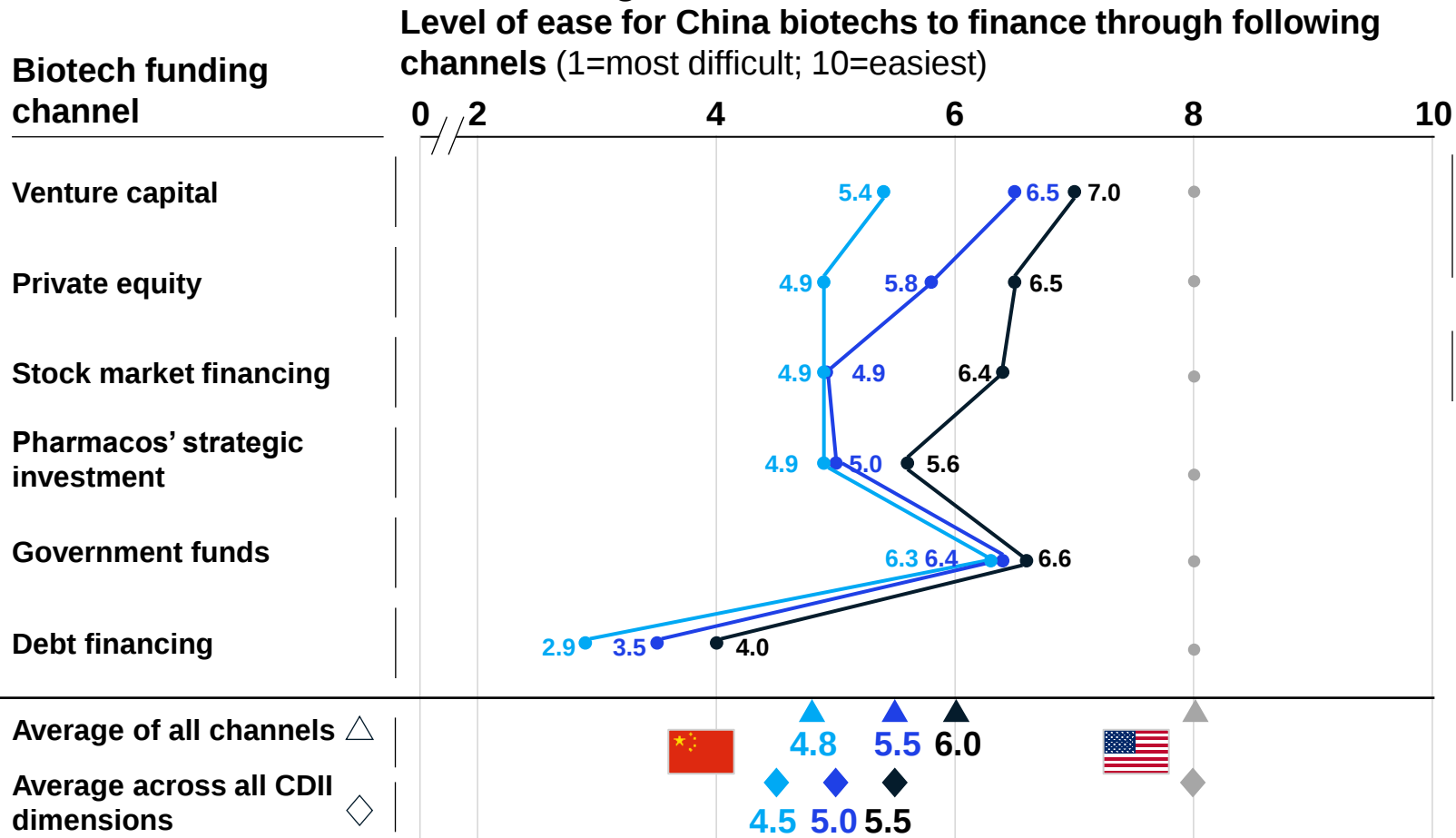


1. New molecular entities (both chemical and biological) in China
2. China biotech defined as companies focusing on innovative drugs; China pharmaco defined as companies with portfolio including both generics and innovative drugs
3. Other modalities include antisense oligonucleotides, peptide, undisclosed, etc.

B: Funding environment remains positive for biotechs in China



China biotechs' access to funding



Key takeaways

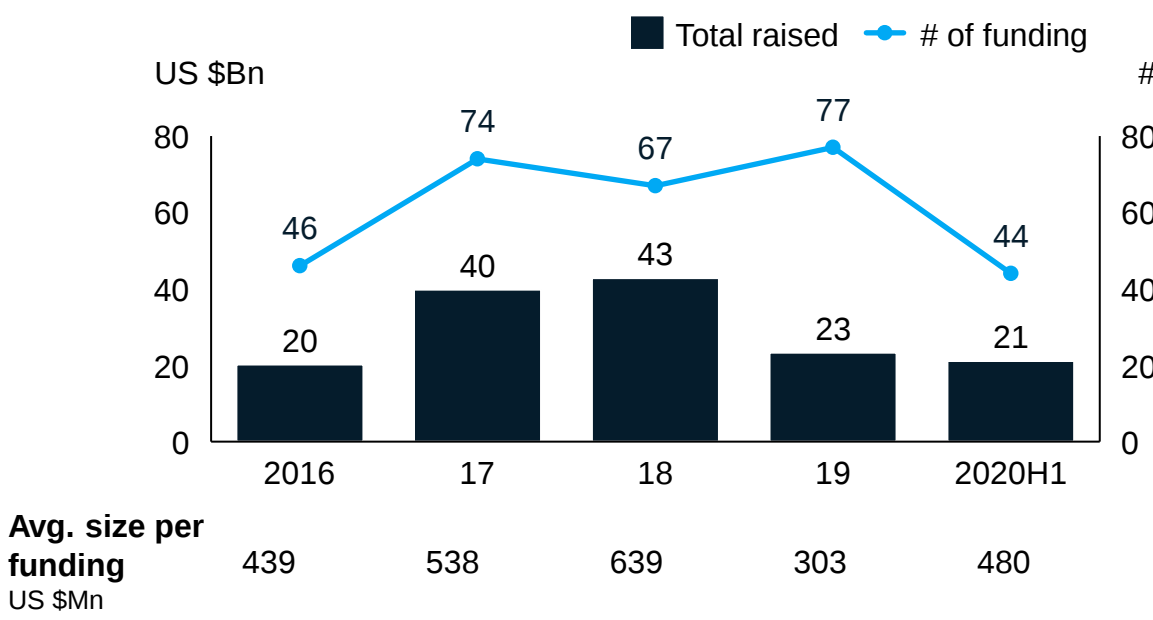
VC & PE among the most accessible funding sources for Chinese biotechs

Stock market is rapidly gaining momentum (score rose from 4.9 in 2018 to 6.4 in 2020) as more options (e.g., Shanghai STAR¹) became available

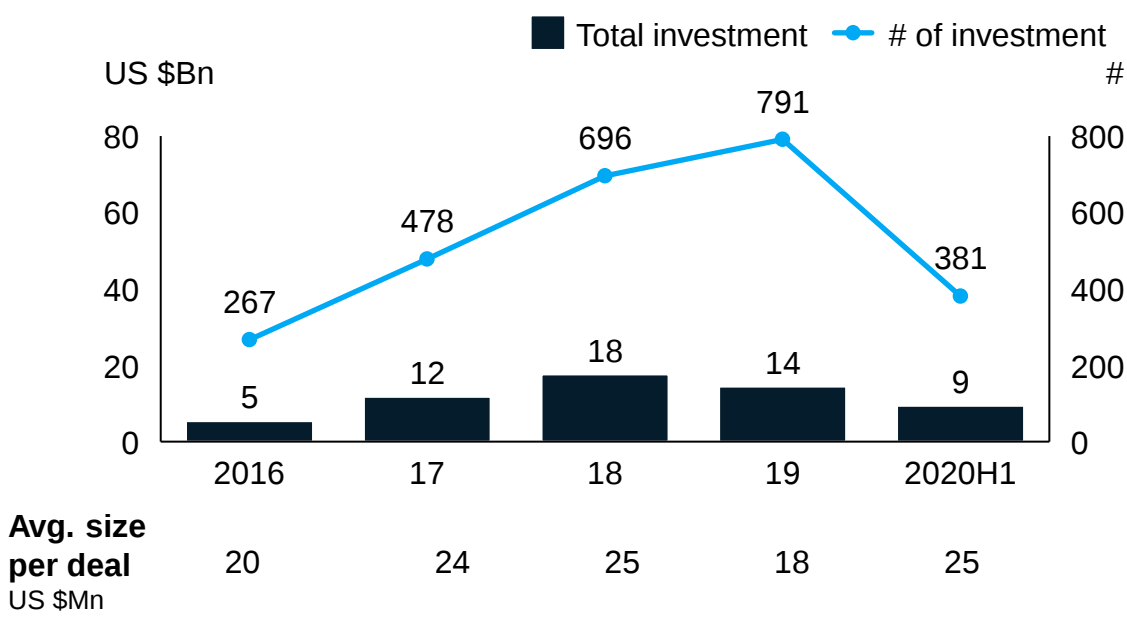
1. Shanghai Stock Exchange Science and Technology Innovation Board

B: Both China healthcare VC/PE fund raising and investment are rebounding in 2020, recovering from a dip in 2019

VC/PE fund raising in China targeting healthcare



VC/PE investment in China healthcare



Notable investment

Hillhouse Capital **US ~\$1Bn**
↓
PIPE¹
↓
BeiGene

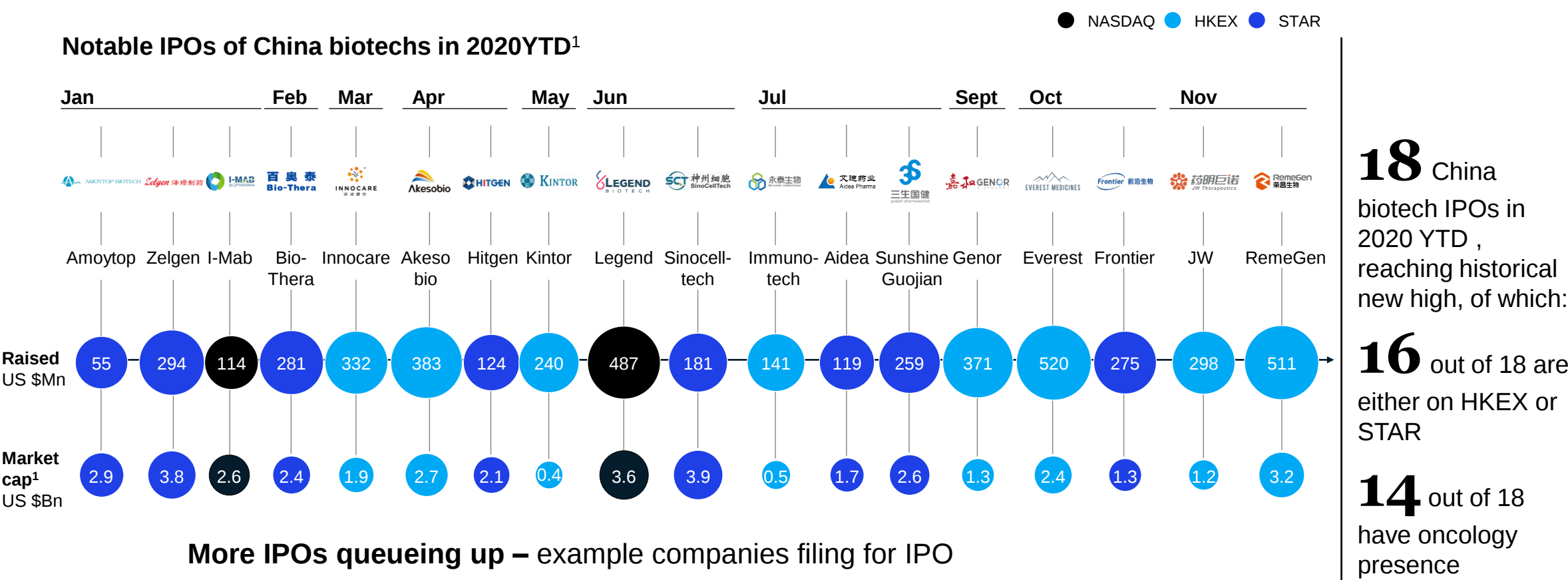
RACAPITAL² **US \$310 Mn**
↓
Crossover financing

拾玉² **US ~\$280 Mn**
↓
Series A funding
Mobwell 迈威生物

Loyal Valley Capital² **US \$186 Mn**
↓
Series C funding
CARSGEN THERAPEUTICS

1. Private investment in public equity
2. Only showing leading investor

B: New wave of IPOs, with increasing number at China based markets



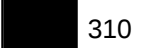
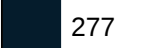
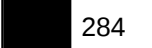
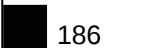
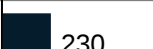
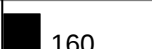
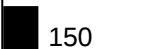
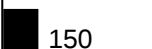
More IPOs queueing up – example companies filing for IPO



1. As of Nov 10, 2020

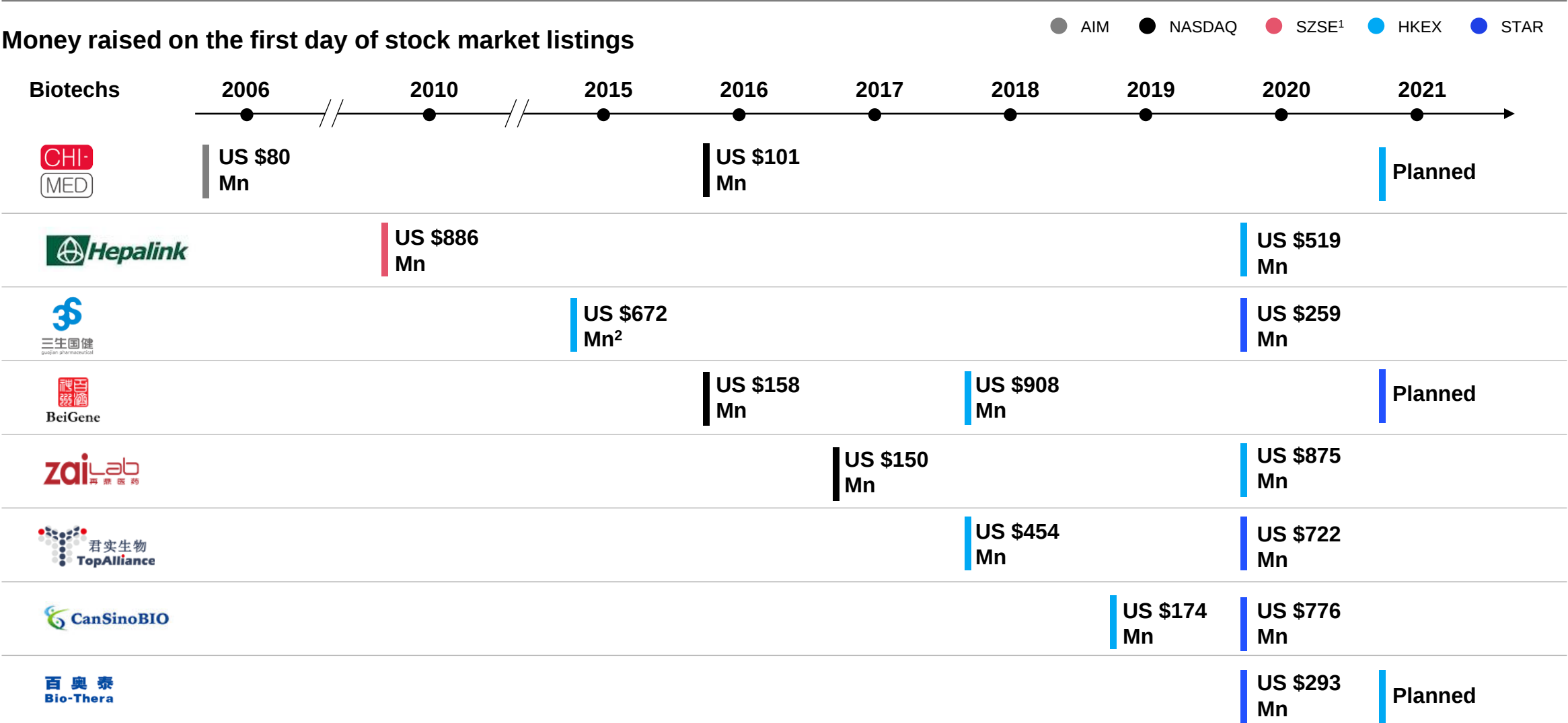
B: China biotechs are rapidly climbing on the global fund raise tables; represent 7 of the top 10 largest IPOs since 2018

Global ranking of fund raised by stage since 2018

Early stage funding (series A&B)				Late stage funding ¹ (series C)				IPO ²						
	Company	Financing date	Origin	Amount raised Mn USD		Company	Financing date	Origin	Amount raised Mn USD		Company	IPO date	Origin	Amount raised Mn USD
1	 samumed	Aug-18		 438		 Lyell	Mar-20		 493		 SK biopharmaceuticals	Jul-20		
2	 Allogene	Apr-18		 300		 RELAY THERAPEUTICS	Dec-18		 400		 moderna	Dec-18		 604
3	 Mabwell	Apr-20		 279		 EVEREST MEDICINES	Jun-20		 310		 EVEREST MEDICINES	Oct-20		 520
4	 嘉和生物药业 Genor Biopharma	Nov-18		 277		 Rakuten Aspyrian	Dec-18		 284		 RemeGen	Nov-20		 511
5	 Nuvation Bio	Oct-19		 275		 I-MAB BIOPHARMA	Jun-18		 220		 LEGEND BIOTECH	Jun-20		 487
6	 基石药业 CSTONE PHARMACEUTICALS	May-18		 260		 KINIKSA PHARMACEUTICALS	Feb-18		 200		 RELAY THERAPEUTICS	Jul-20		 460
7	 VIELABIO	Feb-18		 250		 CARSGEN THERAPEUTICS	Nov-20		 186		 Innovent	Oct-18		 424
8	 gossamerbio	Jul-18		 230		 天广实 Mabworks	Apr-20		 160		 Henlius	Sep-19		 411
9	 ERASCA	Apr-20		 200		 Orchard therapeutics	Aug-18		 150		 ascletis	Aug-18		 402
10	 EQx REMARKING MEDICINE	Jan-20		 200		 艾盛医药 Ascentage Pharma	Jul-18		 150		 君实生物 TopAlliance	Dec-18		 395

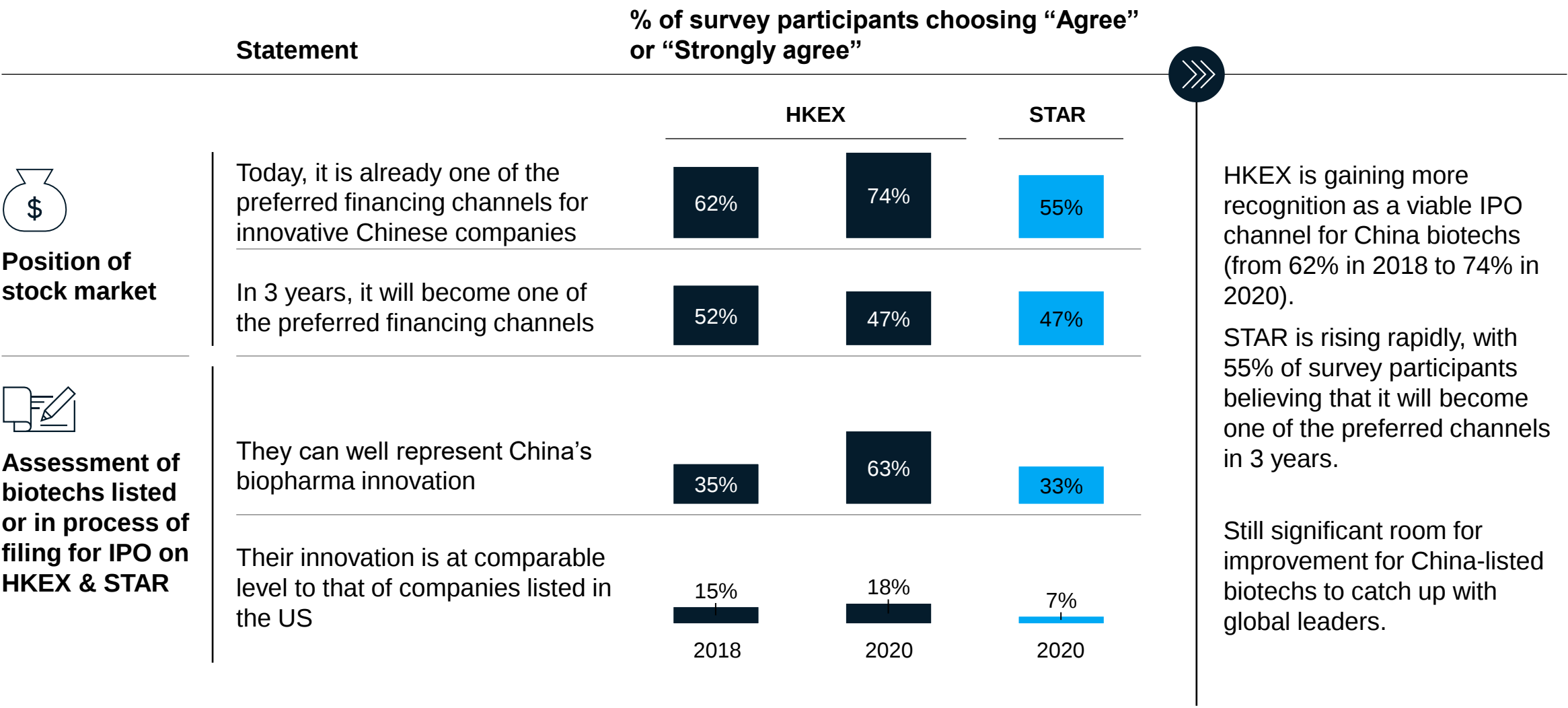
1. Series D, E, and undisclosed are not included in the ranking 2. Follow-on or dual listing are not included in the ranking

B: HKEX and STAR have set the trend of dual listings by China biotechs



1. Shenzhen Stock Exchange 2. The list is done by Sanshine Guojian's parent company 3SBio

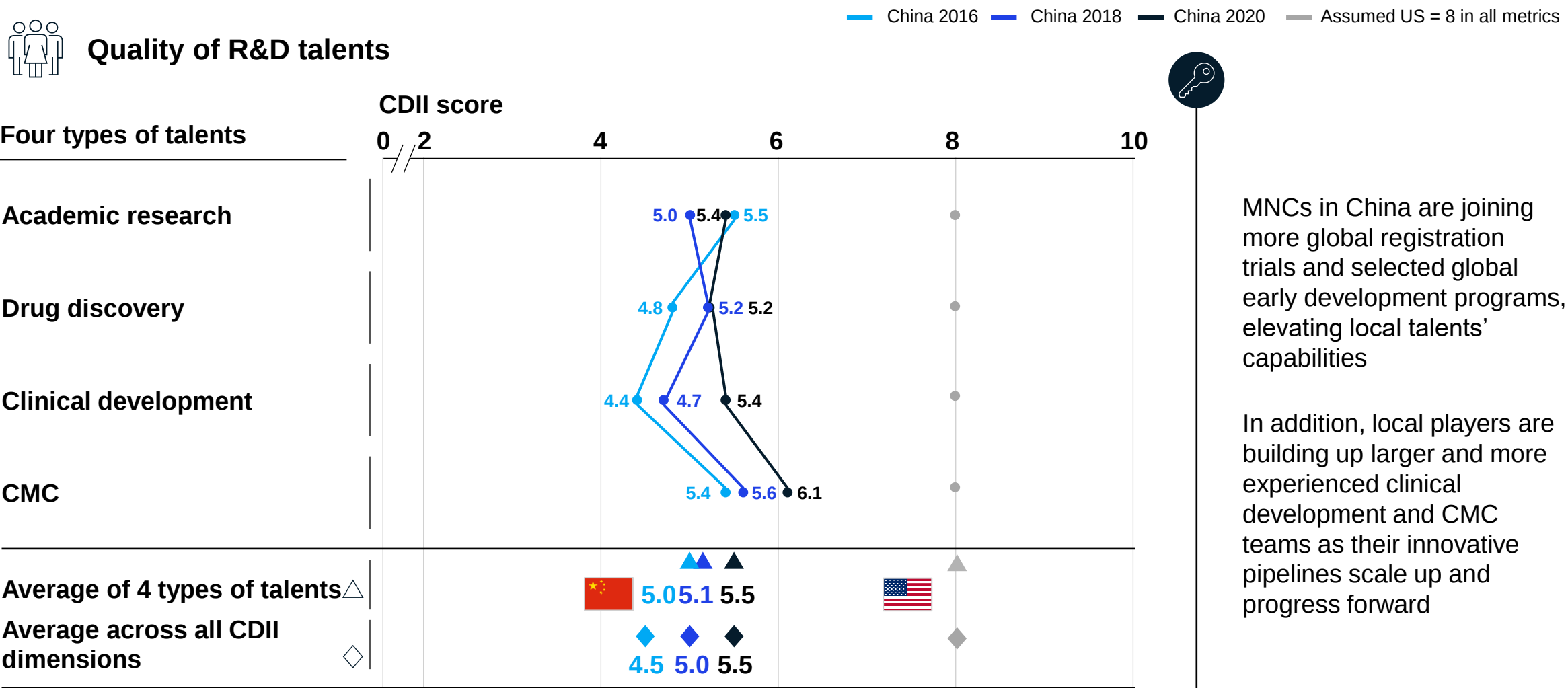
B: While still at early stage of development, HKEX and STAR are both seen as important financing channels for biotechs



C: Clinical development and CMC talent quality seeing biggest improvement, while research & discovery are relatively stagnant



Quality of R&D talents

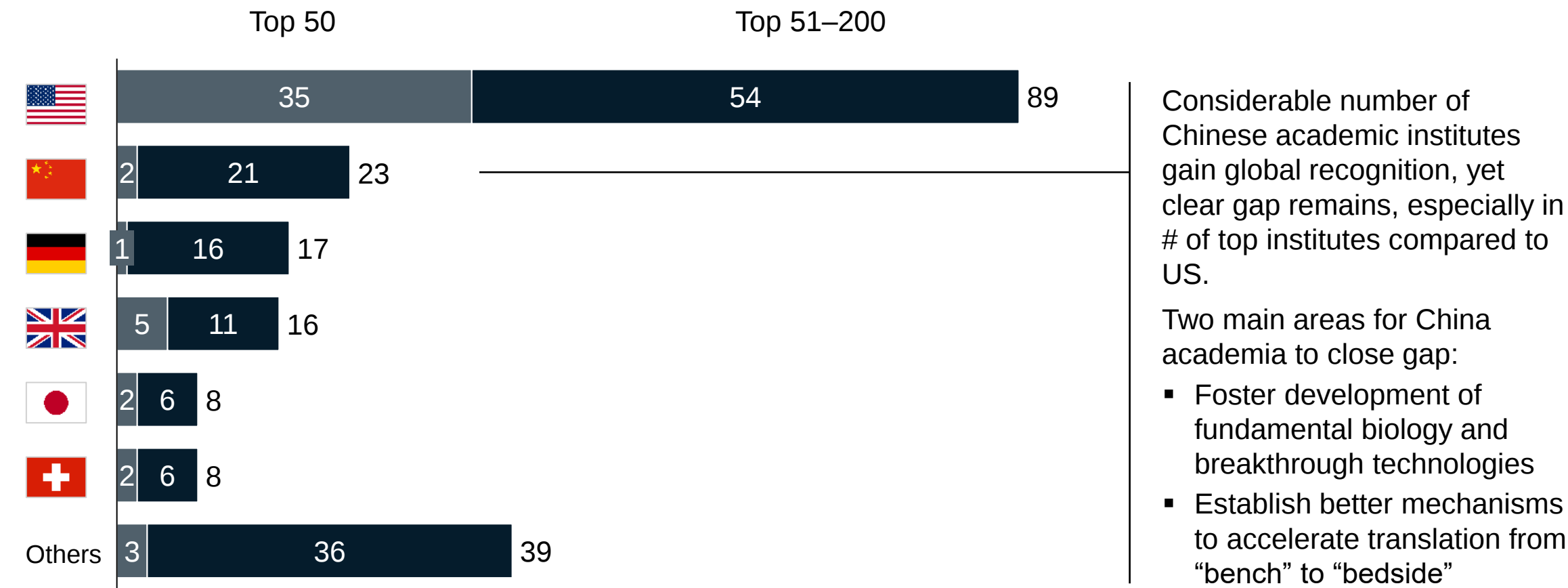


MNCs in China are joining more global registration trials and selected global early development programs, elevating local talents' capabilities

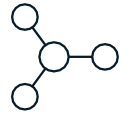
In addition, local players are building up larger and more experienced clinical development and CMC teams as their innovative pipelines scale up and progress forward

C: China still needs to grow top biomedical science research institutes and improve technology transfers to industry

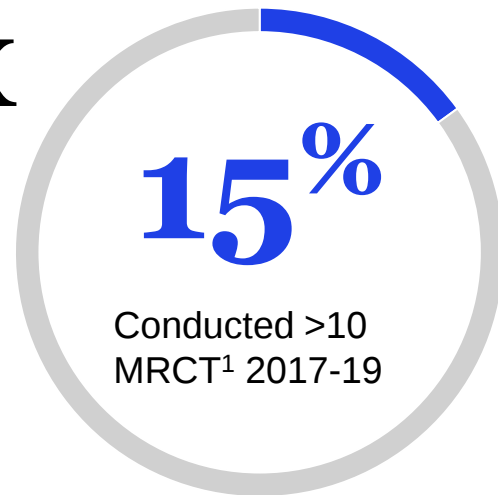
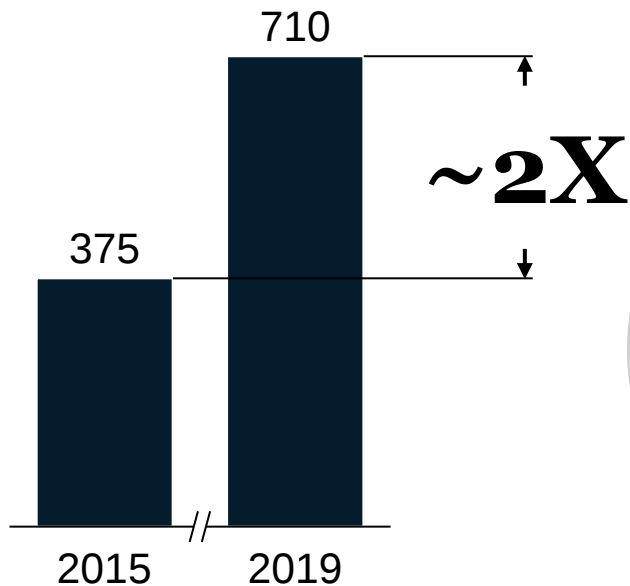
Number of academic institutes in Nature Index 2019 “top 200” for biomedical science



C: Clinical trial sites and PIs are growing in number, with room for continued capability improvement as more gain MRCT experiences



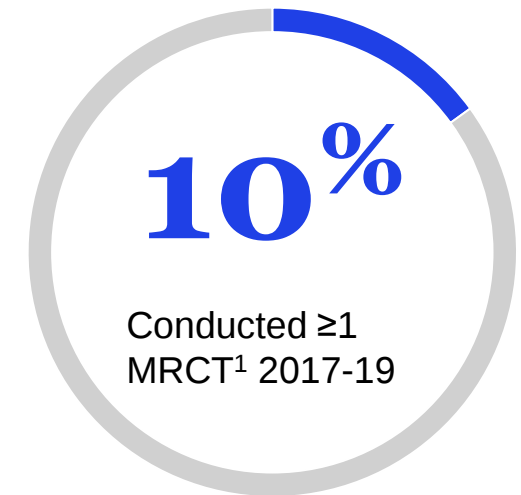
Certified clinical trial sites



Principal investigators

~1.3K

Chinese leading PIs participated in clinical trials 2017–19

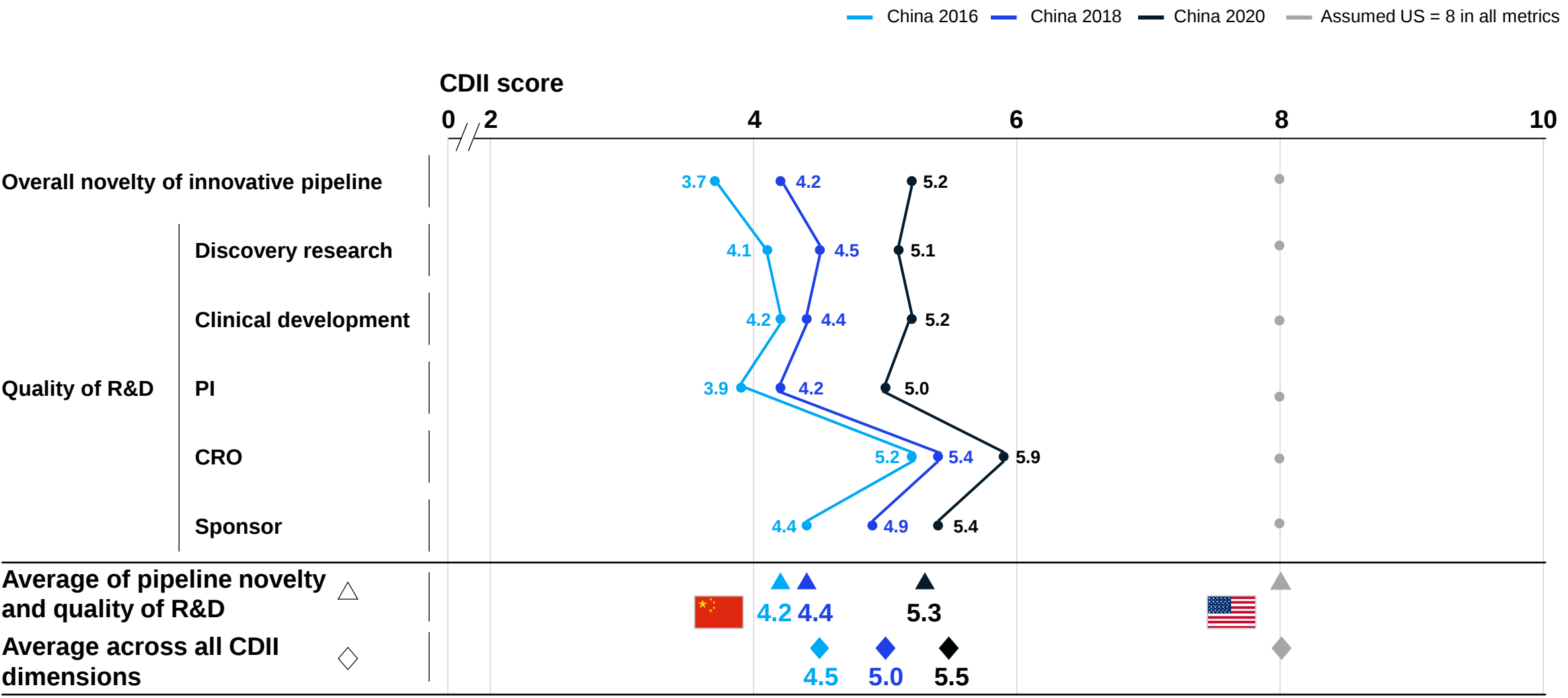


- Clinical trial site notification system, in place since Dec. 2019, could further drive growth of clinical trial sites
- Better coordination and integration among clinical trial sites (e.g., shared clinical resource platform) can promote efficient use of clinical resources
- Leading Chinese PIs show growing appetite to lead MRCTs and early clinical research

1. Multiregional clinical trials

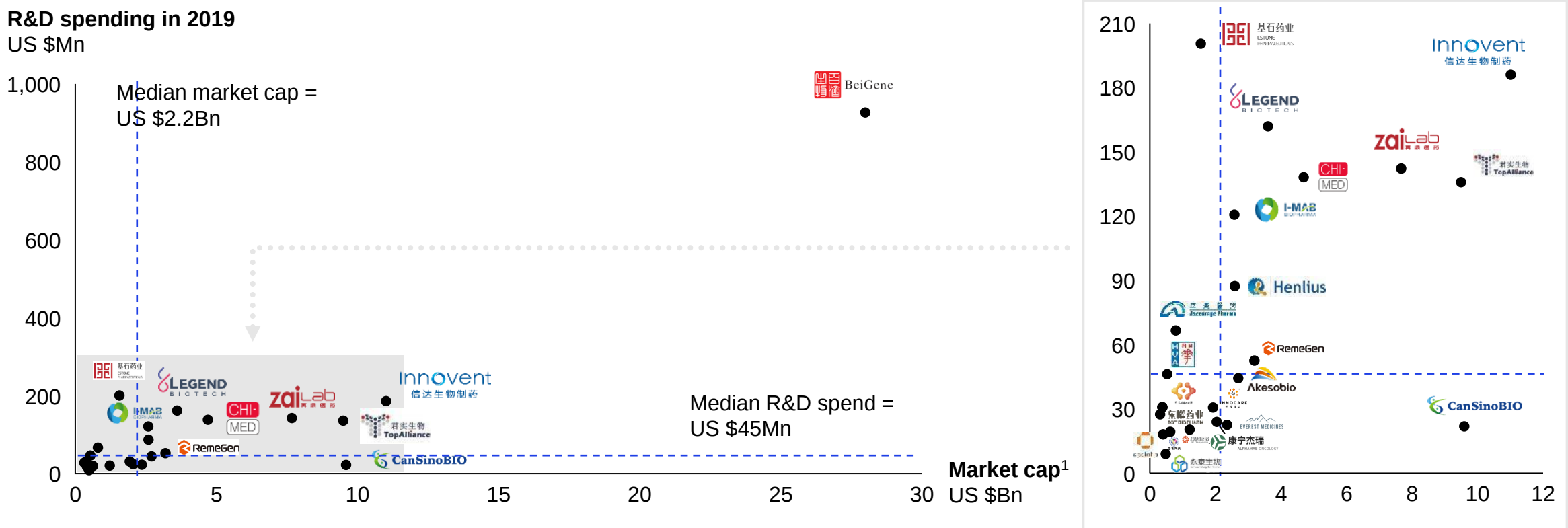
D: Novelty of innovative assets improved, now on par with R&D quality metrics

CDII



D: R&D investments by China biotechs reaching a new scale and can be segregated into tiers

Market cap¹ and 2019 R&D spend of China biotechs listed on HKEX and NASDAQ



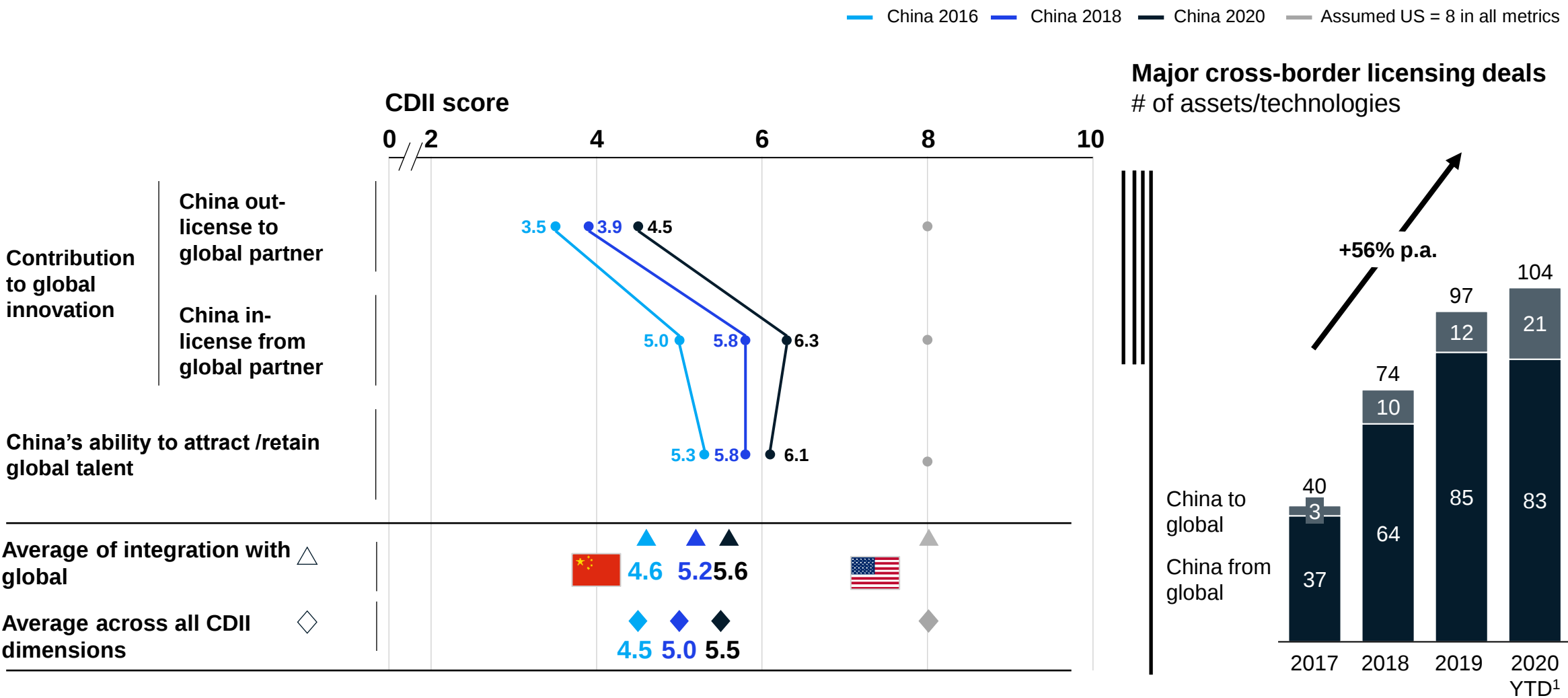
1. As of Nov 10, 2020

D: China-based AI drug-discovery companies are attracting funding from investors and actively partnering with MNCs and locals

Selected examples

Company	AI-enabled drug-discovery services	Total funding raised	Partnerships with MNC and local companies
	Offering fully integrated drug discovery platform: • Target identification using Pandomics • Drug design using Chemistry42 • Clinical trial using InClinico	US \$ 51Mn	Example partner companies:      
	Focusing on solid-state R&D of small molecule drugs and providing prediction and determination of crystal structures	US \$ 68Mn	
	Using big data and deep learning to: • Generate knowledge graphs for researchers • Predict and evaluate small molecule structures and proteins • Predict and recommend organic synthesis routes	US \$ 22Mn	

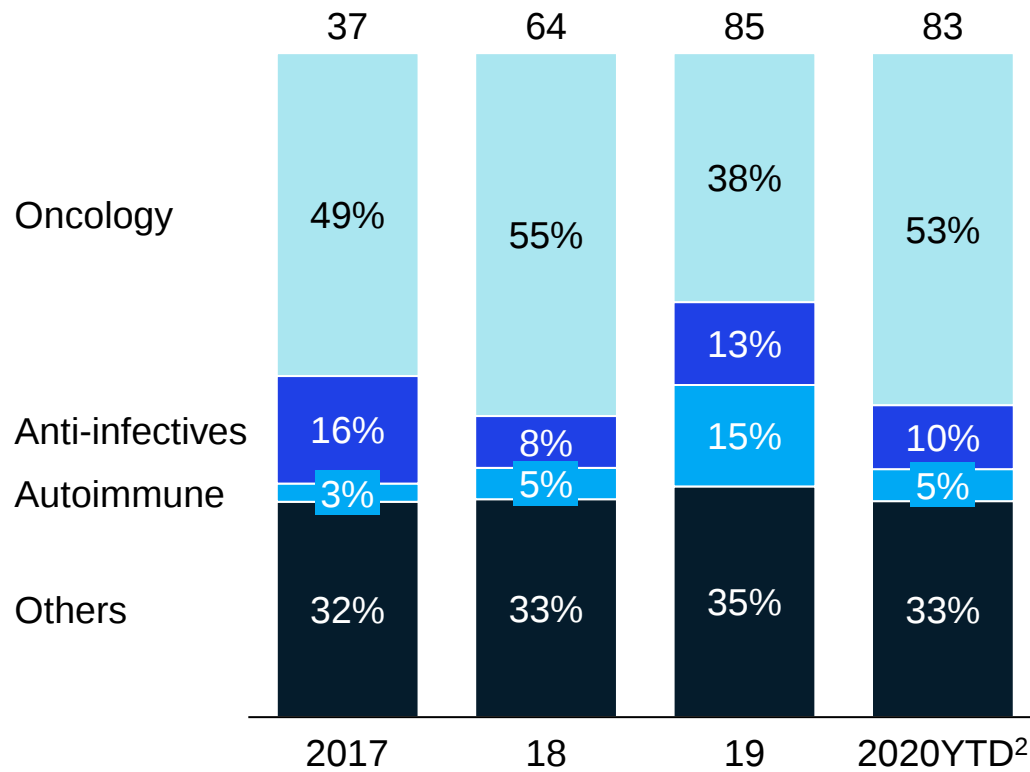
E: Cross-border deals remain active, with growing momentum in out-licensing deals by Chinese companies



1. As of Oct 20, 2020

E: Oncology remains the most concentrated area for China companies' in-licensing deals from global

Breakdown of “China from global” deals¹ by therapeutic area (TA)



Selected examples

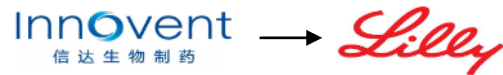
	Global originator	China licensee	Asset	Clinical status	Upfront payment
Oncology	bridgebio	联	Infigratinib	Phase III	US \$27Mn
			BBP-398	Phase I	
	REGENERON	zaiLab 再鼎医药	REGN1979	Phase II	US \$30Mn
Anti-infective	assembly biosciences	BeiGene	ABI-H0731	Phase II	US \$40Mn
			ABI-H2158	Phase II	
			AB1-H3733	Phase I	
Auto-immune	ABFIBODY	INMAGENE 创明生物	ABY-035	Phase II	US \$10Mn
Others	MYOKARDIA	联	Mavacamten (CV)	Phase III	US \$40Mn

1. Include deals over development rights and commercialization rights; exclude global deals with China rights, count for assets/technologies

2. As of Oct 20, 2020

E: Several high-profile partnerships formed to bring China's assets to global market

Aug 2020

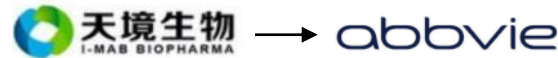


Innovent licensed out ex-China global rights to commercialize PD-1 inhibitor Yyvyt

US \$1.03^{Bn1}

Innovative, China-commercialized drug taken to global market

Sept 2020

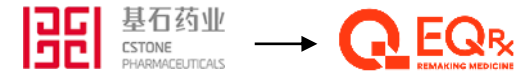


I-Mab licensed out ex-China global rights to develop and commercialize CD47 targeting asset TJC4

US \$1.94^{Bn2}

An in-house discovered and developed potential best-in-class monoclonal antibody (mAb)

Oct 2020



CStone licensed out exclusive rights of sugemalimab (PD-L1) and CS1003 (PD-1) to EQRx for ex-Greater China development and commercialization

US \$1.30^{Bn3}

Broaden accessibility of innovative drug outside China through partnership

1. Including US \$ 200Mn upfront payment and US \$ 825Mn potential milestone payments

2. Including US \$ 180Mn upfront payment, US \$ 20Mn in a milestone payment based on Phase 1 trial results, and US \$ 1.74Bn potential milestone payments

3. Including US \$ 150Mn upfront payment and up to US \$1.15Bn in milestone payments for both drugs as well as separate tiered royalties

China innovation momentum

01

Refreshed
perspective on
China innovation
ecosystem

02

Momentum of
China innovators



Three key trends in China biopharma innovation



Faster



Growing differentiation

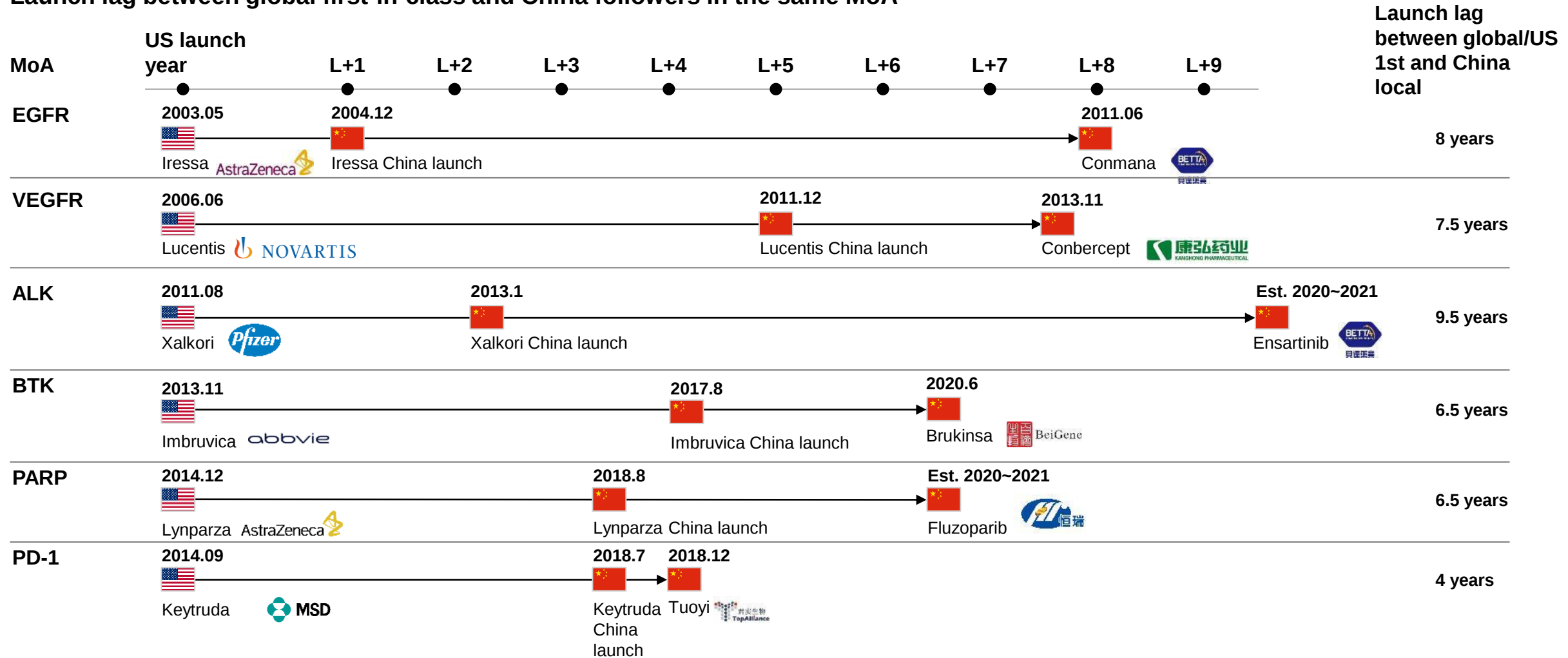


Going global



Faster: Development and launch lags between China and global have been shortening

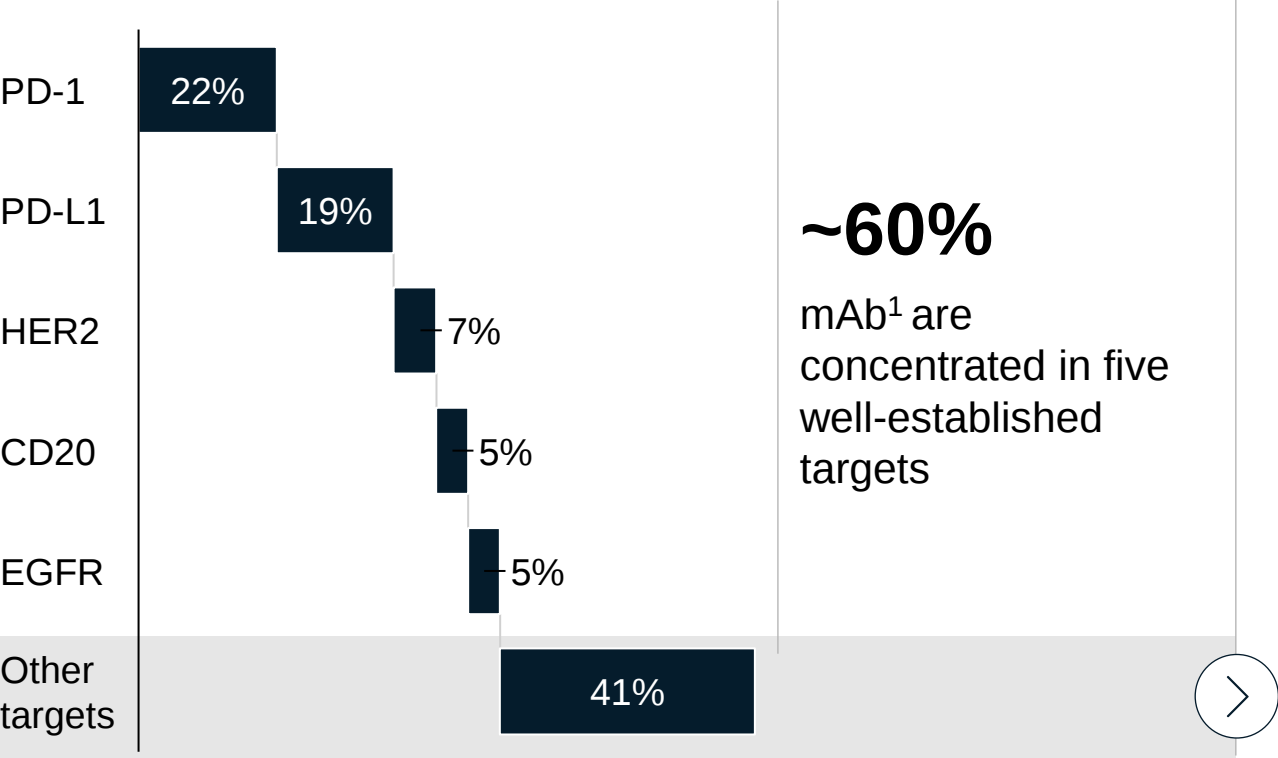
Launch lag between global first-in-class and China followers in the same MoA



Faster: ~40% mAb assets are narrowing down development gap vs. global

Target distribution of innovative (oncology only) mAbs^{1,2} from sampled biopharma and biotech companies

n=58 mAbs from selected companies¹



Other targets by mAbs in development

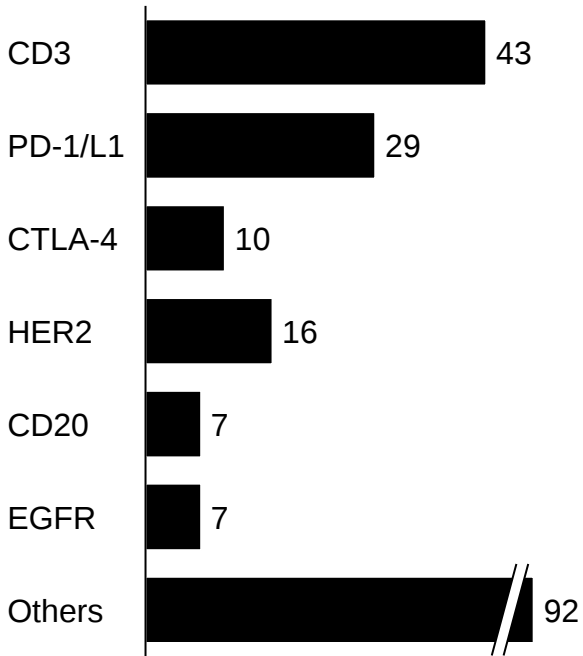
China 3 stages behind global China 2 stages behind global China 1 stage behind global Same stage				
Target	Example China players	China latest stage	Global latest stage	Example US players
RANKL	Mabwell	Phase III	Launched	AMGEN
CTLA-4	Innovent 信达生物制药 HARBOUR BIOMED		Launched	Bristol Myers Squibb
CD38	I-MAB		Launched	immunogen
FGFR2b	zai-lab	Phase II	Phase III	FivePrime
TIM-3	BeiGene		Phase III	NOVARTIS
CD47	Innovent 信达生物制药 I-MAB		Phase III	GILEAD
DKK-1	BeiGene	Phase I	Phase II	leap therapeutics
KDR	创胜集团 TRANSCENTA akeso		Launched	Lilly
B7-H3	I-MAB		Phase III	mAbs
CLDN18	创胜集团 TRANSCENTA	Phase I	Phase III	astellas
TIGIT	Innovent 信达生物制药 BeiGene		Phase III	Roche
LAG-3	Innovent 信达生物制药		Phase III	Bristol Myers Squibb
cMET	Henlius	Phase I	Phase II	Lilly
OX40	Innovent 信达生物制药 BeiGene		Phase II	agenus
CD73	I-MAB		Phase II	Bristol Myers Squibb
4-1BB	Adagene	Phase I	Phase II	Pfizer
BTLA	TopAlliance		Phase I	Lilly

1. Does not include bispecific or ADC
2. Analyses based on clinical-development stage and NDA filed/approved assets of 15 China bipharmacos and 58 leading China biotech

Faster: China Biotechs are rapidly following global development on bispecifics, with a few starting to build their own tech platforms

Globally >100 bispecific programs have entered clinical stage

of global bispecific assets in clinical development, by target



China 3 stages behind global

China 2 stages behind global

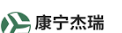
China 1 stage behind global

Same stage

China lead global

China innovators¹ are racing with global in developing bispecifics around most popular targets

Example bispecific assets from selected China companies

Target	China player example	China latest stage	Global latest stage	Global player example
PD-1/L1 bispecific	PD-L1 X CTLA4 	Phase III	N/A	
	PD-1 X CTLA4 	Phase II	Phase I	
	PD-L1 X TGF-β 	Phase II	Phase III	
	PD-1 X VEGF 	Phase II	N/A	
	PD-1 X HER2 	Phase I	N/A	
	PD-L1 X CD47 	Phase I	N/A	
Others	HER2 X HER2  	Phase II	Phase II	

- China biotechs are more focused on PD-1/L1 bispecifics vs. global on CD3
- Some companies, e.g., Akesobio and EpimAb, are also developing proprietary bispecific platforms

1. Analyses based on clinical-development stage and NDA filed/approved assets of 15 China bipharmacos and 58 leading China biotechs

Growing differentiation: Local biotechs' efforts to differentiate starting to pay off

Selected examples of local innovations



Potential best in class



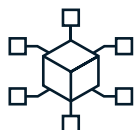
TJC4, a potential best-in-class anti-CD47 mAb, recognizes a unique epitope on CD47 and exhibits minimal binding to red blood cells



Differentiated route of administration



Subcutaneous injectable PD-1, granted orphan-drug designation by FDA in April 2020



Proprietary technology



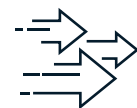
Fast CAR solution, cutting CAR-T cell preparation time to 24 hours



FIT-Ig (Fabs-In-Tandem) technology to develop Bispecific mAb



Targeted protein degradation (TPD) platform which re-wire the cellular ubiquitination system to attack previously believed undruggable targets



First in class



JS004, self-developed by Junshi, is the first BTLA mAb, received IND from both FDA and NMPA



AK104, a potential first-in-class PD-1 x CTLA4 bispecific mAb, has reached pivotal study stage

Going global: Global development efforts by the leading Chinese players are gaining regulatory recognition

Examples of recent FDA designations for innovative therapies by China biopharma and biotechs

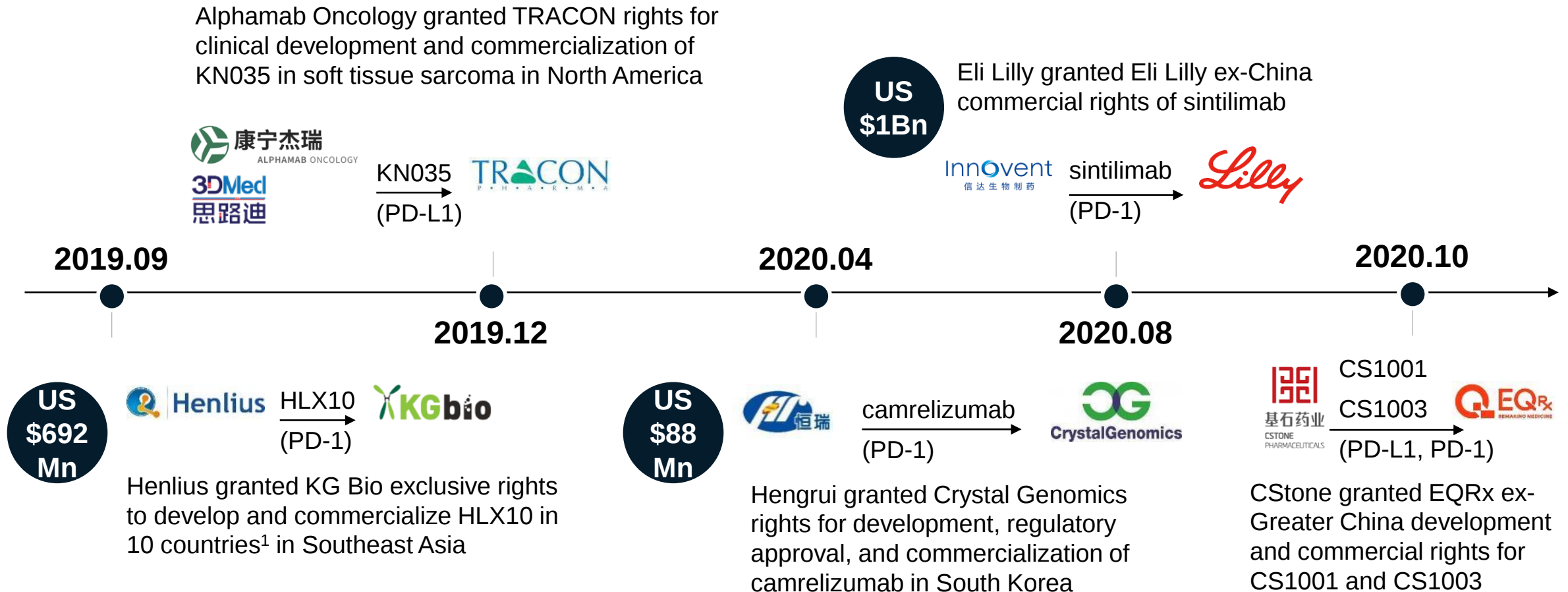
		2019		2020									
		Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct
	Fast track				 RC18 (BLyS and APRIL)		 HMPL-012 (mTKI)	 HQP1351 (BCR-ABL)	 Elunate (VEGFR)	 DB102 (PKCβ)			
	Breakthrough therapy		 JNJ-68284528 (BCMA CAR-T)								 Toripalimab (PD-1)	 Sugemalimab (PD-L1)	
	Accelerated approval	 Zanubrutinib (BTK)		First China innovative drug granted all 5 ¹ FDA designations			 HMPL-012 (mTKI)						
	Orphan drug designation		 KN035 (PD-L1)	 HBM9167 (PD-L1)	 NIP292 (ROCK)	 Toripalimab (PD-1)	 Tyvyt (PD-1)	 HQP1351 (BCR-ABL)		 CS1003 (PD-1)	 KN046 (PD-1x CTLA4)		 APG-2575 (Bcl-2)

1. For different indications; 2019: Accelerated Approval, Priority Review, and Breakthrough Therapy; 2018: Fast Track; 2016: Orphan Drug

Going global: Local innovators making first steps in capturing global market opportunities, PD(L)-1 partnership example

Selected examples of China local companies out-licensing PD-1/L1 rights to MNCs for ex-China market

XX Estimated max payment



1. Including Philippines, Indonesia, Malaysia, Singapore, Thailand, Laos, Myanmar, Cambodia, Brunei, and Vietnam

To further assess China's innovation momentum, we profiled the innovative portfolio of four distinct groups



7 “First-wave” biotechs with IPO before 2019

16 “Second-wave” biotechs with IPO in 2019–2020 Aug

35 “Third-wave” biotechs close to IPO or with significant PE/VC funding¹

15 Biopharmas with the most innovative CTA approvals

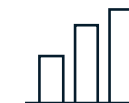
These 73 companies collectively account for:

~1/5 of all clinical stage and NDA filed/submitted assets from Chinese companies

~1/3 of CTA approvals of innovative drugs by Chinese companies in 2016–2020 Aug

Assessing their portfolio² through three lenses

① Portfolio size & stages



② TA breadth & distribution

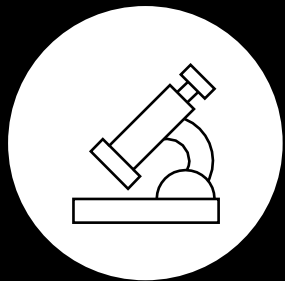


③ Modalities



1. Late-stage funding > 100Mn USD or early-stage funding >50Mn USD

2. Pipeline data updated to Sep. 1, 2020



Insights into leading China players' innovative portfolios

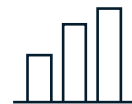
TA breadth & distribution



Biopharmas more diversified in therapeutic areas (TAs) than biotechs (**3.5** vs **1.5-2.6**)

Within biotech, **3rd wave biotechs** is more focused in TA covered (**1.5** vs **2.6** in 1st wave), and **started to diversify away from oncology** (**67%** vs **72%** oncology)

Portfolio size & stages



Biopharmas and **1st wave biotechs** have built up larger portfolios (**~10**) with 1st wave biotechs having more later stage assets

2nd and 3rd wave biotechs have more early-stage focused portfolio

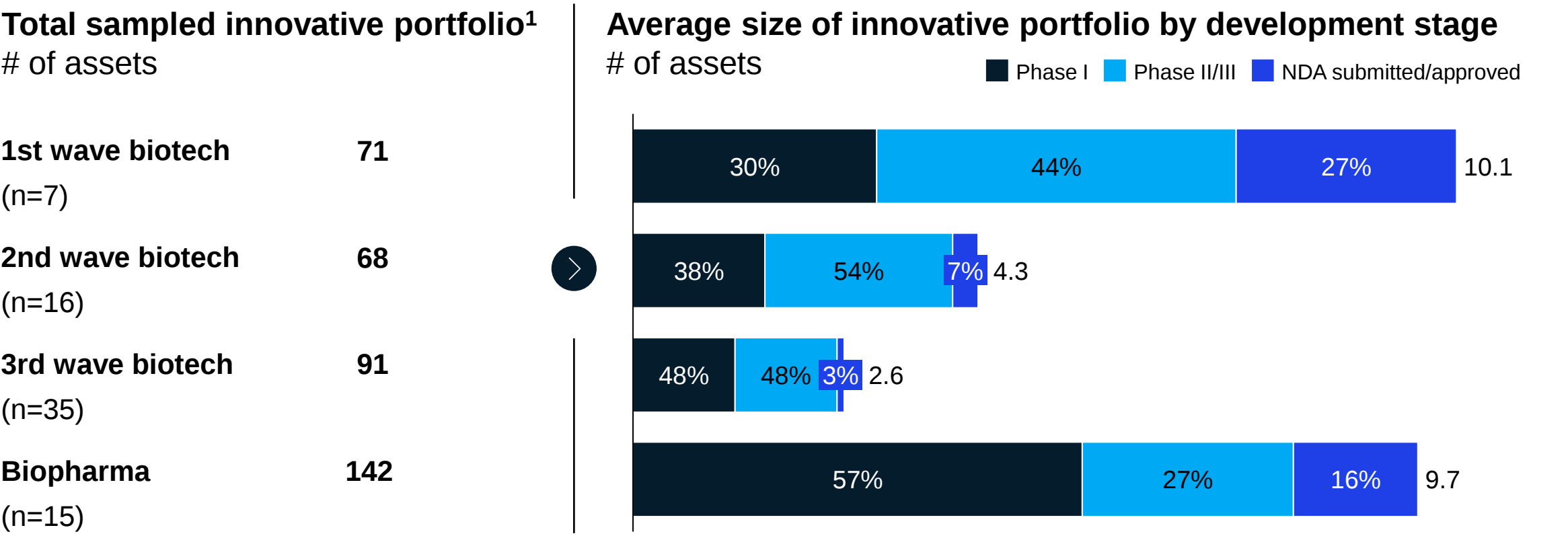
Modalities



Biotechs are more diversified in modalities than Biopharma (**37 -54%** vs **86%** in small molecular)

New modalities are increasingly being explored by **biotechs**

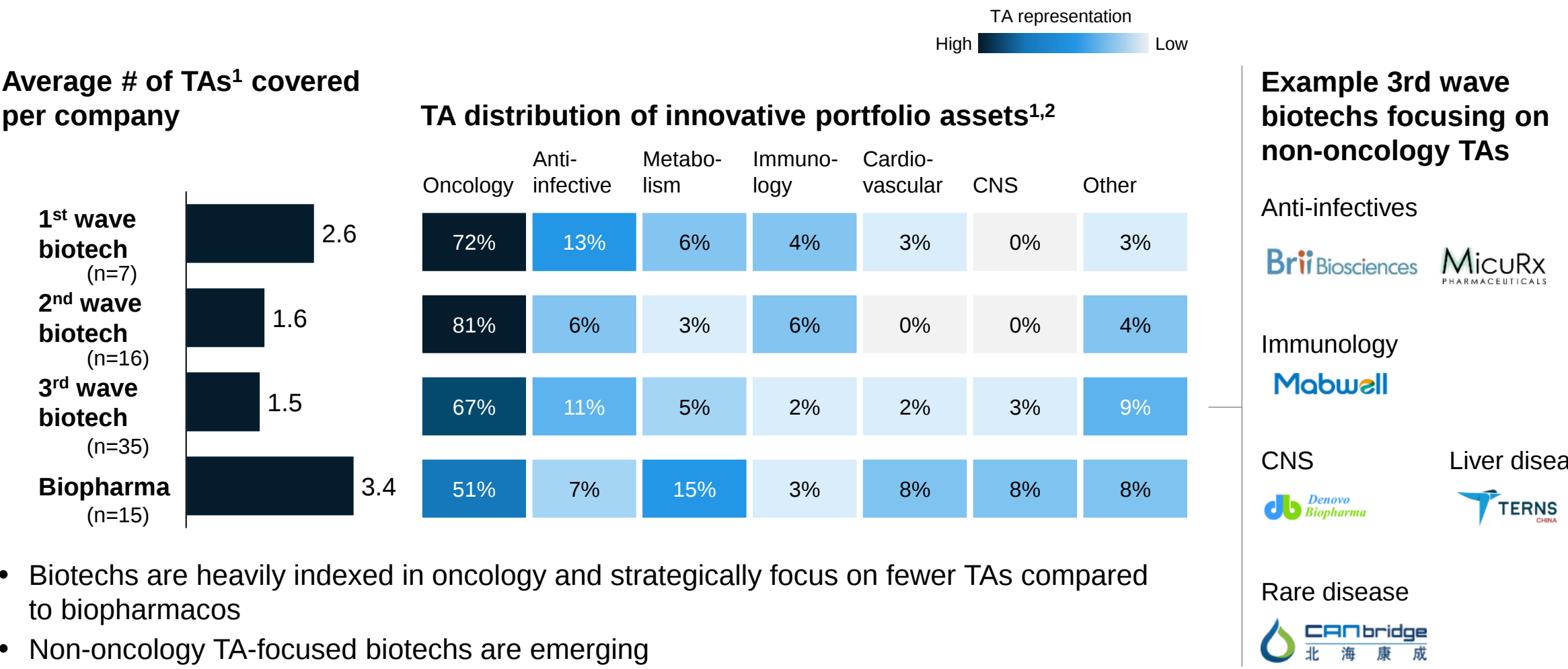
1: Biopharma and 1st wave biotechs have built up scaled innovative portfolios



First-wave biotechs have most late-stage assets, with front-runners already reaching commercialization

Leading biopharmas have built sizable portfolios as they shift focus to innovation; however, more than half are still in early development

2: Oncology remains the main focus of local innovation, with signs of diversifying beyond oncology in later wave biotechs



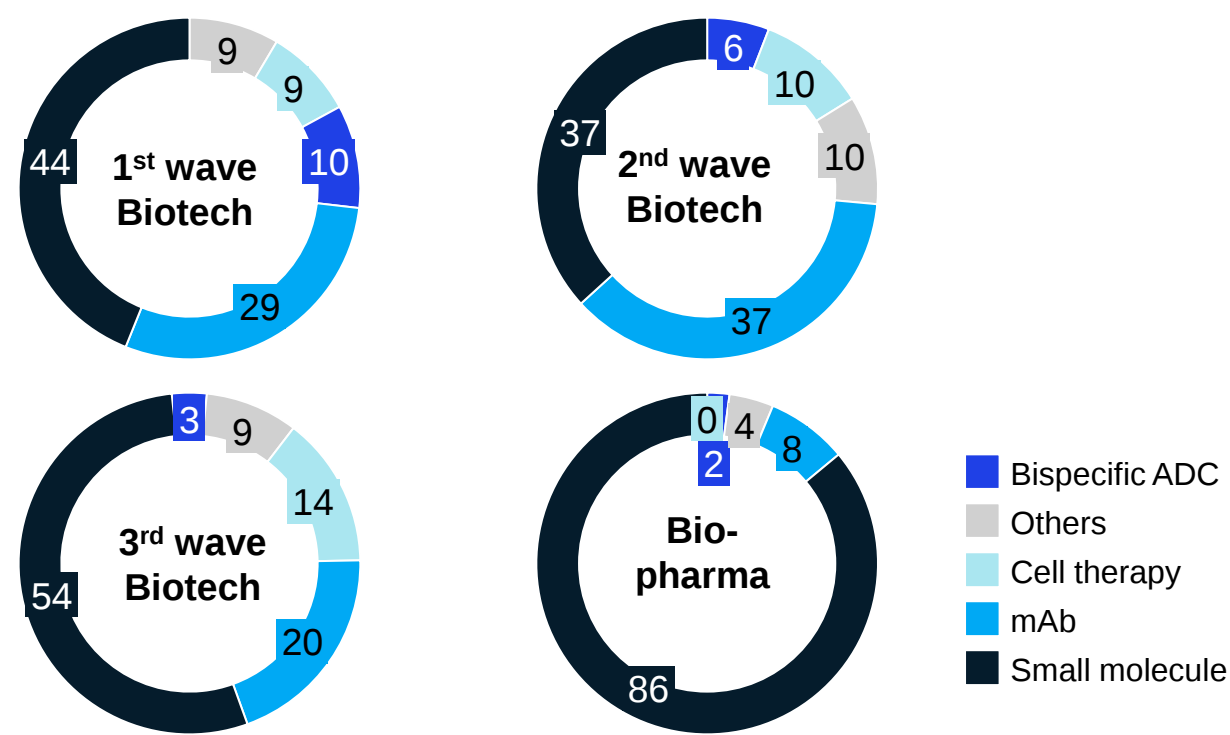
- Biotechs are heavily indexed in oncology and strategically focus on fewer TAs compared to biopharmacos
- Non-oncology TA-focused biotechs are emerging

1. Include clinical-development stage and NDA filed/approved assets; does not include pre-clinical assets
2. For assets with >1 indications, indications with the most advanced clinical/commercial stage were selected

3: Biotechs are more diversified in modalities, with several new modality drugs moving into clinical stage

Modality distribution of sampled innovative oncology portfolio¹

Percent



1. Clinical-development stage and NDA filed/approved assets; does not include pre-clinical assets
2. Others include fusion protein, peptide, virus, gene therapies, etc.
3. Include RNA and DNA

Selected examples of biotechs with new modalities

Bispecific	10+ Biotechs have bispecifics in clinical development
Cell therapy	
Gene therapy³	
Oncolytic virus	

Closing thoughts on the key strategic imperatives for China biotech/innovative biopharma

1st and 2nd wave biotechs

Sustain capital market performance by proactively and systematically mapping out and delivering catalysts, e.g., portfolio milestones and strategic partnerships

Refresh portfolio strategy to win the accelerating race for differentiation

Build a **future-proof commercialization engine**; basics in launch excellence are no longer sufficient; innovate in access, digital and analytics

Upgrade manufacturing to achieve dual mission of quality and cost competitiveness

Transform organization by **combining institutionalized work methods and agility**

Strategic partnerships matter, both in China and global

3rd wave and future biotechs

Bar for innovation is higher, differentiation is a “must-have” to standout

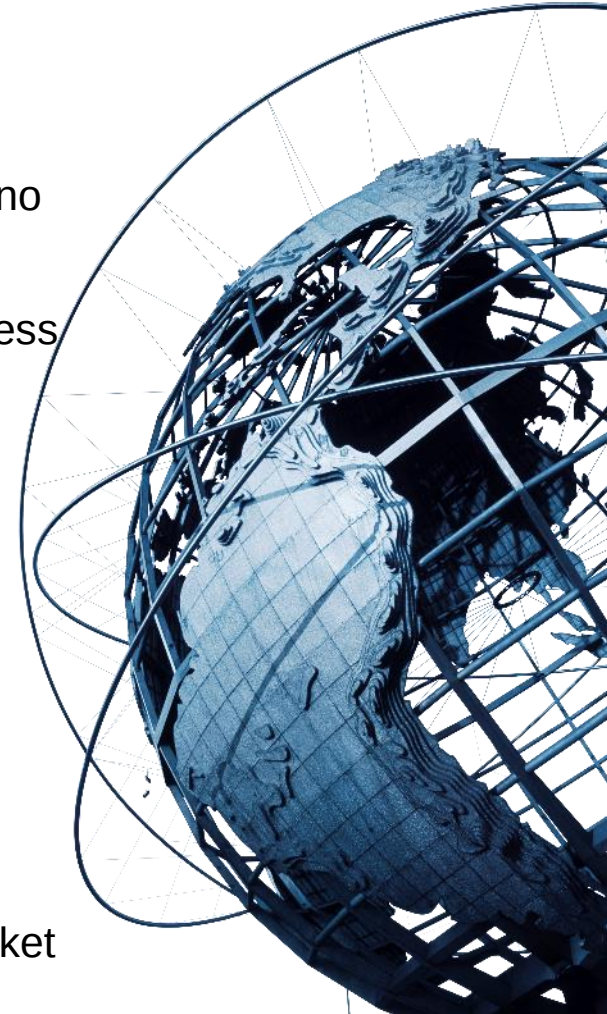
Be selective in building a competitive edge along the value chain

Biopharmas

Set up a **clear innovation agenda** toward differentiation

Adopt a rigorous mechanism to prioritize portfolio and bring lead asset to market

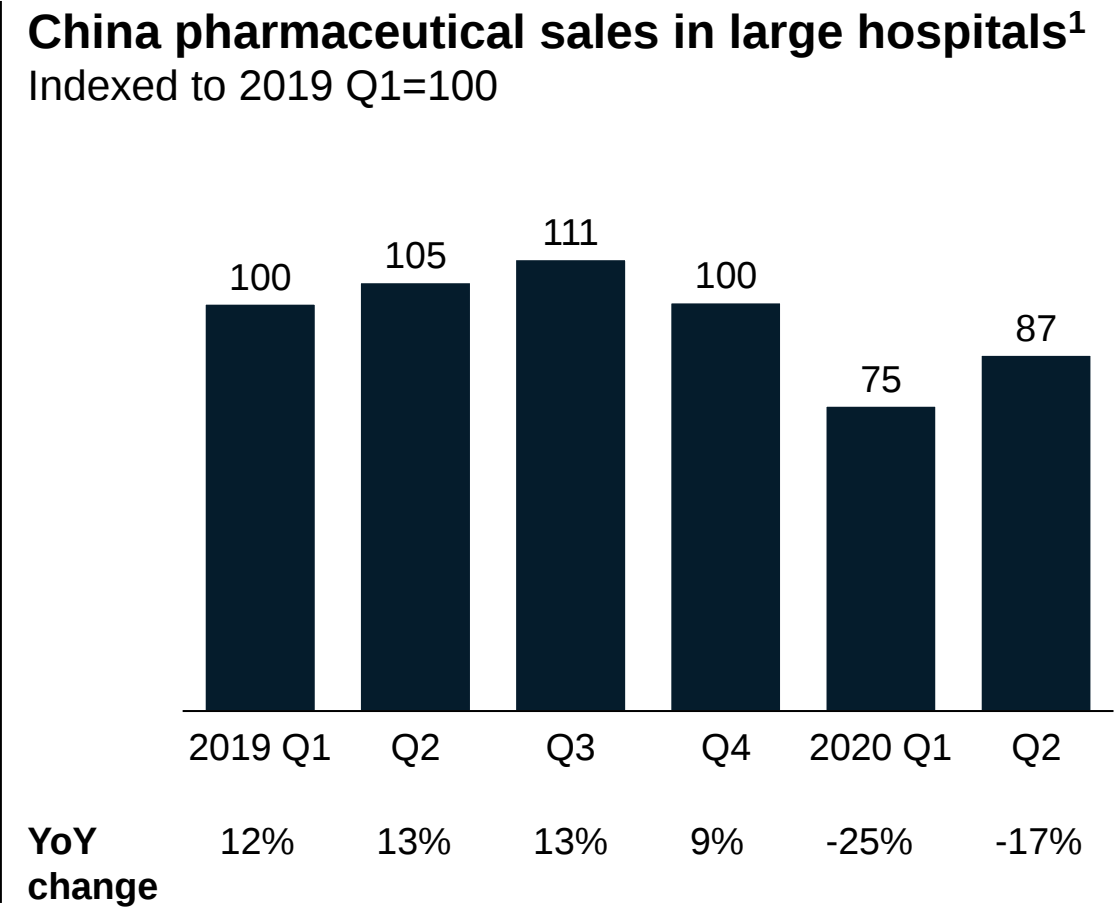
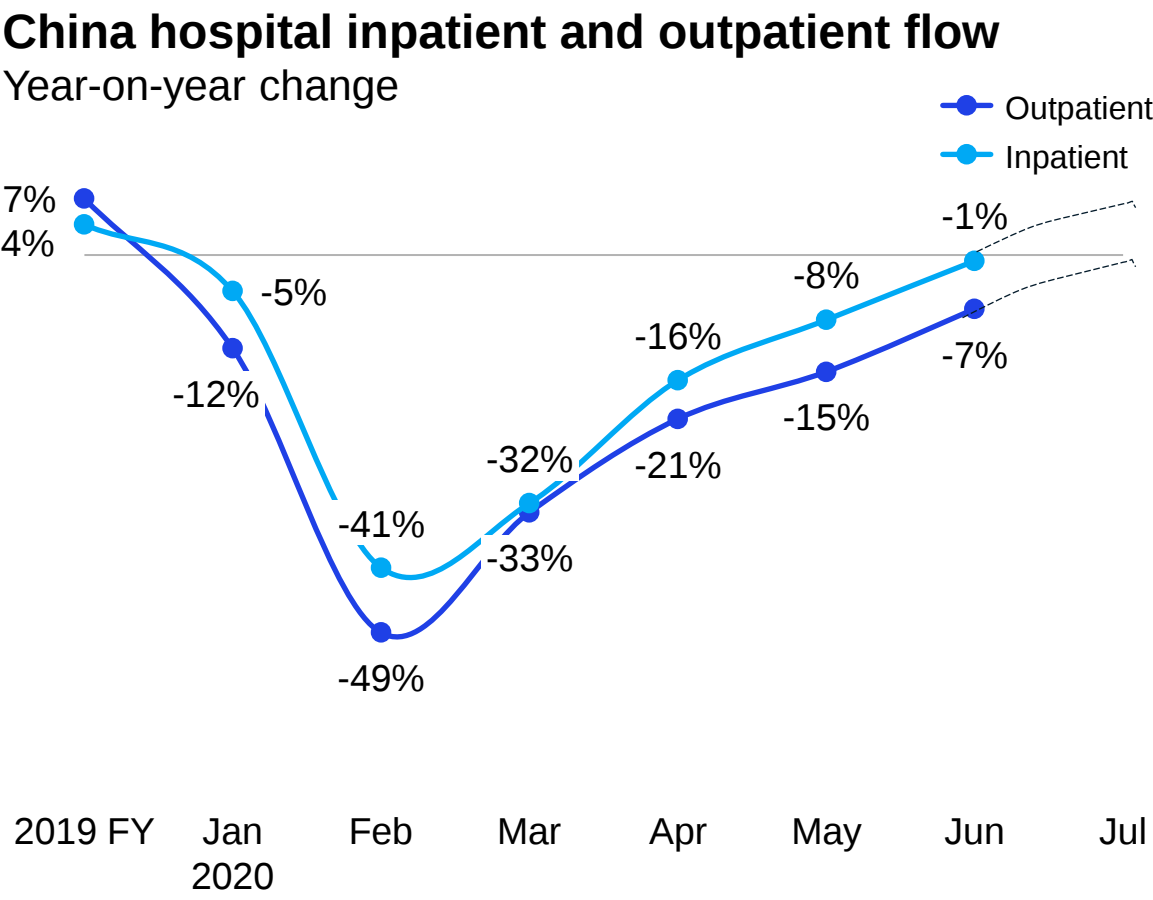
Reskill existing commercial muscles to effectively promote innovative products



New normal for China pharma



China patient flow and pharma market are recovering from COVID-19 induced market disruptions



1. PDB database, consists of 680 sample hospitals (65% Class III, 18% Class II)

Key questions we seek to answer in this section



China pharma market dynamics – what is the extent of the “decoupling,” and where is the market likely to go?



What are key trends across different portfolio segments (i.e., new launches, NRDL, and established portfolio)?

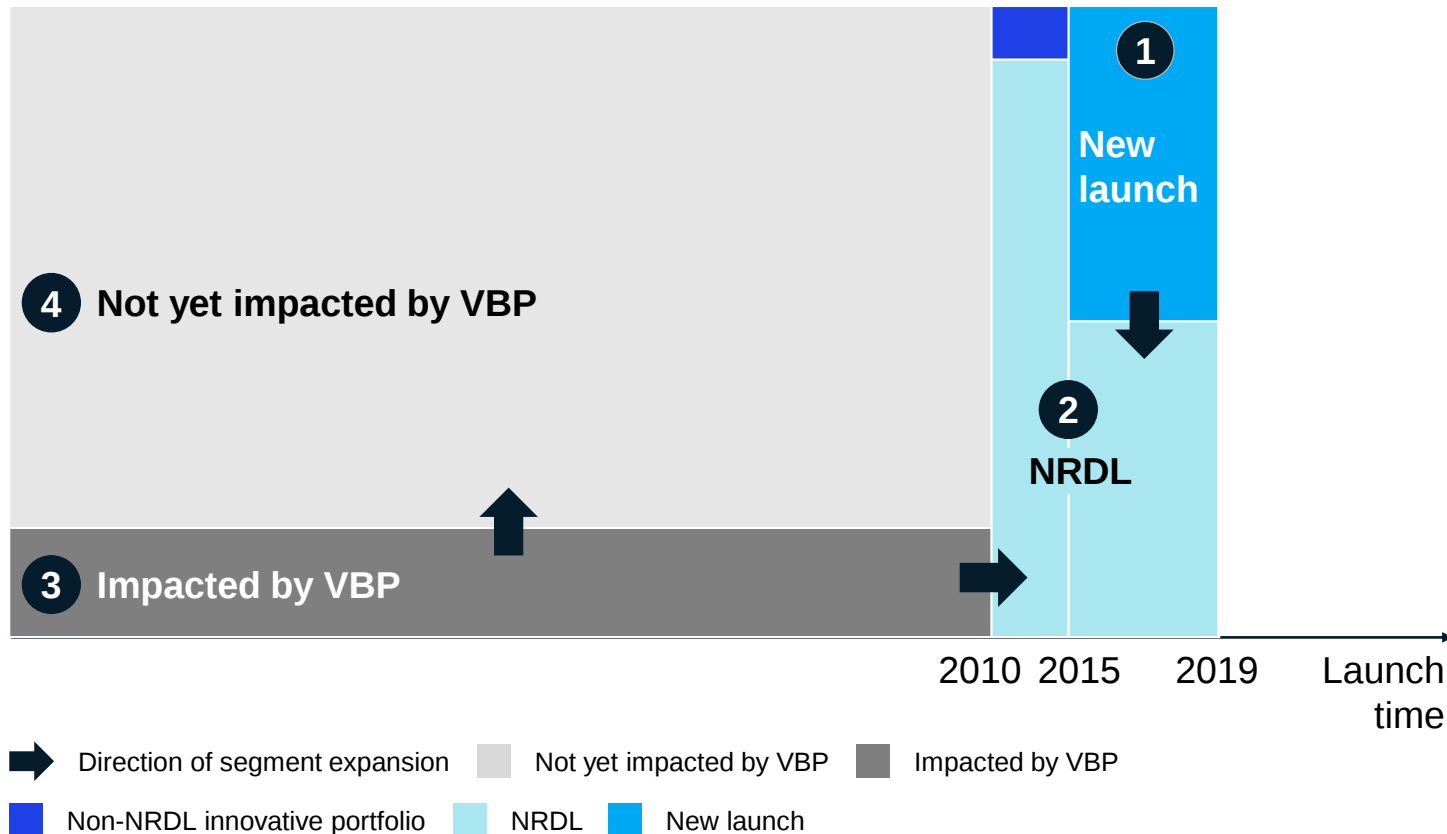


What are the drivers to maximize value for each portfolio segment?

In 2019, we introduced the China pharma “decoupling” framework to crystalize market evolution

Established portfolio

Innovative portfolio¹



1. Launch year of 2010 as a proxy cutoff for innovative portfolio

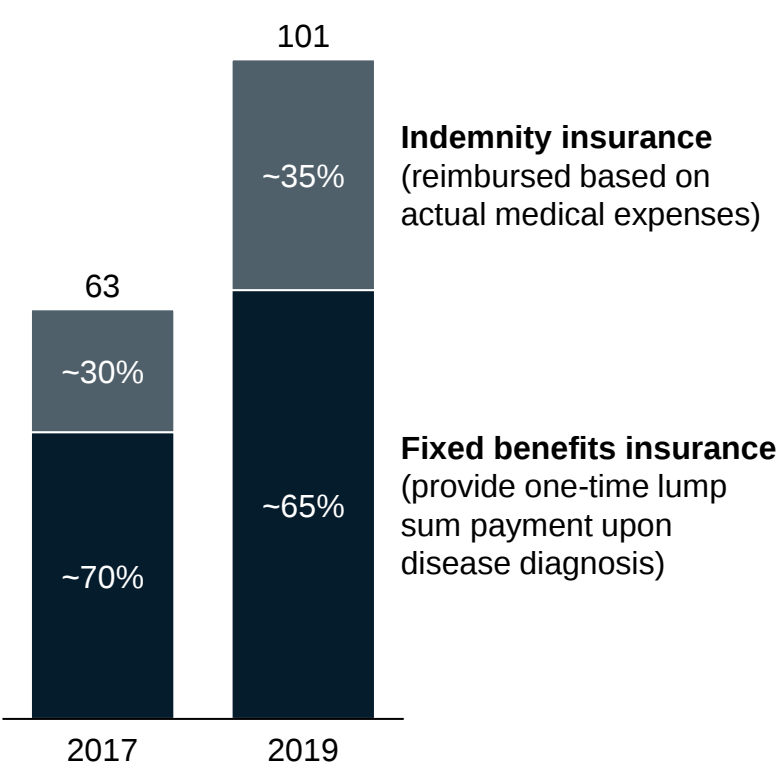
Source: McKinsey analysis

Characteristics of a decoupling market:

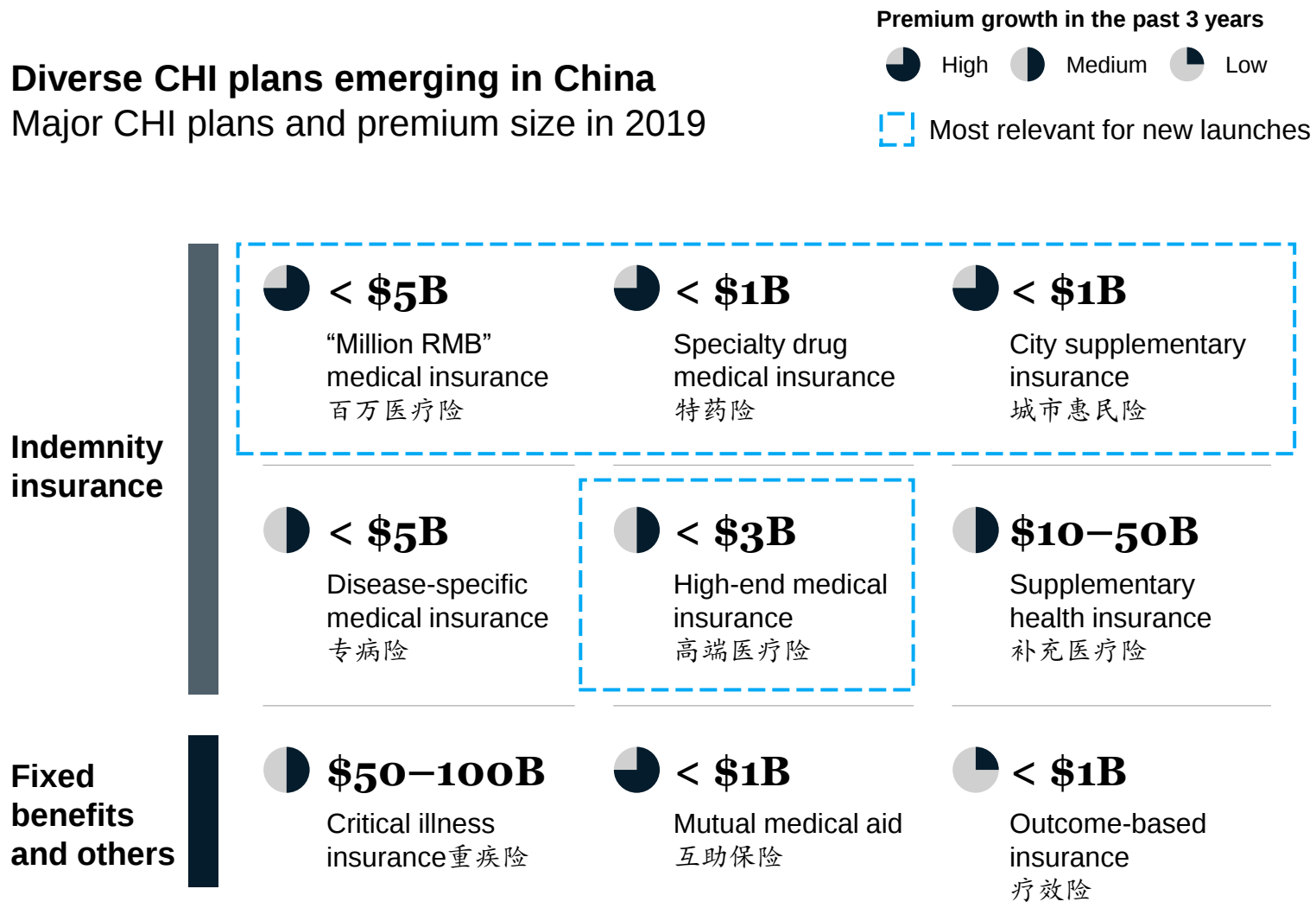
- 1 Rising bar for new launches**
Significantly improved launch performance
- 2 Pressure on National Reimbursement Drug List (NRDL) as a value driver**
Accelerated listing timeline, greater price pressure, chance for a “second launch”
- 3 Lasting impact from volume-based procurement (VBP)**
Here to stay with accelerated expansion
- 4 Mature products under threat**
Limited runway to drive value, alternative channels provide lifeline

1: Despite overall small scale, commercial health insurance (CHI) is becoming increasingly relevant for new launches

China CHI premium
Billion USD



Diverse CHI plans emerging in China
Major CHI plans and premium size in 2019



1: CHI example: City supplementary insurance provides alternative financing for specialty drugs not on NRDL

NON-EXHAUSTIVE



>20 cities and **8** provinces¹ launched such insurance since 2015, majority added in **2020**

>20 Mn enrollees as of October 2020



Among **71 drugs** in the formularies of 11 example cities, there are:

32 non-NRDL drugs launched since 2018

53 oncology drugs

Examples of non-NRDL drugs covered in 11 example cities

IBRANCE
palbociclib

KEYTRUDA
(pembrolizumab) injection 100 mg

Erleada
(apalutamide) 60 mg tablets

百泽安
替雷利珠单抗注射液

LENVIMA
(lenvatinib) capsules 10 mg and 4 mg

Kadcyla
ado-trastuzumab emtansine
20 mg/mL INJECTION FOR INTRAVENOUS USE

Mekinist
(trametinib)
0.5 mg, 2 mg tablets

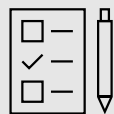
DARZALEX
(daratumumab)
injection for intravenous infusion
100 mg/5 mL, 400 mg/20 mL

Tafinlar
(dabrafenib)
50 mg, 75 mg capsules

Opportunity for pharmacos to work with insurance companies or third-party operators to **shape the formulary of city supplementary insurance**

1. As of Oct. 20, 2020

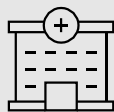
2: Policy momentum in NRDL continues to encourage innovation



Participation of NRDL update changed to **company self-application** vs. previously by nomination



NRDL update becomes annual, **applicable to the latest innovation**; drugs launched before August 2020 are eligible for application



New scheme of BMI will expand coverage of **chronic/specific disease outpatient care**

2: New products can get onto NRDL faster, but must be ready for significant price concessions

High share of recently launched innovative drugs are already on NRDL

Among 2017 launched innovative drugs (n=41):

62% are listed on NRDL

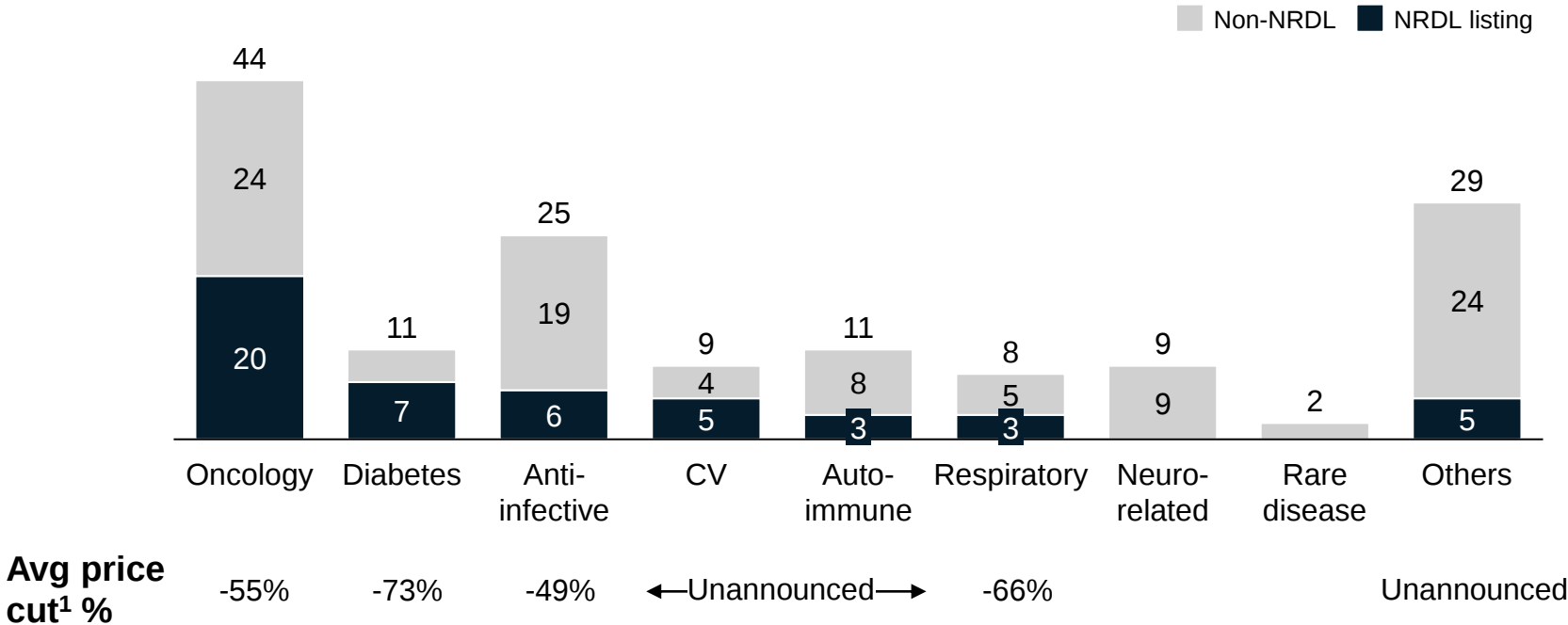
Among 2018 launched innovative drugs (n=54):

45% are listed on NRDL

53 drugs launched in 2019 are not eligible for 2019 negotiation but will be eligible for NRDL update in 2020

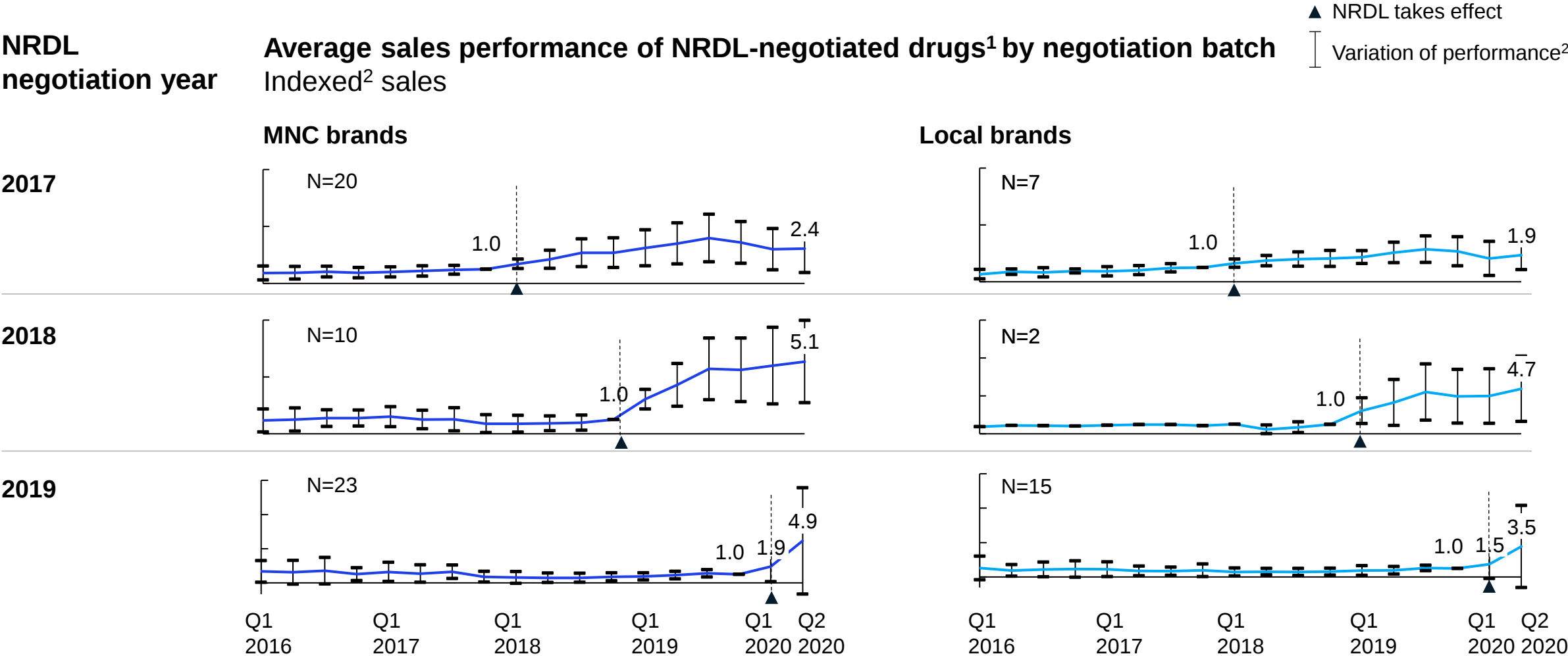
Oncology, diabetes, and CV are 3 TAs with the most new launches on NRDL

Innovative launches by TA in 2017–19 (n=148), # of launched products



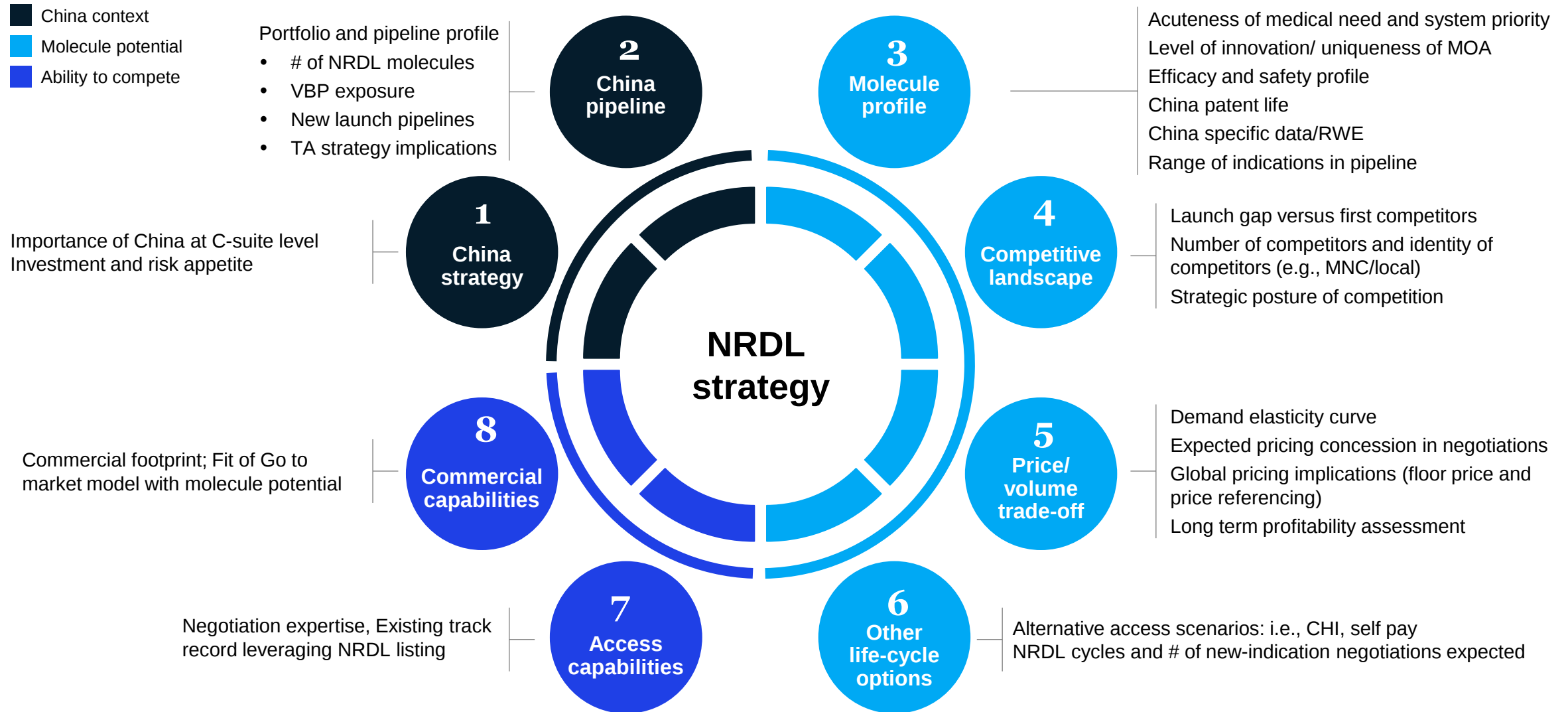
1. Only includes publicly announced post-NRDL price in 2017 and 2018 launches. 2019 launches will be included in 2020 NRDL

2: Brands see a boost from NRDL; however performance varies significantly



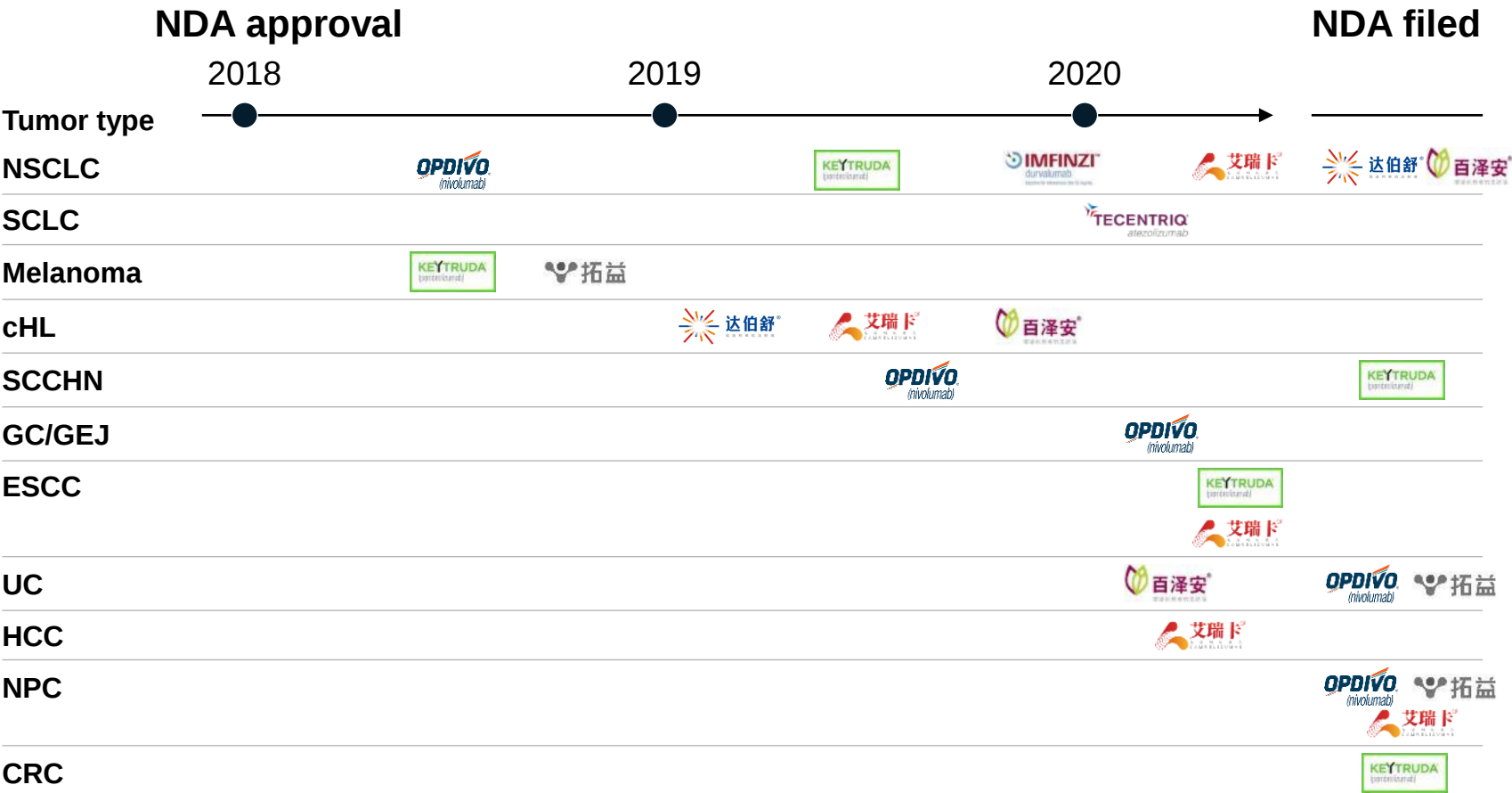
1. Includes drugs with quarterly sales records since 2016; incomplete data are not included
2. Sales are indexed with the last Q4 sales prior to NRDL negotiation set as 1.0; vertical bars represent ± 1 standard deviation

2: Participation in NRDL should be based on a systematic molecule assessment, taking into account a fair amount of uncertainty



2: With improving access environment, competition for innovation is intensifying: PD-1/L1 example

NDA approvals and filings in China of different PD-1/L1 brands¹



1. As of November 16, 2020

Source: GBI; company website; McKinsey analysis

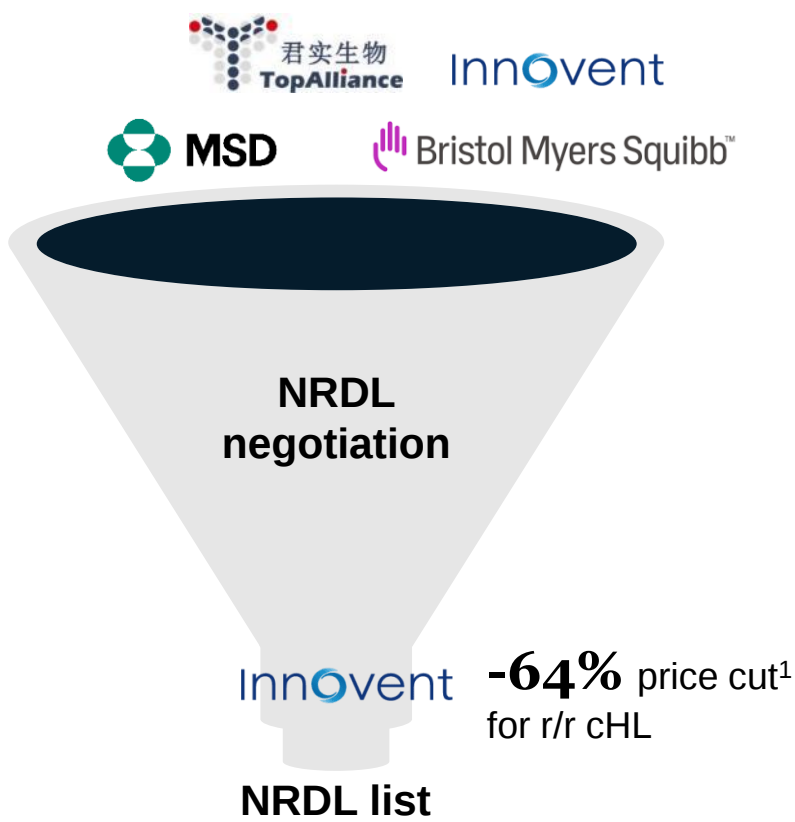
8 brands launched,
4 are local brands

Given fierce competition, it is important for companies to

- Accelerate development timeline and build China data
- Drive NRD/CHI strategy through distinctive clinical evidence, health economics, and cost effectiveness
- Build efficient reach and scale to shape clinical practices

2: While reimbursement is constrained in competitive categories, market position is driven by multiple factors

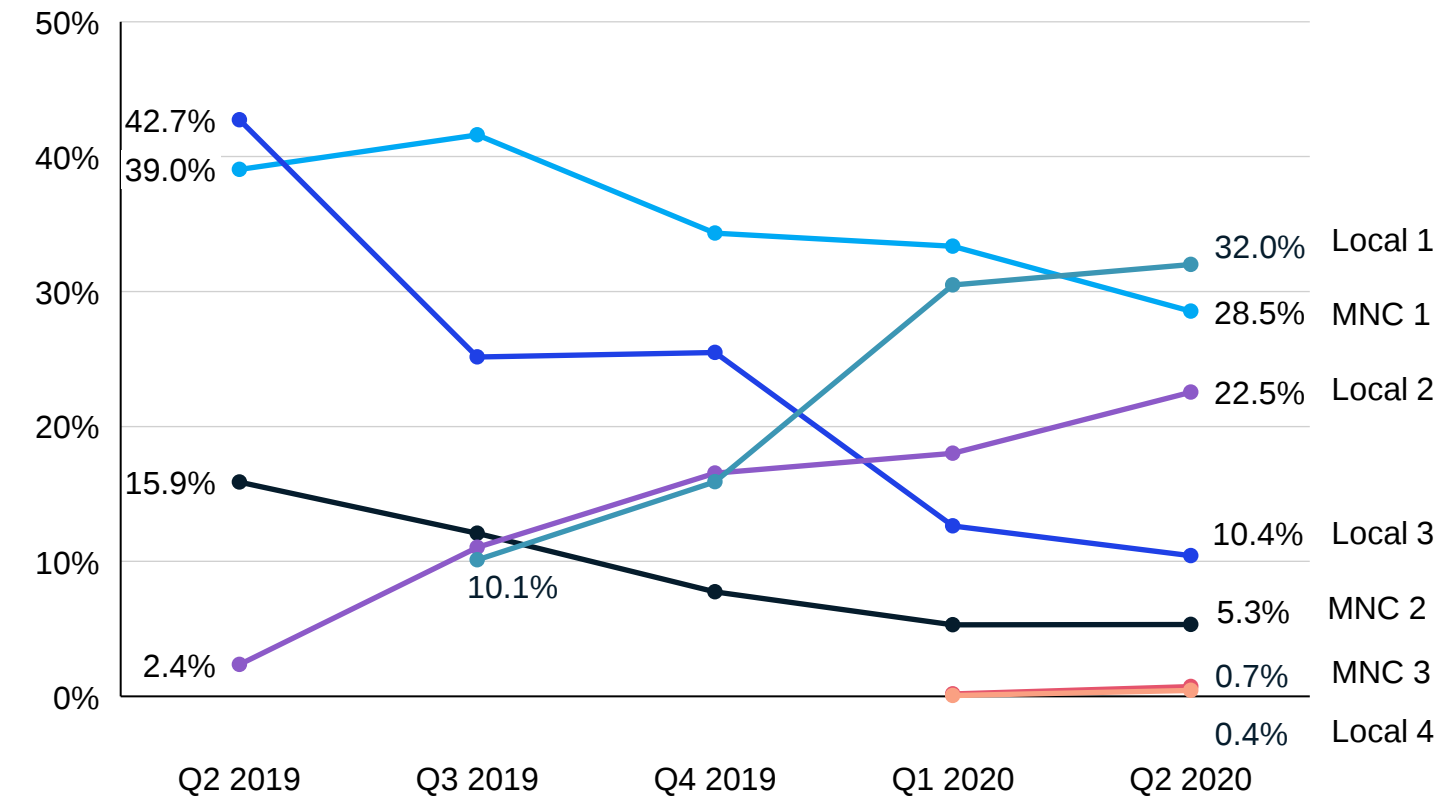
Only 1 PD-1 included in the 2019 NRDL negotiation



1. Comparing to pre-NRDL price w/o PAP scheme
2. In 680 selected hospitals in PDB database; >60% are class III hospitals
3. Only include brands with sales data in the PDB database

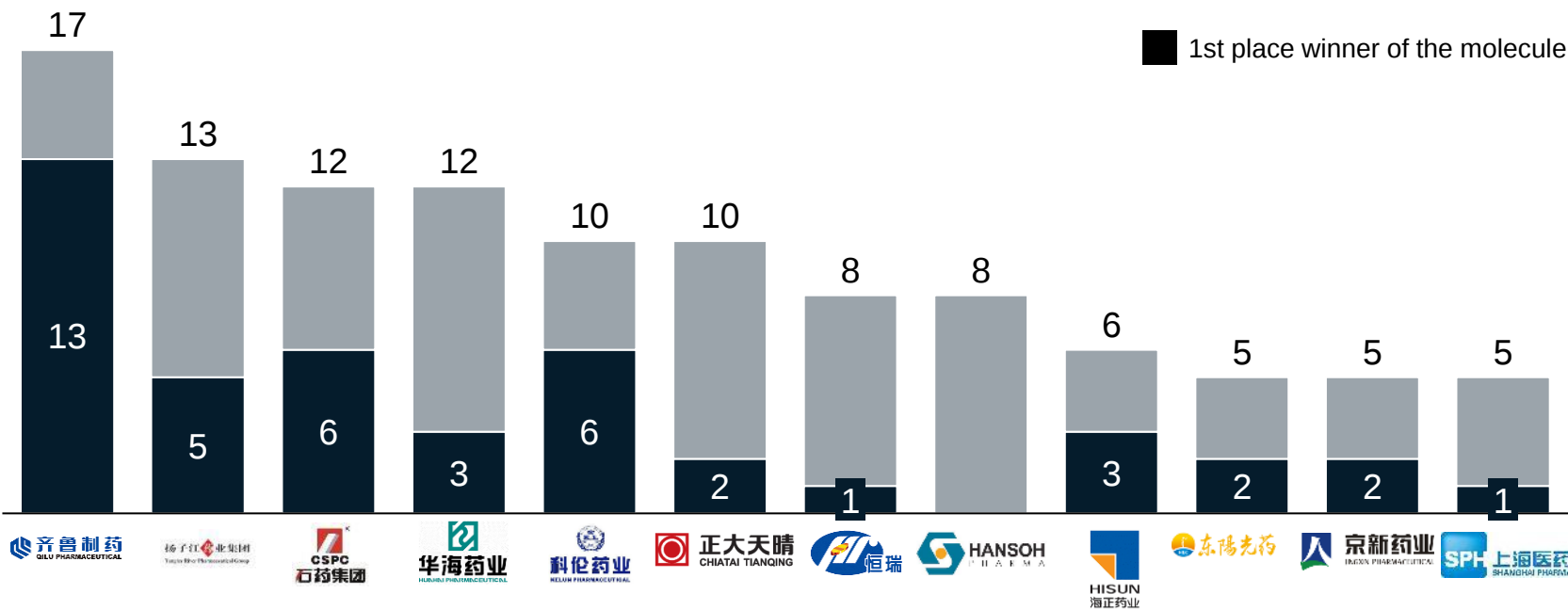
Market position shifting rapidly, driven by multiple factors, including commercial presence, access status, and clinical profile

China PD-1/L1 market share² by brands³ (Q2 2019 to Q2 2020), %



3: Large local pharmacos are the biggest VBP winners

of bids/molecules won by local biopharma in 3 rounds of national VBP¹



Top 5 together won 50% of molecule bids (55 out of 112)

1. Does not include "4+7"

Leading local pharmacos are frequent winners:

Aggressive bidding strategies (frequently lowest price)

Greater eligibility due to breadth of VBP-relevant portfolio

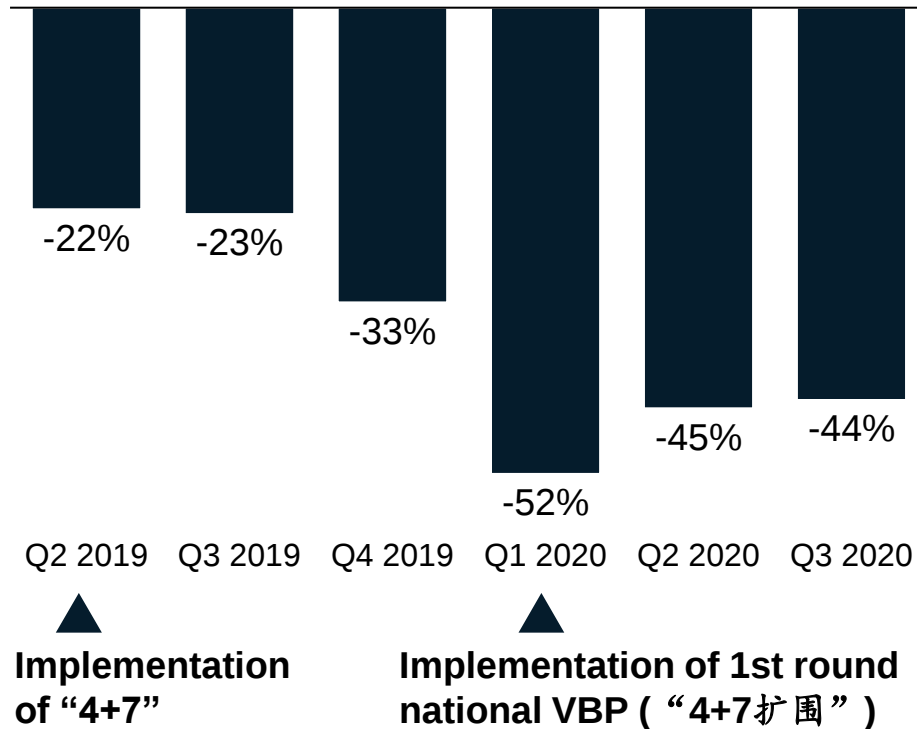
Cost competitiveness based on full value-chain capabilities in both API and formulation

Points to long-term sustainability of VBP setup and likely consolidation of industry

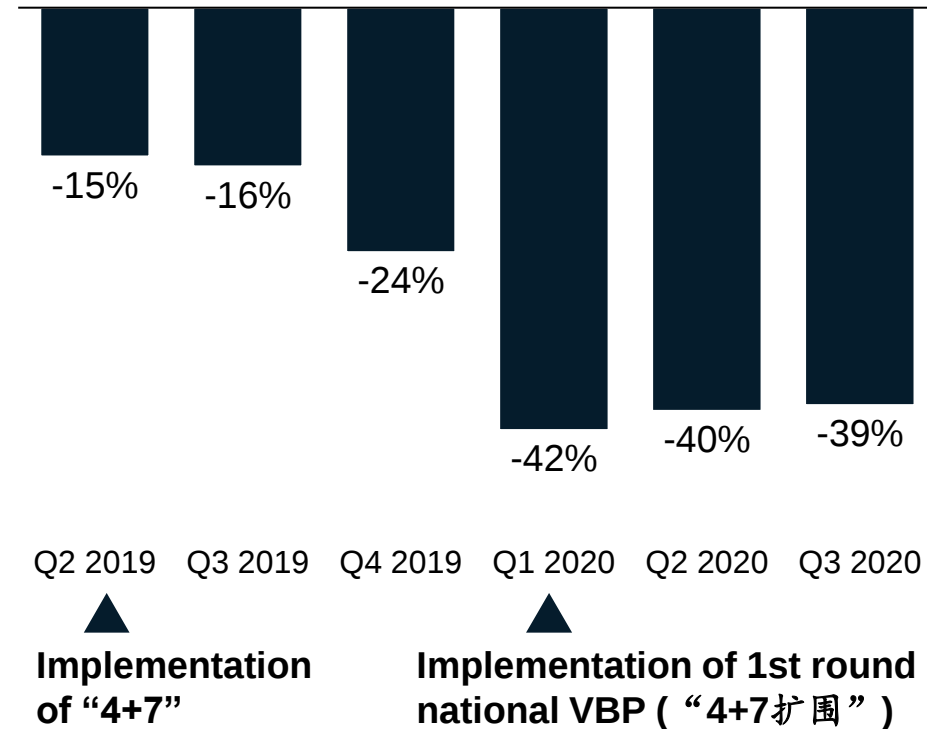
3: Different VBP outcomes lead to comparable sales outlook so far; jury is still out on longer term impact

YoY sales growth of MNC pharmaco products¹ affected by 1st round national VBP, %

Average of 10 MNC brands that did not win VBP bidding (n=10)

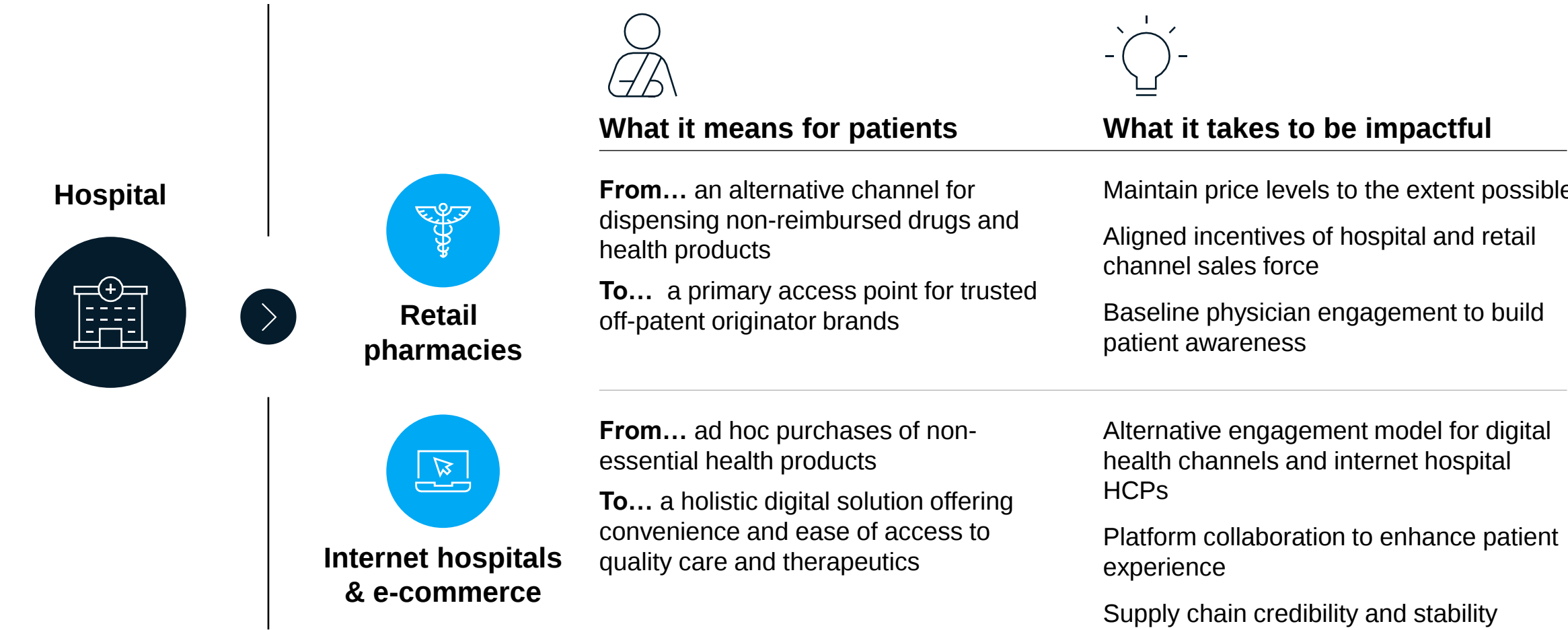


Average of 4 MNC brands that won bidding in 1st round national VBP (n=4)



1. Only including MNC products with available data in PDB

3: Alternative channels offer opportunities for MNC to maximize product value post VBP tender



Implications for pharmacos to navigate the next normal



Industry shift accelerating: Standing on VBP quicksand, pharmacos face a shortened runway to drive shift to innovative portfolios in China. Speed becomes more critical than ever.

VBP a permanent fixture: Companies need to make strategic trade-offs on participation. Alternative channels provide renewed value drivers.

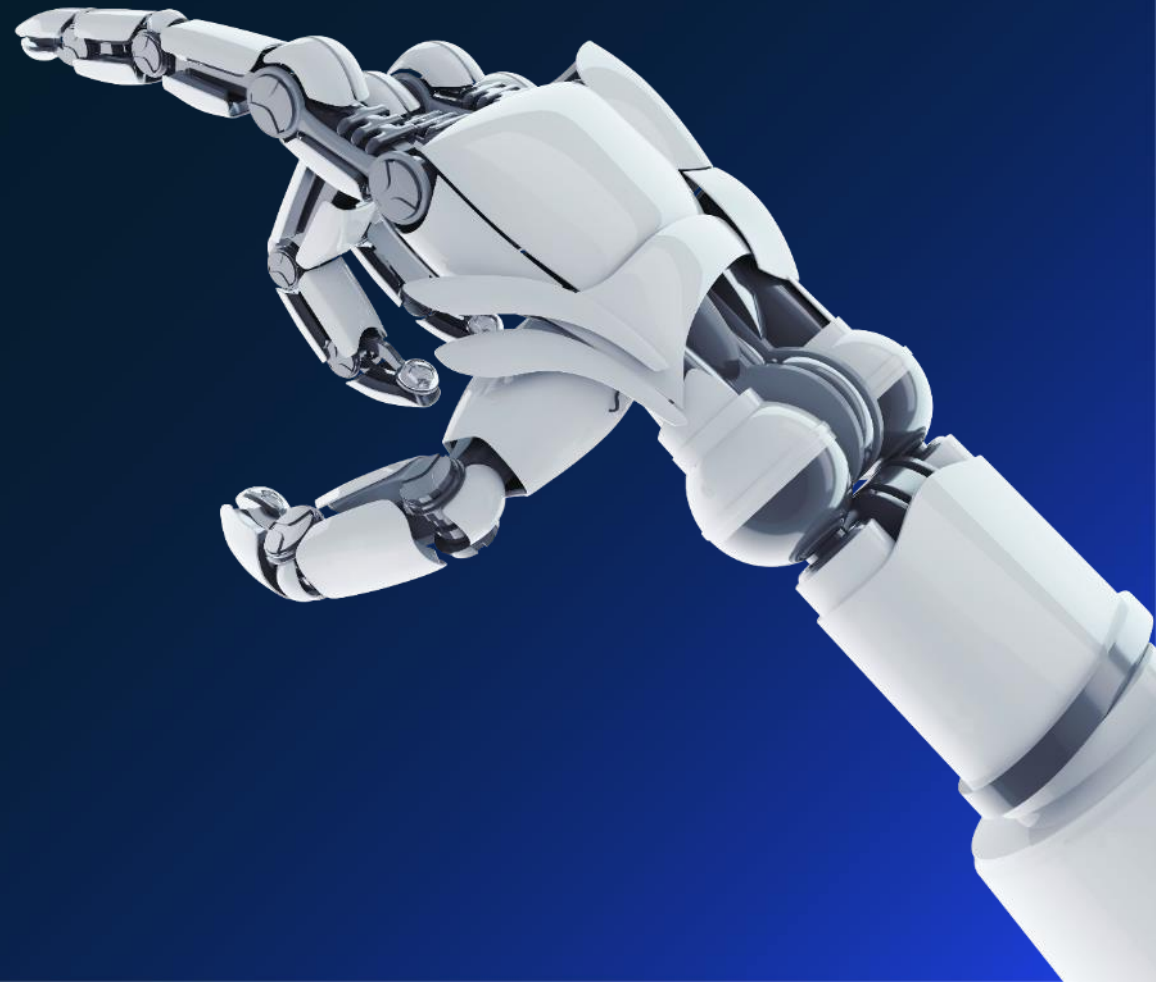
NRDL a dilemma: Complex decision making process to participate or not, given degree of uncertainty, implications, and short track record of impact for listed molecules.

CHI a welcome silver lining, not yet a silver bullet: It will play a meaningful role in reducing NRDL coverage gaps. New capabilities in evidence generation, service offerings, strategic partnerships will be key.

Intensifying competition in innovation: Rising bar to maximize performance of innovative assets. A comprehensive approach to building clinical differentiation, commercial capabilities, and access breakthroughs is needed to win.

Next-generation capabilities: With traditional capabilities no longer sufficient to win, pharmacos need to define next-generation capabilities (e.g., D&A, omnichannel, digital key account, retail partnership, RWE) and introduce new operating and talent development models.

Next horizon of digital healthcare



Three key forces power the digital transformation of China healthcare

■ H1 2019 ■ H1 2020



Physicians increasingly digital savvy

~80% of physicians join academic meetings or obtain professional information online¹

~1.3mn physicians are active on top 3 online education platforms²



DXY



Medtime



Yishengzhan



Patients moving online

17 times more visits via NHC hospitals' online channels

~2X–5X increase in registered users of leading online pharmacies



JDH



1药网



叮当快药



Vibrant digital ecosystem

~200 newly registered internet hospitals in first half 2020

~70 internet hospitals currently obtained online BMI settlement³

vs. **~25** in 2018³

Compared with US...

Patients using largest online consultation platform⁴ (in millions)



平安好医生

289

346



TELADOC

37

73

Daily consultation amount⁴ (in thousands)



平安好医生

656

831



TELADOC

11

26

1. Online physician survey in May 2020

2. Total active registered physicians;

3. 2020 internet hospital report, VCBeat, June 30, 2020

4. 2020 half-year results: China: Total registered users; US: Total paid memberships + visit-fee-only access;

Chief digital officers (CDOs) from six leading healthcare companies shared their visions for China



What are must-win areas for digital health in China?

“” **Transform physician engagement model** to achieve greater reach, improve effectiveness, and enhance experience

Deliver **higher levels of patient care** through new channels, platforms, and solutions

Empower the organization with **data and analytics**, and double down on RWE

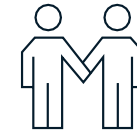


What's coming next?

“” Re-imagining healthcare through application of **new technology** (e.g., 5G, AI)

New opportunities and business models enabled by **private-public partnerships**

Care delivery becoming smarter, more omnipresent, and experience-oriented, as a key source of value creation



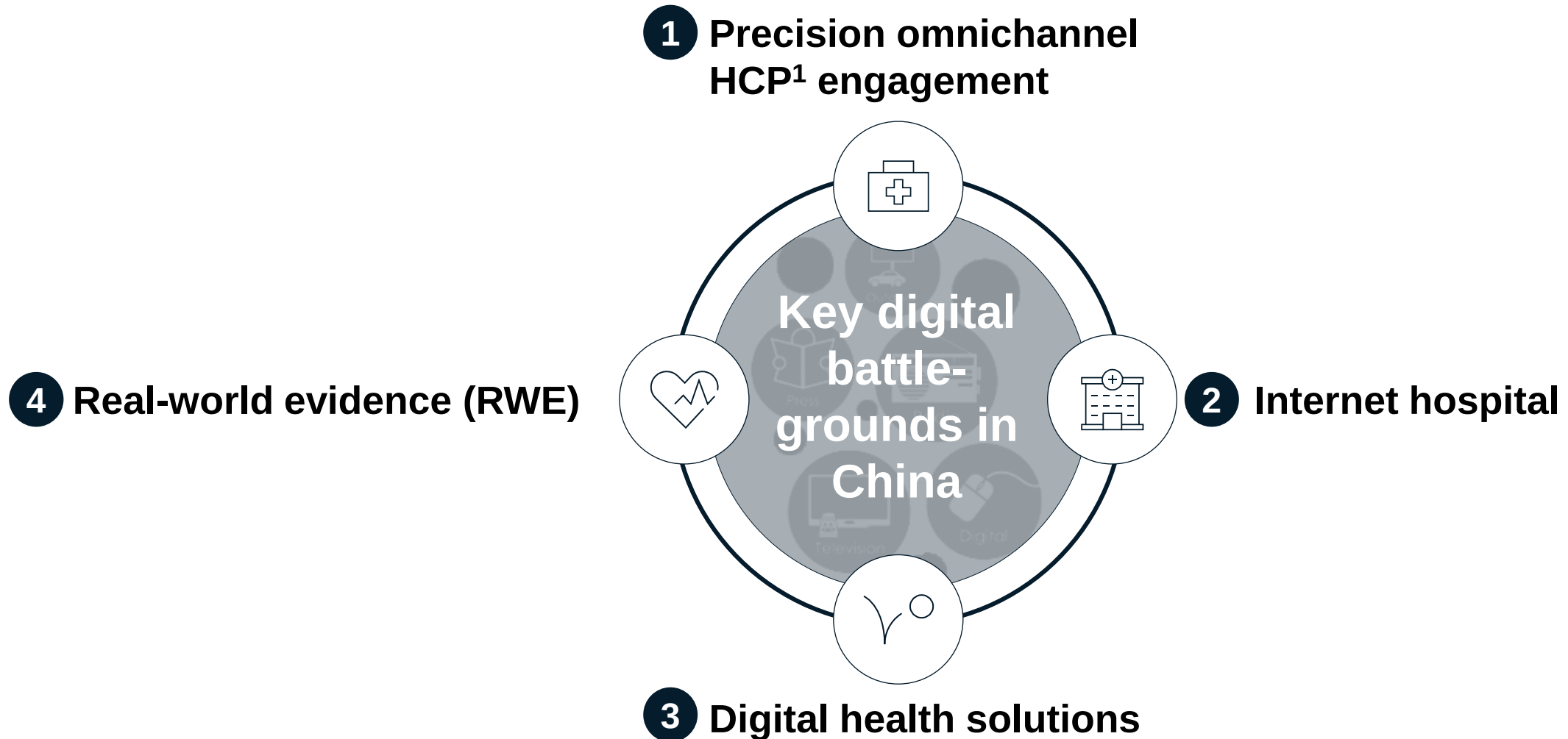
What's most important to realizing these visions?

“” Attract **differentiated talent profiles** and build new **capabilities at scale**

Organizational changes in **mindset and a digital operating model**

Acknowledge we don't know what the ecosystem will look like but must **be part of the journey**

Four key digital & analytics battlegrounds for pharma in China



1. Healthcare Professionals

1: Evolving HCP digital preferences and external environment accelerate adoption of precision omnichannel engagement

Opportunities for online interactions surge, driving HCP habit change



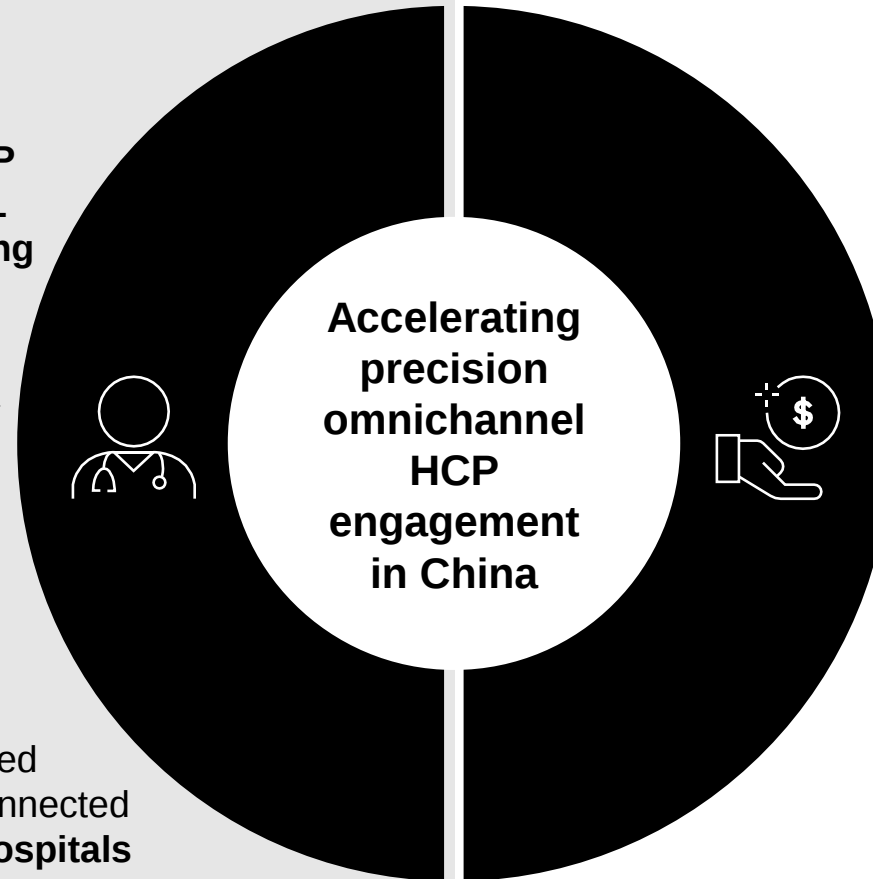
Rise of online platforms providing solutions for **HCP academic meetings, KOL lectures, and broadcasting**



Significant increase in online traffic, e.g. **over 180K viewers** of online webcasts on DXY Broadcast platform alone during COVID-19



Major medical events moved online, e.g., CCIF 2020 connected **60K doctors** from **200+ hospitals** online; other conferences adopting online/offline mix mode



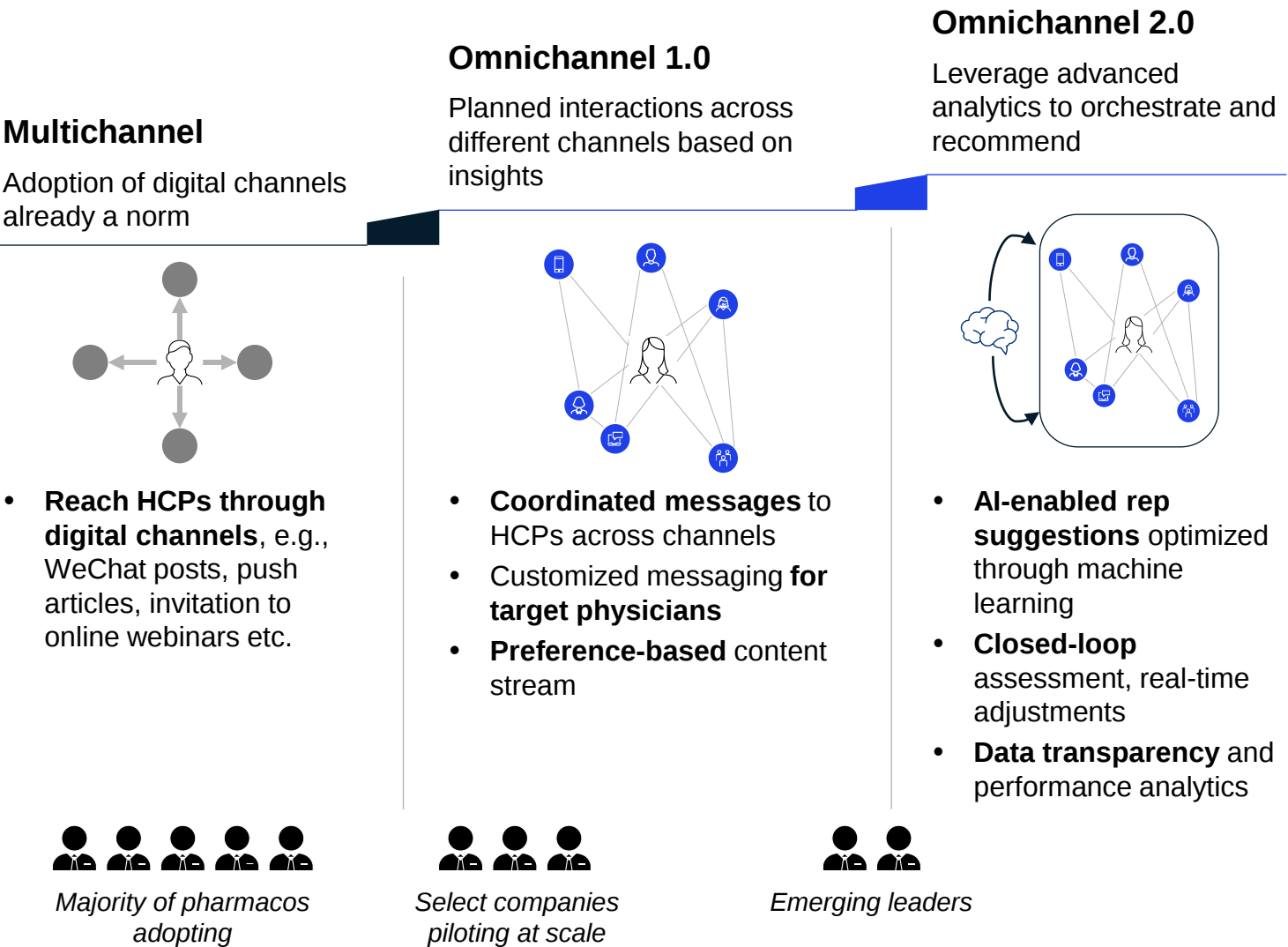
Evolving external environment requires more effective HCP engagement

Intensifying competition for HCP share of attention requires greater precision, customization, and cross-channel orchestration

Growing need for expanding coverage to lower-tier hospitals and broad market in a **cost-effective way**

Tightening regulations for face-to-face visits in hospitals poses increasing challenge for sales rep access to hospitals

1: Innovation in precision omnichannel engagement begins to emerge, with ample room for growth



Source: Company website, McKinsey analysis

Innovation in omnichannel engagement in China emerging

 **Leverage “virtual reps” model** to reach broader HCPs, automate HCP support, and empower reps with virtual follow-ups



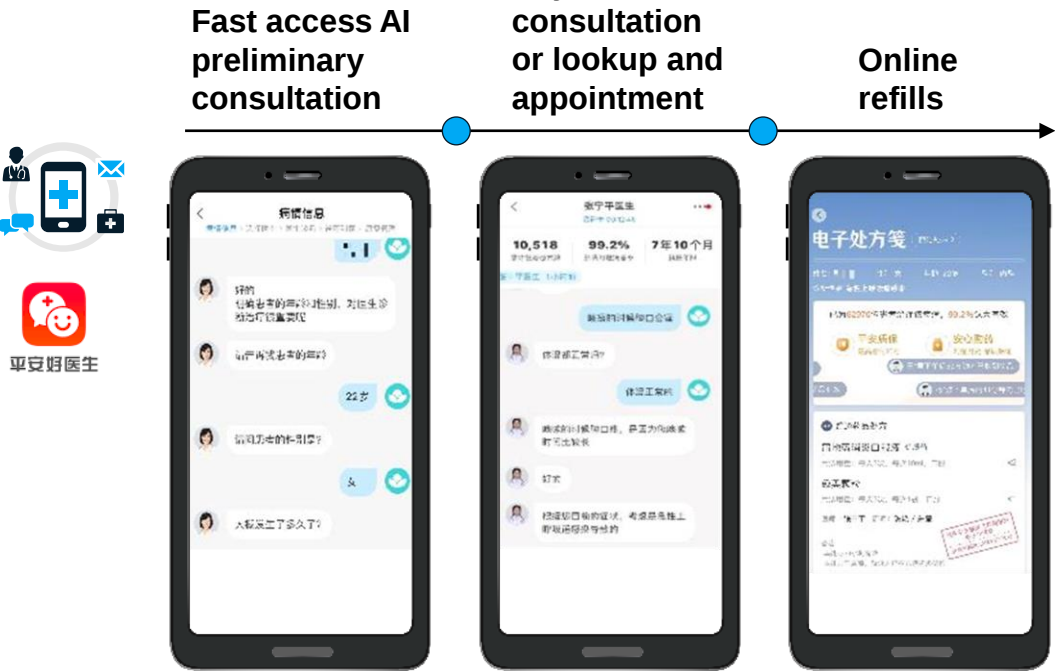
 Reach HCPs beyond company platforms and MR contacts with **targeted messaging through digital networks supported by HCP insights**



2: Internet hospitals revolutionize patient and physician experience

Revolutionizes the patient experience

Tech-player-led



Hospital-led



Brings tangible convenience and benefits to physicians



New pathway for physician multisite practice and patient care

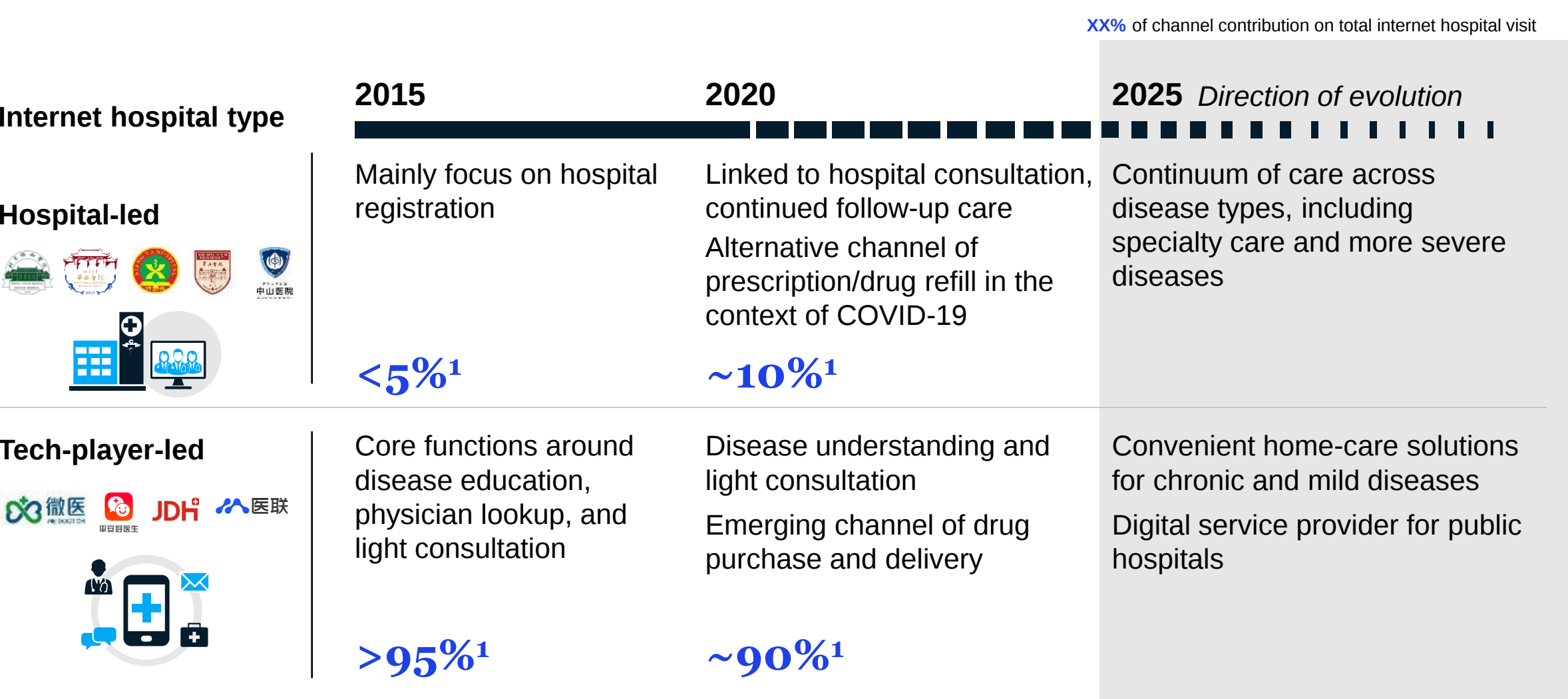


Alternative channel for information and knowledge



Additional sources of influence building

2: Two types of internet hospitals are actively expanding their capabilities and moving in different directions



1. Based on public information and top-player performance

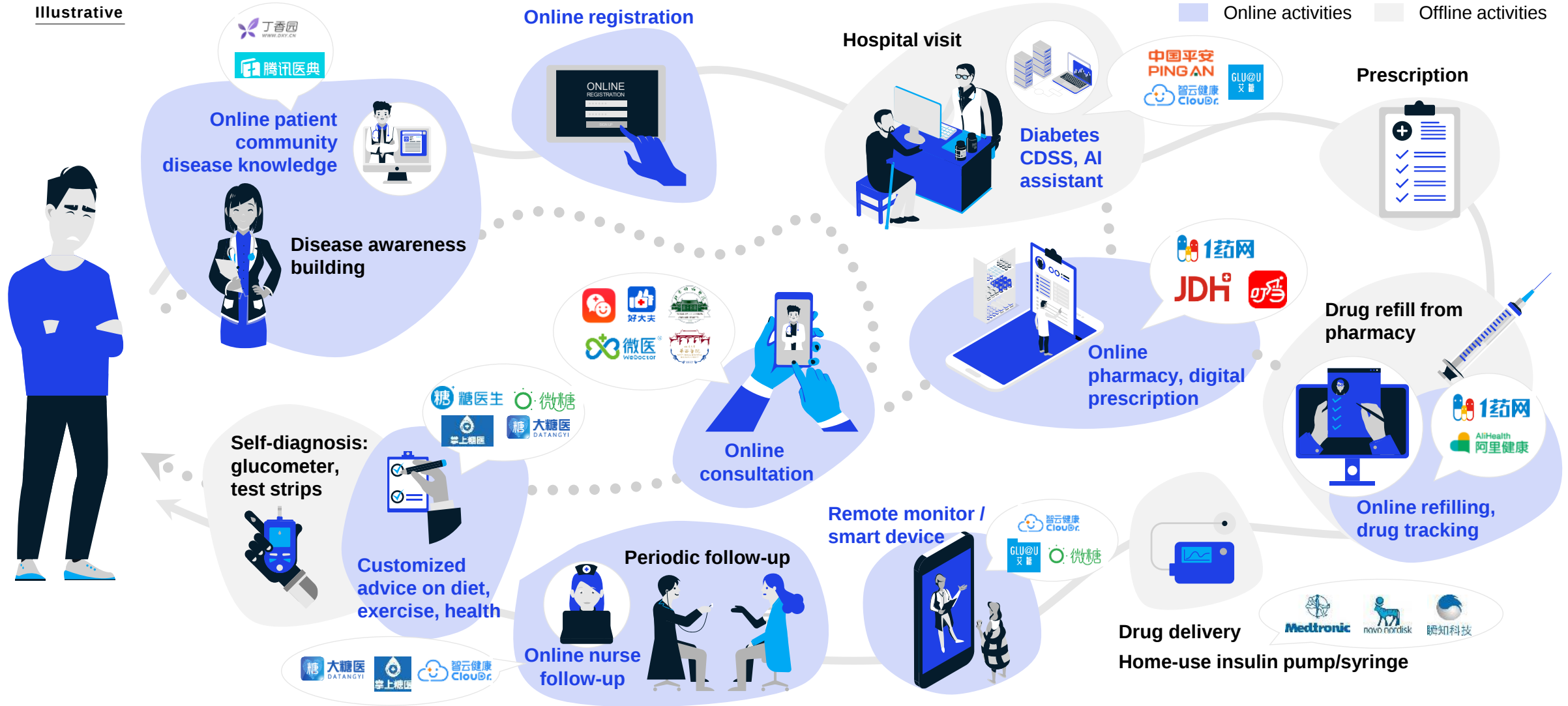
3: Digital health solutions shaping overall care journey, with increasing focus on diagnosis and treatment support

Non-exhaustive										● 2018–2020
Care journey	Latest digital health application	Level of activity ¹	Cases example ¹							
 Wellness/ prevention	Health and disease education Disease prevention Smart wearables Personal wellness improvement (fitness coaches, sleep tracking, etc.)	● ● ●	 Digital campaign on HPV prevention	 Preventative ECG management	 Child vaccination management					
			 Diabetes patient community	 Online medical encyclopedia	 Smart wearables					
 Screening & diagnosis	Online consultation AI-assisted diagnosis and medical examination Clinical decision support system (CDSS)	● ● ● ● ●	 AI+ diagnosis of infectious disease	 Diabetes CDSS	 AI+ imaging diagnosis	 AI+ health examination				
			 AI+ Parkinson movements analysis	 Hospital diagnosis & data storage system	 AI+ diagnosis and CDSS	 AI+ imaging diagnosis				
 Treatment	Automated EMR Digital therapeutics Connected hospital system Online pharmacy Robotics	● ● ● ● ●	 AI+ patient record automation	 Orthopedic surgical robotics	 Neurosurgical robotics	 Digital therapeutics				
			 AI+ precision treatment for stroke	 EMR and hospital system	 Online pharmacy: B2C, B2B, O2O	 Capsule endoscopy platform				
 Management	Indicator monitoring and medication reminder Remote care support Drug refilling and tracking system	● ● ● ●	 Specialty care United Health Alliance (专病健共体)	 Patient management tool	 AI platform for health management					
			 Recovery robotics and center	 Online epilepsy center	 Continuous glucose monitoring and remote management					

1. Based on digital initiatives announced by leading pharma, medtech companies, and representative startups in China since 2018

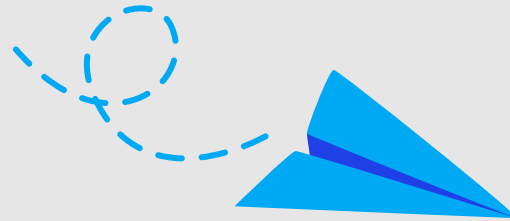
3: Future patient journey will be enabled by a vibrant ecosystem of digital innovators: Diabetes example

Illustrative



4: RWE is moving to the spotlight in China with a range of tailwinds and headwinds

Tailwinds



- A Policy trend** RWE has become the **policy spotlight** with inspiring use cases observed
- B Digital players** **Growing investment** in healthcare data-related companies in China
- C Data landscape** **Local healthcare data** becomes more available, led by both government and private players' efforts on data curation

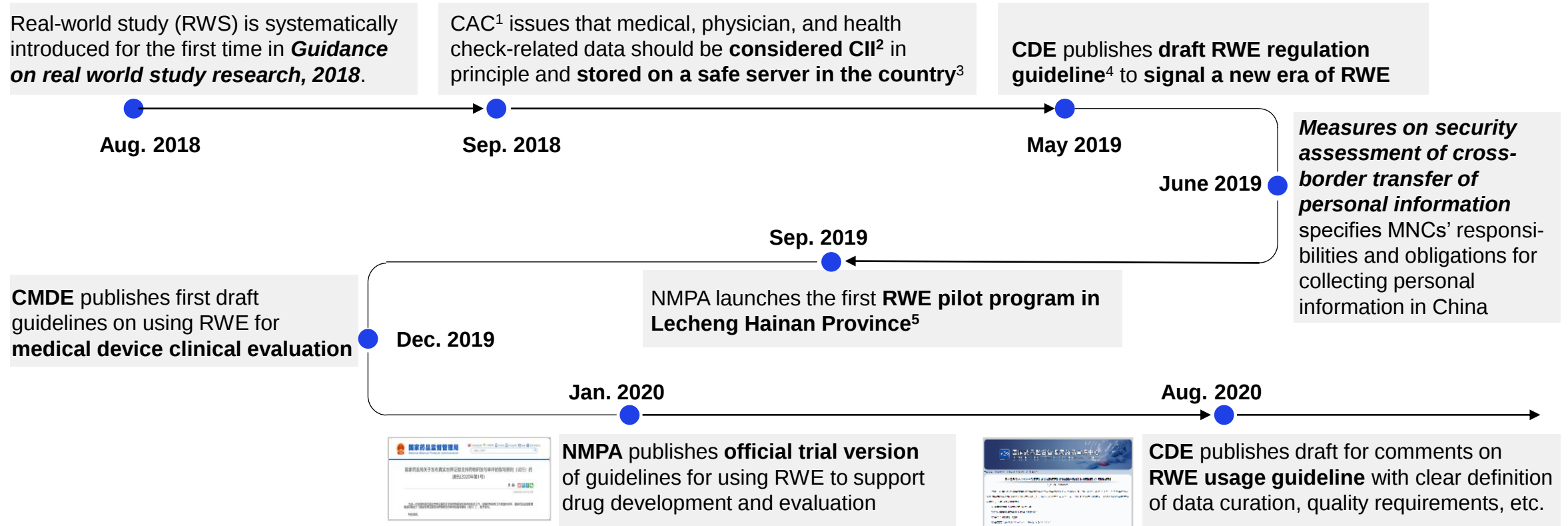
Headwinds



- ...while **strengthening regulation** on data privacy increases uncertainty
- ...while **business model and opportunities** for pharmacos to leverage RWE remain unclear
- ...while **variable quality and fragmented data sets** present challenges for industry players to maximize the value of RWE

4: Momentum of RWE guidelines provide clarity on long-term viability as well as greater focus on privacy and security

Multiple policies and regulation around RWE and data privacy/security have been introduced in the past 3 years:



1. Cyberspace Administration of China
2. Critical information infrastructure
3. Promoting and regulating the application and development of big data in health and medical care
4. Key considerations in using real-world evidence to support drug development
5. Boao Lecheng International Medical Tourism Pilot Zone in Hainan Province, allowing the usage of RWE for drug and medical device registration

4: US \$2B raised among healthcare data companies in China over the past 4 years

Series A Series B Series C Series D Series E Series F

Funding rounds for China RWE companies^{1, 2}
(in million USD)

	2017	2018	2019	2020 Q3 YTD
 LinkDoc Case Data · Case Life	151			101 (D+ round)
 太美医疗科技 TAIMEI TECHNOLOGY	14	48	160	174
 VIEW HIGH	218 (strategic investment)			
 Medbanks		10	203	
 数坤科技 SHUKUN			29	58
 森亿智能 SYNYI·AI	8	16	36	
 XtalPi		61		
...		(20+ other companies with smaller deal amount)		
Total deal amount, (in million USD)	350+	350+	750+	300+

Business model to be further clarified



Most data integrators/RWE players in China are still struggling to find a sustainable business model

CXO, leading local data startup



Many startups have moved back to focus on traditional CSO or report-selling businesses

VP, leading healthcare venture capital fund

1. e.g., data integrators, analytics specialists, and EMR providers; data extracted from Pitchbook database with deal size US >\$5million for companies based in China, 2017 to 2020
2. RWE applications of patient disease management platforms (e.g., APP) are at early stage in China and not included

4: Fragmented data storage and low quality/non-standardized data are key challenges to overcome

Key challenges for pharmacos to capture the power of RWE:

Fragmented/siloed data

Fragmented hospital data due to **dispersed hospital visits** and **fragmented EMR market**

Lack of longitudinal data

Hard to access follow-up data due to scattered data landscape and high investment required for data collection (e.g., call center)



Low quality of original data

In general **low quality of raw data** (e.g., missing and unstructured data fields in EMRs, outdated IT systems)

Lack of established data standard

Lack of **widely accepted data standard** (e.g., unified terminology); multiple efforts led by government and data players are in early stage

4: While data remains a key bottleneck, multiple sources already exist in China

Non-exhaustive														
Data type		Data readiness ¹	Accessibility for pharmacos ²	Selected sources of data										
	EMR				万达信息		Neusoft		神州医疗 Digital China Health		YIDUCLOUD		LinkDoc Care Data · Care Life	Hospitals
	Registry				NCC NATIONAL CANCER CENTER 国家癌症中心		中国队列共享平台 China Cohort Consortium	Academic associations	Patient support group	Hospitals				
	Claim				中国平安 PING AN		太平洋保险 CPIC		国新健康		博睿同信 BRAINPOWER PHARMA CONSULTING			
	Genomic		 ⁴		金域医学 KingMed Diagnostics		迪安诊断 DIAN DIAGNOSTICS		华大基因 BGI		达安基因 DA AN GENE			
	Patient-reported outcome				LinkDoc Care Data · Care Life		MediTrust 镁信健康 Health							
	Digital touchpoints				丁香园 WWW.DXY.CN		平安好医生 要健康上平安好医生		微医 WE DOCTOR		好大夫在线 网上问诊 双手点赞好大夫		AliHealth 阿里健康	
	Commercial (e.g., 3rd party report, DTP ³ data)				IQVIA™		LinkDoc Care Data · Care Life		MediTrust 镁信健康 Health		Medbanks		圆心科技	

1. Data readiness for RWE applications in general, considering completeness, granularity, time range, update frequency, etc.
2. Readiness and easiness for a pharmaco to access the datasets for RWE applications, considering regulation, data distribution, data owners' intention to collaborate, etc.
3. Direct-to-patient pharmacy
4. Not accessible for MNCs with strict regulation in place

Five predictions for future digital health in China



China speed evolution of the ecosystem, with potential to **be ahead of the curve** in digital health adoption around the world.

Businesses and go-to-market models will evolve for industry players, digital enabled “power reps” will be widely deployed, and digital health services will become new sources of business.

Internet hospitals will fundamentally change the care-delivery pathways and reshape the physician-engagement model and the patient experience.

Digital solutions will flourish, supported by **improved tech and data infrastructure** to realize seamless integration between offline care delivery and online health management.

Digital organizations elevated with a new group of talents that bring both digital and analytics expertise as well as deep understanding of its healthcare implications

Closing thoughts: A view of the “bridge to innovation” framing from our 2014 report

Broad bridge



Mature drugs have lasting staying power and continue to grow beyond 2020

China delivers meaningful and broad step-up to reward of innovation

Narrow bridge



Mature drugs have staying power, but come under stronger pressure and plateau beyond 2020

China delivers meaningful but narrow reward for innovation, closely aligned with disease priorities

Broken bridge



Window for mature drugs starts closing rapidly by 2020, earlier for some drug categories

Innovation remains heavily constrained

Self-pay market becomes main viable segment

China 2025 – Redefining the bridge to innovation to reflect the potential for impact outside of China

Global bridge to affordable innovation



Moderate pricing pressure and fast improving access conditions support fast rise of a broadly participated and vibrant innovation market

China sourced innovation broadly adopted and successful in disrupting market dynamics in developed markets

Digital enabled healthcare innovation from China referenced and adopted in global markets

Broad bridge to a thriving China innovation market



Intense pricing pressure leads to a growing but highly competitive innovation market

Market supports participation by both MNCs and local biopharmas in innovation

China sourced innovation gains in credibility but has moderate impact on developed markets

Digital enabled healthcare achieves scale and becomes a positive disruption to the health system serving patients and physicians with greater quality and efficiency

Narrow bridge to a China centric innovation market



Intense pricing pressure and constrained access conditions lead to a stagnant innovation market

Local biopharmas broadly present with selective participation by MNCs, reward for innovation remains limited

China sourced innovation fails to gain traction outside of China

Digital enabled healthcare remains at pilot level, with fragmented and sub-scale innovation

For more on China healthcare ...

www.mckinseychina.com

**McKinsey China healthcare practice
leadership team
(21 Partners and Associate Partners)**

- Digital and Analytics (D&A) dedicated leaders



McKuskey China Cancer Center

20+ years and **200 members** in Greater China & India

~40% of our revenue in oncology and 10% in surgery

10+ leading physicians in Greater China and over **1000** in U.S.

80%+ growth in total revenue and 100% annual growth in U.S. cases

1. Cancer therapy designed to meet the needs of patients with cancer in Asia

2. Cancer therapy designed to meet the needs of patients with cancer in Asia

3. Cancer therapy designed to meet the needs of patients with cancer in Asia

4. Cancer therapy designed to meet the needs of patients with cancer in Asia

5. Cancer therapy designed to meet the needs of patients with cancer in Asia

6. Cancer therapy designed to meet the needs of patients with cancer in Asia

Launch of McKinsey China cancer center

The screenshot shows a Zoom meeting interface. On the left, a presentation slide titled "10) Hybrid and Augmented Reality in Marketing: the effectiveness of new products launch" is displayed. The slide contains a list of bullet points and a video player. On the right, a video feed shows a man with glasses and a beard, wearing a dark shirt, gesturing with his hand. The Zoom window has a green title bar at the top and a toolbar at the bottom.

10) Hybrid and Augmented Reality in Marketing: the effectiveness of new products launch

- Hybrid and Augmented Reality (AR) are two emerging technologies that are transforming the marketing landscape.
- Hybrid AR (HAR) combines the elements of both AR and Virtual Reality (VR), allowing users to interact with virtual objects in a real-world environment.
- HAR is being used in a variety of ways, including product demonstrations, training, and customer support.
- HAR is also being used to create immersive experiences that can be used for marketing purposes.
- HAR is a powerful tool that can be used to create engaging and interactive marketing campaigns.
- HAR is a technology that is still in its early stages, but it has the potential to revolutionize the way we interact with the world around us.

Video player controls: Play, Pause, Stop, Full Screen, etc.

**McKinsey
China Digital
Launch
Roundtable**

**McKinsey
China Pharma
and Biotech
Executive
Roundtable**

[illegible]

**McKinsey
China Biotech
roundtable**