

## CHINESE ECONOMY: DYNAMICS AND CHALLENGES

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### ▪ Macro issues

- Is “China model” unique?
- The biggest challenge: Rebalancing Chinese economy
- Explaining consumption decline
- Highlighting rural economy

### ▪ Three policy models

- GDP and income growth since 1978
- Urbanization and rural migrants: Micro data

### ▪ Short- and long-term policy issues

- Income and employment growth
- Technology takeoff?

## FEATURES OF A CERTAIN COUNTRY

- ◆ Government savings doubled in 10 years
- ◆ Rapid industrialization: Agricultural employment fell by 1/3 in 20 years
- ◆ Gini coefficient was 0.50
- ◆ Wage growth lagged GDP growth
- ◆ Actively attracting FDI
- ◆ 75% of assets of top 100 firms: SOEs
- ◆ One-party system

## TWO QUESTIONS

- ◆ Which country is this?
- ◆ And how much did it grow?

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## IT IS BRAZIL

- ◆ “Miracle years:”
  - GDP grew by 11% between 1968-1974
- ◆ But bad performance afterwards
  - “Brazil has a lot of potentials and it will always have a lot of potentials.”
  - Lost decade of the 1980s and financial crises
  - Richer than Korea and Taiwan in 1950 but far poorer today
  - Hyperinflation
  - Anemic growth in the 1990s and crisis

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## **IT IS BRAZIL**

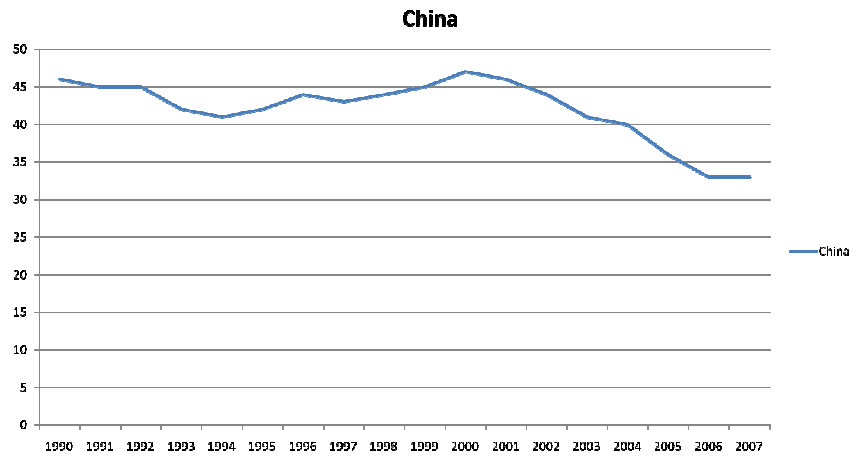
- ◆ Personal income is the key to growth
  - Better performance now after Lula de Silva began to address INCOME issues
  - Circular flow of money: Costs to A = Income to B
- ◆ China model is not unique:
  - You can have miracle growth with low income growth and massive government investments
  - But it is not sustainable
- ◆ Rebalancing Chinese economy:
  - Consumption-driven
  - But fundamentally it is about income and employment growth

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## **THE BIGGEST CHALLENGE: CONSUMPTION DECLINE**

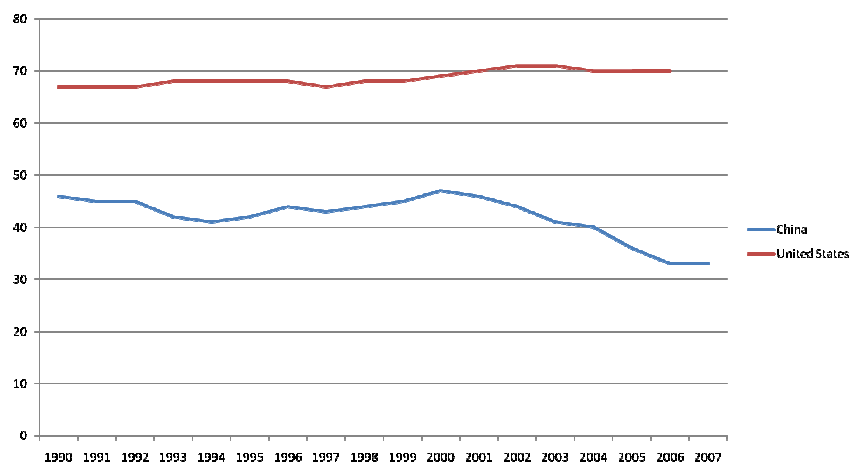
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## THE MYSTERIOUS CASE OF CHINA'S HOUSEHOLD CONSUMPTION



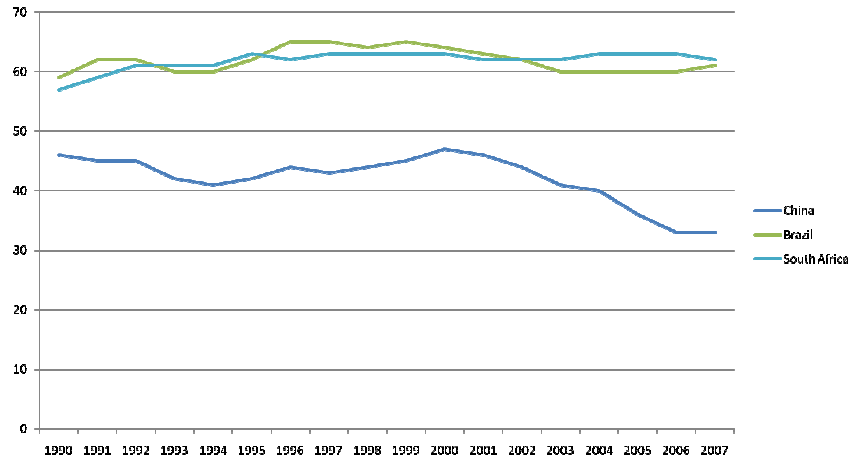
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## THE ROOTS OF GLOBAL IMBALANCES: THE GREAT DIVERGENCE



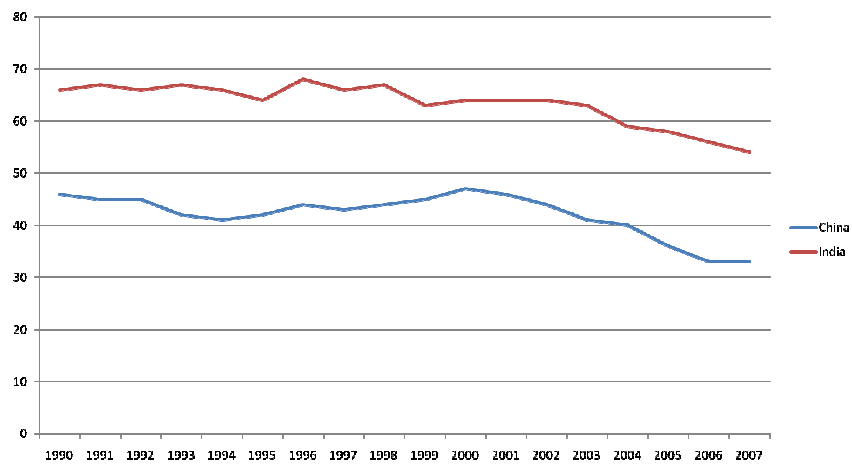
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## CHINA'S UNUSUAL CONSUMPTION DECLINE



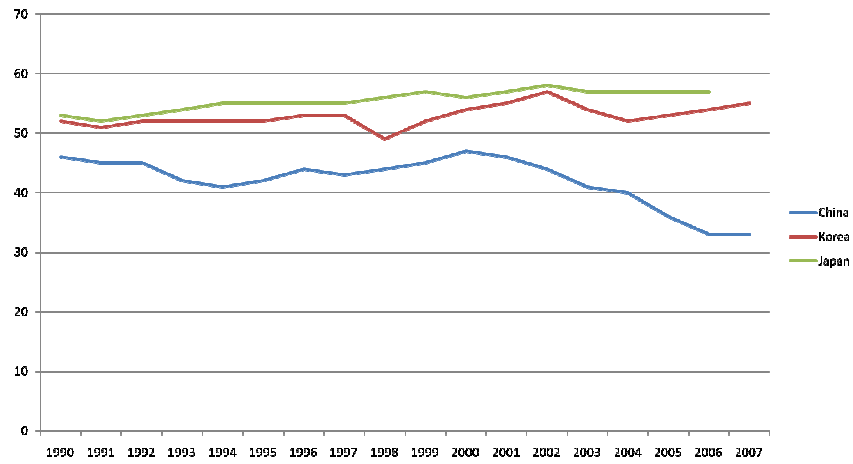
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## CHINA'S UNUSUAL CONSUMPTION DECLINE



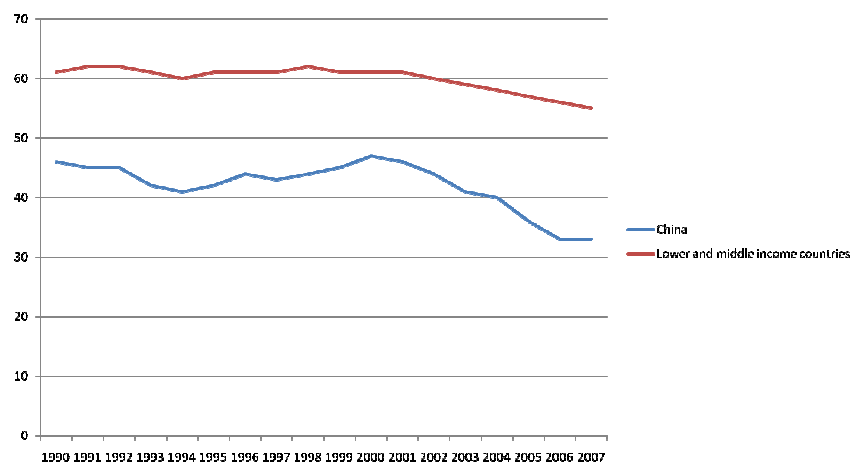
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## IT IS NOT AN EAST ASIAN PHENOMENON



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## CHINA'S UNUSUAL CONSUMPTION DECLINE



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## **TWO INTER-RELATED QUESTIONS**

- ◆ Has China successfully rebalanced its economic structure toward consumption-driven growth?
  - Some very impressive retail numbers
  - But what do these numbers mean?
- ◆ How to explain the steep consumption decline?
  - Precautionary savings are too high?
  - Or cautionary spending is too low?

**DID CHINESE CONSUMPTION  
REBOUND: HOW TO INTERPRET  
15% RETAILS GROWTH in 2009?**

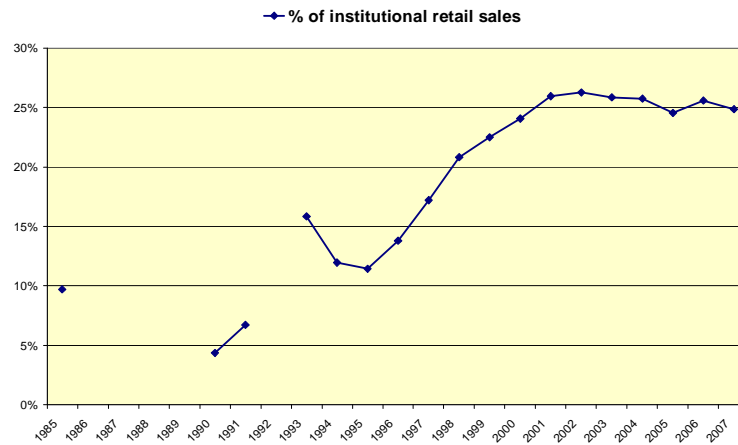
## UNDERSTANDING CHINA'S RETAIL NUMBERS

- ◆ NBS: 15% growth during January-November 2009
- ◆ The unstated assumption of the analysts: Only households purchase at retail outlets
- ◆ The Chinese term is “*social* retail consumption,” not personal (or household) retail consumption.
- ◆ Social retail consumption are defined as:
  - Retails purchased by institutions (such as government agencies and firms)
  - Retails purchased by households

## UNDERSTANDING CHINA'S RETAIL NUMBERS

- ◆ “Consumption-driven growth” implicitly means growth driven by household consumption, not by government consumption
  - Government consumption financed by taxation
  - Crowding out personal/household consumption
- ◆ So it is critical to know how much of China's retail consumption is driven by households vis-à-vis institutions.
- ◆ No published breakdowns so relying on estimates:
  - Requiring to net out service consumption by the households
  - Comparing household survey data with retail data

## INSTITUTIONAL RETAIL CONSUMPTION HAS RISEN SHARPLY



## WHY DID CONSUMPTION DECLINE IN CHINA?

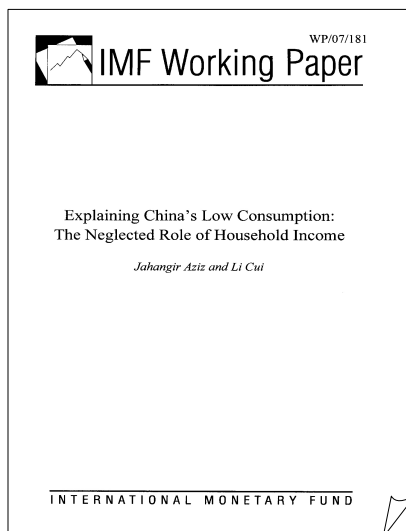
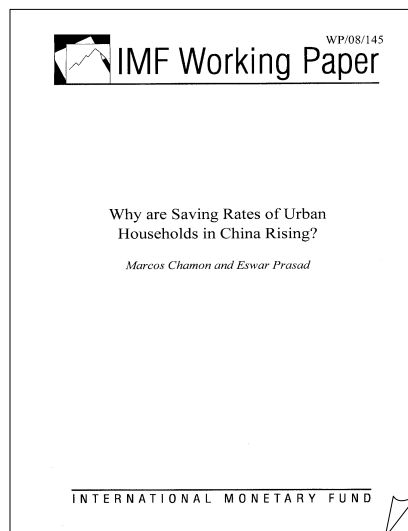
- ◆ Two hypotheses:
  - ◆ Precautionary savings hypothesis
  - ◆ Cautionary spending hypothesis
- ◆ Very different analytical and policy implications

## WHY DID CONSUMPTION DECLINE IN CHINA?

- ◆ Precautionary savings hypothesis:
  - High and rising savings rate is the problem
  - Measures to reduce the savings by 1) product marketing and distribution and 2) social protection
- ◆ Cautionary spending hypothesis
  - ◆ Low income growth, not high savings rate
  - ◆ Policy and institutional reforms to improvement employment and income growth

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## TWO COMPETING HYPOTHESES



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## SOME DATA ISSUES

- ◆ Low income growth vis-à-vis high savings rate
  - Chamon and Prasad (2008): Urban savings rate rose from 14.8% in 1990 to 22.4% in 2005
  - Aziz and Cui (2007): Rise of savings rate (5%) explained about 1% drop of consumption (out of 8%)
- ◆ Did household savings rate really rise?
  - How exactly is savings rate defined?

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## SOME DATA ISSUES

- ◆ Chamon and Prasad (2008):
  - Savings=Disposable income-consumption expenditures
  - This is a very narrow definition of expenditure
- ◆ US National Income and Products Accounts (NIPA) definition
  - Personal savings=Personal income-personal outlays
  - Personal outlays=Personal consumption+ Personal interest payments + Personal current transfers (to government and others)
  - US personal savings rate: Negative in 2005 but rising now to positive territory
  - But household expenditures>consumption expenditures
  - Non-consumption expenditures such as paying taxes are counted as household savings

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## RECONCILING CHINESE DATA WITH NIPA DEFINITION

- ◆ Urban household surveys, UHS (60,000 households)
  - Current transfers rose sharply since the early 1990s
    - Chamon and Prasad (2008) only accounted for individual income tax but other taxes rose as well
  - The effect of housing reforms:
    - Interest payment on cars and owned housing rose substantially
    - Renovation expenses
    - (Housing purchases counted as savings)

## PERSONAL OUTLAYS VIS-À-VIS CONSUMPTION EXPENDITURE

· 18 · 中国城市住户调查手册

级表 1			
项 目	机器代码	变量名称	金 额
甲	丙	丁	1
四、借贷收入	206040000000	D944	
1. 提取储蓄存款	206040100000	D941	
2. 借入款	206040200000	D942	
3. 收回借出款	206040300000	D943	
4. 收回储蓄性保险本金	206040400000	D944	
5. 兑付有价证券	206040500000	D945	
6. 收回投资本金	206040600000	D946	
7. 住房贷款	206040700000	D947	
8. 汽车贷款	206040800000	D948	
9. 教育贷款	206040900000	D949	
10. 其它贷款	206041000000	D9410	
11. 其它借贷收入	206041100000	D9411	
五、家庭总支出	206050000000	D95	
(一) 消费支出	206050100000	D951	
其中：服务性消费支出	206050100010	D9510	
1. 食品	206050101000	D9511	
2. 衣着	206050102000	D9512	
3. 家庭设备用品及服务	206050103000	D9513	
4. 医疗保健	206050104000	D9514	
5. 交通和通信	206050105000	D9515	
6. 教育文化娱乐服务	206050106000	D9516	
7. 居住	206050107000	D9517	
8. 杂项商品和服务	206050108000	D9518	
(二) 购房与建房支出	206050200000	D952	
1. 购房	206050201000	D9521	
2. 建房	206050202000	D9522	
(三) 转移性支出	206050300000	D953	
1. 缴纳的税款	206050301000	D9531	
2. 捐赠支出	206050302000	D9532	
3. 购买彩票	206050303000	D9533	
4. 赡养支出	206050304000	D9534	
其中：在外就学子女费用	206050304010	D95340	
5. 各种非储蓄性保险支出	206050305000	D9535	
其中：车辆保险支出	206050305010	D95350	
6. 其它转移性支出	206050306000	D9536	
(四) 财产性支出	206050400000	D954	

# PERSONAL OUTLAYS EXPENDITURES VIS-À-VIS CONSUMPTION EXPENDITURE

城市住户调查方案

· 19 ·

续表 2

项 目	机器代码	变量名称	金 额
甲	丙	丁	1
1. 非生产性贷款利息支出	206050401000	D9541	
2. 其它	206050402000	D9542	
(五) 社会保障支出	206050500000	D955	
1. 个人交纳的养老金	206050501000	D9551	
2. 个人交纳的住房公积金	206050502000	D9552	
3. 个人交纳的医疗基金	206050503000	D9553	
4. 个人交纳的失业基金	206050504000	D9554	
5. 其它社会保障支出	206050505000	D9555	
六、借贷支出	206060000000	D96	
1. 存入储蓄款	206060100000	D961	
2. 借出款	206060200000	D962	
3. 归还借款	206060300000	D963	
4. 缴蓄性保险支出	206060400000	D964	
5. 购买有价证券	206060500000	D965	
6. 其它投资支出	206060600000	D966	
7. 归还住房贷款	206060700000	D967	
8. 归还汽车贷款	206060800000	D968	
9. 归还教育贷款	206060900000	D969	
10. 归还其它贷款	206061000000	D9610	
11. 其它借贷支出	206061100000	D9611	
七、期末手存现金	206070000000	D97	

调查指导员： 调查员： 填表人： 报出日期：200 年 月 日

说明：1. 本表由各省、自治区、直辖市调查队核实转报。  
2. 统计范围是抽中调查户。  
3. 报表报送时间：年报为1月30日前，月报为月后8日前。报送方式为网络传输。

## NO EVIDENCE ON RISE OF SAVINGS RATE

- ◆ Rural income and consumption growth:
  - 1980s and since 2003: Consumption growth matched income growth
  - 1990s: Income growth exceeded consumption growth but by a slim margin
- ◆ Zhou Xiaochuan (07/09, governor of China's central bank)
  - No increase in household savings rate in recent years
- ◆ No support for the pre-cautionary savings hypothesis

## **CAUTIONARY SPENDING HYPOTHESIS**

- ◆ Cautionary spending hypothesis:
  - Low personal/household income growth relative to GDP growth
  - Low expectations of future income growth
- ◆ The case of rural migrant workers
  - Low consumption due to both precautionary savings and cautionary spending

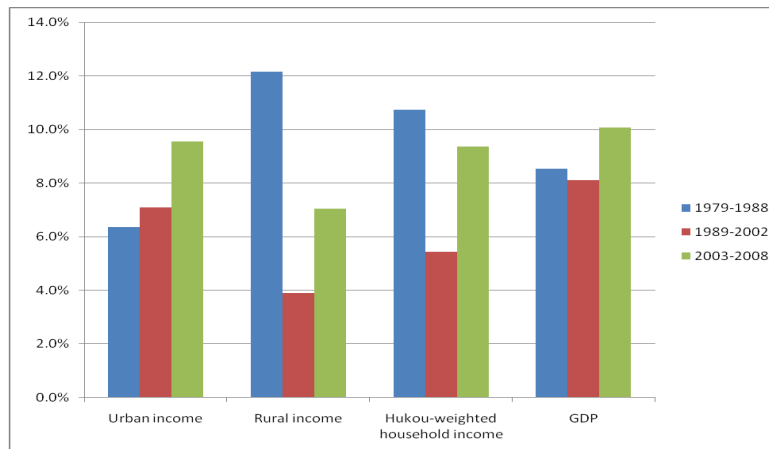
## **DYNAMICS OF CHINESE ECONOMY: 1978-2009**

- ◆ Bottom-up, entrepreneurial growth: 1980s
  - The rural miracle
  - Income exceeded GDP growth
  - Policy liberalization
- ◆ Urban bias and state-led: 1990s
  - Policy reversals in rural area
  - Rapid urbanization but modest income effects

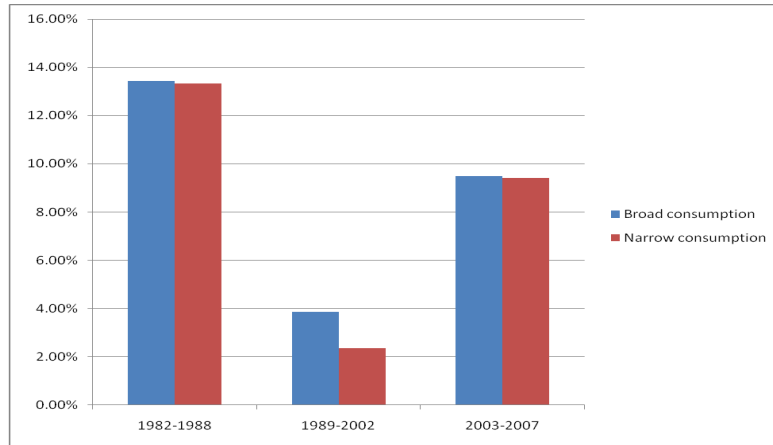
## DYNAMICS OF CHINESE ECONOMY: 1978-2009

- ◆ Social adjustments: Now
  - Rural policy adjustments
  - Emphasizing distributional issues
  - Income gains
- ◆ But sustainable?
  - Re-distribution with some reforms
  - Many policy legacies from the 1990s
  - The comeback of the state sector?

## GDP AND HOUSEHOLD INCOME GROWTH: 1978-2008



## REAL RURAL CONSUMPTION GROWTH (1978 PRICES)



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## HIGHLIGHTING RURAL SECTOR

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## WHY RURAL SECTOR MATTERS

- ◆ Demand side:
  - 721 million rural residents in 2008
  - 230 million rural migrants (NBS 2009)
  - “Rural cities:” Comparison with India
- ◆ Supply side (=Entrepreneurship):
  - Rural China is more entrepreneurial due to lack of social protection and less political control
  - Households=business units in rural China
  - Households are unambiguously private
- ◆ Global crisis:
  - Substantial effects on rural migrants: Layoffs and pay reduction
  - Policy discussions to revive rural entrepreneurship and rural finance

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## MANY PROBLEMS BUT SOME SIGNS OF IMPROVEMENT

- ◆ Impressive rural household income gains in 2009
  - 9% in 2009 compared with 8% for GDP in 2009
  - For the first time since late 1980s household income may have grown faster than GDP growth
- ◆ Data issue:
  - Possible over-sampling of high-income households (32% in 2007)
  - But real growth acceleration since 2005

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## **MULTIPLE IMPLICATIONS OF A RURAL TURNAROUND**

- ◆ Scale effects:
  - Huge consumption potentials due to the scale of rural population
  - Green economy: Rural consumption is energy saving
- ◆ Supply side effects of a rural turnaround
  - Rural entrepreneurship fueled China's growth in the 1980s and early 1990s
  - Labor market dynamics: Labor costs
    - Why China is short of labor?
    - 2009 Guangdong survey: Moderate pay reduction
  - Pushing firms to innovate rather than relying on cheap labor

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## **WHAT HAPPENED IN THE 1990S?**

- ◆ Policy directions in the 1990s:
  - Financial policy reversal in the rural area
  - Urban bias and state-led urbanization
  - Lagging wage growth among rural migrant workers
- ◆ The economic and political challenge of moving away from these policies

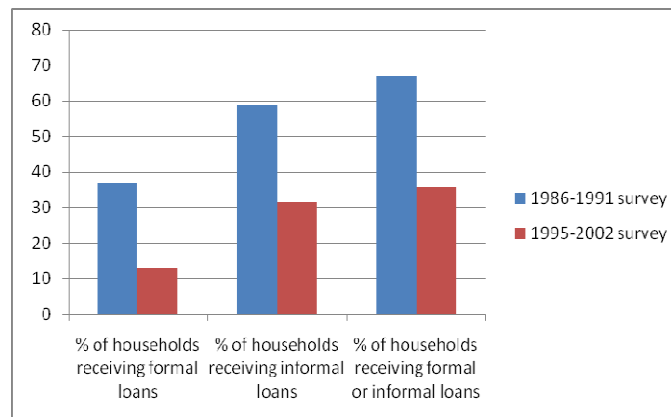
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## FINANCIAL REVERSAL: TWO RURAL SURVEYS

- ◆ Empirical strategy: Comparing 1986-1991 wave with 1995-2002 wave
- ◆ Findings:
  - Coverage: % of households with access to either formal or informal loans declined
  - Loan allocation: 1) Non-farm rural entrepreneurship was no longer supported and 2) importance of political connections increased.

## HOUSEHOLD CREDIT ACCESS: TWO WAVES OF RURAL HOUSEHOLD SURVEYS

Figure 1 Percent of households receiving formal or informal loans



## DID URBANIZATION RAISE INCOME?

### **URBANIZATION (CHINESE STYLE)**

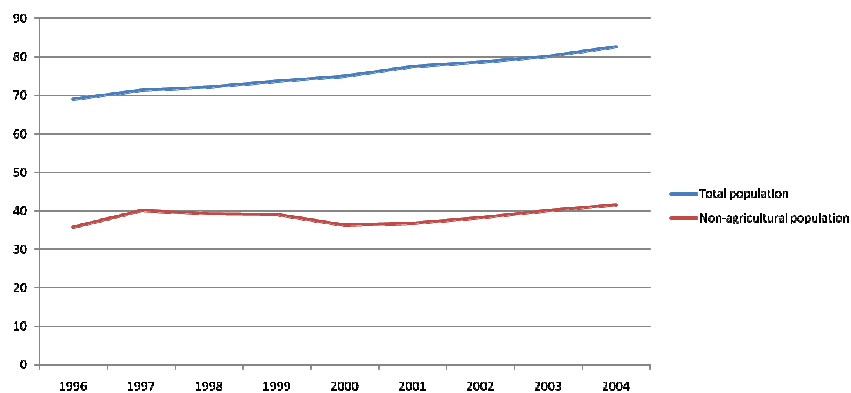
- ◆ Agglomeration effects of *market-based* urbanization
  - Reduce transaction costs and lower the provision costs of public goods.
  - Raise income and consumption: Middle class
- ◆ Political urbanization
  - Geographic expansions
  - Government pricing of land transactions
  - Income effects:
    - Zhou Xiaochuan (2009): Little effects
    - Data analysis

## AGGLOMERATION (=POPULATION DENSITY)

- ◆ Chinese cities are getting larger in terms of size of population
  - But the average size of a Chinese city is actually small: 1.2 million in 2004 (only 1 million in 1996)
  - The urban hukou population is even smaller: 750,000 in 2004 and 606,800 in 1996
- ◆ Dynamics
  - But the average size of the Chinese cities grew slowly
  - The median city actually has LOST population
  - Comparisons with India

## MEDIAN CITY: NO GROWTH IN THE URBAN HUKOU POPULATION

Population of a median city: 10,000 persons



## **AGGLOMERATION**

- ◆ Preliminary takeaways:
  - Chinese urbanization may not be an agglomeration process
  - The conversion from rural hukou to urban hukou lagged the urbanization pace
  - The agglomeration effect comes from rural labor migration, rather than from legal migration
- ◆ Implications
  - Rural migrants contribute to urban growth but are not claimants on urban services (healthcare and education)

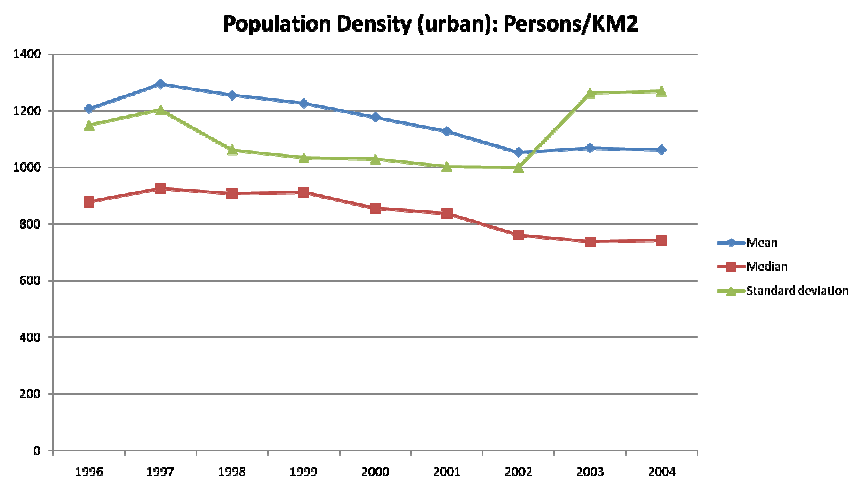
## **LAND AND GEOGRAPHIC URBANIZATION**

- ◆ Some key features of the Chinese urbanization:
  - Land acquisition and geographic expansion of city boundaries
  - Population density actually declined

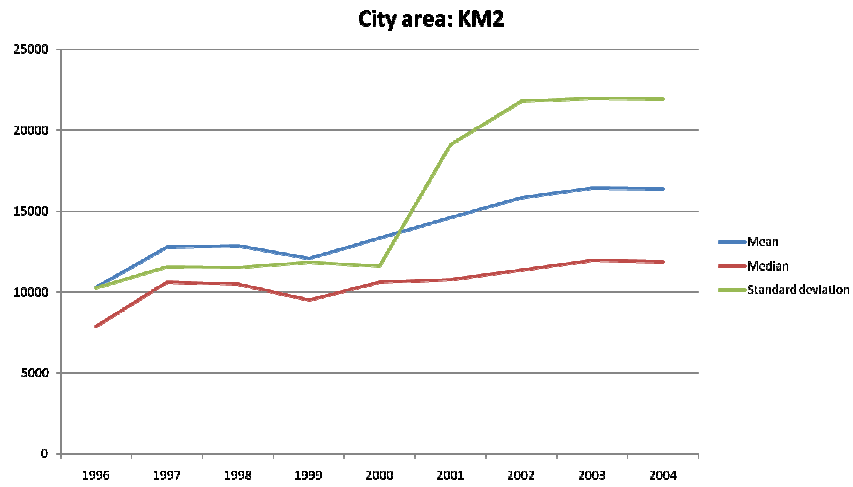
## LAND AND GEOGRAPHIC URBANIZATION

- ◆ Some key features of the Chinese urbanization:
- ◆ Politics vis-à-vis economics
  - A discrete, not a continuous, process
    - Milestone in 2000: The size measure of the Chinese cities began to increase substantially
    - The period before 2000: Relatively flat
  - Land allocation is heavily political and state-driven
  - Politics, not just economics (=industrialization)

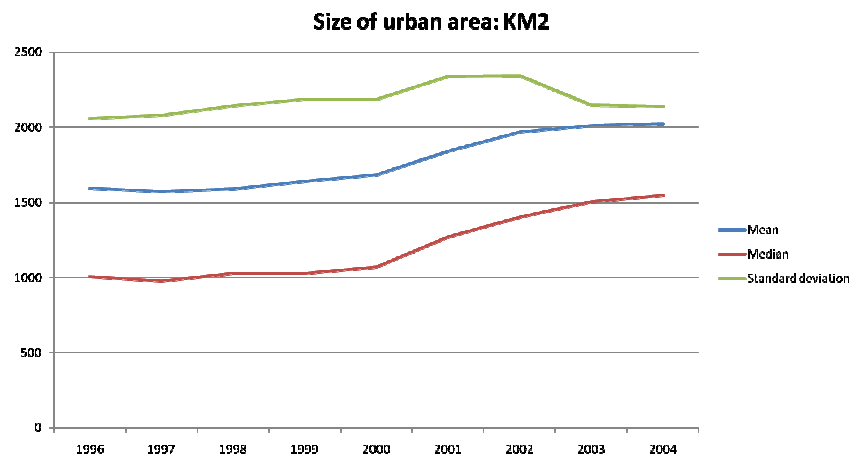
## DECLINING POPULATION DENSITY BUT GREATER DIVERGENCE SINCE 2000



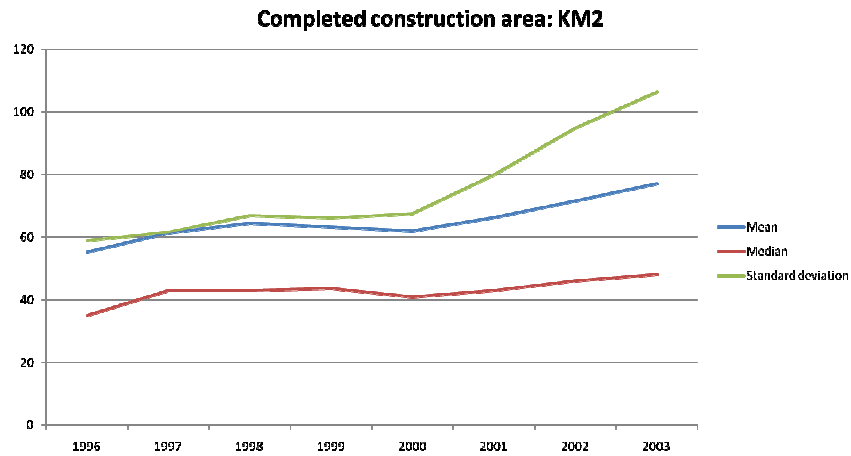
## GEOGRAPHIC EXPANSION: POLITICAL MEASURE (CITY SIZE)



## A NARROWER MEASURE: URBAN AREA (市区)



## THE NARROWEST MEASURE: CONSTRUCTED AREA (城建区)



## QUESTION: ECONOMIC IMPACT?

- ◆ “Political” and geographic urbanization (as opposed to market-based and agglomeration):
  - Does it raise income?
  - Does it change consumption behavior
  - Does it create wealth?
  - Does it promote social well-being (by making provisions of social services cheaper)?

## CURRENT AND FUTURE RESEARCH AGENDA

- ◆ Matching of two datasets:
  - CHIP2002: Very little effect on wealth creation related to land transactions
  - NBS survey data:
    - Mixed effects on household income growth during the fast urbanization
    - Negative or no effects on financial wealth holdings on the part of Chinese rural and urban households
- ◆ Survey of 1,500 rural migrant workers in 2009

## MATCHING CITY DATA WITH CHIP 2002

Table 1 Definitions of the key variables

Variables	Definitions and notes
<b>Dependent variables for rural CHIP:</b>	
Household income growth (HIG)	The growth of the net rural household income per capita from 1996 to 2002. Net household income=Gross income-production expenses.
Household wealth level (HWL)	The log value of rural household net wealth per capita defined as the sum of the value of household fixed assets for production, self-owned housing stock, all the financial assets, and value of durable goods minus the household debt)
<b>Dependent variables for urban CHIP:</b>	
Household income growth (HIG)	The growth of urban household income from 1996 to 2002. Household rather than per capita income is used because data on household size for 1998 are not available.
Household wealth level (HWL)	The log value of net household wealth per capita defined as the sum of the value of household fixed assets for production, self-owned housing stock, financial assets, value of durable goods, and other assets, minus the household debt.
<b>Independent variables for rural CHIP and for urban CHIP:</b>	
Hukou urbanization level in 2002 (HUK02)	The ratio of those residents with an urban <i>hukou</i> to the total population residing within the boundaries of a city as of 2002.
Hukou urbanization growth (HUKG(96-02))	The growth of those residents with an urban <i>hukou</i> to the total population residing within the boundaries of a city from 1996 to 2002.
Construction urbanization level (CST1(02))	The ratio of the constructed area to the total administrative area of a city in 2002
Construction urbanization growth (CSTG1(96-02))	The growth of the ratio of the constructed area to the total administrative area of a city from 1996 to 2002
Alternative construction urbanization level (CST2(02))	The ratio of the current construction area to the total administrative area of a city in 2002.
Alternative construction urbanization growth (CSTG2(96-02))	The growth of ratio of the current construction area to the total administrative area of a city from 1996 to 2002.
PRIEMP02	The share of self-employment in the total employment in 2002

# MIXED EFFECTS ON INCOME GROWTH

Table 1 Income effects of urbanization growth measures

Dependent Variable=Rural or urban household income growth between 1998 and 2002						
	Hukou Urbanization		Construction Urbanization			
	Rural CHIP	Urban CHIP	Rural CHIP	Urban CHIP	Rural CHIP	Urban CHIP
Panel (1) Substantive variables:						
HUKG(96-02)	0.048 (0.12)	-0.166 <sup>***</sup> (0.0514)				
CSTG1(96-02)			0.155 <sup>**</sup> (0.0694)	-0.0469 <sup>**</sup> (0.0272)		
CSTG2(96-02)					-0.0013 (0.0064)	0.0036 <sup>**</sup> (0.0018)
Panel (2) Other variables:						
INCOME98	-1.65 <sup>***</sup> (0.06)	-0.95 <sup>***</sup> (0.02)	-1.65 <sup>***</sup> (0.06)	-0.95 <sup>***</sup> (0.02)	-1.65 <sup>***</sup> (0.06)	-0.95 <sup>***</sup> (0.02)
PRIEMP02	-0.212 (0.161)	-0.144 <sup>***</sup> (0.051)	0.04 (0.1)	-0.2 <sup>***</sup> (0.05)	0.2 (0.2)	-0.2 <sup>***</sup> (0.05)
Panel (3) Control Variables:						
Household Characteristics	YES	YES	YES	YES	YES	YES
Regional Characteristics	YES	YES	YES	YES	YES	YES
Constant	9.23 <sup>***</sup> (1.46)	5.27 <sup>***</sup> (0.62)	9.75 <sup>***</sup> (1.51)	5.12 <sup>***</sup> (0.63)	9.51 <sup>***</sup> (1.45)	5.14 <sup>***</sup> (0.69)
Observations	5358	5483	5450	5483	5450	5483
R-squared	0.14	0.29	0.15	0.29	0.145	0.29

Notes: Standard errors are in parentheses. <sup>\*\*\*</sup> p<0.01, <sup>\*\*</sup> p<0.05, <sup>\*</sup> p<0.1.

# VERY LITTLE EFFECTS ON WEALTH CREATION

Table 1 Household wealth and urbanization growth

Dependent Variable=Rural or urban household per capita net wealth level (log value)						
	Hukou Urbanization		Construction Urbanization			
	Rural CHIP	Urban CHIP	Rural CHIP	Urban CHIP	Rural CHIP	Urban CHIP
Panel (1) Substantive variables:						
HUKG(96-02)	-0.16 <sup>***</sup> (0.04)	1.24 (1.58)				
CSTG1(96-02)			-0.03 (0.02)	0.06 (0.06)		
CSTG2(96-02)					-0.002 (0.002)	0.005 <sup>**</sup> (0.002)
Panel (2) Other variables:						
PRIEMP02	0.1 <sup>**</sup> (0.0)	0.1 <sup>**</sup> (0.0)	0.1 <sup>***</sup> (0.0)	0.1 <sup>***</sup> (0.0)	0.2 <sup>***</sup> (0.0)	0.1 (0.1)
Panel (3) Control Variables:						
Household Characteristics	YES	YES	YES	YES	YES	YES
Regional Characteristics	YES	YES	YES	YES	YES	YES
Constant	7.41 <sup>***</sup> (0.49)	4.43 <sup>***</sup> (0.70)	7.22 <sup>***</sup> (0.49)	4.91 <sup>***</sup> (0.76)	7.3 <sup>***</sup> (0.49)	5.16 <sup>***</sup> (0.76)
Observations	5403	5945	5495	5500	5495	5500
R-squared	0.363	0.386	0.36	0.388	0.36	0.388

Notes: Standard errors are in parentheses. <sup>\*\*\*</sup> p<0.01, <sup>\*\*</sup> p<0.05, <sup>\*</sup> p<0.1. All the regressions include the initial household income level in 1998. In the regressions in this table, we dropped the household wealth and the 1998 household income variables from the control variables.

## 2009 SURVEY ON RURAL MIGRANTS IN GUANGDONG

- ◆ Income effects:
  - One time and substantial increase from rural to urban migration
  - But extremely modest income gains once in the city
  - Very high savings rate and substantial precautionary savings
- ◆ Very low consumption but a huge effect on output

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## 2009 SURVEY ON RURAL MIGRANTS IN GUANGDONG

- ◆ Income effects:
  - Average wage: About 40% to 50% of wage level or urban residents (¥20,000 or \$3,000 in 2008)
  - But longer labor hours
  - Urban earning=2 to 4 times rural earning
- ◆ One time and substantial increase in income from rural to urban migration
- ◆ But extremely modest income gains once in the city

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## 2009 SURVEY ON RURAL MIGRANTS IN GUANGDONG

- ◆ Wage growth is very recent
  - 95% of respondents experienced first on-job wage increase in 2005
    - 53% of the sample migrated before 2000
    - Wage increase through job change: 3 times on average
  - 10% wage growth between 2005 and 2008
  - A small decline in 2009: Survivor bias
- ◆ Stagnant wage growth in the 1990s
  - German survey in Shenzhen (1993)
    - Real annual wage growth between 1993-2005: 1%

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## 2009 SURVEY ON RURAL MIGRANTS IN GUANGDONG

- ◆ Consumption:
  - High savings rate:
    - 40% (Urban: 20%)
    - But 47% with zero deposit balances
  - Very economical on food: 10 yuan per day
  - But substantial spending on children education:  
1/3 spent on private education on children

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## **2009 SURVEY ON RURAL MIGRANTS IN GUANGDONG**

- ◆ Hukou system and precautionary savings
  - 27% have expectations for a hukou change
    - #2 savings motivation: Build house and return to home village
  - Exclusion of public goods
    - Barred from access to local public schools
    - Education of children ranked #1 savings motivation

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## **2009 SURVEY ON RURAL MIGRANTS IN GUANGDONG**

- Human capital trap
  - But almost no expenditure on skill training
  - No public investments in private schools for migrant children
  - Substantial achievement gaps
  - Public/private school teacher pay: 5:1
  - Barred from college entrance examination in Guangdong
    - Forced to return to and attend inferior high schools in home provinces

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## **SHORT AND LONG-TERM ISSUES**

### ◆ Short term issues:

- Raise income and employment is the key to rebalancing
- Reforms, not government investments
  - Abolish the hukou system
- The worrisome effects of the 2009 stimulus program

### ◆ Long-term issues

- Technology takeoff in China?

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## **CHINA'S SCIENTIFIC TAKEOFF?**

## COMMITMENTS TO KNOWLEDGE

- ◆ Consistent and high level commitments to science (since 1978)
  - 1978: National Science Conference repudiating Cultural Revolution restrictions on science
  - 1986: National Natural Science Foundation
  - 1995: “Indigenous innovations” and “211” program to strengthen 100 universities
  - 1998: Zhu Rongji heading “National Steering Group for Science, Technology and Education”
  - 2006: Wen Jiabao, Innovation is “the soul of scientific and technological development and the engine behind national development”
  - 2008-2009: Recruiting overseas talent program
- ◆ R&D expenditures
  - Exceeding 1.4% of GDP in 2004
  - Rapidly approaching 2%, the prevailing level among OECD countries
  - Unusual for a developing country at China’s GDP per capita (\$6,000 in 2008 PPP basis; US: \$47,000)?

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## KNOWLEDGE WORKERS

- ◆ Higher education undergraduate enrollment:
  - 1999: 1.5 million
  - 2007: 19 million
  - 2009 graduates: 6 million
- ◆ Graduate programs:
  - Graduate program enrollments (Master and PhD degree programs):
    - 1998: 70,000
    - 2007: 365,000
  - PhD graduates: More than 50,000 in 2007, exceeding the United States

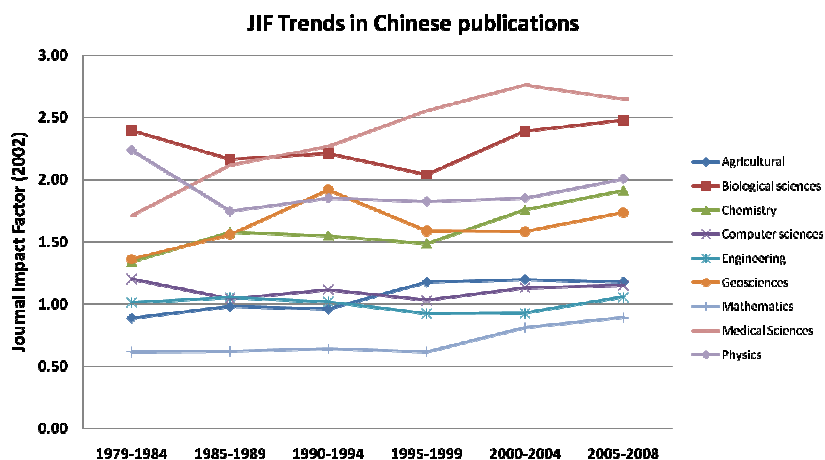
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## AVANCES IN BASIC RESEARCH

- ◆ China now as a major participant in the global knowledge economy
  - The only developing country in Human Genome Project
  - The first developing country to complete a manned space program
- ◆ The quantity of scientific publications is large and has increased enormously
  - Ranked 5th in scientific publications and 2nd in engineering publications (2005 data; NSF 2007)
- ◆ Chinese scientific paper database (Fensterheim, Huang and Murray 2008):
  - Scientific paper counts: 3,304 in 1983, 25,000 in 1998 and 110,459 by 2008
  - But still only 50% of the US and European Union level
  - Some areas, such as life science and biology, China is approaching world frontier

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## QUALITY MEASURE: JOURNAL IMPACT FACTOR (JIF)



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## **MANY PROBLEMS AND CHALLENGES**

- ◆ Quality vis-à-vis quantity:
  - Rote memorization and stifling of creativity
  - Market-economy skill sets
  - Very high unemployment among college graduates
  - Declining average returns on education
  - Even corruption among academics!

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## **YES, MANY PROBLEMS BUT SCALE MATTERS**

- ◆ Milton Friedman: “The conquest of the technological frontier, like the conquest of the geographical frontier, requires millions of individuals.”
- ◆ Why scale matters:
  - Base effect:
    - “Winners produce all” (as opposed to “Winners take all”): 10% of the knowledge workers produce 90% of the knowledge
    - 50% employment of 6 million graduates in 2009 vis-à-vis 100% employment of 1.5 million in 1999

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## YES, MANY PROBLEMS BUT SCALE MATTERS

- ◆ Market effect:
- ◆ Knowledge has spillovers
- ◆ Effects of spillovers positively correlated with market size
- ◆ Application potentials are large in a large, unified market
- ◆ A few innovations have massive payoffs (e.g., Baidu, Alibaba)

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## DESIGNING NEW BUSINESS MODELS

- ◆ Knowledge creation as a collaborative process:
  - High-powered life science research and international collaboration
- ◆ Knowledge creation and financial crisis
  - Endowment effects of the West: Harvard, Yale, MIT, and Stanford
  - Liquidity effects of China: China's huge liquidity advantage
- ◆ Business model: How to take advantage of these two effects?
  - China has an unprecedented opportunity to acquire world-frontier knowledge
  - MIT in China: Exploring opportunities for cross-border frontier research and knowledge applications

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**THANK YOU!**