

Comparing China and India: National Intellectual Capital Perspective

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Introduction (1)

- A simple definition of <u>intellectual capital</u> is "the knowledge, information, experience, intellectual property, structure, and systems that facilitate the creation of future wealth" (Edvinsson & Malone 1997; Stewart, 1997)
- Intellectual capital was expanded from firm level to <u>national level -NIC (Lin and Edvinsson, 2011: 8)</u>, covering:
 - Human capital
 - Market capital
 - Process capital
 - Renewal capital
 - Financial capital



Introduction (2)

Why China and India?

- China and India are the <u>two most populous countries</u> in the world, thus transforming such large countries is a very daunting task.
- Historically they are connected to each other through the silk-road and the Buddhist religion.
- * Their <u>fast economic development</u> over the last decade eclipsed both Brazil and Russia.
- China and India still had positive GDP growth during the 2008-2009 global financial crisis. <u>China</u> performs particularly well in its share of total world GDP from <u>1.6%</u> in 1990 to 7.1% in 2008, whereas that of <u>India is from 1.5%</u> to 2.0% (OECD, 2009).



Importance of National Intellectual Capital (NIC)

- Wer the last few decades, <u>intangible assets have</u> been identified as fundamental <u>sources of wealth</u> and progress.
- NIC represents the competencies and resources of a nation
- NIC is core national competency and valuable resource for nations to obtain sustainable competitiveness (<u>Core Competency Theory</u> – Prahalad and Hamel, 1990) & (<u>Resources-based</u> <u>Theory</u> – Barney, 1991)



Purpose of this study

China & India

NIC development

Economic growth

Relationship & co-evolution



Indicators in each type of capital

K	Human Capital index	Market capital index
	1. Skilled labor*	1. Corporate tax*
	2. Employee training*	2. Cross-border venture*
	3. Literacy rate	3. Openness of culture*
	4. Higher education enrollment	4. Globalization*
	5. Pupil-teacher ratio	5. Transparency*
	6. Internet subscribers	6. Image of country*
	7. Public expenditure on education	7. Exports of goods
	Process capital index	Renewal capital index
	1. Business competition environment*	1. Business R&D spending
	2. Government efficiency*	2. Basic research*
	3. Intellectual property rights protection*	3. R&D spending/GDP
	4. Capital availability*	4. R&D researchers
	5. Computers in use per capita	5. Cooperation between universities and enterprises*
	6. Convenience of establishing new firms*	6. Scientific articles
	7. Mobile phone subscribers	7. Patents per capita (USPTO + EPO)
	Remarks:	

•Financial capital is the logarithm of GDP per capita adjusted by purchasing power parity.

•Indicators marked with an asterisk (*) are rated qualitatively using a scale of 1–10.



National intellectual capital ranking of China and India among 48 countries covering 1995-2010

	Hu car	man pital	Ma car	rket pital	Pro cap	cess iital	Ren car	ewal pital	Fina car	ncial pital	Ove N	erall IC
Mean (48 countries) 6.052		5.541		5.150		3.489		9.049		29.312		
SD (48 countries)	1.1	150	0.9	998	1.5	510	2.037		0.741		5.715	
Country	Score	Ranking	Score	Ranking	Score	Ranking	Score	Ranking	Score	Ranking	Score	Ranking
China	4.327	46	5.264	28	3.501	38	2.106	29	7.576	45	22.757	40
India	3.844	47	5.039	31	3.283	42	1.781	35	7.060	48	20.975	46



NIC vs. GDP per capita (ppp) for 48 countries in 2010



Human Capital, Market Capital, Process Capital and Renewal Capital of China and India





Economic development

China & India





and the second

GDP per capita (ppp)



Real GDP Growth Percentage Change of China and India

← China ← India



1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010

Total General Government Debt Percentage GDP of China and India



1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010



NIC & GDP per capita (ppp) co-development China & India: 1995-2010



NIC & GDP per capita (ppp) co-development of China and India:1995-2010



Country China India GDP US\$ 1995 1996 -Overall IC

Scatterplot of GDP US\$ vs Overall IC for China and India



Statistical analysis

- **«** Correlation
- sustaining effect -
 - Correlate the present level of indicators with present level of GNP (GDP) annual growth
- **Boosting effect**
 - Correlate the present level of indicators with the <u>trend</u> of GNP (GDP) annual growth
 (Stahle & Bounfour, 2008)
- Regression analysis



Correlation table for <u>China</u> covering 1995-2010

	Sustaining effect	Boosting effect	GDP \$	НС	MC	РС	RC	GDP Gro.	Govern. Debt	Unempl. %
Sustaining effect										
Boosting effect	0.993**									
GDP \$	0.997**	0.991**								
НС	0.883**	0.817**	0.876**							
MC	-0.410	-0.357	-0.428	-0.193						
PC	0.409	-0.204	0.363	0.550*	-0.163					
RC	-0.036	0.019	-0.022	0.230	-0.058	0.111				
GDP Gro.%	0.421	0.423	0.428	0.396	0.161	0.247	-0.002			
Govern. Debt	-0.315	-0.299	-0.309	-0.502	-0.272	0.023	0.082	0.089		

Remark: * < 0.05 ** < 0.01



Correlation table for India covering 1995-2010

	Sustaining effect	Boosting effect	GDP \$	HC	MC	РС	RC	GDP Gro.	Govern. Debt	Unempl. %
Sustaining effect										
Boosting effect	0.981**									
GDP\$	0.991**	0.981**								
НС	0.552*	0.056	0.479							
MC	0.828**	0.714**	0.801**	0.468						
РС	0.810**	0.773**	0.776**	0.576*	0.880**					
RC	0.602*	0.218	0.551*	0.481	0.688**	0.527*				
GDP Gro.%	0.531*	0.525	0.541*	0.201	0.731**	0.497	0.484			
Govern. Debt	0.326	0.235	0.216	-0.090	0.447	0.430	0.390	0.208		

Remark: * < 0.05 ** < 0.01



Regression analysis of GDP per capita (ppp) and NIC of China and India (data combined)

(GDP) (GDP 2y lag) (GDP) (GDP 2y lag) human capital (HC) 2634.55^{***} 3329.69^{***} 2220.00 699.86 (422.27) (504.88) (5088.04) (6433.91) market capital (MC) -490.22 -538.09 15669.84^{***} 17205.04^{***} (421.85) (504.38) (6033.99) (7630.08) process capital (PC) 478.53 679.39 -10955.36 -12023.22 (507.91) (607.28) (9783.56) (12371.48) renewal capital (RC) 775.16 1004.03 2952.12 4517.17 (745.97) (891.91) (11214.24) (14180.59) HC x MC -3555.51** -3668.24* (1642.65) (2077.16) (169.89) HC x PC 1684.13 2023.09 HC x RC 6208.90**** 690.90.90*** (1023.23) (1293.90) (1293.90) MC x RC -4572.48* (2065.28) (2611.58) PC x RC -2190.81 -2435.87 (2274.00)		Model 1	Model 2	Model 3	Model 4
human capital (HC) 2634.55*** 3329.69*** 2220.00 699.86 (422.27) (504.88) (5088.04) (6433.91) market capital (MC) -490.22 -538.09 15669.84** 17205.04** (421.85) (504.38) (6033.99) (7630.08) process capital (PC) 478.53 679.39 -10955.36 -12023.22 (507.91) (607.28) (9783.56) (12371.48) renewal capital (RC) 775.16 1004.03 2952.12 4517.17 (745.97) (891.91) (11214.24) (14180.59) HC x MC -3555.51** -3668.24* (1642.65) (2077.16) 1684.13 2023.09 HC x PC 1684.13 2023.09 (1344.30) (1699.89) MC x PC 1654.39 1717.48 (1023.23) (1293.90) MC x PC -3862.80* -4572.48* (2065.28) (2611.58) PC x RC -0.74 0.77 0.87 0.87		(GDP)	(GDP 2y lag)	(GDP)	(GDP 2y lag)
(422.27) (504.88) (5088.04) (6433.91) market capital (MC) -490.22 -538.09 15669.84** 17205.04** (421.85) (504.38) (6033.99) (7630.08) process capital (PC) 478.53 679.39 -10955.36 -12023.22 (507.91) (607.28) (9783.56) (12371.48) renewal capital (RC) 775.16 1004.03 2952.12 4517.17 (745.97) (891.91) (11214.24) (14180.59) HC x MC -366.24* (1642.65) (2077.16) HC x PC 1684.13 2023.09 (1344.30) (1699.89) HC x RC 6208.90*** 6990.90*** (1293.90) MC x RC -3862.80* -4572.48* (2611.58) PC x RC -4572.48* (2065.28) (2611.58) PC x RC -4572.48* (2065.28) (2611.58) R ² 0.74 0.77 0.87 0.87	human capital (HC)	2634.55***	3329.69***	2220.00	699.86
market capital (MC) -490.22 (421.85) -538.09 (504.38) 15669.84** 17205.04** process capital (PC) 478.53 (507.91) 679.39 (607.28) -10955.36 (12371.48) -12023.22 (12371.48) renewal capital (RC) 775.16 (745.97) 1004.03 (891.91) 2952.12 (11214.24) 4517.17 (14180.59) HC x MC -3555.51** (1642.65) -3668.24* (1642.65) -3668.24* (1642.65) -3090.90*** (1344.30) -3668.24* (1699.89) HC x PC 1684.13 (1233.09) 2023.09 (1344.30) (1699.89) -3668.24* (1821.68) 6900.90*** (2303.55) MC x PC 1654.39 (1023.23) 1717.48 (1023.23) 1293.90) MC x RC -3862.80* (2065.28) -4572.48* (2611.58) -2190.81 (2274.00) -2435.87 (2875.51) PC x RC -0.74 0.77 0.87 0.87		(422.27)	(504.88)	(5088.04)	(6433.91)
(421.85) (504.38) (6033.99) (7630.08) process capital (PC) 478.53 679.39 -10955.36 -12023.22 (507.91) (607.28) (9783.56) (12371.48) renewal capital (RC) 775.16 1004.03 2952.12 4517.17 (745.97) (891.91) (11214.24) (14180.59) HC x MC -3658.51** -3668.24* (1642.65) (2077.16) HC x PC 1684.13 2023.09 HC x RC 6208.90*** 6990.90*** MC x PC 1654.39 1717.48 (1023.23) (1293.90) 1717.48 (1023.23) (2193.90) -3862.80* -4572.48* PC x RC -386.81* -2435.87 -2435.87 (2065.28) (2611.58) -2435.87 -2435.87 (2275.51) -4355.51 -435.87 -2435.87 (2275.51) -2190.81 -2435.87 -2435.87 (287.51) -2190.81 -2435.87 -2435.87 (287.51) -5	market capital (MC)	-490.22	-538.09	15669.84**	17205.04**
process capital (PC) 478.53 (507.91) 679.39 (607.28) -10955.36 (9783.56) -12023.22 (12371.48) renewal capital (RC) 775.16 (745.97) 1004.03 (891.91) 2952.12 (11214.24) 4517.17 (14180.59) HC x MC -3555.51** (1642.65) -3668.24* (1642.65) -3668.24* (2077.16) HC x PC 1684.13 (1233.09) 2023.09 (1344.30) 1699.89) HC x RC 6208.90*** (1821.68) 6990.90*** (2303.55) 6990.90*** (1293.90) MC x PC 1654.39 (1023.23) 1717.48 (1293.90) MC x RC -3862.80* (2065.28) -4572.48* (2061.58) PC x RC -2190.81 (2274.00) -2435.87 (2275.51) R ² 0.74 0.77 0.87 0.87		(421.85)	(504.38)	(6033.99)	(7630.08)
(507.91) (607.28) (9783.56) (12371.48) renewal capital (RC) 775.16 (745.97) 1004.03 (891.91) 2952.12 (11214.24) 4517.17 (14180.59) HC x MC -3555.51** -3668.24* (1642.65) (2077.16) HC x PC 1684.13 2023.09 (1344.30) (1699.89) HC x RC 6208.90*** 6990.90**** (1821.68) 6990.90**** (2303.55) MC x PC 1654.39 1717.48 (1023.23) (1293.90) MC x RC -3862.80* (2065.28) -4572.48* (2061.58) (2611.58) PC x RC -2190.81 -2435.87 (2274.00) (2875.51) R ² 0.74 0.77 0.87 0.87	process capital (PC)	478.53	679.39	-10955.36	-12023.22
renewal capital (RC) 775.16 (745.97) 1004.03 (891.91) 2952.12 (11214.24) 4517.17 (14180.59) HC x MC -3668.24* (1642.65) (2077.16) HC x PC 1684.13 2023.09 (1344.30) (1699.89) HC x RC 6208.90*** (1821.68) 6990.90*** (2303.55) MC x PC 1654.39 1717.48 (1023.23) 1293.90) MC x RC -3862.80* (1023.23) -4572.48* (2065.28) (2611.58) PC x RC -2190.81 (2274.00) -2435.87 (2275.51) -2435.87 (2274.00) 2435.87 (2875.51)		(507.91)	(607.28)	(9783.56)	(12371.48)
(745.97) (891.91) (11214.24) (14180.59) HC x MC -3658.24* (1642.65) (2077.16) HC x PC 1684.13 2023.09 (1344.30) (1699.89) HC x RC 6208.90**** 6990.90**** (2303.55) MC x PC 1654.39 1717.48 (1023.23) (1293.90) MC x RC -3862.80* -4572.48* (2065.28) (2611.58) PC x RC -2190.81 -2435.87 (2274.00) (2875.51) R2 0.74 0.77 0.87 0.87	renewal capital (RC)	775.16	1004.03	2952.12	4517.17
HC x MC -3555.51** -3668.24* HC x PC 1684.13 2023.09 HC x RC (1344.30) (1699.89) HC x RC 6208.90**** 6900.90*** MC x PC 1654.39 1717.48 (1023.23) (1293.90) MC x RC -3862.80* -4572.48* (2065.28) (2611.58) PC x RC -2190.81 -2435.87 (2274.00) (2875.51) R ² 0.74 0.77 0.87 0.87		(745.97)	(891.91)	(11214.24)	(14180.59)
HC x PC (1642.65) (2077.16) HC x RC 1684.13 2023.09 (1344.30) (1699.89) HC x RC 6208.90*** 6990.90*** MC x PC 1654.39 1717.48 (1023.23) (1293.90) MC x RC -3862.80* -4572.48* (2065.28) (2611.58) PC x RC -2190.81 -2435.87 (2274.00) (2875.51) R2 0.74 0.77 0.87 0.87	HC x MC			-3555.51**	-3668.24*
HC x PC 1684.13 2023.09 (1344.30) (1699.89) HC x RC 6208.90**** 6990.90**** (1821.68) (2303.55) MC x PC 1654.39 1717.48 (1023.23) (1293.90) MC x RC -3862.80* -4572.48* (2065.28) (2611.58) PC x RC -2190.81 -2435.87 (2274.00) (2875.51) R ² 0.74 0.77 0.87 0.87				(1642.65)	(2077.16)
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HC x RC 6208.90*** 6990.90*** MC x PC (1821.68) (2303.55) MC x PC 1654.39 1717.48 (1023.23) (1293.90) (1023.23) MC x RC -3862.80* -4572.48* PC x RC (2065.28) (2611.58) PC x RC -2190.81 -2435.87 (2274.00) (2875.51) (2875.51)				(1344.30)	(1699.89)
MC x PC (1821.68) (2303.55) MC x PC 1654.39 1717.48 (1023.23) (1293.90) MC x RC -3862.80* -4572.48* (2065.28) (2611.58) PC x RC -2190.81 -2435.87 (2274.00) (2875.51) R ² 0.74 0.77 0.87 0.87	HC x RC			6208.90 ***	6990.90***
MC x PC 1654.39 1717.48 (1023.23) (1293.90) MC x RC -3862.80* -4572.48* (2065.28) (2611.58) PC x RC -2190.81 -2435.87 (2274.00) (2875.51) R ² 0.74 0.77 0.87 0.87				(1821.68)	(2303.55)
MC x RC .1023.23) (1293.90) MC x RC .3862.80* .4572.48* (2065.28) (2611.58) PC x RC .2190.81 .2435.87 (2074.00) (2875.51) R ² 0.74 0.77 0.87	MC x PC			1654.39	1717.48
MC x RC -3862.80* -4572.48* (2065.28) (2611.58) PC x RC -2190.81 -2435.87 (2274.00) (2875.51) R ² 0.74 0.77 0.87				(1023.23)	(1293.90)
PC x RC (2065.28) (2611.58) PC x RC -2190.81 -2435.87 (2274.00) (2875.51) R ² 0.74 0.77 0.87	MC x RC			-3862.80*	-4572.48*
PC x RC -2190.81 -2435.87 (2274.00) (2875.51) R ² 0.74 0.77 0.87				(2065.28)	(2611.58)
R ² 0.74 0.77 0.87 0.87	PC x RC			-2190.81	-2435.87
R ² 0.74 0.77 0.87 0.87				(2274.00)	(2875.51)
\mathbf{R}^2 0.74 0.77 0.87 0.87					
	\mathbb{R}^2	0.74	0.77	0.87	0.87
Adjusted R ² 0.70 0.73 0.80 0.80	Adjusted R ²	0.70	0.73	0.80	0.80

Remark: * < 0.05 ** < 0.01 *** < 0.001



Implications

- For NIC to have a better influence on GDP growth, a country needs to have satisfactory people's basic needs (Maslow needs hierarchy)
- Enhancing both human capital and market capital, and then facilitating the <u>co-development</u> of human capital with market capital/renewal capital, which provides an effective growth pattern for emerging economies
- Currently China's human capital and India's market capital are their uprising competencies
- Internal resources substitution is observed in India (market capital substitutes insufficient human capital,...)
- Countries with slower development need to pay more attention to the national fundamentals (such as education...)
- National intellectual capital development is <u>contingent on national</u> <u>economic development</u>



Conclusion

- * NIC starts to show higher correlation with GDP growth when the country is developed to a certain level (around <u>USD6000</u> GDP per capita (ppp) in China's case)
- Market capital is the strength of both China and India
- Human capital is highly correlated with GDP per capita (ppp) in China, but not in India
- * The best predictors of both short-term and midterm GDP (two years lag) are market capital and human capital co-developed with renewal capital



Contribution of the study

- Know the current standing of a nation (among 48 countries)
- **#** Identify a nation's strengths and weaknesses
- **#** Prioritize a sequence of national development
- # Allocate resources strategically
- Maximize the return on NIC investment for national well-being