Intellectual Property Regimes and Wage Inequality

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June 7 2019

Indian Firms Trying to Innovate In the Last 3 Decades
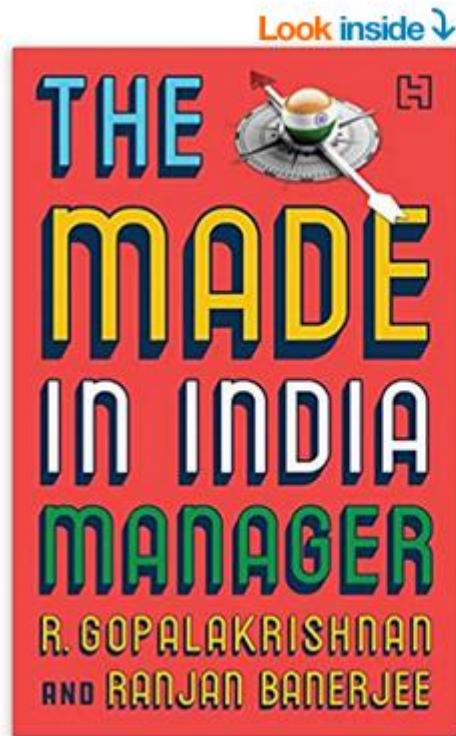

Trade Liberalization & Globalization

Shifting IPR Environment

Within and Across Firm/Industry Changes

The Rise of the Indian Manager

The Made-In-India Manager Hardcover – 2 Nov 2018

by R. Gopalakrishnan ∨ (Author), Ranjan Banerjee ∨ (Author)

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Who are Made-in-India managers? What do they do differently?

Over the last fifty years, several Indians have occupied top positions in multinationals across the globe. From Vikram Pandit at Citicorp and Padmasree Warrier at NIO to Satya Nadella at Microsoft, there are now more Indian CEOs helming S&P's 500 companies than any other nationality except American.

Is there a Relationship between their Innovation Appetite and their Taste for Managers? How can one understand that causally? Does it have implications for within/across firm inequality between managers/non-managers? For market power and anti-trust in India? Distributional Implications?

# Are India's Shifting IPRs Useful to Examine This Question

- Does Intellectual Property Impact Wage Inequality Within and Across Firms?
  - Extant literature shows **drop in tariffs due to trade agreements** (Guadalupe and Wulfe 2010), **export market participation** (Caliendo and Rossi-Hansberg 2012, Keller and Olney 2017 and others), **input-trade liberalization** (Chakraborty & Raveh 2018) impacting organizational structure.

  - How about Intellectual Property?

  - Established work shows that organizational size and structure is a crucial determinant for firm innovation
    - Size (Cohen 2010), compensation (Manso 2011, Teece 1994), employee contracts (Azoulay et.al 2011)
    - Scope (Burgelman 1984), vertical integration (Azoulay 2004), complexity (Argyres & Silverman 2004, Teece 1994)
    - But causal association remains an elusive frontier.
    - Azoulay & Lerner (2013) point out that "*current empirical research on the relationship between innovation and organizational economics fails to distinguish between association and causation.*"

- A quasi-natural experiment (stronger IPR in India) that increases incentives to innovate for firms.

- Using it as an instrument for innovation, we then examine what **stronger patents do to wage inequality between managers and non-managers within and across firms** in their organizing for innovation.

Motivation

Technology Adoption: High-Tech and Low-Tech Firms
Indian Manufacturing Firms, 1990-2006
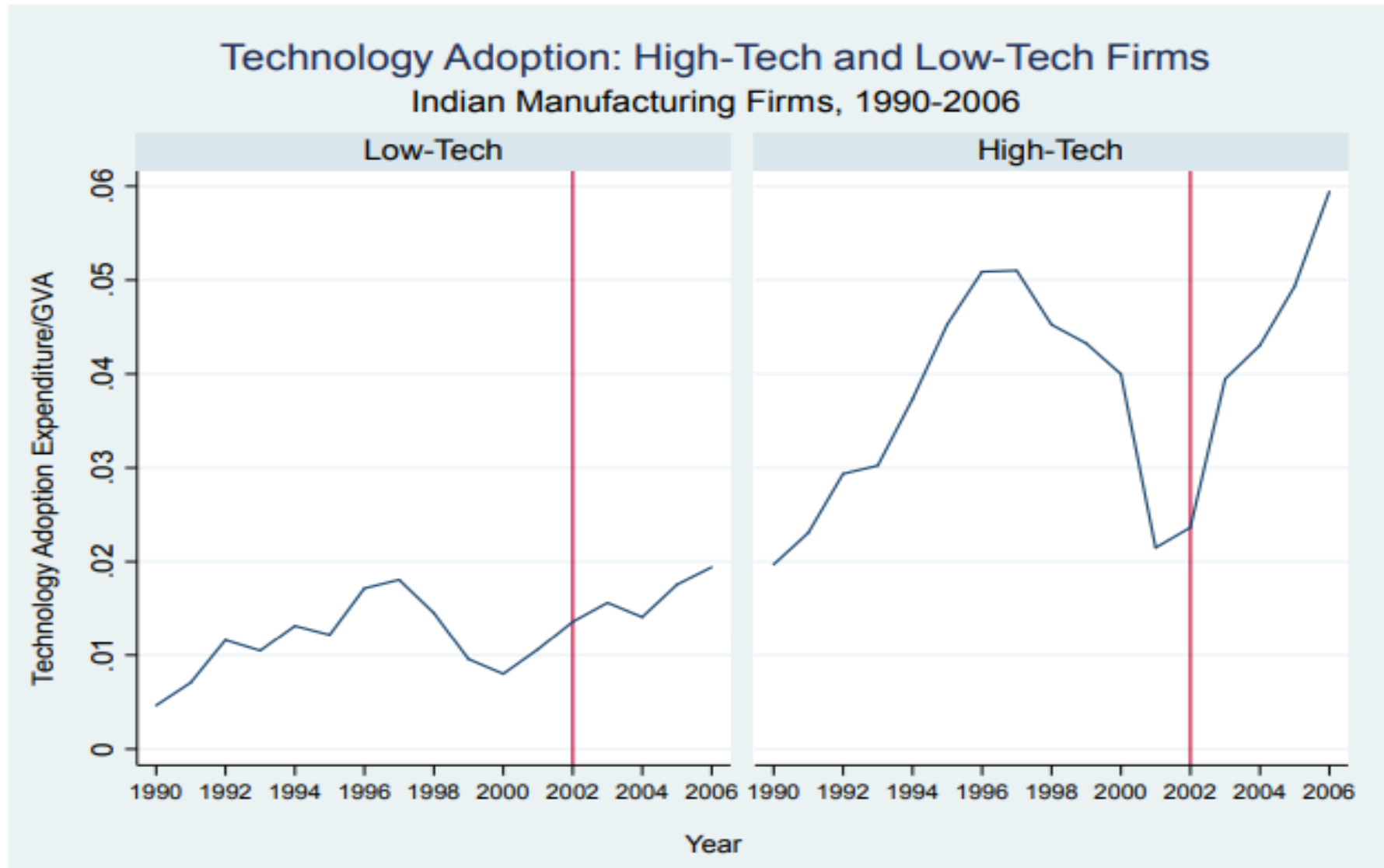
Motivation

Managerial Compensation: High-Tech and Low-Tech Firms
Indian Manufacturing Firms: 1990-2006
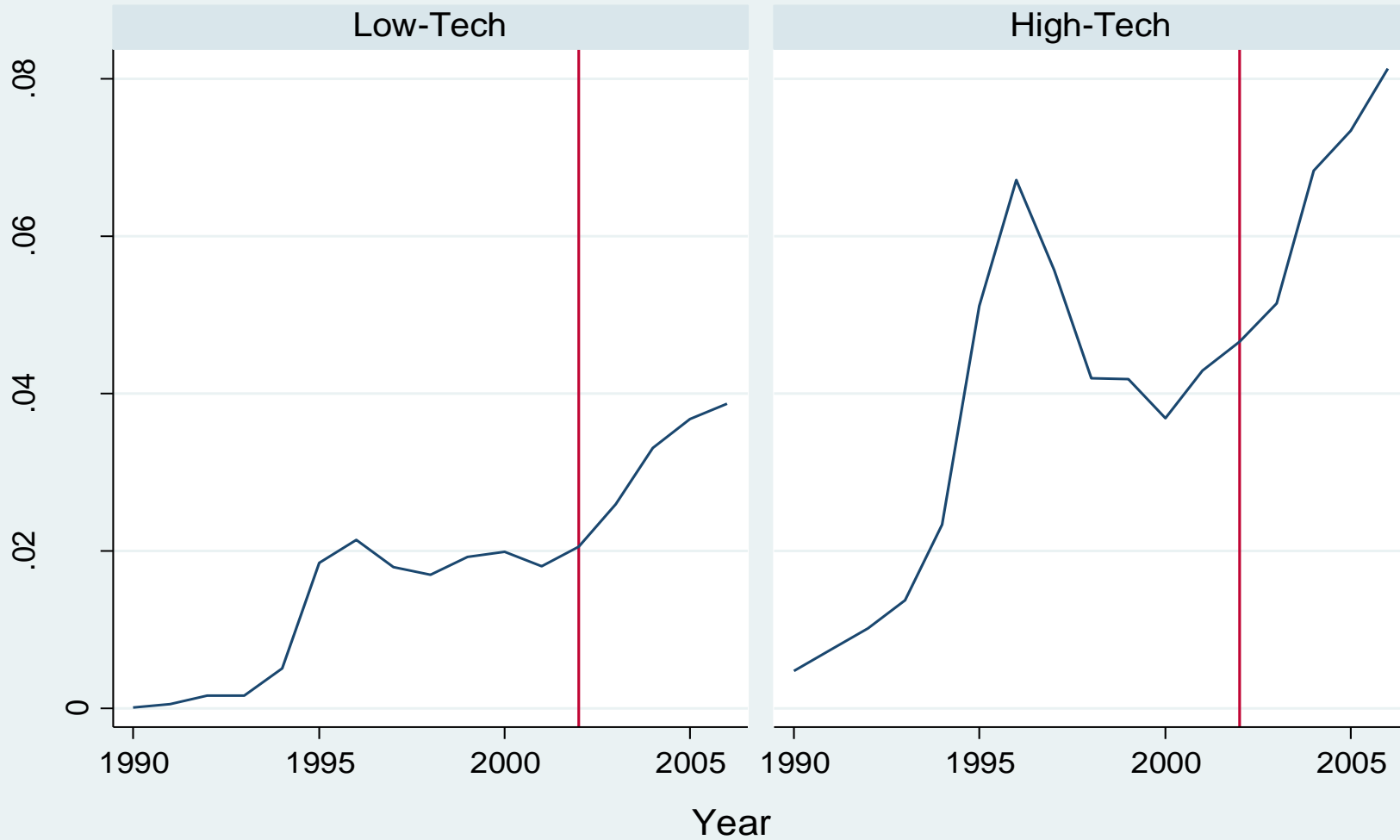
Preview of Findings

1) Evidence of **significant rise in the share of managerial compensation by about 2%** due to change in intellectual property regimes
   - Especially for **a priori high-tech firms relative to a priori low-tech firms.**
     - High-Tech firms more likely to win patent races
     - Results robust to a variety of sensitivity checks and estimation methodologies.

2) Impact **within and between firm wage inequality, latter effect being stronger.**

3) A **snail-shaped heterogenous effect** across firms.

4) Impact manifesting through **sharper incentives** (more bonus hikes than fixed wages) [Larkin, Pierce and Gino 2012, Larkin 2012, Frey and Gallus 2017].

Contribution

- To the <u>theoretical literature on organizational economics</u> that posits firms as a knowledge hierarchy & managers as problem solvers (Garicano 2000 and others).

- To the <u>literature on innovation economics</u> (Cohen 2010, Branstetter & Sakakibara 2001, Budish et al. 2014, Williams 2017, Kline et al. 2019 among others).

- To the <u>literature on management as technology</u> (Bloom, Van Reneen and coauthors 2007, 2010, 2013, 2014).

- To the <u>literature on trade/globalization/ICT and organizational change</u> (Guadalupe and Wulf 2010, Caliendo and Rossi-Hansberg 2012, Bresnahan et al. 2000, Caroli and Van Rennen 2001, Acemoglu et al. 2007 among others).

Dataset

- **PROWESS** Database (CMIE), panel information from income statements & balance sheets of all the listed companies

- More than 70% of economic activity in the "registered" industrial sector, 75% of corporate taxes & 95% excise duty

- Advantages
  - panel of firms
  - detailed product-level information at the firm level
  - suits our period of concern (1990-2006)

- Variables are measured in INR Millions

- Unbalanced panel is used for estimation purposes

- Additional Data for Robustness Checks:
  - Annual Survey of Industries
  - Management Practices data from Nick Bloom and Van Reneen's work
  - Chinese trade data from WITS

Dataset on Managers

- PROWESS also provides detailed information on employee compensation
  - Managers
  - Non-managers

- Managers
  - Top management (Executives - CEO, CMD, Managing Director, Chairman, etc.)
  - Middle management (Directors - Head of the Divisions, etc.)

- It also gives the names of the managers by different management levels

- For every firm, there are at the most three layers

- Relative managerial compensation (managerial compensation/total compensation) as the outcome of interest
  - indicator for the relative demand for managers

Patent Policy Changes in India 1/2

- Goes back to **Act VI of 1856**

- **British Patents Act 1911** pre-Independence & post-Independence

- **1948-50, Patent Enquiry Committee** & **1957-59 Ayyangar Committee**
    - No domestic inventive activity.
    - Foreign ripping off (held 80-90% of the patents in India and achieving monopolistic control of the market)

- **Indian Patent Act of 1970** (process patents, 14 year term with 5-7 for chemicals and drugs, CL & license of right, several areas excluded, linked to emergency use by GOI in case of scarcity).

- Indian BOP crisis of 1991, 1994 Marrakesh Agreement, eight years after the **Uruguay Round,** agreed to be bound by TRIPs, 10-year transition period (1995-2005)

- Transition started with failed Patents (Amendment) Ordinance of 1994 that was brought about by a coalition government, allowing for a mailbox provision.

- The Ordinance lapsed along with **The Patents (Amendment) Bill, 1995,** parliament with a coalition government dissolved, national elections.

- Despite civil society concerns, India did implement the **Patents (Amendment) Act, 1999** only retrospectively as a result of the failed **The Patents (Amendment) Bill, 1995**
    - First of the three formal legislations passed between 1995-2005 in the country's transition to a strong IPR regime

Patent Policy Changes in India 2/2

- Implementation of **The Patents (Amendment) Act, 1999** did not encourage much innovative and related activities within India as it was basically a post factum of the failed Act of **The Patent (Amendment) Bill, 1995** and too many conditions were attached for a smooth transition to a greater patent protection regime

- A second legislation soon followed, the **Patents (Amendment) Act, 2002**
  - According to the Controller General of Patents, Design and Trademarks, Govt. of India, **The Patents (Amendment) Act 2002**, replaced the earlier patent rules implemented by the 1970 Act This act came into force on 20th May, 2003

- This second legislation (This Act really broadened the scope for the implementation of the TRIPs complying IPR regime that India committed to adopt during the ministerial meeting of the WTO talks in Marrakesh, Morocco in April 1994)
  - Bolar Provision
  - implemented products patents in all fields of technology
  - increased the term of patents from 14 to 20 years (complying with TRIPs)
  - deleted the "license of rights" provisions
  - limited scope for compulsory licensing and governments to use patented inventions
  - recognised parallel imports of patented products

- The political situation is also important to note here, as India signed the TRIPs agreement under the Indian National Congress (INC), which was then (in 2002) in opposition, while the Bharatiya Janata Party (BJP) a political party with more market-oriented approach was in power (Reddy and Chandrashekaran, 2017)

Empirical Strategy

Exploit the following reduced version using OLS fixed effects type of estimation

$$\left(\frac{Mcomp}{Tcomp}\right)_{it} = \alpha_i + \alpha_t + \alpha_{jt} + \beta_1 * (IPR_{02} * HighTech_i) + \beta_2 * IPR_{02} + \beta_3 * X_{it-1} + firmcontrols_{it-1} + \epsilon_{it}$$

Empirical Strategy

Exploit the following reduced version using OLS fixed effects type of estimation

$$\left(\frac{Mcomp}{Tcomp}\right)_{it} = \alpha_i + \alpha_t + \alpha_{jt} + \beta_1 * (IPR_{02} * HighTech_i) + \beta_2 * IPR_{02} + \beta_3 * X_{it-1} + firmcontrols_{it-1} + \epsilon_{it}$$

- $Mcomp/Tcomp \rightarrow$ share of managerial in total compensation of a firm
- $IPR_{02} \rightarrow$ indicator for change in intellectual property regimes; a year dummy variable which takes 1 as year is greater than 2002
- $HighTech_i \rightarrow$ technology adoption dummy. It takes a value 1 if the average GVA share of innovation expenditure of a firm is greater than the median share of the industry (to which the firm belongs) before the reform (1990-2001)
  - innovation expenditure - sum of R&D expenditure and Technology Transfer
  - Branstetter et al. (2006, 2011)
- $X_{ijt-1} \rightarrow$ vector of firm-industry characteristics
- Firm controls: age, age-squared, capital employed, size of a firm.

- α_{jt} Interaction industry fixed effects (5−digit) and year trends or industry−year FE.

- $\alpha_i, \alpha_t \rightarrow$ firm and year fixed effects
  - $\alpha_{jt} \rightarrow$ interaction of industry fixed effects (5-digit) and year trends
  - standard errors are clustered at the firm-level

Endogeneity of Reforms (1999 effect)

	1999 Reform		
	(1)	(2)	(3)
IPR_{02}	0.030^{***}	0.027^{***}	0.028^{***}
	(0.005)	(0.004)	(0.004)
IPR_{99}	-0.005	-0.002	-0.001
	(0.007)	(0.007)	(0.008)
$IPR_{02} \times HighTech_{i,90-01}$	0.005^{**}	0.007^{**}	0.006^{*}
	(0.003)	(0.002)	(0.007)
$IPR_{99} \times HighTech_{i,90-01}$	0.001		
	(0.002)		
$IPR_{99} \times HighTech_{i,90-98}$		-0.006^{*}	-0.006^{*}
		(0.003)	(0.003)
$IPR_{02} \times HighTech_{i,90-98}$			0.001
			(0.003)
Firm Controls$_{t-1}$	Yes	Yes	Yes
R-Square	0.50	0.50	0.50
N	$62,677$	$62,677$	$62,677$
Firm FE	Yes	Yes	Yes
Industry FE(2-digit)*Year FE	Yes	Yes	Yes

Endogeneity of Reforms (pre-reform characteristics)

	Pre-reform Characteristics			$IPR_{02} \times$ $HighTech_i$
	Man Comp/ Total Comp	Skilled Workers	Factory Size	
$IPR_{02} \times HighTech_{i,90-01}$	-0.0001 (0.002)	0.0001 (0.002)	0.001 (0.008)	
$(ManComp/TComp)_{t-2}$				0.005 (0.012)
Firm Controls$_{t-1}$	Yes	Yes	Yes	Yes
R-square	0.41	0.95	0.95	0.48
N	56,086	56,081	56,081	56,086
Firm, Industry*Year FE	Yes	Yes	Yes	Yes

Endogeneity of Reforms (time trends)

	Man Comp/Total Comp
$IPR_{02} \times HighTech_{i,90-01}$	0.006^a (0.002)
$IPR_{02}(t-4) \times HighTech_{i,90-01}$	-0.009 (0.007)
$IPR_{02}(t-3) \times HighTech_{i,90-01}$	0.005 (0.005)
$IPR_{02}(t-2) \times HighTech_{i,90-01}$	0.001 (0.003)
$IPR_{02}(t+1) \times HighTech_{i,90-01}$	0.011^a (0.003)
$IPR_{02}(t+2) \times HighTech_{i,90-01}$	0.016^a (0.004)
$IPR_{02}(t+3) \times HighTech_{i,90-01}$	0.021^a (0.005)
$IPR_{02}(t+4) \times HighTech_{i,90-01}$	0.024^a (0.006)
Firm Controls$_{t-1}$	Yes
R-square	0.50
N	62, 677
Firm, Industry*Year FE	Yes

N.B: $a = 1\%$, $b = 5\%$, $c = 10\%$

Baseline Specification - Revisited

$$\left(\frac{Mcomp}{Tcomp}\right)_{it} = \alpha_i + \alpha_t + \alpha_{jt} + \beta_1(IPR_{02} * HighTech_i) + \beta_2 IPR_{02} + \beta_3 X_{it-1} + firmcontrols_{it-1} + \epsilon_{it}$$

Benchmark Finding

Stronger patents increase relative managerial compensation for a priori high-tech firms

Table 4: Intellectual Property Regimes and Wage Inequality: Benchmark Results

	Managerial Compensation/Total Compensation					
						ATT
	(1)	(2)	(3)	(4)	(5)	(6)
IPR_{02}	0.013***	0.016***	0.008	−0.016	0.015***	Yes
	(0.004)	(0.005)	(0.009)	(0.010)	(0.004)	
$IPR_{02} \times HighTech_{i,90-01}$	0.016***	0.017***	0.017***	0.017***	0.010***	0.017^{a}
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
$(CapEmployed)_{t-1}$	0.004**	0.005***	0.005***	0.005***	0.004**	Yes
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	
$HighTech_{i,90-01} \times$ Year FE	No	No	No	No	Yes	No
Firm Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes
R-Square	0.49	0.49	0.49	0.50	0.49	n/a
N	57,461	57,461	57,461	57,461	57,461	68,016
Firm FE	Yes	Yes	Yes	Yes	Yes	No
Year FE	Yes	No	No	No	No	No
Industry FE (5-digit)*Year Trend	Yes	No	No	No	Yes	Yes
Industry FE (2-digit)*Year FE	No	Yes	No	No	No	No
Industry FE (3-digit)*Year FE	No	No	Yes	No	No	No
Industry FE (4-digit)*Year FE	No	No	No	Yes	No	No

Temporal Variation In the Coefficient Estimates

Impact of The 2002 Patent Reform: Managerial Compensation
Indian Manufacturing Firms, 1991-2006
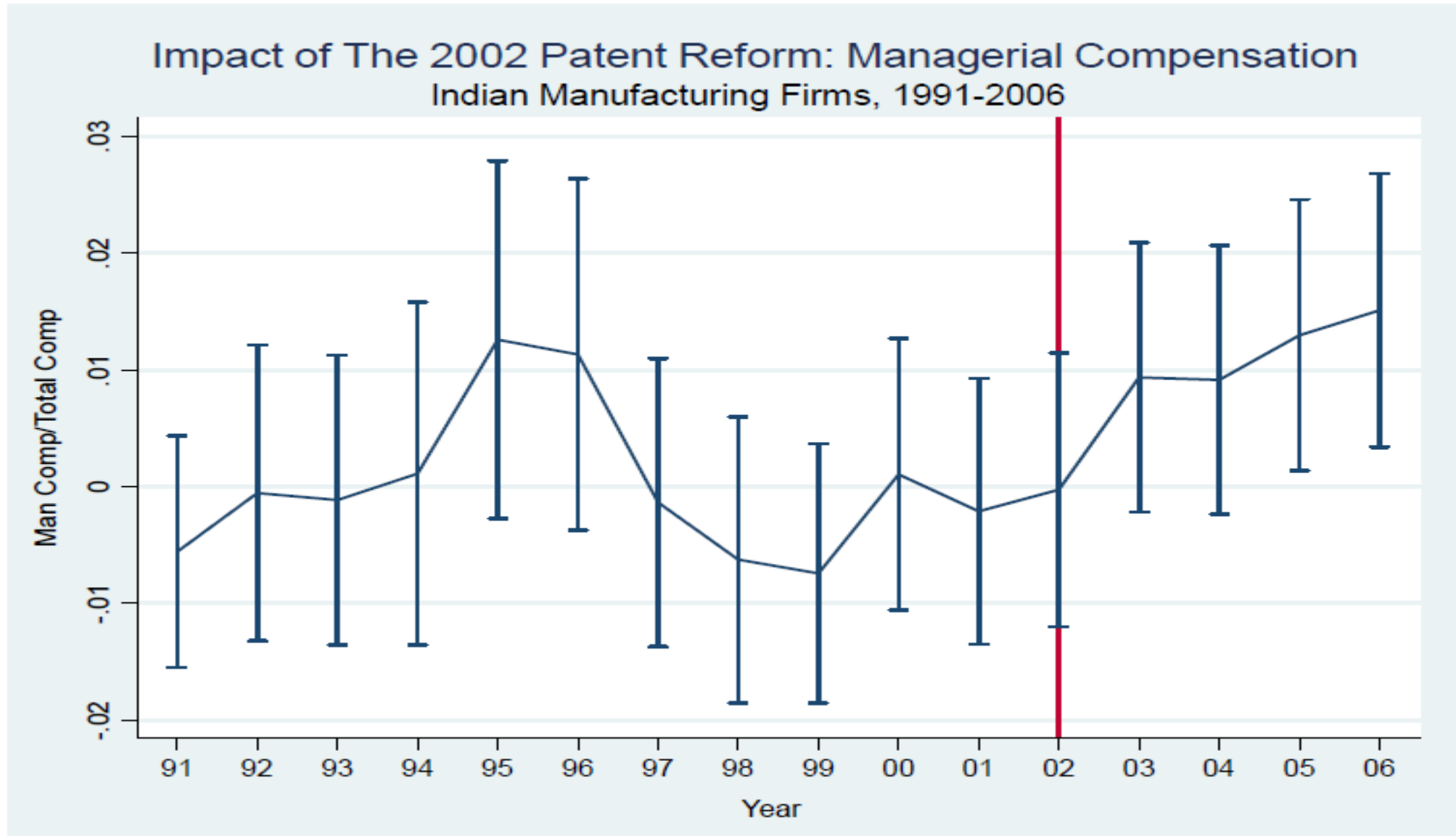
There doesn't seem to be a Quantity/Quality Trade-off

Table 14: Intellectual Property Regimes and Wage Inequality: Additional Results

	Total Managers		Man Comp		Avg Man Comp	
	(1)	(2)	(3)	(4)	(5)	(6)
IPR_{02}	0.104 (0.078)	-0.046 (0.129)	0.319*** (0.039)	0.371*** (0.043)	0.431*** (0.121)	0.596*** (0.162)
$IPR_{02} \times HighTech_{i,90-01}$	0.460*** (0.051)	0.063** (0.032)	0.714*** (0.023)	0.712*** (0.023)	0.460*** (0.051)	0.457*** (0.051)
$(CapEmployed)_{t-1}$	0.122** (0.056)	0.084** (0.041)	0.088*** (0.012)	0.073*** (0.011)	0.122** (0.056)	0.096* (0.051)
$HighTech_{i,90-01} \times$ Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes
R-Square	0.58	0.61	0.74	0.74	0.78	0.80
N	5,935	5,935	57,461	57,461	5,935	5,935
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE (5-digit)*Year Trend	Yes	No	Yes	No	Yes	No
Industry FE (2-digit)*Year FE	No	Yes	No	Yes	No	Yes

Heterogeneity Across Firms – Snail Shaped Effect

	Quintile			Decile		
	(1)	(2)	(3)	(4)	(5)	(6)
IPR_{02}	0.016*** (0.005)	0.018*** (0.006)	0.022*** (0.004)	0.015*** (0.005)	0.018*** (0.006)	0.016*** (0.005)
$IPR_{02} \times Qtile_1$	0.004 (0.006)	0.005 (0.006)	0.003 (0.007)			
$IPR_{02} \times Qtile_2$	0.002 (0.005)	0.003 (0.004)	0.001 (0.005)			
$IPR_{02} \times Qtile_3$	0.006 (0.004)	0.007* (0.004)	0.007* (0.004)			
$IPR_{02} \times Qtile_4$	0.006* (0.004)	0.007** (0.004)	0.007** (0.004)			
$IPR_{02} \times Qtile_5$	0.010** (0.005)	0.012** (0.005)	0.011** (0.005)			
$IPR_{02} \times Decile_1$				0.010 (0.007)	0.011 (0.008)	0.005 (0.010)
$IPR_{02} \times Decile_2$				0.008 (0.006)	0.009 (0.006)	0.004 (0.007)
$IPR_{02} \times Decile_3$				0.002 (0.008)	0.002 (0.007)	0.003 (0.008)
$IPR_{02} \times Decile_4$				0.009 (0.008)	0.010 (0.008)	0.0002 (0.007)
$IPR_{02} \times Decile_5$				0.007 (0.006)	0.008 (0.006)	0.011 (0.008)
$IPR_{02} \times Decile_6$				0.007* (0.004)	0.008* (0.004)	0.007* (0.004)
$IPR_{02} \times Decile_7$				0.008* (0.005)	0.008* (0.005)	0.008* (0.005)
$IPR_{02} \times Decile_8$				0.008* (0.004)	0.009* (0.006)	0.007* (0.004)
$IPR_{02} \times Decile_9$				0.014** (0.007)	0.016** (0.008)	0.014** (0.007)
$IPR_{02} \times Decile_{10}$				0.007 (0.007)	0.009 (0.007)	0.007 (0.007)
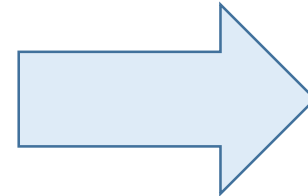
The Snail-Shaped Effect Across Deciles

2002 Patent Reform and Managerial Compensation: Deciles
Indian Manufacturing Firms, 1990-2006
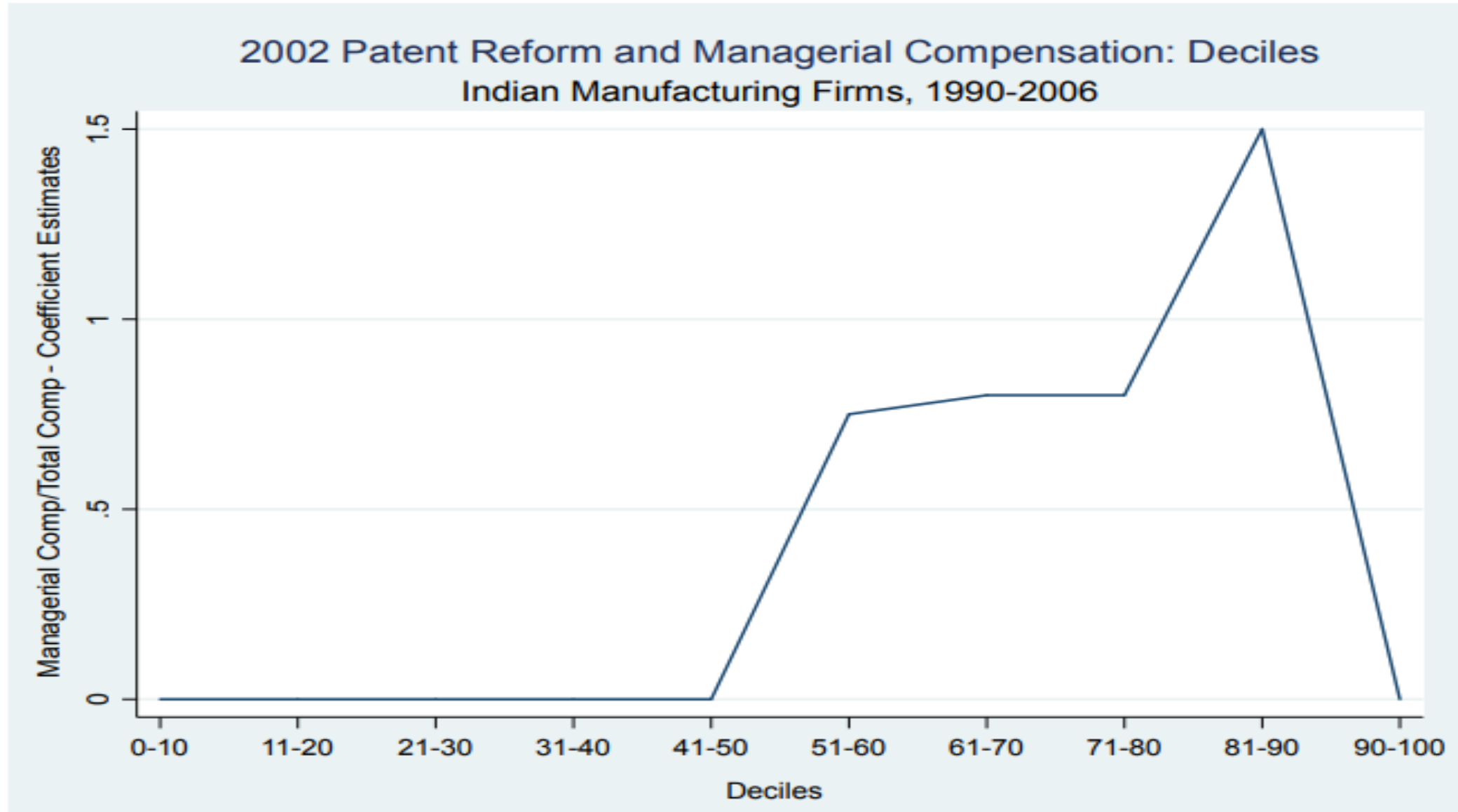
Explaining Snail-Shaped through a Theoretical Setup

- Firms (1 through n) are contesting in an innovation race and are distributed in their capital stock (k):

$$k_1 > k_2 > \ldots > k_n > 0.$$

- Firm j employs $\textbf{\textit{m}}_j$ unit of managerial time at a cost of w>0 per unit, this is the only choice variable in our setup.

- Payoff function in the innovation contest embeds two basic assumptions (managerial time and technological capital are complements (Garicano 2000, Acemoglu et. al (2006)) <u>and</u> innovation is a competitive process broadly speaking).

- Patents come with a value of v>0

- Each firm wins patent with probability $\dfrac{m_j k_j^{\alpha}}{\sum_{i=1}^{n} m_i k_i^{\alpha}}$

Firm Profit Function & First Order Conditions

$$\pi_j(m_1, m_2, ...m_n) = \frac{m_j k_j^{\alpha}}{\sum_{i=1}^{n} m_i k_i^{\alpha}} v - m_j w,$$

We have

$$\frac{\partial \pi_j}{\partial m_j} = \frac{k_j^{\alpha} \left[\sum_{i \neq j}^{n} m_i k_i^{\alpha} \right]}{\left(\sum_{i=1}^{n} m_i k_i^{\alpha} \right)^2} v - w \tag{1}$$

We solve this for:
- An unconstrained & a constrained game (managerial employment non-negative)
- For active and inactive firms
- To find the m-k relationship in equilibrium (non-monotonic).
- More details in the theory section of the paper, happy to chat offline.

Result on Fixed Wages Versus Incentives

	Managerial Wages/ Total Wages	Managerial Incentives/ Total Incentives
	(1)	(2)
IPR_{02}	0.019*** (0.006)	−0.013 (0.023)
$IPR_{02} \times HighTech_{i,90-01}$	−0.008** (0.004)	0.032** (0.013)
$(CapEmployed)_{t-1}$	0.004* (0.002)	0.006 (0.005)
Firm Controls$_{t-1}$	Yes	Yes
R-Square	0.62	0.78
N	57,461	57,461
Firm FE	Yes	Yes
Year FE	Yes	Yes
Industry FE (5-digit)*Year Trend	Yes	Yes

Robustness With IP Classification at Industry Level

	Managerial Compensation/Total Compensation					
	High-IP Group			High-IP Clusters		
	(1)	(2)	(3)	(4)	(5)	(6)
IPR_{02}	0.032*** (0.007)	0.033*** (0.009)	-0.001 (0.002)	0.024*** (0.003)	0.023*** (0.004)	0.001 (0.001)
$IPR_{02} \times HighIP_j$	0.012** (0.005)	0.013* (0.007)	0.003** (0.001)	0.005* (0.003)	0.010** (0.005)	0.001* (0.000)
$HighIP_j \times$ Year FE	No	Yes	No	No	Yes	No
Firm Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes
R-Square	0.61	0.61	0.61	0.59	0.59	0.59
N	22,119	22,119	22,119	31,726	31,726	31,726
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE (5-digit)*Year Trend	Yes	Yes	Yes	Yes	Yes	Yes

Robustness Controlling For Other Policy Changes

	Managerial Compensation/Total Compensation				
	India's Trade Liberalization Program			Domestic Market Competition - China	Export Market Competition - US
	(1)	(2)	(3)	(4)	(5)
IPR_{02}	0.013*** (0.005)	0.014*** (0.004)	0.013*** (0.005)	0.015*** (0.005)	0.015*** (0.005)
$IPR_{02} \times HighTech_{i,90-01}$	0.010*** (0.002)	0.010*** (0.002)	0.011*** (0.002)	0.015*** (0.002)	0.022*** (0.003)
$HighTech_{i,90-01} \times InpTariff_{t-1}$	0.003*** (0.001)		−0.006 (0.008)		
$HighTech_{i,90-01} \times OutTariff_{t-1}$		0.003*** (0.001)	0.009 (0.008)		
$InpTariff_{t-1}$	−0.004* (0.002)		−0.004** (0.002)		
$OutTariff_{t-1}$		−0.002 (0.002)	−0.0002 (0.001)		
$DComp_{IN}^{China} \times HighTech_{i,90-01}$				0.0002 (0.0002)	
$FComp_{IN}^{China} \times HighTech_{i,90-01}$					−0.004* (0.002)
$(CapEmployed)_{t-1}$	0.005** (0.002)	0.005*** (0.002)	0.005*** (0.002)	0.004*** (0.002)	0.005** (0.002)
Firm Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes
R-Square	0.50	0.50	0.50	0.49	0.49
N	52,391	52,391	52,391	52,014	56,971
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE (5-digit)*Year Trend	Yes	Yes	Yes	Yes	Yes

Robustness Controlling For Other Channels

	Managerial Compensation/Total Compensation							
	Skill Intensity	Management Technology	Factories	Total Factor Productivity	IT and Consul Fees	Family Firm	Insider Board	Labour Regulation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IPR_{02}	0.015*** (0.004)	0.015*** (0.004)	0.015*** (0.004)	0.012** (0.006)	0.015*** (0.004)	0.009** (0.004)	0.003 (0.028)	0.024** (0.011)
$IPR_{02} \times HighTech_{i,90-01}$	0.007*** (0.002)	0.007*** (0.002)	0.007*** (0.002)	0.010*** (0.002)	0.010*** (0.002)	0.016*** (0.002)	0.003 (0.006)	0.016*** (0.002)
$HighTech_{i,90-01} \times SkIntens_{t-1}$	0.010*** (0.002)							
$HighTech_{i,90-01} \times ManTech$		0.003*** (0.001)						
$HighTech_{i,90-01} \times Factories_{t-1}$			0.016*** (0.003)					
$HighTech_{i,90-01} \times TFP_{t-1}$				0.009** (0.0004)				
$HighTech_{i,90-01} \times ITFees_{t-1}$					0.003 (0.006)			
$HighTech_{i,90-01} \times ConsFees_{t-1}$					0.005*** (0.001)			
$IPR_{02} \times HighTech_{i,90-01} \times Familyfirm_i$						−0.0003 (0.000)		
$IPR_{02} \times HighTech_{i,90-01} \times IndDir_{it}$							−0.006 (0.007)	
Firm Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Square	0.49	0.49	0.49	0.70	0.49	0.51	0.87	0.51
N	57,456	56,210	57,456	26,264	56,084	52,391	4,834	52,391
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE (5-digit)*Year Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE*Year FE	No	No	No	No	No	No	No	Yes

Robustness For Other Econometric Grouses

	Managerial Compensation/Total Compensation					
	Time Period: 1990-2005	Industry-Level	Only Pharma	Drop Firms > 90th Percentile	Fractional Logit	PPML
	(1)	(2)	(3)	(4)	(5)	(6)
IPR_{02}	0.043***	−0.028	0.004	0.039***	3.378***	−0.264***
	(0.009)	(0.018)	(0.005)	(0.009)	(0.840)	(0.029)
$IPR_{02} \times HighTech_{i,90-01}$	0.005**	0.007**	0.006	0.006***	0.126***	0.083***
	(0.002)	(0.003)	(0.006)	(0.002)	(0.029)	(0.027)
$(CapEmployed)_{t-1}$	0.005**	0.001	0.005	0.005**	0.540***	0.563***
	(0.002)	(0.003)	(0.006)	(0.002)	(0.040)	(0.035)
Firm Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes
R-Square	0.50	0.60	0.50	0.50	n/a	0.04
N	57,339	1,742	8,880	62,674	62,677	62,677
Firm FE	Yes	No	Yes	Yes	Yes	Yes
Industry FE	No	Yes	No	No	No	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE (5-digit)*TimeTrend	Yes	Yes	Yes	Yes	Yes	Yes

A Placebo with Non-Managers

	Total Non-Managers	Non-Man Comp/ Total Comp	Avg Non-Man Comp	Avg Non-Man Wages	Avg Non-Man Incentives
	(1)	(2)	(3)	(4)	(5)
IPR_{02}	0.487***	0.065***	0.152	0.177*	0.011
	(0.101)	(0.021)	(0.099)	(0.093)	(0.030)
$IPR_{02} \times HighTech_{i,90-01}$	1.040***	−0.019***	0.032	0.027	−0.003
	(0.097)	(0.003)	(0.025)	(0.019)	(0.004)
$(CapEmployed)_{t-1}$	0.020	−0.011**	0.005	0.003	0.003
	(0.028)	(0.005)	(0.099)	(0.017)	(0.006)
Firm Controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes
R-Square	0.54	0.62	0.82	0.85	0.85
N	2,082	57,461	2,082	2,082	2,082
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE (5-digit)*TimeTrend	Yes	Yes	Yes	Yes	Yes

Summary of Findings

1) Evidence of significant rise in the **share of managerial compensation due to change in intellectual property regimes**

2) **A Snail-Shaped Effect Across Firms**

3) Impact through **sharper incentives (more bonus hikes than fixed wages).** (Holmstrom 1989, Teece 1994, Manso, 2011; Ederer and Manso, 2011; Azoulay et al., 2011; Cunat and Guadalupe 2009)

4) Broadly evidence of **between and within firm inequality in managerial organization of firms with stronger patents** (Aghion et al 2018, Kline et al 2018 & Boler 2015).

5) **Next Steps:** We are looking to sharpen our theory for the snail-shaped effect. We are also looking to write grants to examine cross country evidence with employer-employee data (Brazil (Poliquin 2019) and China (Cheng 2019) are prime candidates to test this) and understand changes in organizational-layers/designs.

Innovation Policy & the Economy: Implications

- Industry evolution and anti-trust implications.
- Non-competes and its role in Indian manufacturing.
- The market for problem solving managers in a world of AI.
- LDC Extension in TRIPs+ and implications for industry evolution in LDC economies.
- Inequality and its macroeconomic and political consequences.

Thank you for your kind attention

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