

Technology and Labour Demand: Insights from Indian Manufacturing

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Scheme of Presentation

- Technology and Jobs: Theoretical Understanding
- Employment and Technological Progress in Indian Manufacturing
- Technology and Labour Demand
- Issue of Skill
- Conclusion

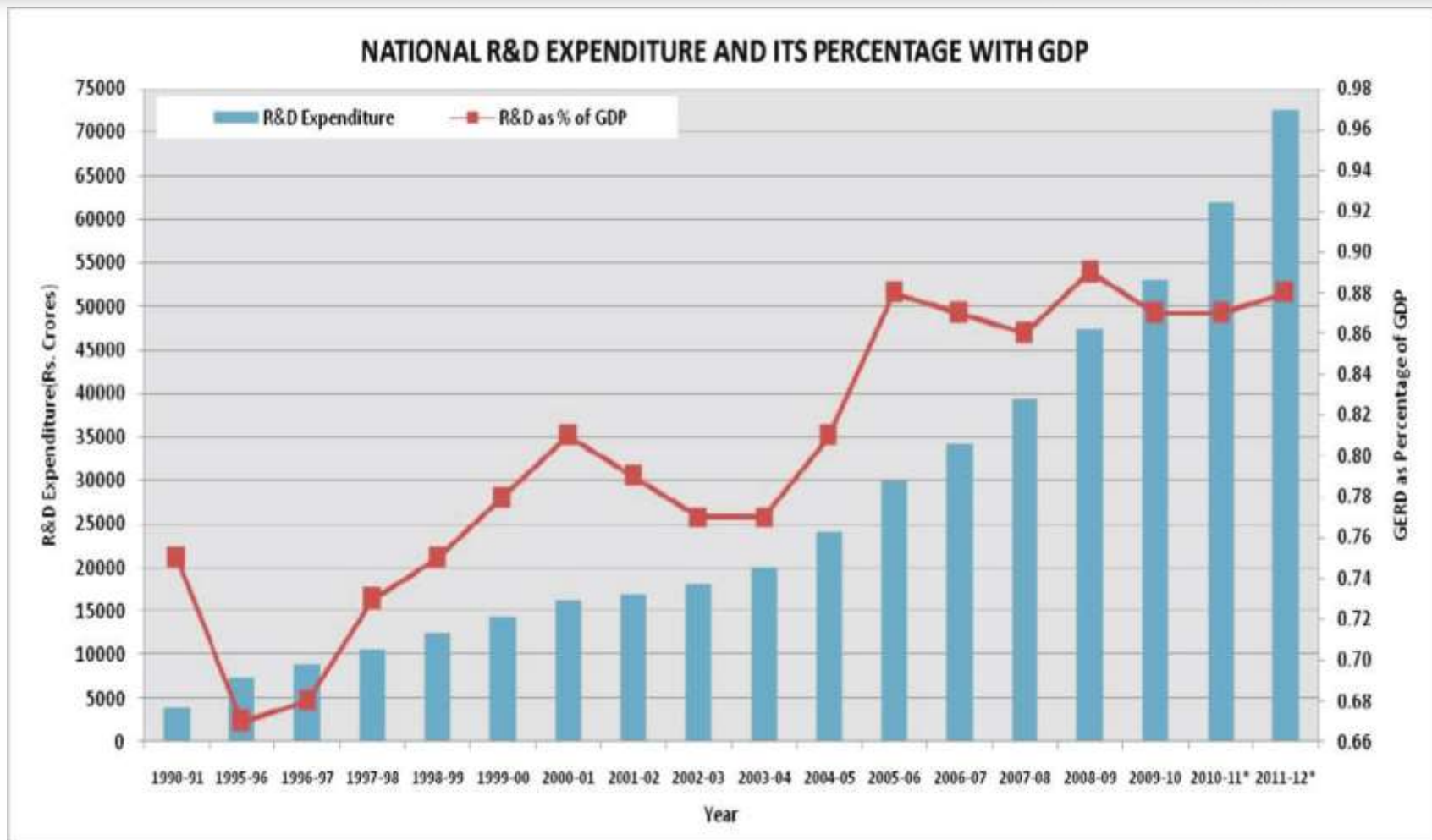
Technology and Employment Debate

- *Technological Unemployment*
- *Compensation Framework - Labour saving technology not a problem in long run*
- *Job creation through new products: Expansion of capital sectors and emergence of new products*
- *Reduction in unit cost and increase in demand*
 - *What about imperfect market*
- *Increase in investment*
- *Decrease in Wage and back to labour intensive technology or end of labour saving innovations*
- *Trade union and increase in income: Keynesian Kaldorian tradition*
- *Job Creation through higher consumption*
 - *What if benefits of productivity gain not shared with workers*

Technology and Employment Debate

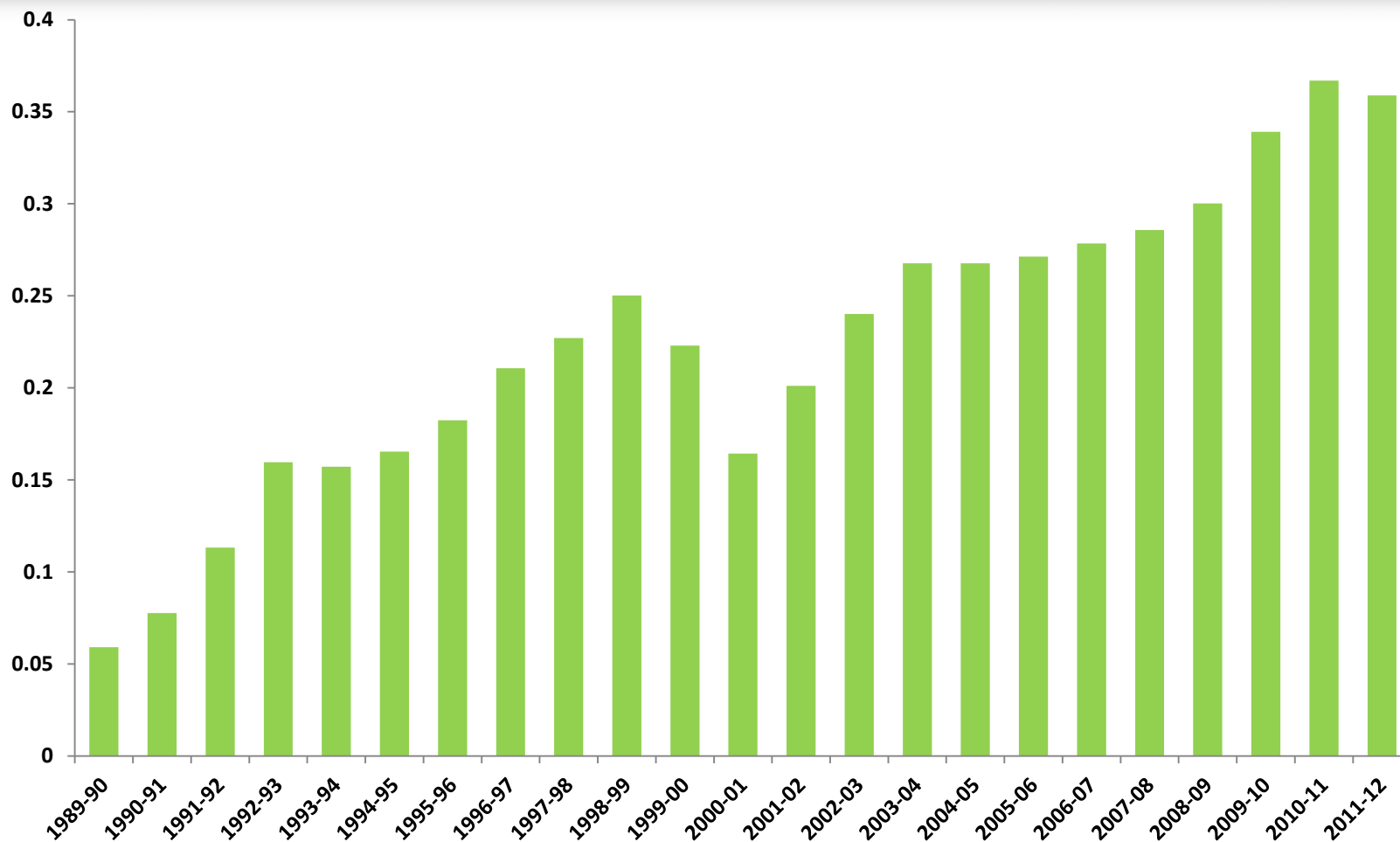
- *The substitution framework*
- *Labour saving technology cause employment displacement*
 - *End of work or workless world (Rifkin (1995))*
 - *Knowledge sector vis-à-vis rest*
 - *Skill Biased Technological Progress*
 - *Task based model and Job polarization*
 - *Abstract, routine and manual task*
- *Technological Unemployment lack empirical support*
- *Deskilling job polarization and increase in inequality*

Research and Development Expenditure in India



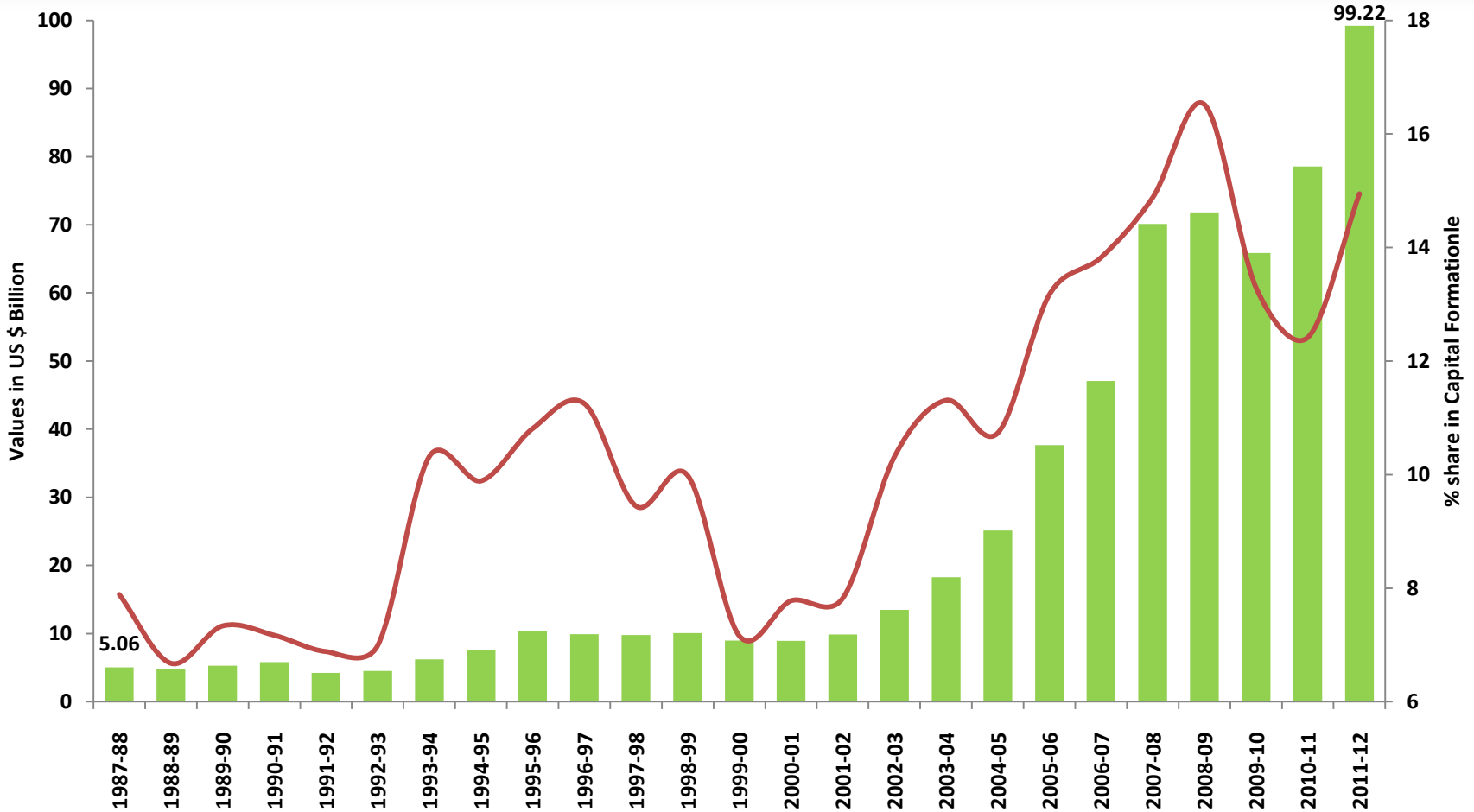
Source: Department of Science and Technology, Government of India

R&D Sales Ratio: Manufacturing Sector



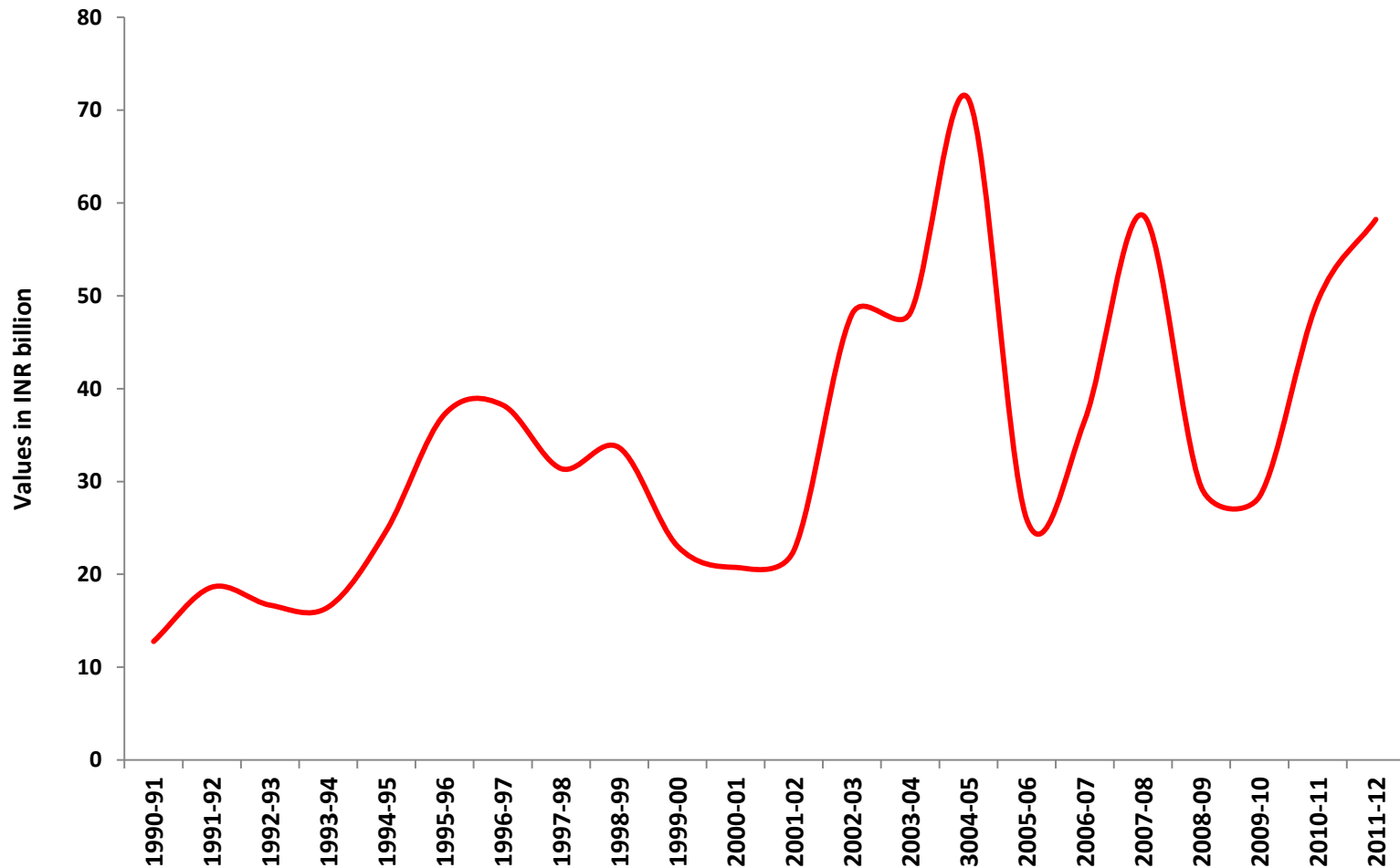
Source: Compiled from CMIE Prowess Database

Surge in Capital Imports



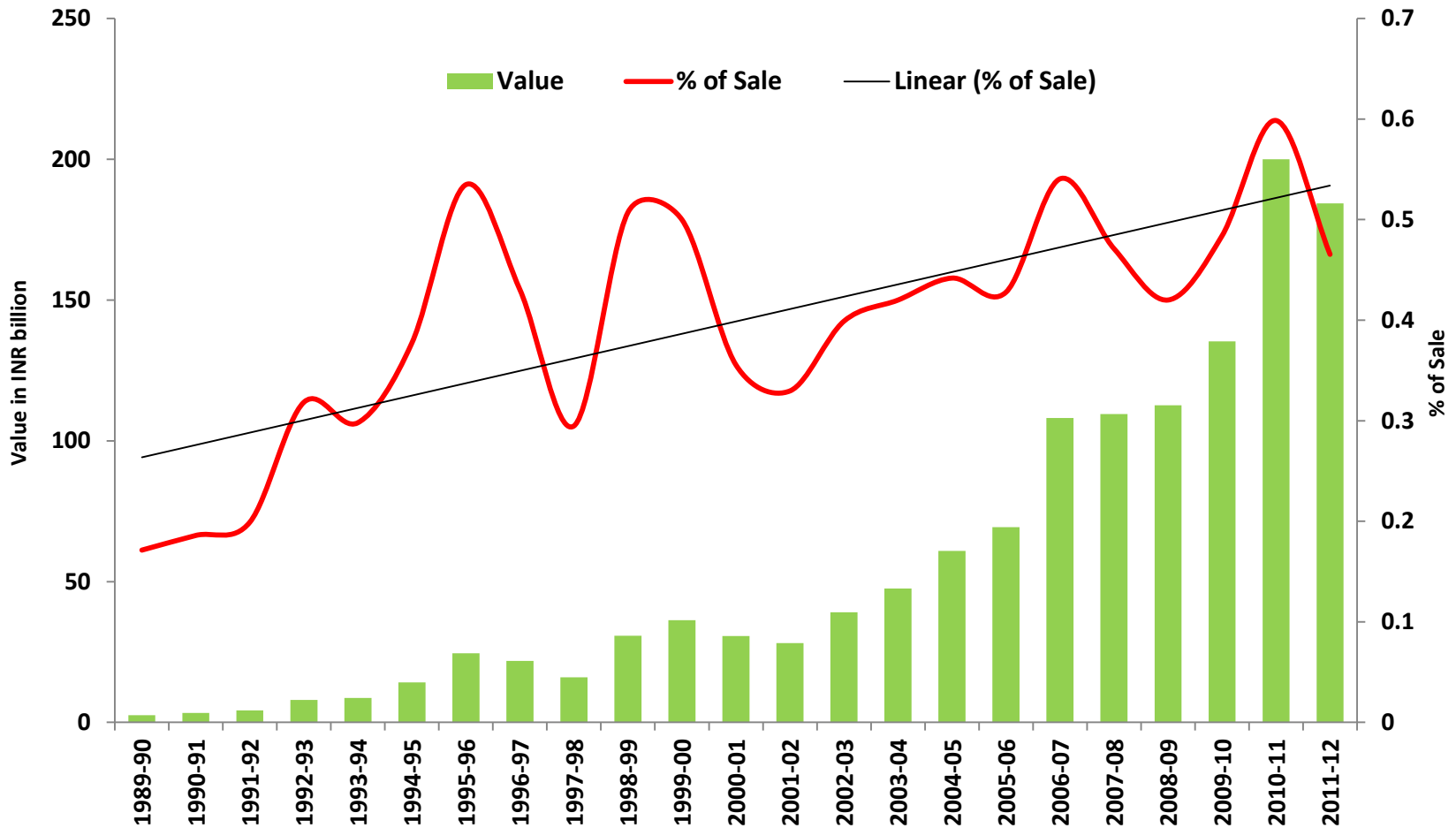
Source: Reserve Bank of India

Capital Imports/ Net Capital Formation in Manufacturing



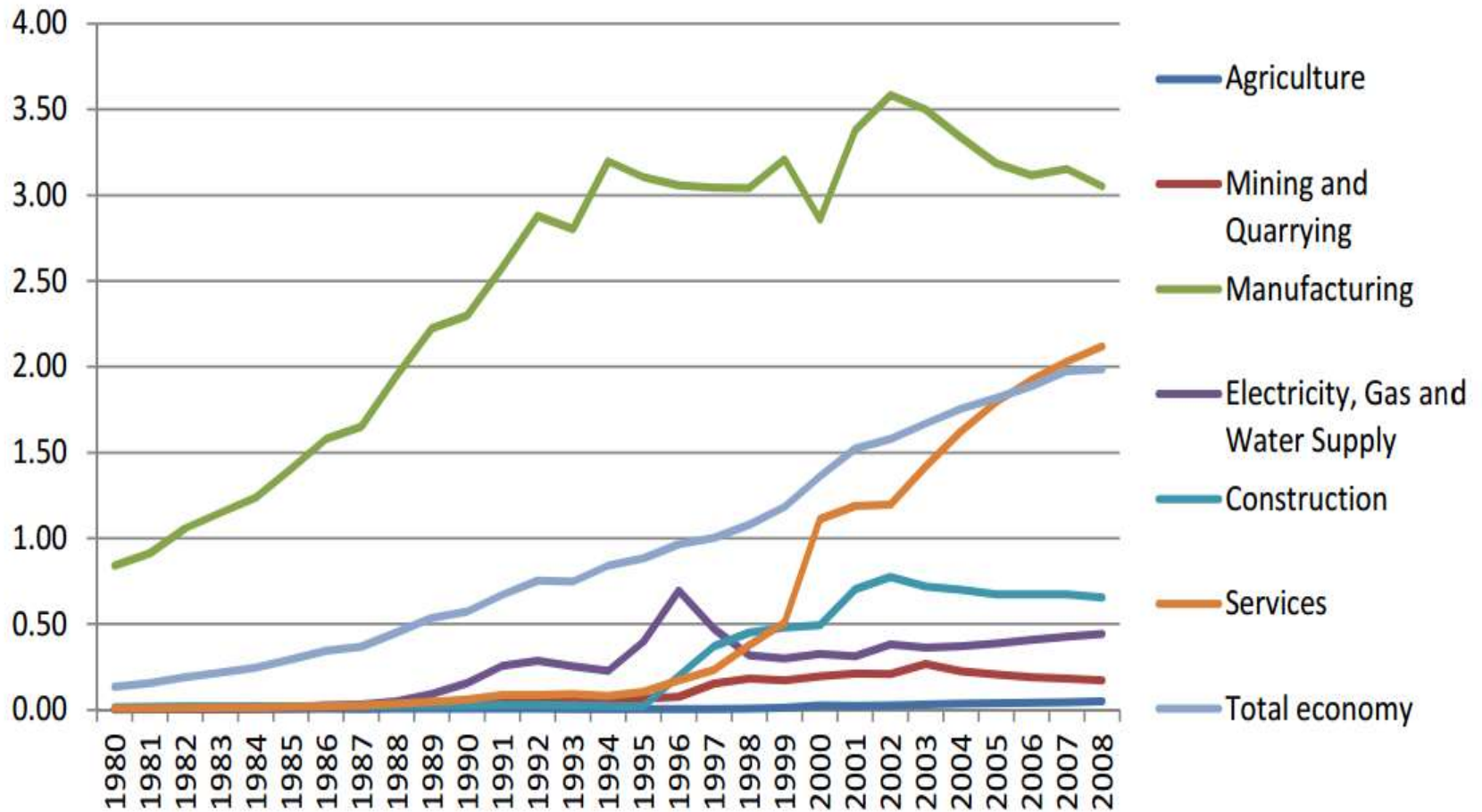
Source: Compiled from CMIE Prowess database

Surge in Royalty payment



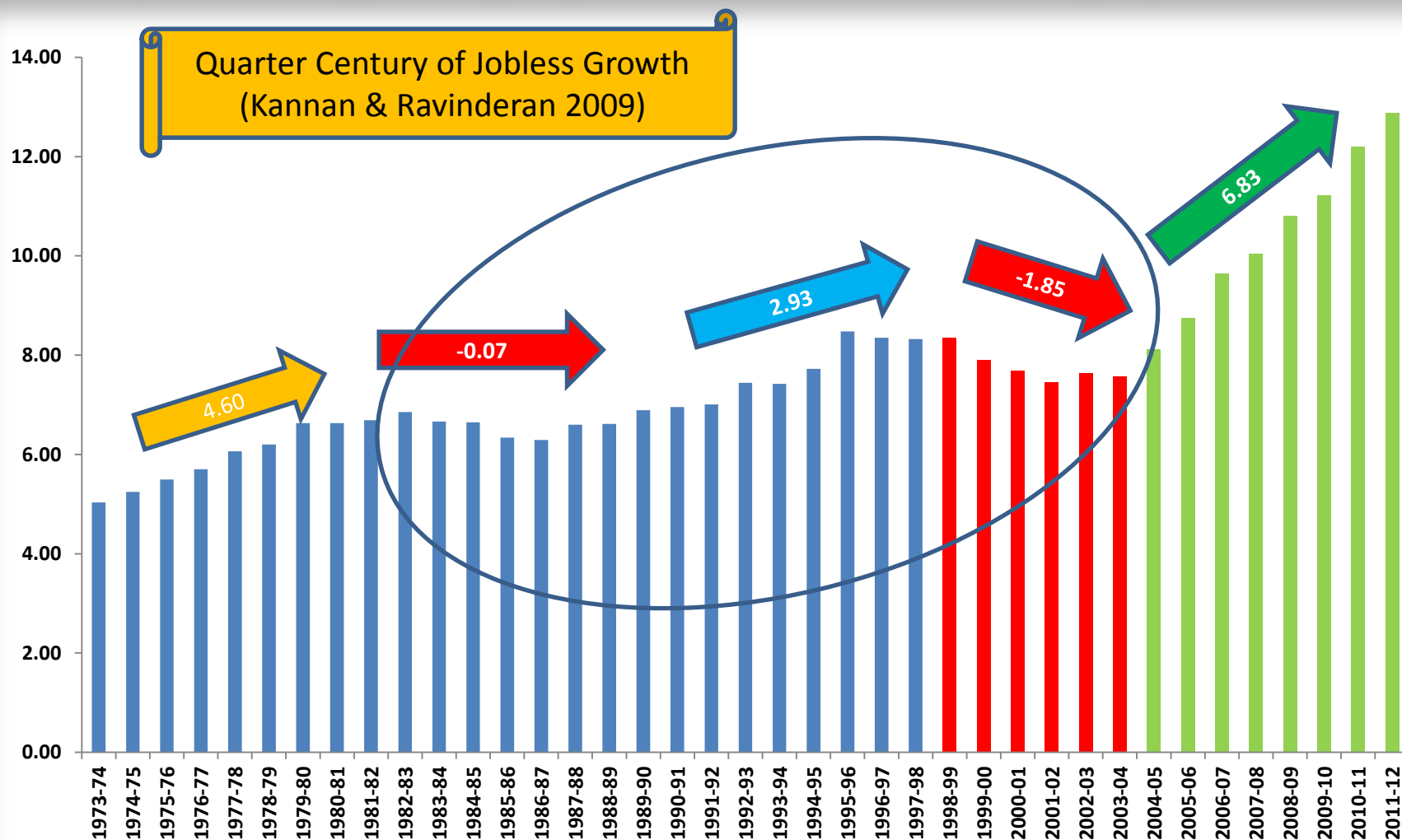
Source: Compiled from CMIE Prowess database

Increase in ICT capital



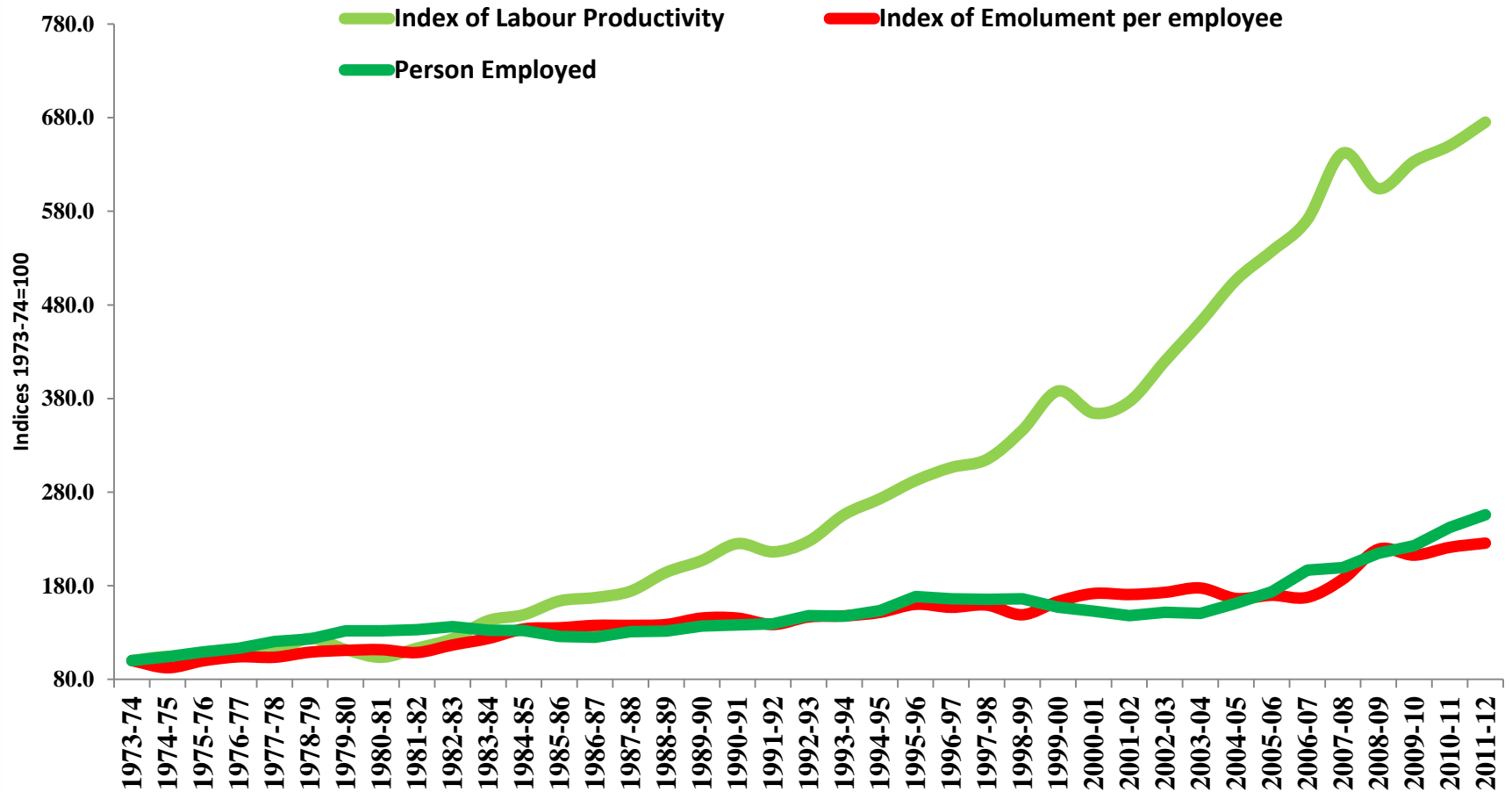
Source: Reproduced from Erumban and Das 2014

Manufacturing Employment: The End of Jobless Growth



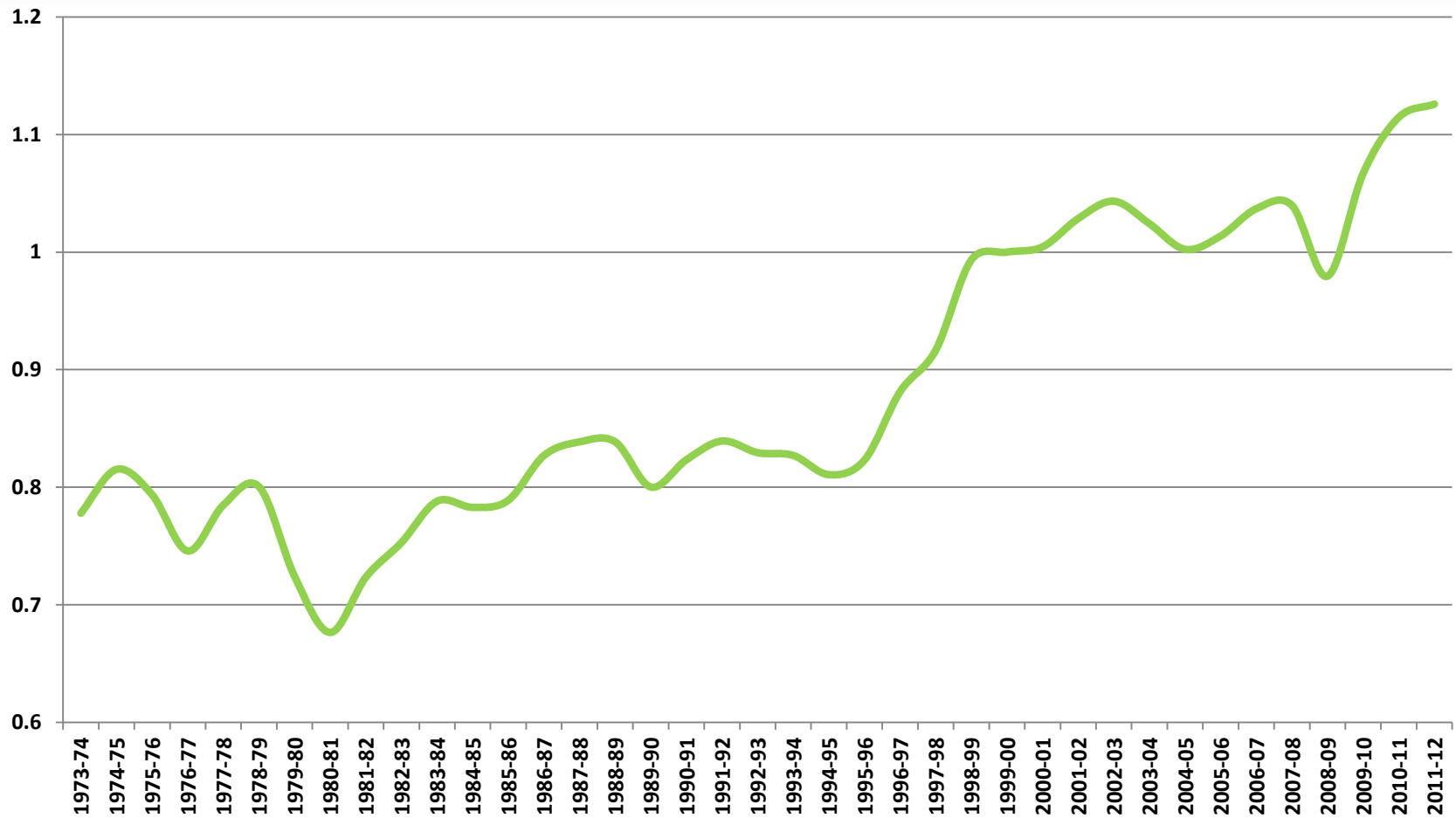
Source: Annual Survey of Industry

Productivity Employment Decoupling?



Source: Annual Survey of Industry

Wage Productivity GAP



Source: Annual Survey of Industry

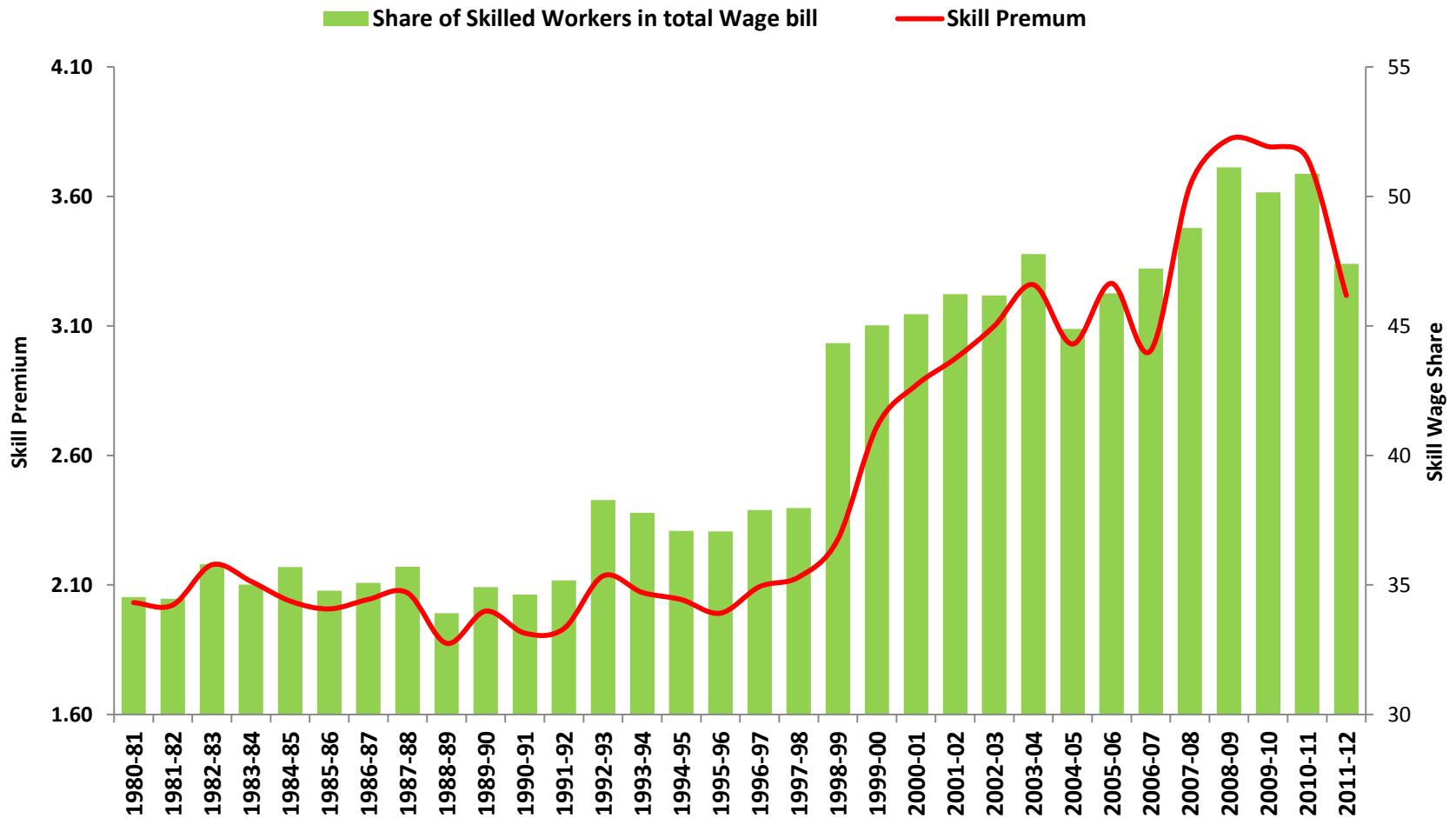
Quantifying the Impact of Technology

- Labour demand equation
- Static Labour demand equation: Fixed Effect
- Dynamic Panel: LSDV and GLS estimators biased and inconsistent
- GMM, difference and system, provides efficient estimates in absence of second-order autocorrelation in the residual
- GMM gives efficient results when sample is very large (Alvarez and Arellano 2003)
- Biased Correct LSDV: (Bun and Kiviet 2005)
- Monte carlo Evidence: biased corrected LSDV is better than GMM when T is less than 20 and N is less than 50

Labour Demand Equation for Indian Manufacturing

	Fixed Effect		LSDV BC
	1	2	3
LN t-1		--	0.756*
		--	(16.92)
Ln W	-0.484*	-0.463*	-0.263*
	(-3.25)	(-3.11)	(-3.68)
Ln Q	0.458*	0.489*	0.189*
	(6.67)	(6.62)	(5.2)
LN Capital Imports	-0.033	-0.102***	-0.068*
	(-1.19)	(-1.81)	(-2.48)
LN Capital Imports Square		0.007***	0.004***
		(1.89)	(1.79)
LN R& D Expenditure	-0.102	-0.069	-0.016
	(-0.88)	(-0.66)	(-0.16)
LN Royalty Payment	0.025	-0.012	-0.007
	(1.45)	(-0.47)	(-0.28)
LN ICT Capital	-0.089	-0.079	-0.027
	(-1.34)	(-1.16)	(-0.82)
Constant	10.44*	10.04*	--
	(5.84)	(5.47)	--
Observations	1100	1100	1100
R Square	0.63	0.78	--

Skill Premium in Indian Manufacturing

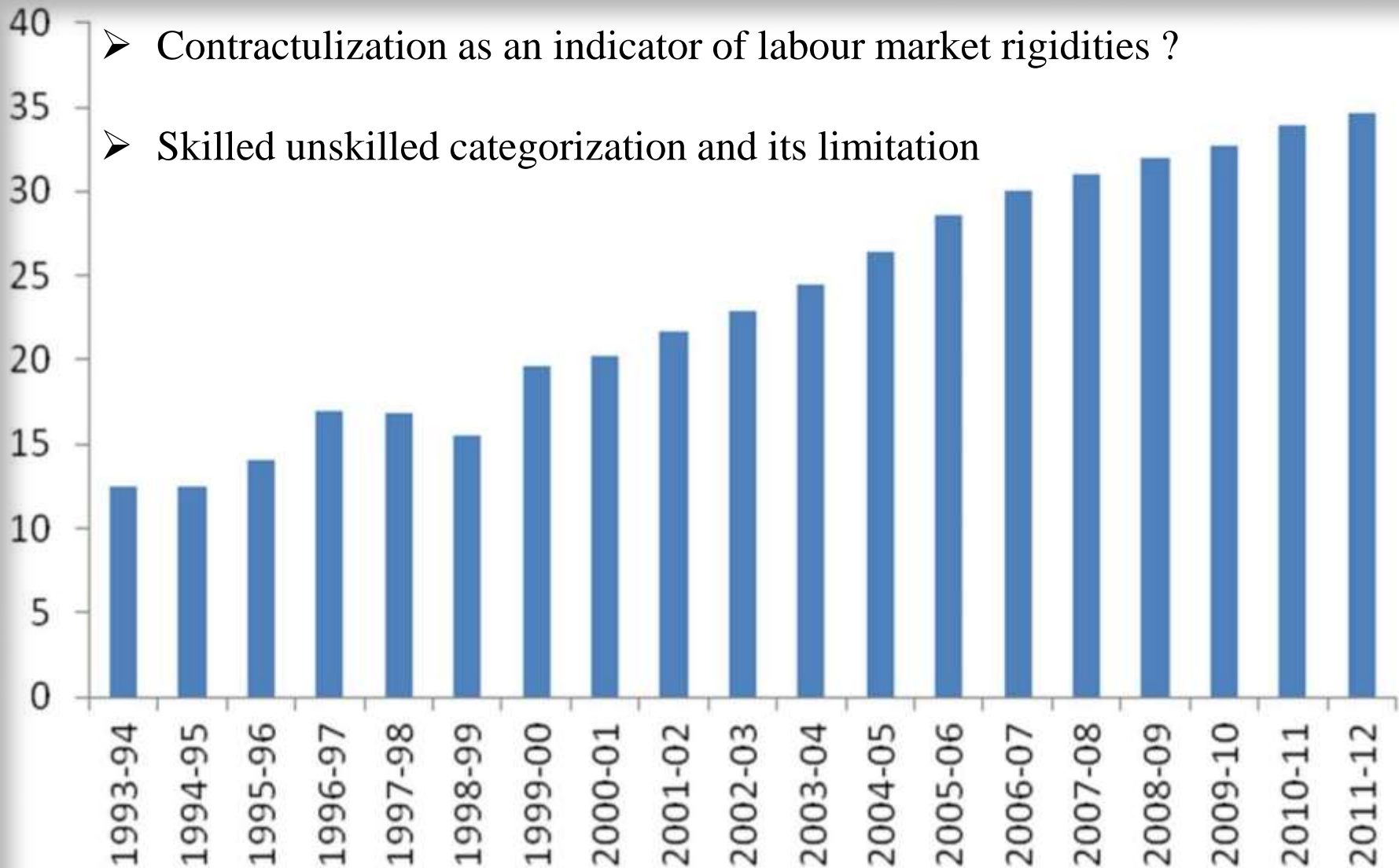


Source: Annual Survey of Industry

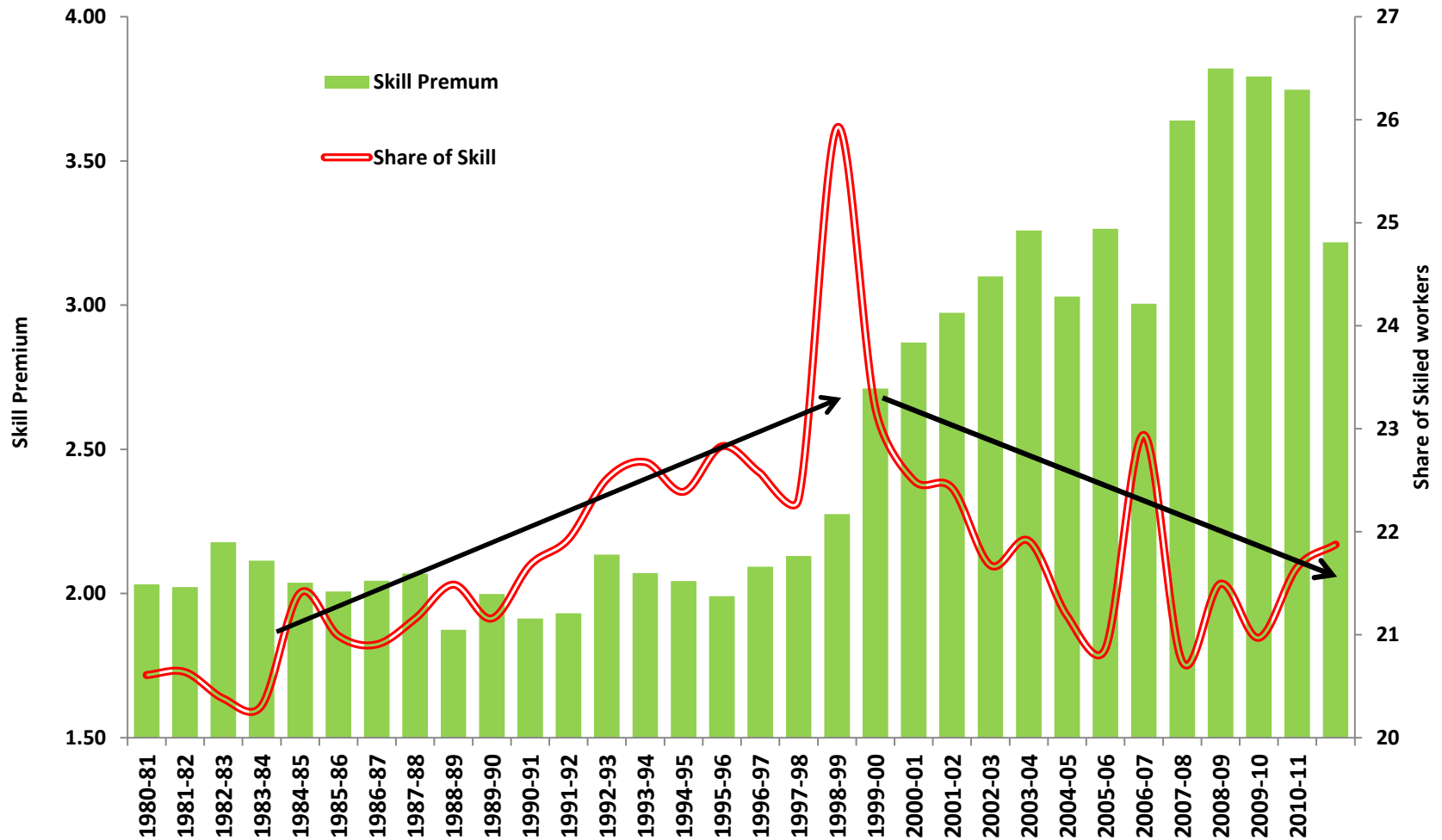
What is driving the Wage Disparity

- Skill Biased Technological Progress (Berman et al 2005, Ramaswamy 2008)
- Wage inequality is driven by increase in within industry inequality
- Presence of capital skill complementarity (Berman et al 2005, Ramaswamy 2008)
- Labour market rigidities (Ramaswamy 2008)
- Significant positive relation between ICT capital and Skill wage share (Abraham 2010)
- Positive relation between relative wage and capital imports

SBTP and Constractulization: The Contradiction



Skill Premium and Share skill Worker



Source: Annual Survey of Industry

Employment Composition by Occupation

	Employment Share			Wage Share		
	1993-94	2011-12	Change	1993-94	2011-12	Change
Professional and Associates	5.3	8.4	3.1	15.3	27.1	11.8
Plant and Machine Operators	13.3	22.7	9.4	18.8	21.3	2.5
Clerks and Craft Workers	63.2	47.5	-15.7	52.0	38.1	-13.9
Elementary Occupations	18.1	21.5	3.4	13.9	13.5	-0.4

Source: NSSO

Conclusion and Policy Implications

- Significant technology upgradation in Indian manufacturing
- Introduction of new technology reduces labour demand, however negative impact tapers off with time
- Vertical increase in wage inequality but SBTP does not fully explain it
- Signs of job polarization: demand for craft related occupation is declining
- Skill mismatch: Adapting supply of labour to skill demanded
 - Update vocational education
 - Emphasize on higher education and its quality
 - Issue of educational disparity
- Debate on labour regulations needs to be revisited
- Distortion in capital market?

Conclusion

Thank You!

Derivation of Labour Demand Equation

$$Q_{it} = A^\gamma K^\alpha L^\beta \quad 1$$

$$Q_{it} = A^\gamma \left(\frac{\alpha L_{it} W_i}{\beta c} \right)^\alpha L_{it}^\beta \quad \dots 2$$

$$\ln Q_{it} = \gamma \ln A + \left(\frac{\alpha \ln \alpha L_{it} \alpha \ln W_i}{\alpha \ln \beta \alpha \ln c} \right) + \beta \ln L_{it} \dots \dots \dots 3$$

$$\ln Q_{it} = \gamma \ln A + \frac{\alpha \ln \alpha}{\alpha \ln \beta} + \frac{\alpha \ln L_{it}}{\alpha \ln \beta} + \alpha \ln \left(\frac{W_i}{c} \right) + \beta \ln L_{it} \dots \dots \dots 4$$

$$\ln Q_{it} = \gamma \ln A + \alpha \ln \alpha - \alpha \ln \beta + \alpha \ln L_{it} + \alpha \ln \left(\frac{W_i}{c} \right) + \beta \ln L_{it} \dots \dots \dots 5$$

$$\ln Q_{it} = \gamma \ln A + \alpha \ln \alpha - \alpha \ln \beta + \alpha \ln \left(\frac{W_i}{c} \right) + \alpha + \beta (\ln L_{it}) \dots \dots \dots 6$$

$$\ln Q_{it} - (\gamma \ln A + \alpha \ln \alpha - \alpha \ln \beta) - \alpha \ln \left(\frac{W_i}{c} \right) = \alpha + \beta (\ln L_{it}) \dots \dots \dots 7$$

$$\ln L_{it} = \frac{-((\gamma \ln A + \alpha \ln \alpha - \alpha \ln \beta))}{\alpha + \beta} - \frac{-\alpha \ln(W_i/c)}{\alpha + \beta} + \frac{\ln Q_{it}}{\alpha + \beta} \dots \dots \dots 8$$

$$\ln L_{it} = \theta + \theta_1 \ln W_{it} + \theta_2 \ln Q_{it} \quad 2$$

