



Changing Task Content of Jobs in India: Implications and Way Forward

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Trade, Technology and Skill Premium



- Globalization
- ICT Revolution



Changing task content and its drivers



- Routine task content declined in the developed countries (Michaels et al. 2014)
- Transition economies following the same trend (Hardy et al. 2015)
- Technology (Autor et al 2003, Goos 2009)
- Up-scaling: Increase in supply graduates (Salvatori 2015; Hardy et al. 2015)
- Structural change (Barany and Siegel 2015)

SBTC VS Task Models



- SBTC: Empirical success and issue of mechanism
- Labour market polarization
- Task models

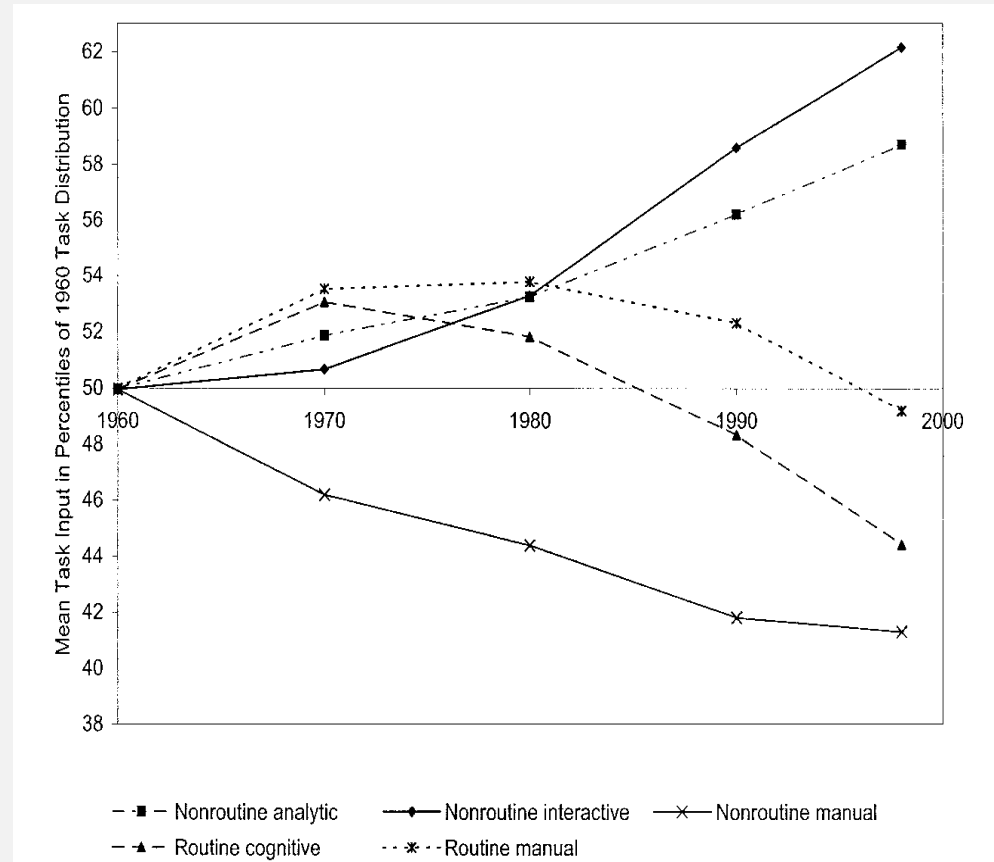


Figure reproduced from Autor , Levy and Murnane 2003

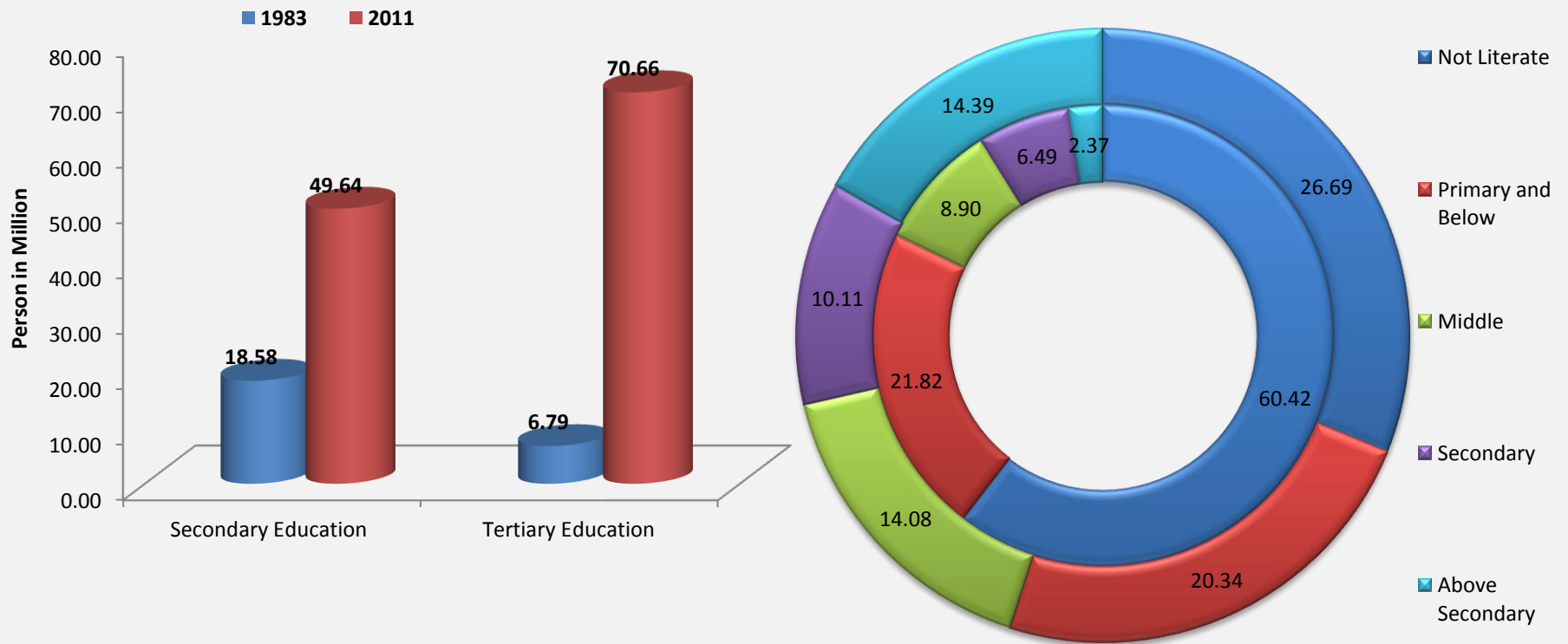
Technology up-gradation



- Capital imports 
- R&D expenditure 
- Share of ICT capital 



Supply of Labour



Source: Own calculation from NSSO data

Changing Structure of Indian Economy



Sector	Share in GDP		Employment (PS+SS)	
	1983	2011	1983	2011
Agriculture	35.29	14.10	68.44	47.93
Mining and Quarrying	2.95	2.06	0.64	0.59
Manufacturing	14.79	15.70	10.63	12.19
Electricity, Gas and Water Supply	1.59	1.88	0.38	0.59
Construction	6.77	7.87	2.39	13.79
Services	38.61	58.39	17.52	24.91
Total	100.00	100.00	100.00	100.00

Source: Own calculation from National Account Statistics and NSSO data

Is India following the global trend?



- Job polarization (Aedo et al. 2013)
- Change in task content (Aedo et al. 2013)

Methodology and data sources



NSSO Round 38, 43,
50, 55, 61, 66, 68

O-Net 2003

NCO 1960
NCO 2004

O-Net SOC
SOC 2000
SOC 2010

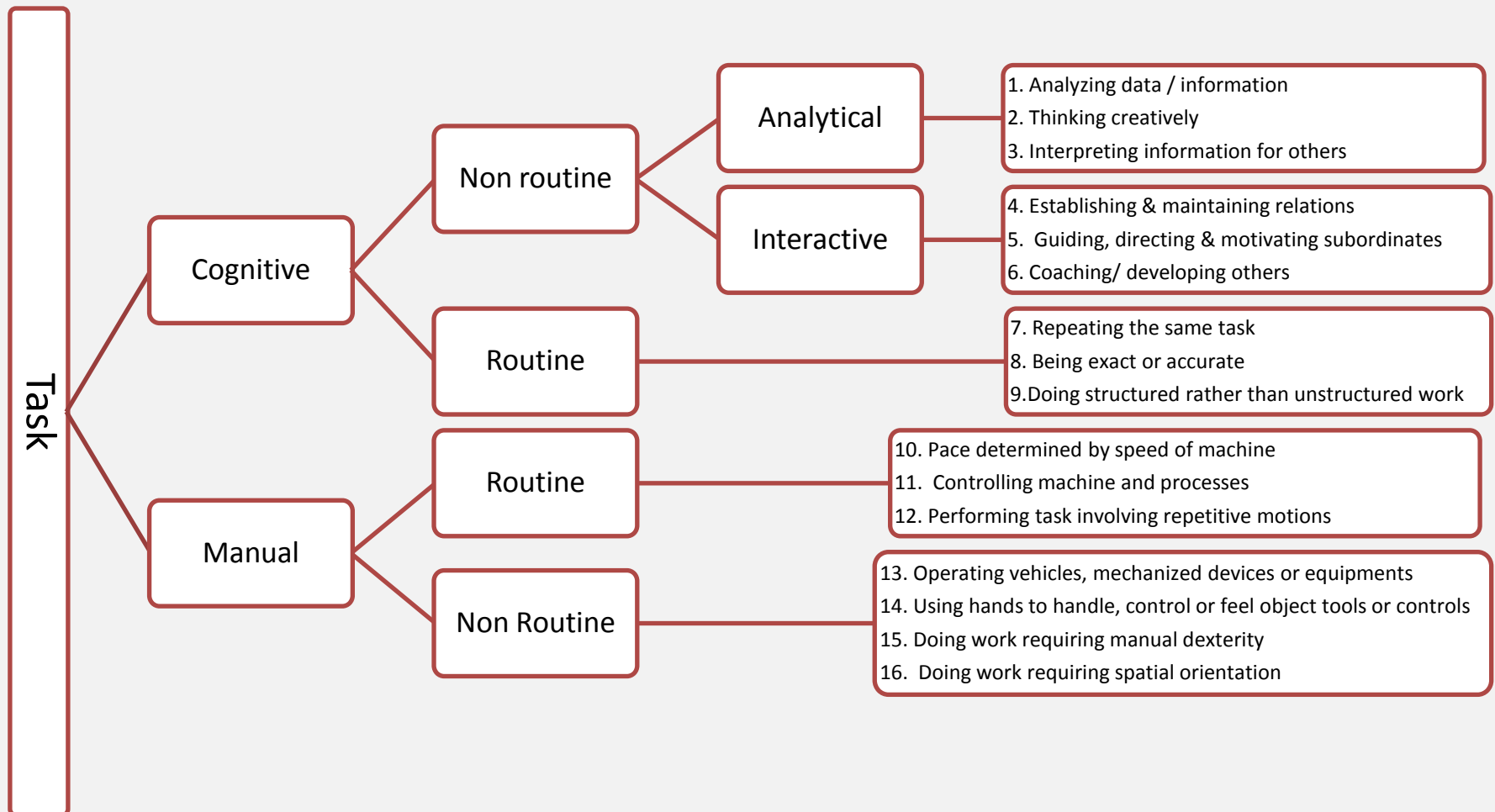
113 occupations
at 3 digit level

NSS data: some issues



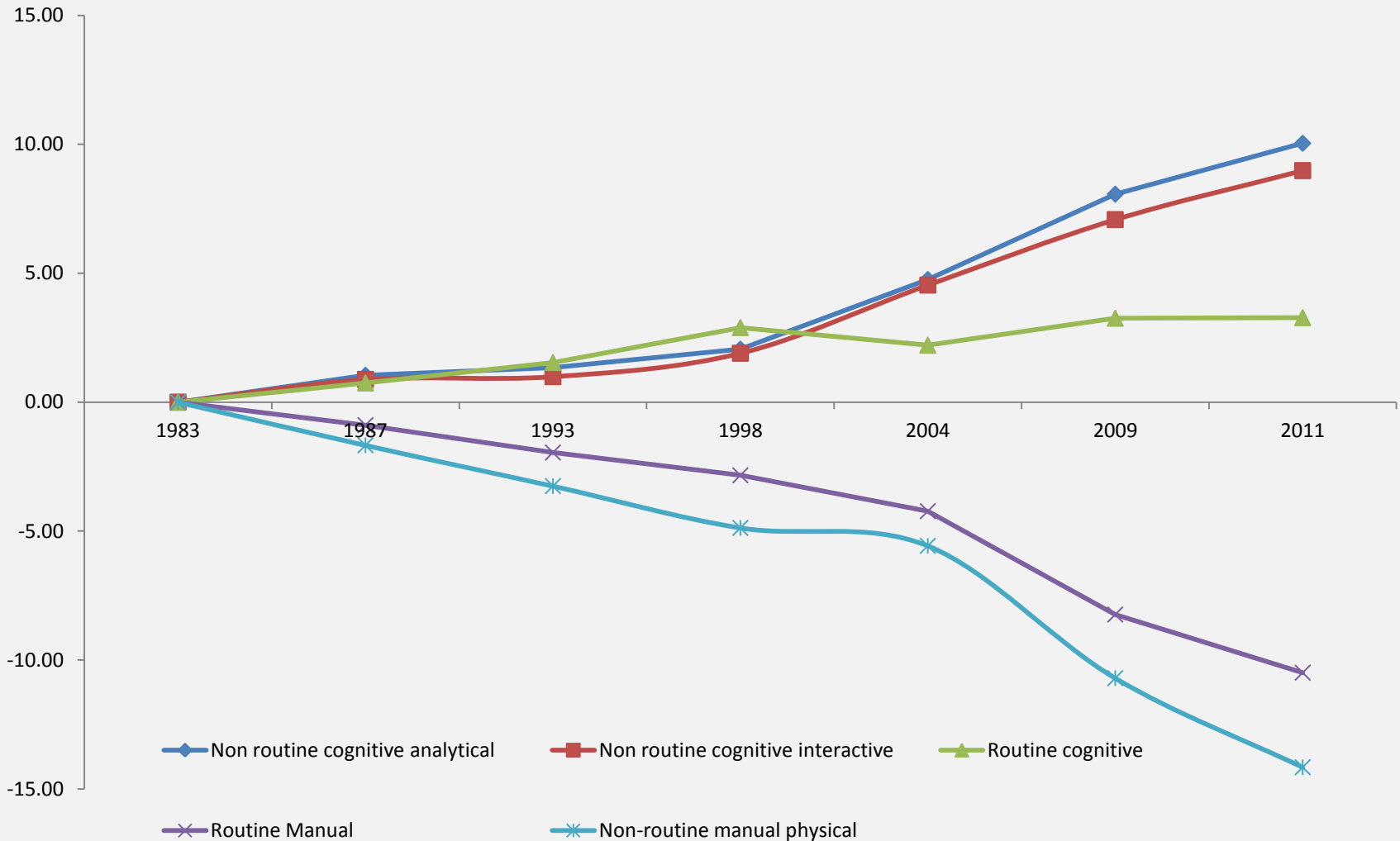
	Missing NCO Code		Wrong NCO	
	No. of Observations	Share in Employment	No. of Observations	Share in Employment
NSS Round 38	985	0.34	918	0.31
NSS Round 43	9110	3.22	850	0.30
NSS Round 50	1246	0.42	697	0.26
NSS Round 55	3006	0.33	694	0.20
NSS Round 61	1190	0.32	0	--
NSS Round 66	817	0.36	0	--
NSS Round 68	203	0.10	0	--

Task items

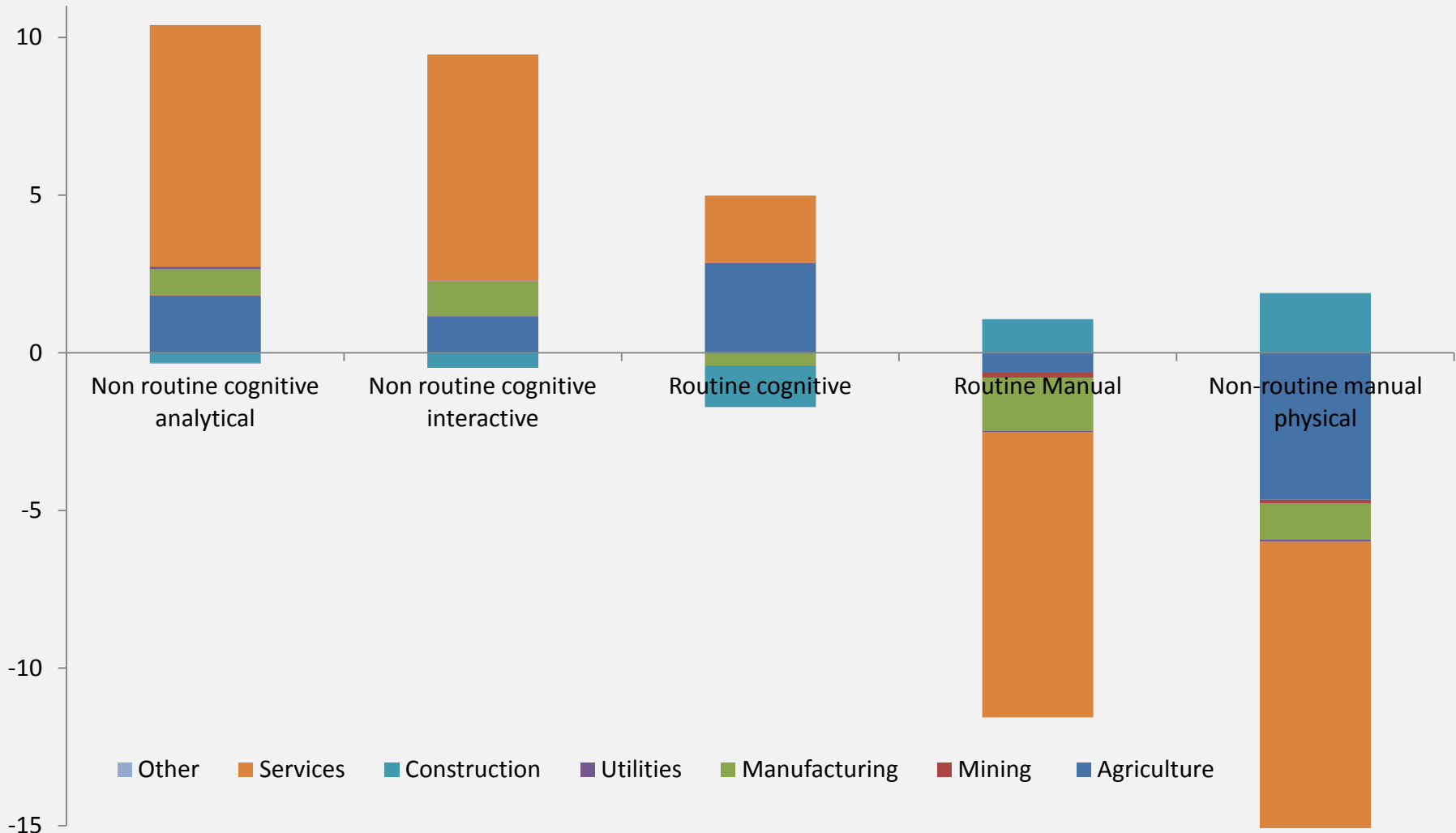


Source: Own compilation based on Autor, Levy and Murnane 2003

Task content of jobs in India



Services biggest contributor to change in task content

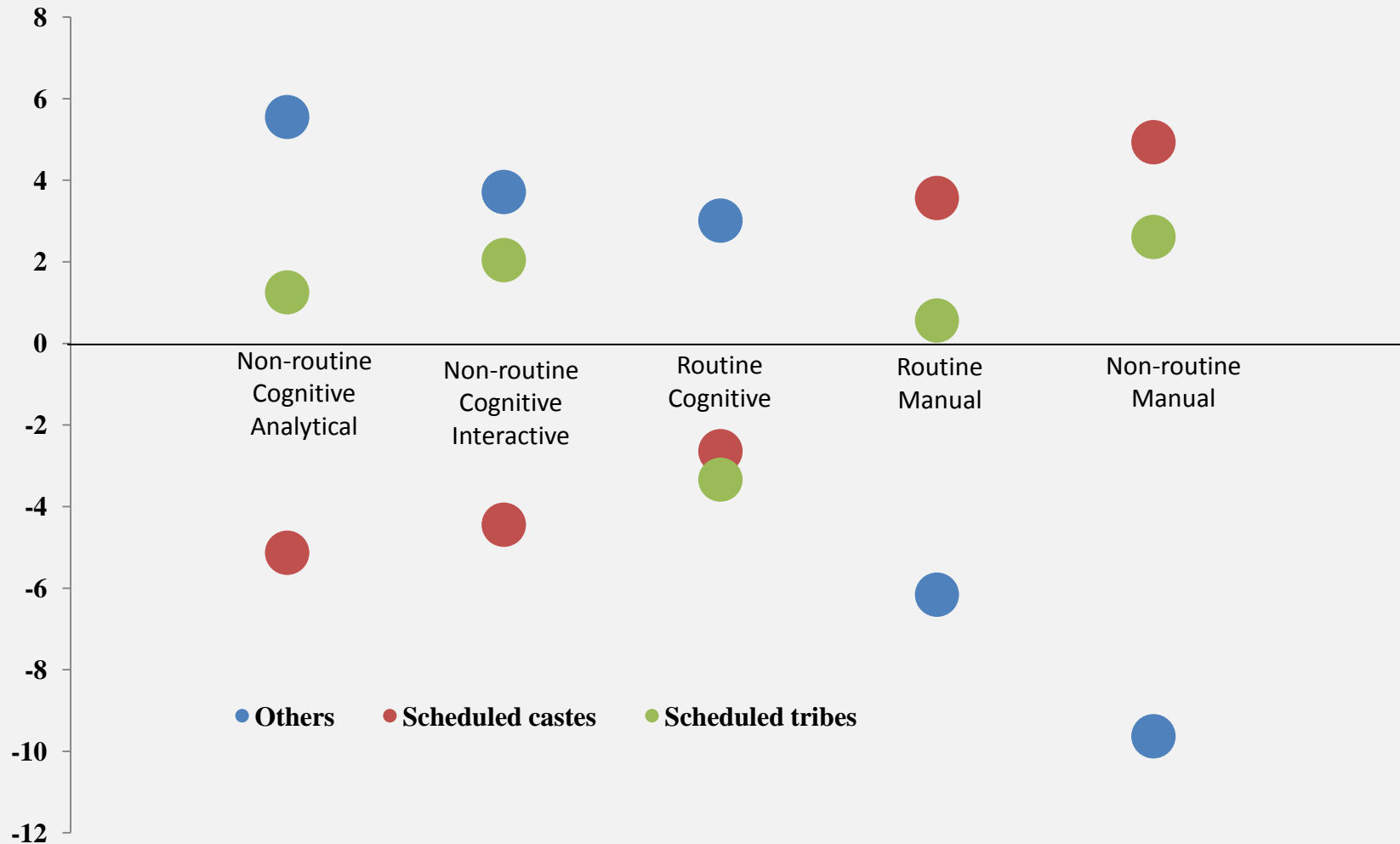


Task content by age cohort

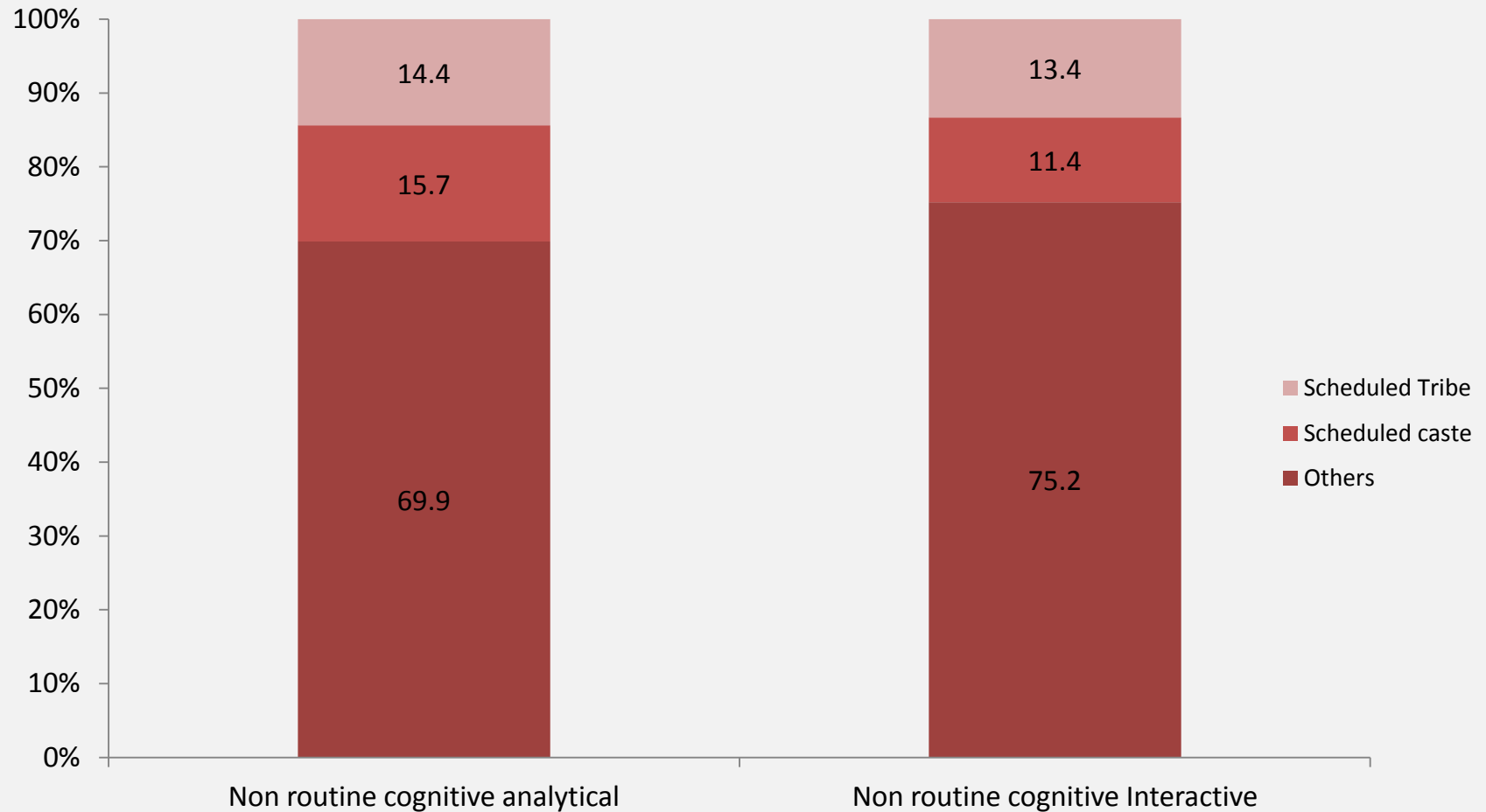


	1983-84	1988-89	1993-94	1998-99	2004-05	2009-10	2011-12
Non-routine Cognitive Analytical							
Before 1947	0.62	2.12	2.86	3.78	6.20	7.76	8.07
1948 - 1957	-0.74	0.93	2.47	4.31	7.14	9.52	10.48
1958 - 1967	-2.95	-1.44	0.50	1.92	5.35	9.80	12.02
1968 - 1977	-2.61	-2.89	-1.83	0.38	4.13	8.15	10.68
1978 - 1987			-3.87	-3.54	1.47	6.93	9.63
Average Annualised Change 1983-84 to 2011-12							
Within Cohort	0.51						
Within Age Group	0.35						
Non-routine Cognitive Interactive							
Before 1947	0.13	1.63	2.38	3.54	6.29	8.94	10.02
1948 - 1957	-1.92	-0.48	0.87	3.03	6.13	8.65	10.50
1958 - 1967	-3.21	-2.23	-1.00	0.87	4.33	7.95	10.17
1968 - 1977	-2.47	-2.84	-2.49	-0.62	3.04	6.22	8.68
1978 - 1987			-3.65	-3.67	0.42	4.46	7.13
Average Annualised Change 1983-84 to 2011-12							
Within Cohort	0.45						
Within Age Group	0.22						
Routine Cognitive							
Before 1947	-0.59	-0.34	-0.10	1.27	-0.52	1.14	0.32
1948 - 1957	1.23	2.26	3.08	4.77	2.83	3.47	2.90
1958 - 1967	-2.07	-0.12	2.48	3.70	2.72	4.62	4.42
1968 - 1977	-4.43	-3.90	-1.04	1.91	2.36	2.95	3.21
1978 - 1987			-4.45	-2.48	0.05	2.16	2.46
Average Annualised Change 1983-84 to 2011-12							
Within Cohort	0.21						
Within Age Group	0.16						
Routine Manual							
Before 1947	-0.93	-1.74	-2.99	-4.03	-4.17	-5.31	-4.74
1948 - 1957	-0.17	-2.03	-4.28	-5.90	-7.28	-9.07	-9.40
1958 - 1967	3.38	1.26	-2.34	-3.82	-5.90	-10.75	-13.47
1968 - 1977	3.38	4.67	1.93	-1.44	-4.43	-9.58	-12.52
1978 - 1987			4.74	4.00	-0.17	-7.19	-10.80
Average Annualised Change 1983-84 to 2011-12							
Within Cohort	-0.52						
Within Age Group	-0.49						
Non-routine Manual							
Before 1947	-1.56	-2.77	-4.09	-5.74	-3.66	-6.81	-6.54
1948 - 1957	-1.66	-4.35	-7.36	-9.65	-9.35	-12.03	-13.34
1958 - 1967	3.30	0.10	-4.72	-6.97	-8.06	-14.44	-18.41
1968 - 1977	5.54	5.70	1.26	-3.70	-6.69	-12.76	-16.96
1978 - 1987			5.67	3.88	-1.48	-9.81	-14.70
Average Annualised Change 1983-84 to 2011-12							
Within Cohort	-0.70						
Within Age Group	-0.77						

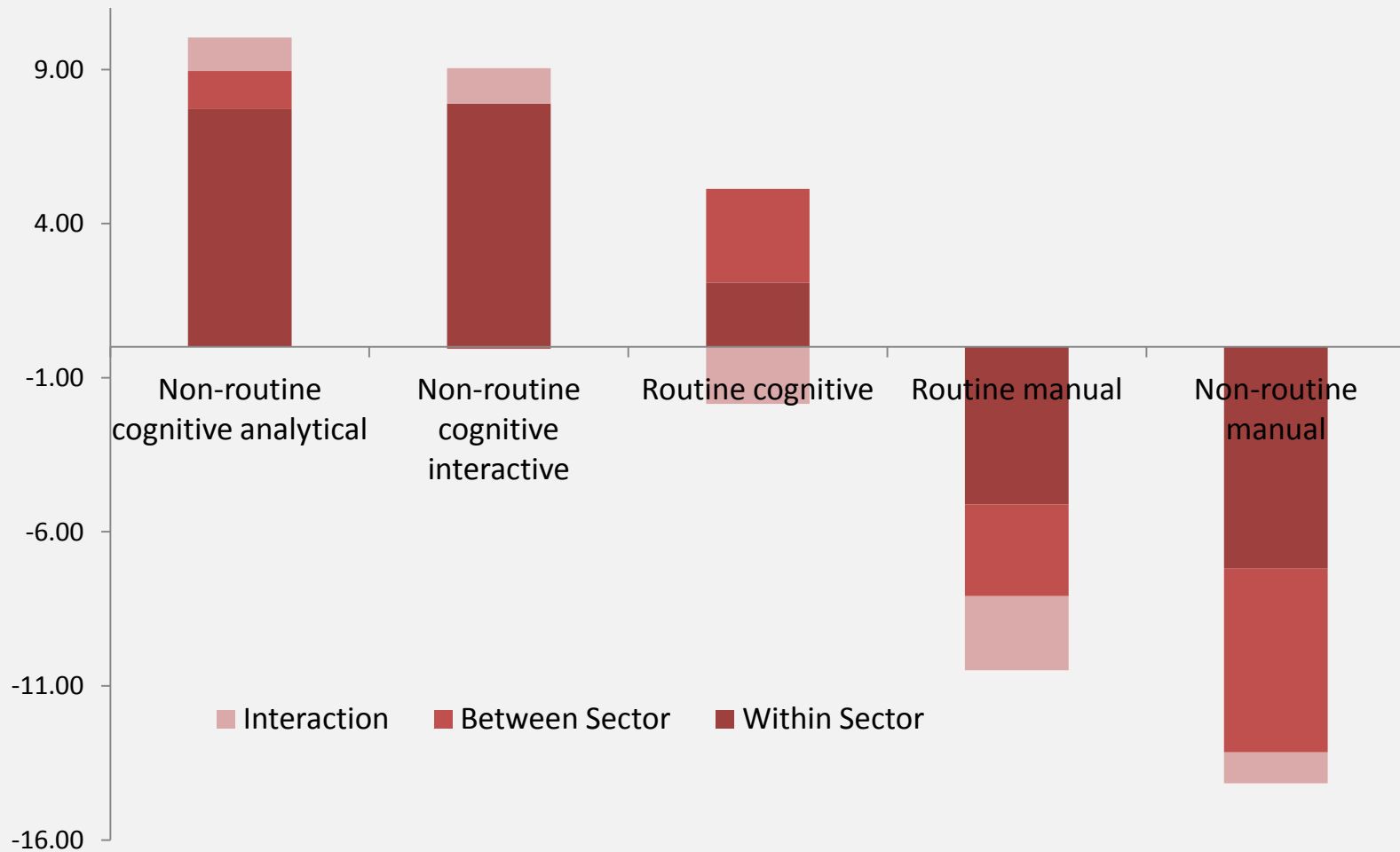
Social dimension of task content



Are weaker sections lagging behind?



Within sector change driving the non routine cognitive task content



Fixed effect regression of task content measures



	Non Routine Cognitive Analytical		Non Routine Cognitive Interactive	
	1	2	3	4
High Education Share	.029* (.003)	.004 (.005)	.029* (.004)	.005 (.006)
Medium Education Share	-.007 (.011)	.004 (.003)	-.007 (.012)	.003 (.002)
Total Factor Productivity		.013* (.002)		.012* (.003)
No. of Observations	42	42	42	42
Within R Square	.35	.62	.30	.55

*, **, *** significant at 1, 5 and 10 percent respectively. Estimation using Driscoll Kraay standard error.
Standard error in parenthesis

Fixed effect regression of task content measures



	Routine Cognitive		Routine Manual		Non-Routine Manual Physical	
	5	6	7	8	9	10
High Education	.002 (.003)	.001 (.004)	-.049* (.005)	-.053* (.006)	-.042* (.004)	-.041* (.006)
Medium Education	.009*** (.004)	.009** (.002)	-.053* (.002)	-.052* (.003)	-.037* (.005)	-.038* (.004)
Total Factor Productivity		.000 (.000)		-.001 (.003)		-.001 (.002)
No. of Observations	42	42	42	42	42	42
Within R Square	.02	.02	.57	.58	.56	.57

*, **, *** significant at 1, 5 and 10 percent respectively. Estimation using Driscoll Kraay standard error.
Standard error in parenthesis

Conclusion and Implications



- Significant change in task composition
- Technology driving the non-routine cognitive task components
- Routine cognitive task is holding in services and agriculture
- Complete De-Routinization in Manufacturing: Role of labour regulation?
- Learnability and Quality of education

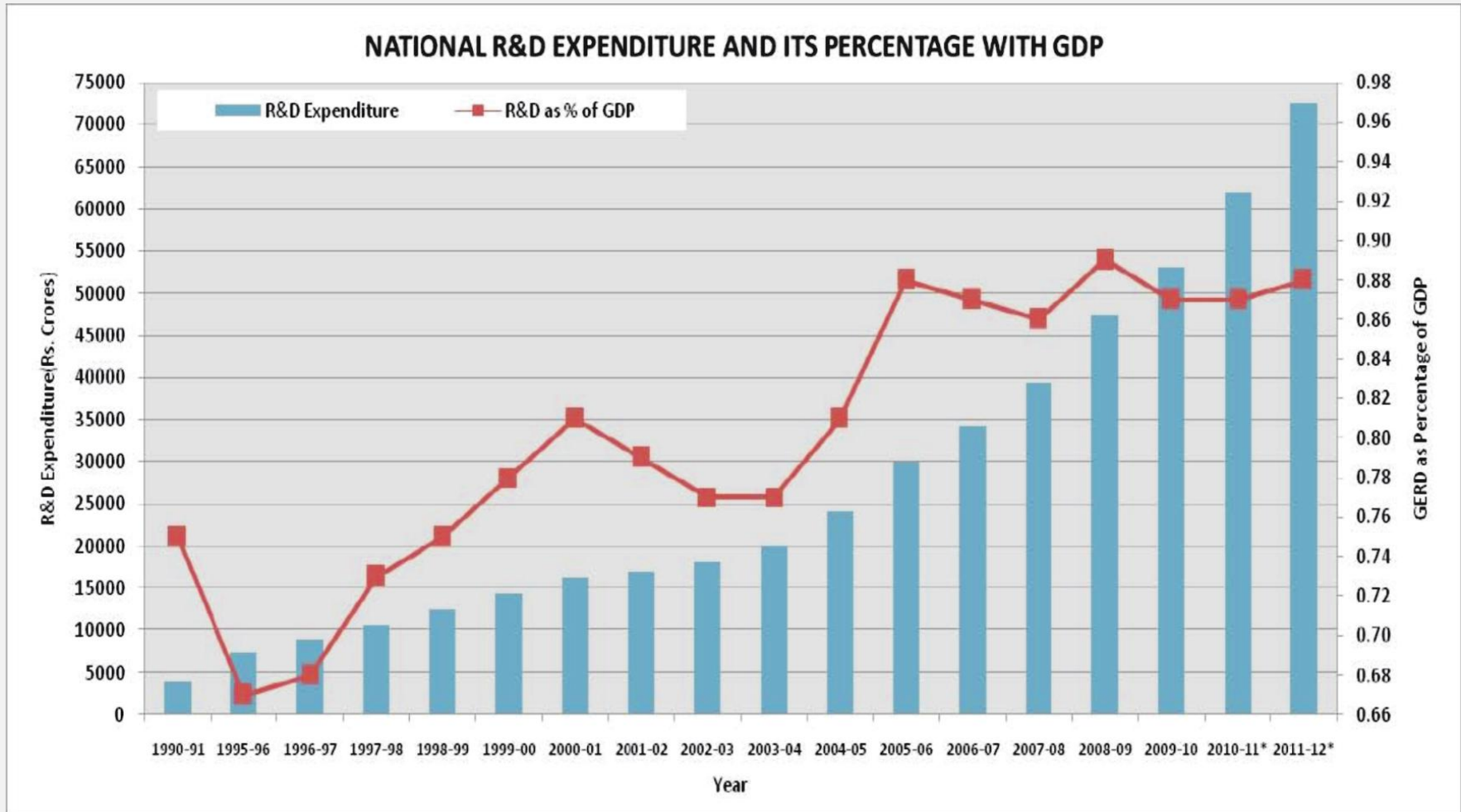


Thank you!

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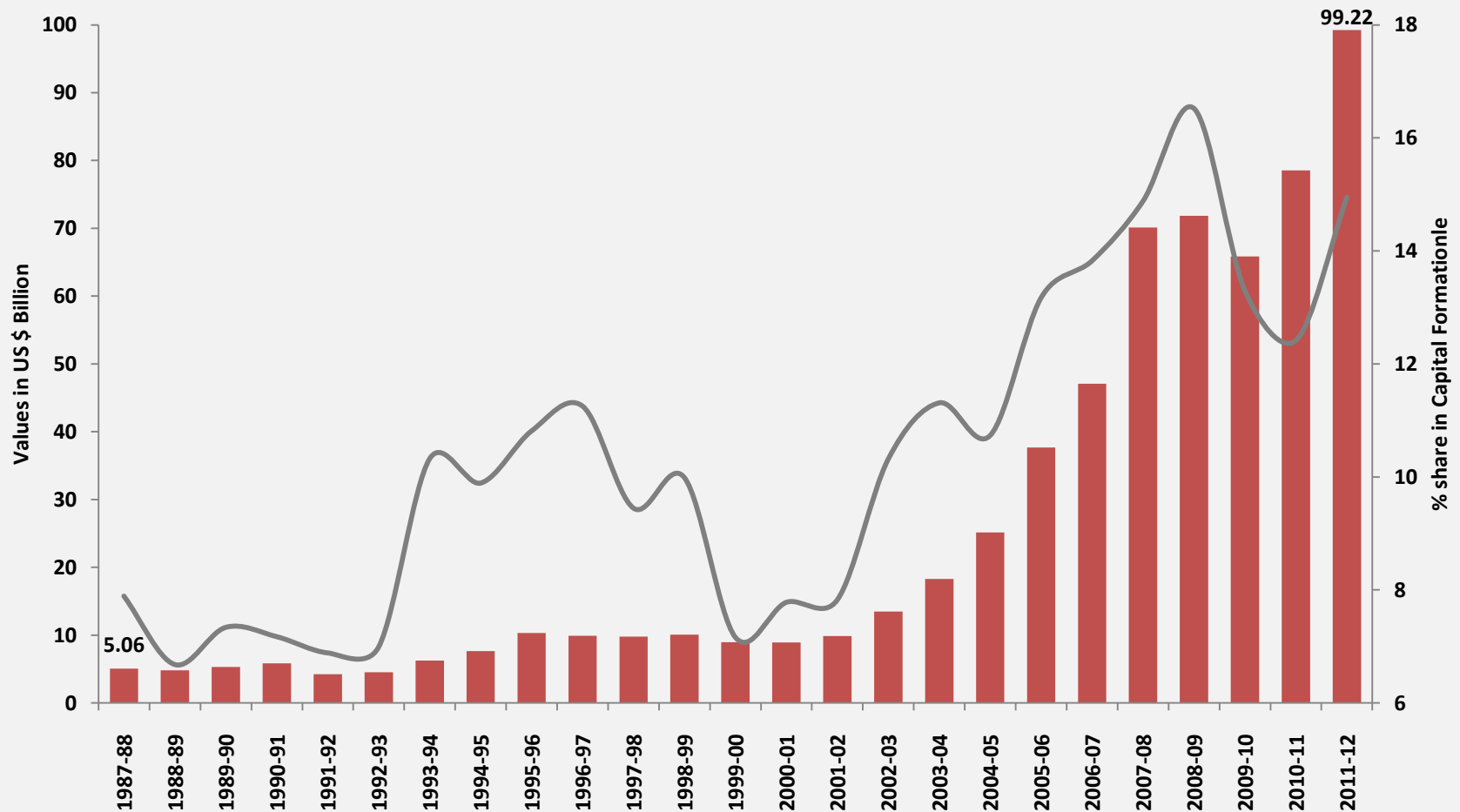
Research and Development Expenditure in India



Source: Department of Science and Technology, Government of India



Surge in Capital Imports



Source: Reserve Bank of India



Occupation structure



	1983-84	1993-94	1998-99	2009-10	20100-12
Legislator, senior officers and managers	1.13	1.95	2.90	5.17	6.76
Professionals	1.45	1.69	1.76	3.51	3.54
Technical and associate professionals	2.20	2.42	2.66	2.76	3.11
Clerks	1.66	1.72	1.75	1.77	1.88
Services, Shop and market sales workers	6.37	7.28	7.87	6.65	7.36
Skilled Agriculture and Fishery Workers	44.54	40.05	36.30	34.33	31.77
Craft Related Trade Workers	9.50	10.27	11.02	11.23	12.96
Plant and Machine Operator Workers	2.97	3.26	3.53	3.49	4.64
Elementary Occupations	29.82	30.92	31.27	30.60	27.78
Missing NCO Code	0.34	0.42	0.93	0.36	0.10

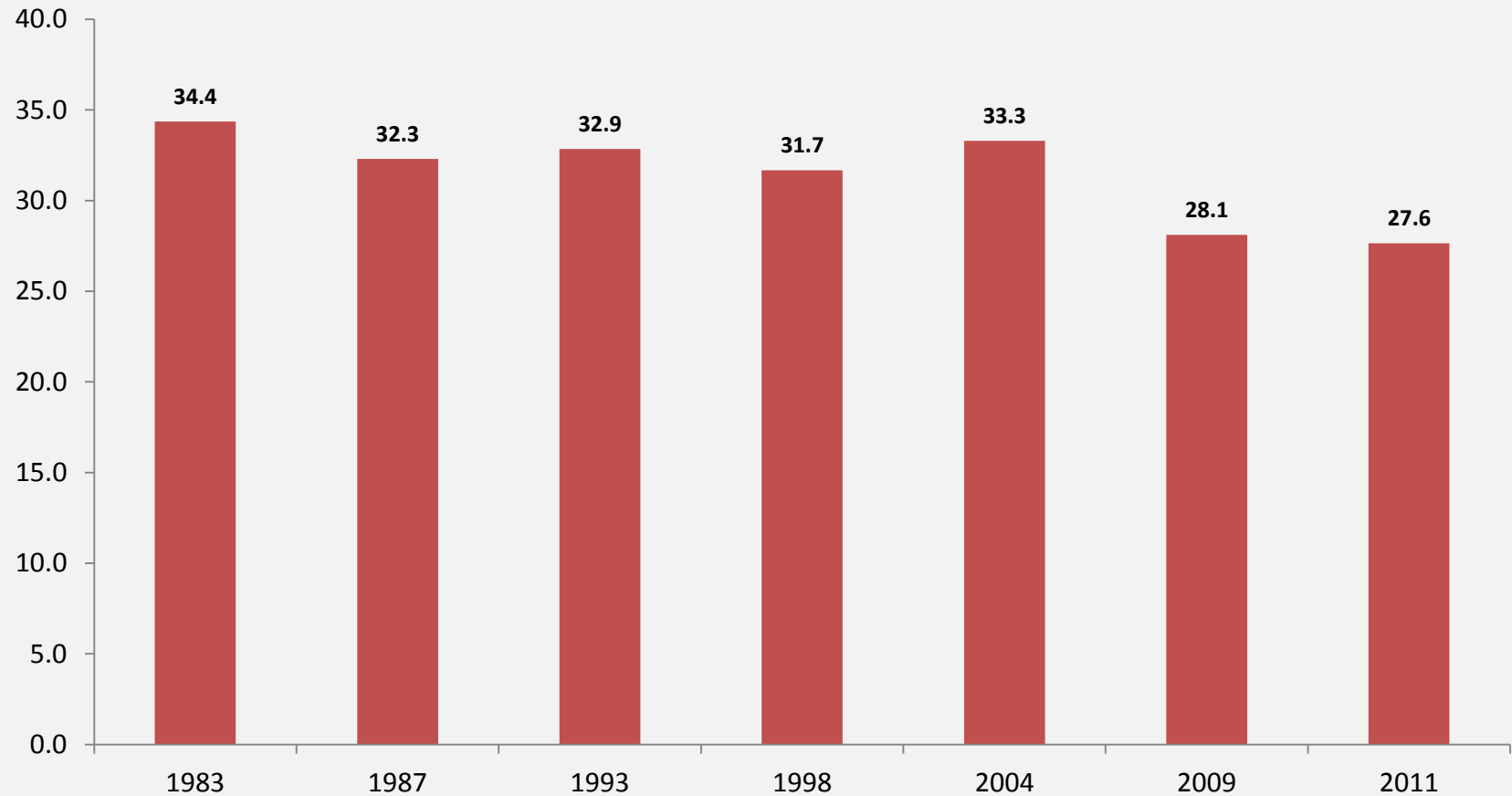
Source: Own calculation from NSSO data

Diagnostic test



		NRGA	NRGI	RC	RM	NRMP
Modified Wald Test Heteroskedasticity	Chi 2	22.33	11.34	129.46	75.86	455.99
	Prob. of Chi2.	0.0011	0.0485	0.0000	0.0000	0.0000
Breusch – Pagan LM Test for Cross Sectional Dependence	Chi 2	30.849	31.789	30.215	42.929	26.389
	Prob. of Chi2.	0.0092	0.0069	0.0112	0.0002	0.0341
Wooldridge Test for Serial Correlation	Chi 2	4.574	21.465	3.576	15.323	6.659
	Prob. of Chi2.	0.0855	0.0057	0.0872	0.0112	0.0494

Female Share in Employment



Source: Own calculation from NSSO data