



Technical Change and Task Content of Jobs in India

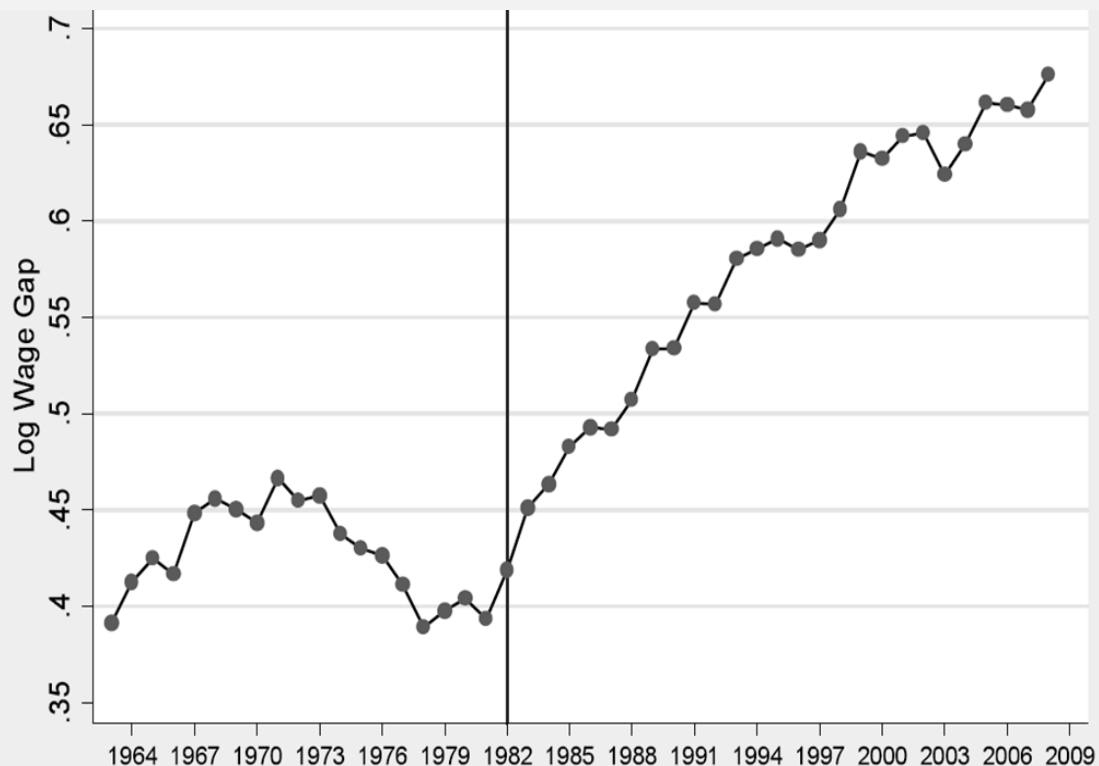
Pankaj Vashisht
Jay Dev Dubey



Trade, Technology and Skill Premium



- Globalization
- ICT Revolution



SBTC VS Task Models



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

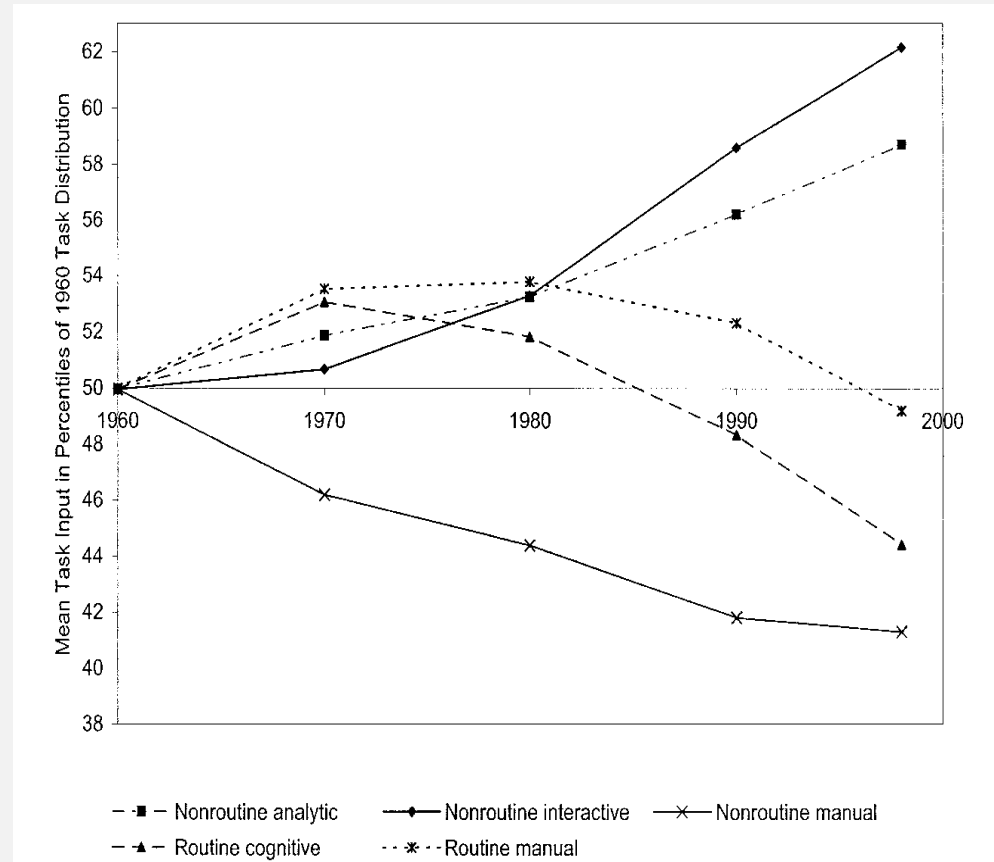


Figure reproduced from Autor, Levy and Murnane 2003

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)

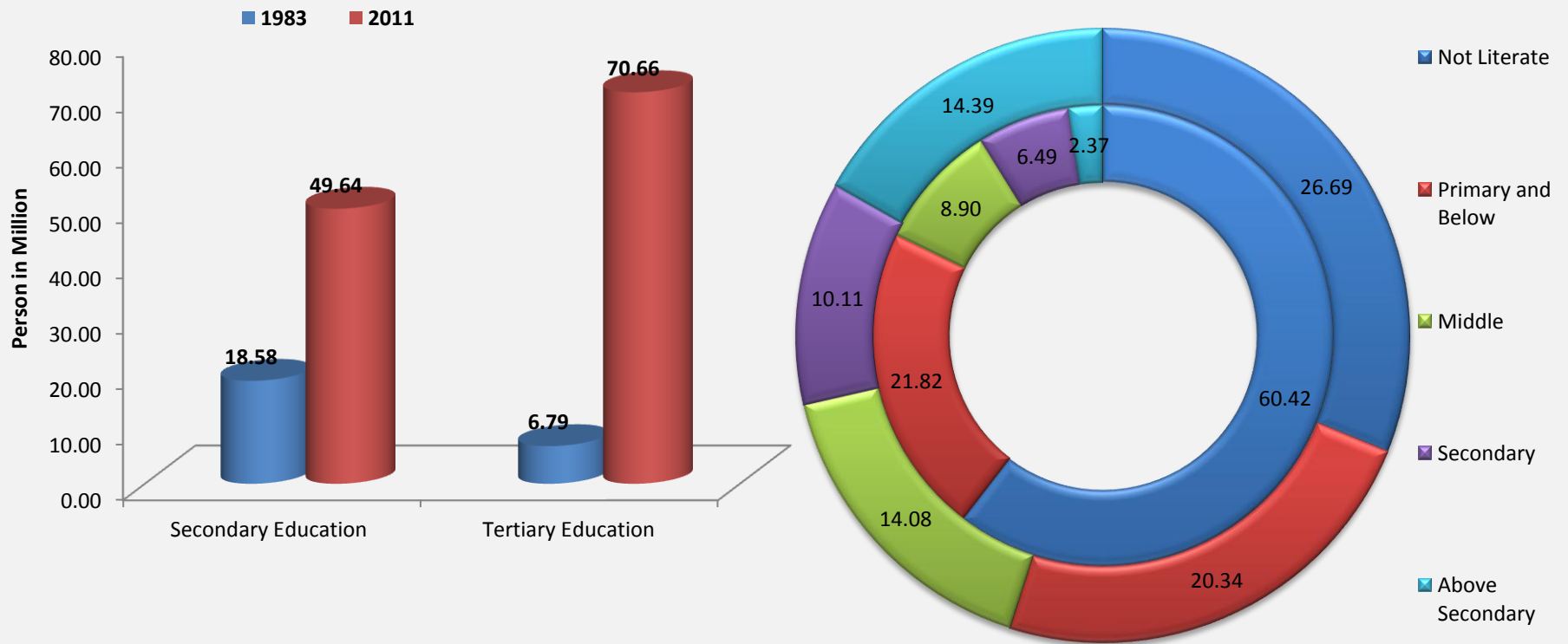
Technology up-gradation



- 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, 2014

NCO 1960
NCO 2004

O-Net SOC
SOC 2000
SOC 2010

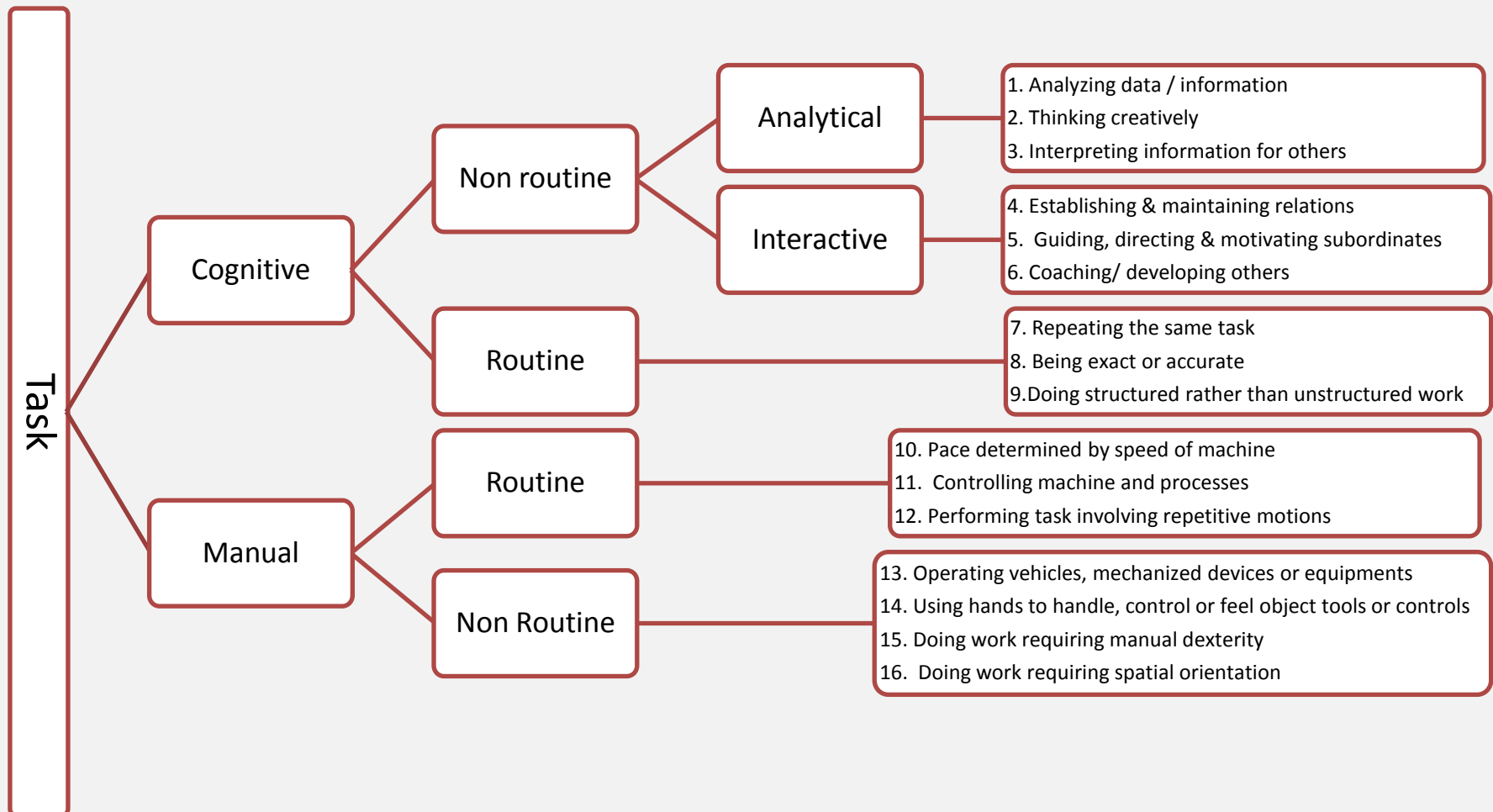
113 occupations
at 3 digit level

NSS data: some issues



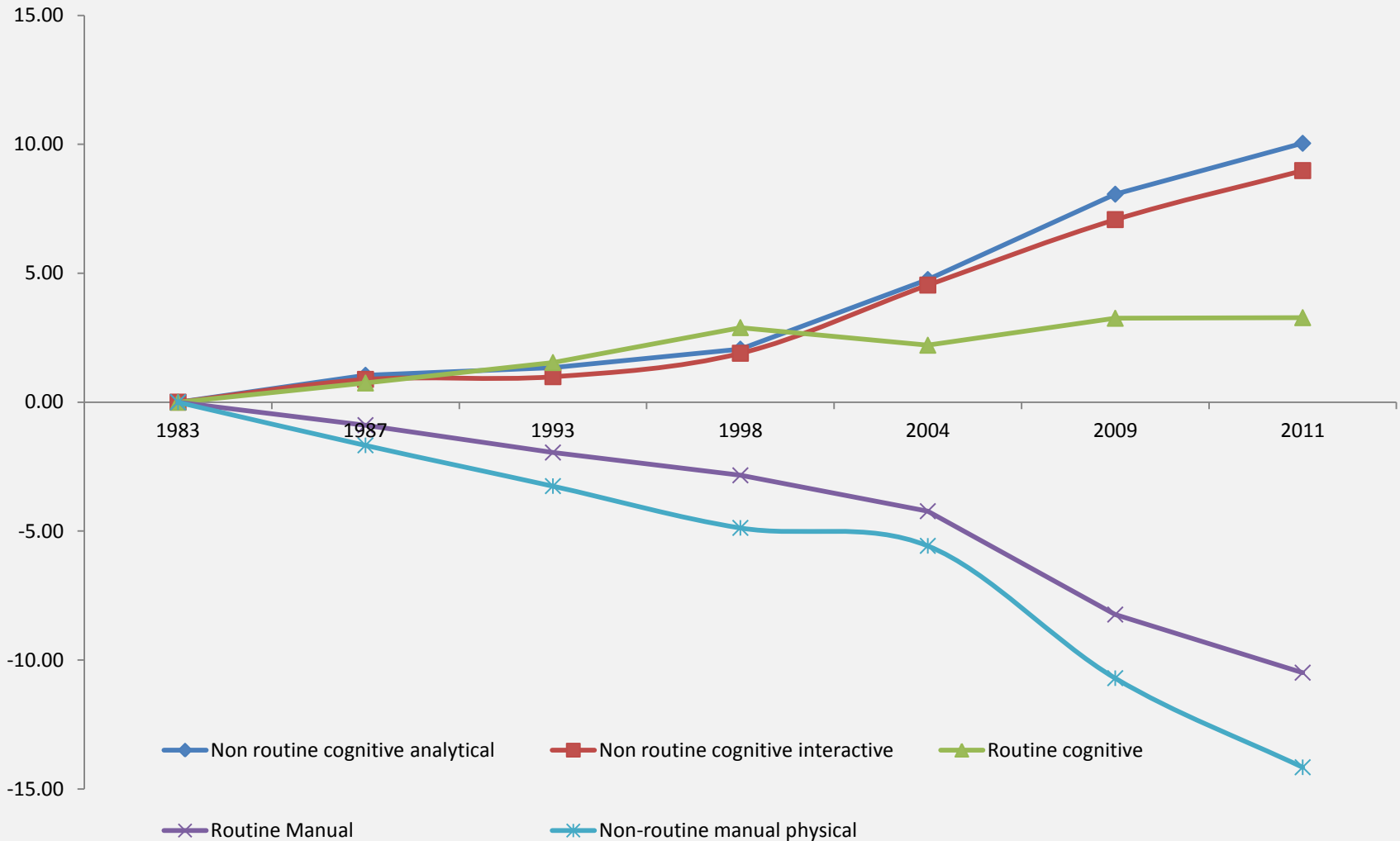
| | Missing NCO Code | | Wrong NCO | |
|--------------|---------------------|---------------------|---------------------|---------------------|
| | No. of Observations | Share in Employment | No. of Observations | Share in Employment |
| NSS Round 38 | 985 | 0.34 | 918 | 0.31 |
| NSS Round 43 | 9110 | 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

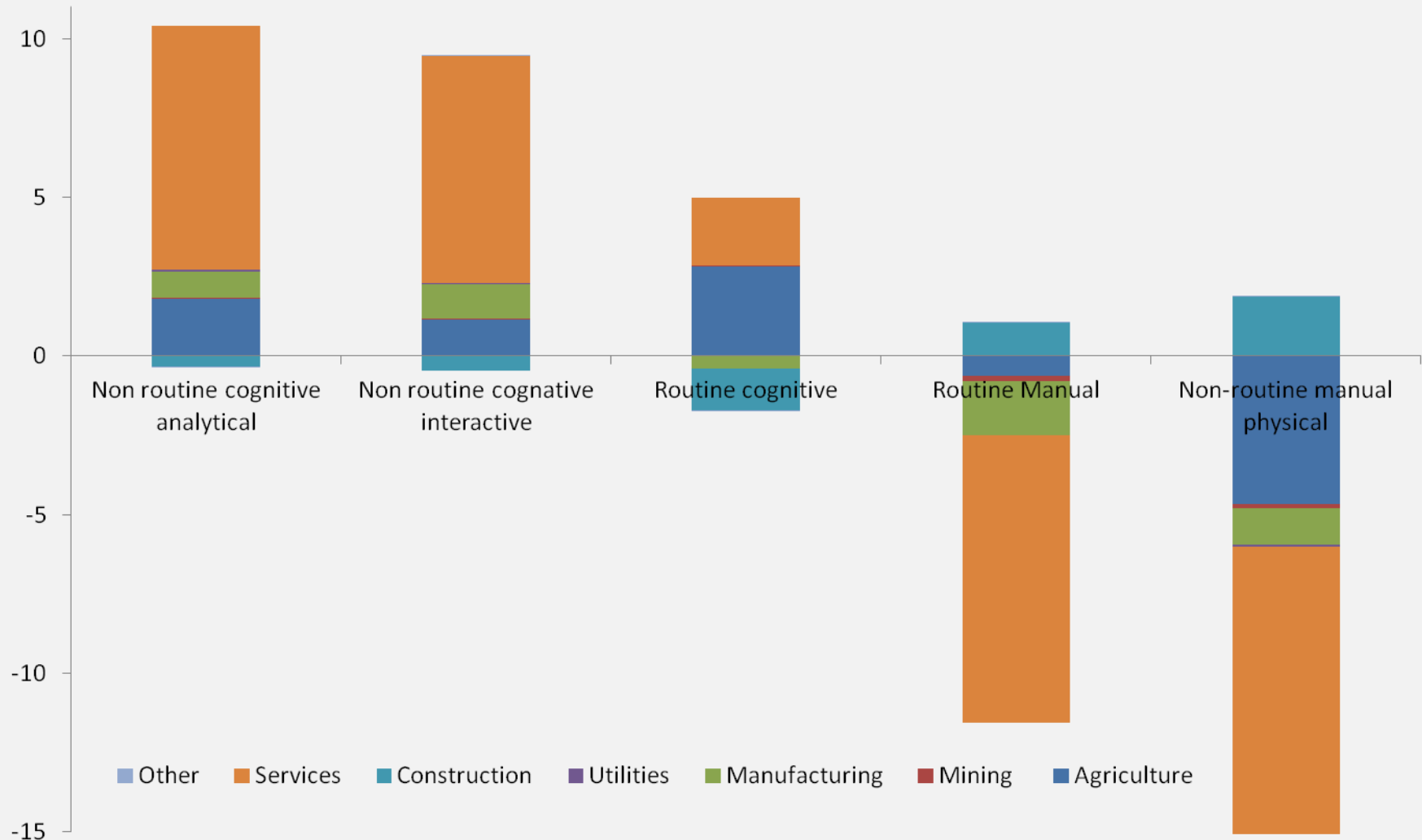


Source: Own compilation based on Autor, Levy and Murnane 2003

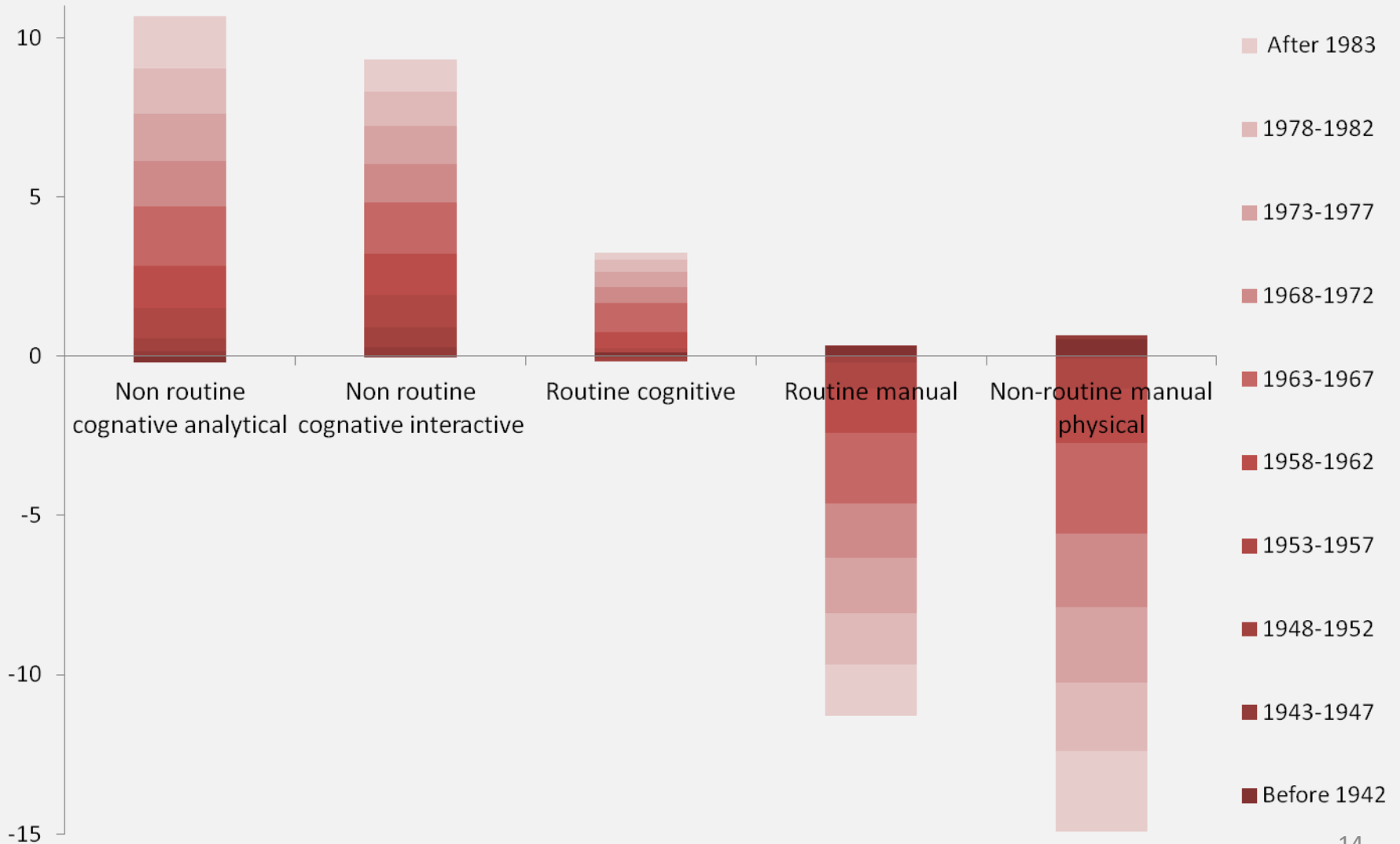
Task content of jobs in India



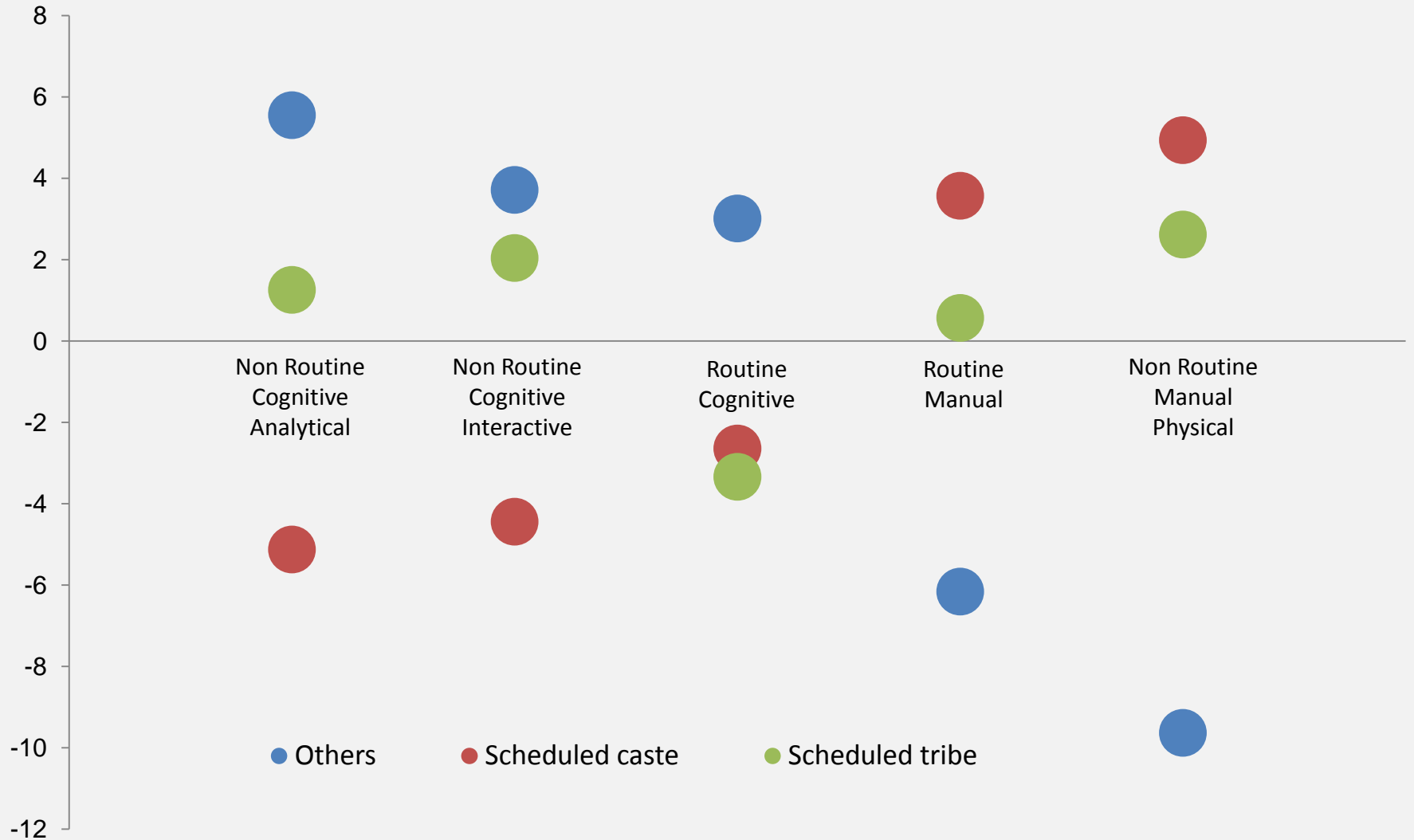
Services biggest contributor to change in task content



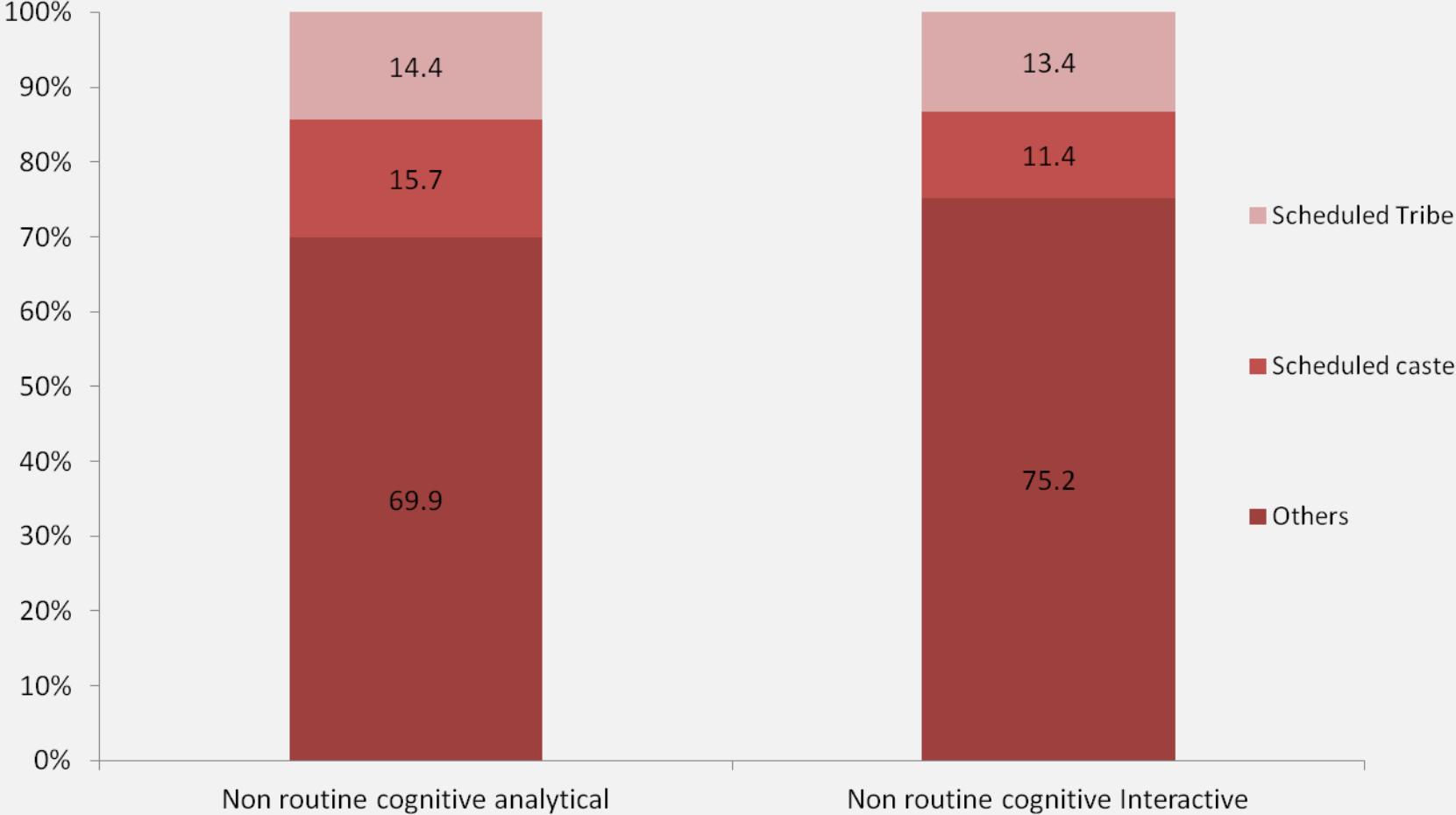
Task content by age cohort



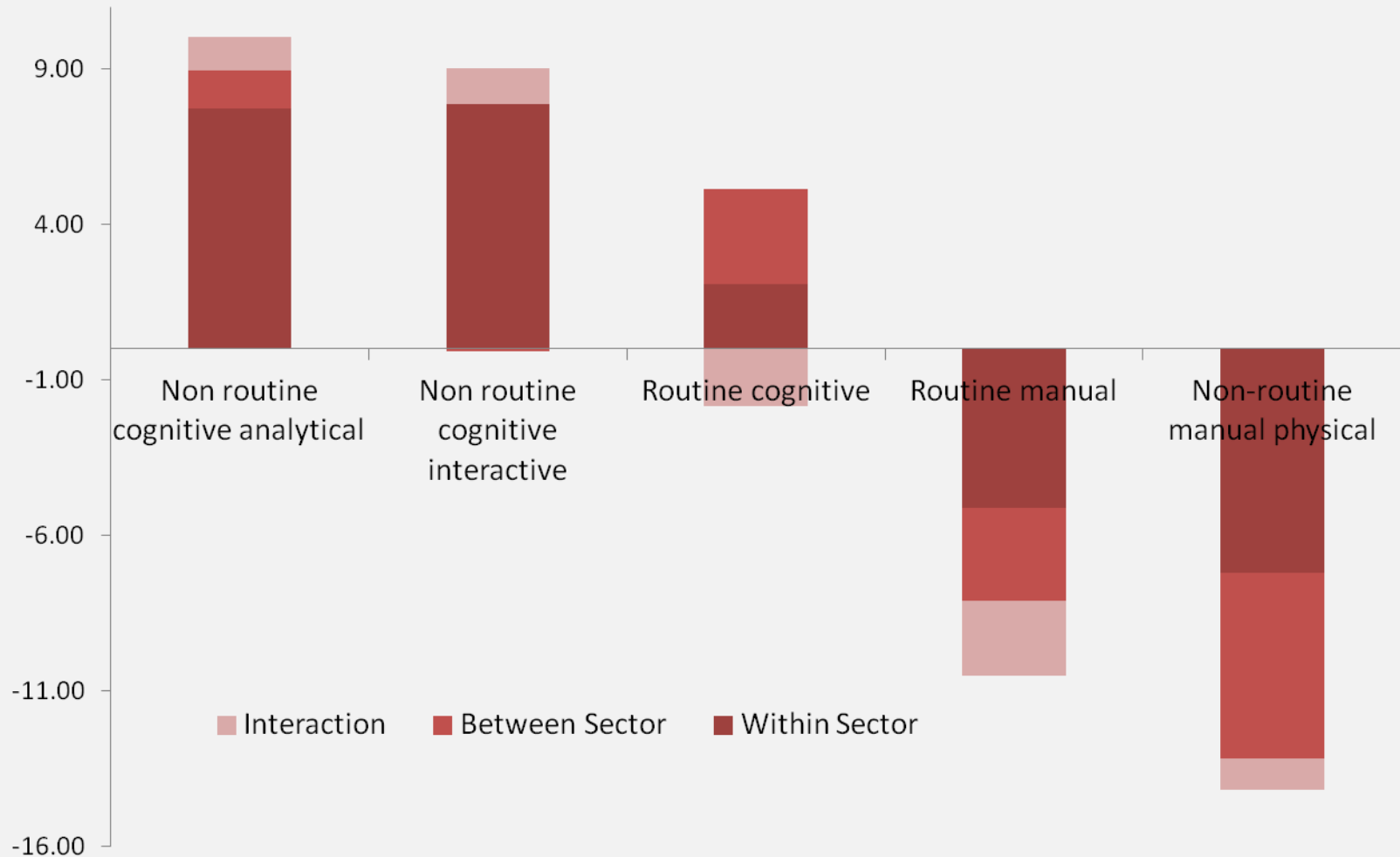
Social dimension of task content



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
- Risk of leaving weak behind
- Quality of education in public school
- Complete De-Routinization in Manufacturing: Role of labour regulation?

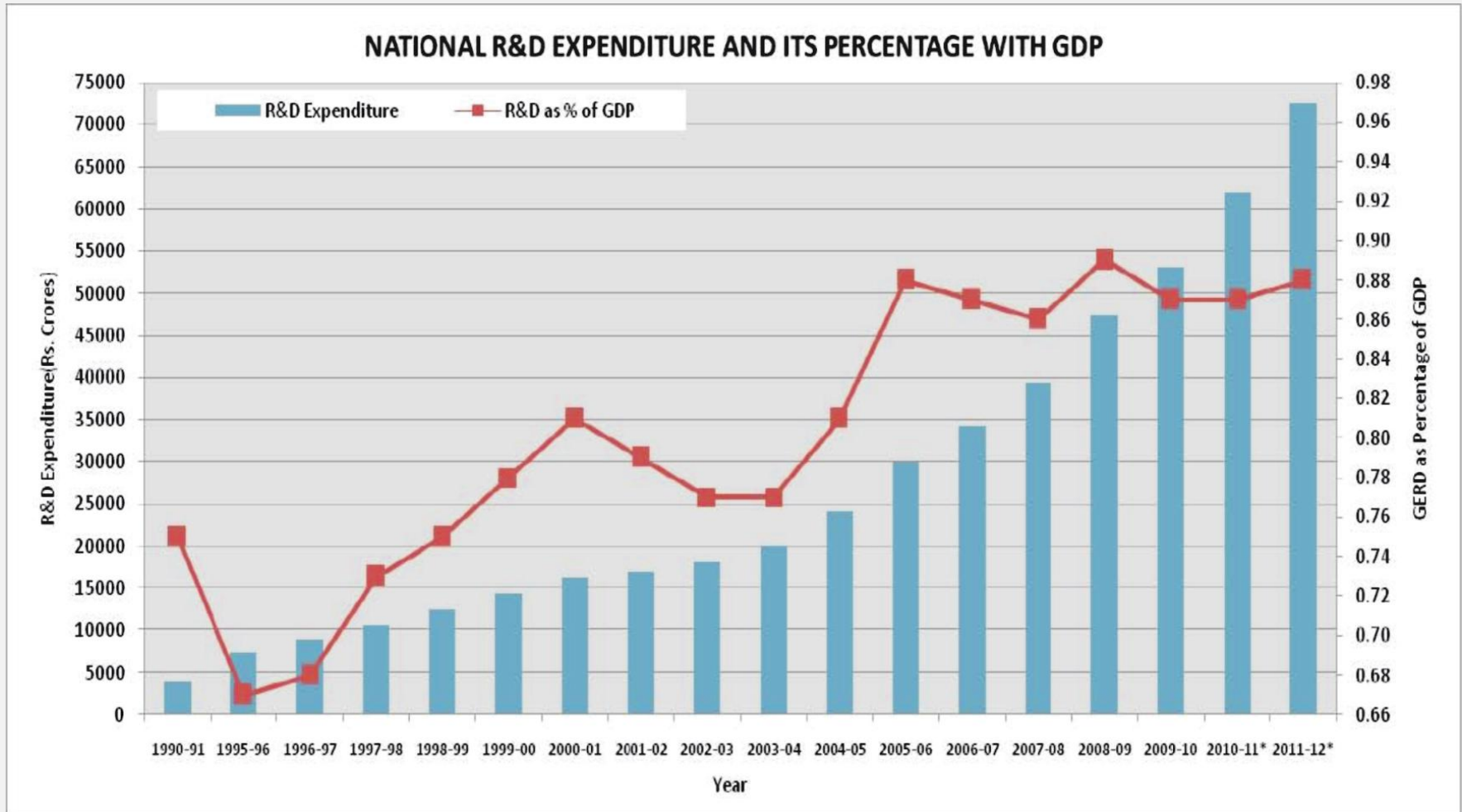


Thank you!

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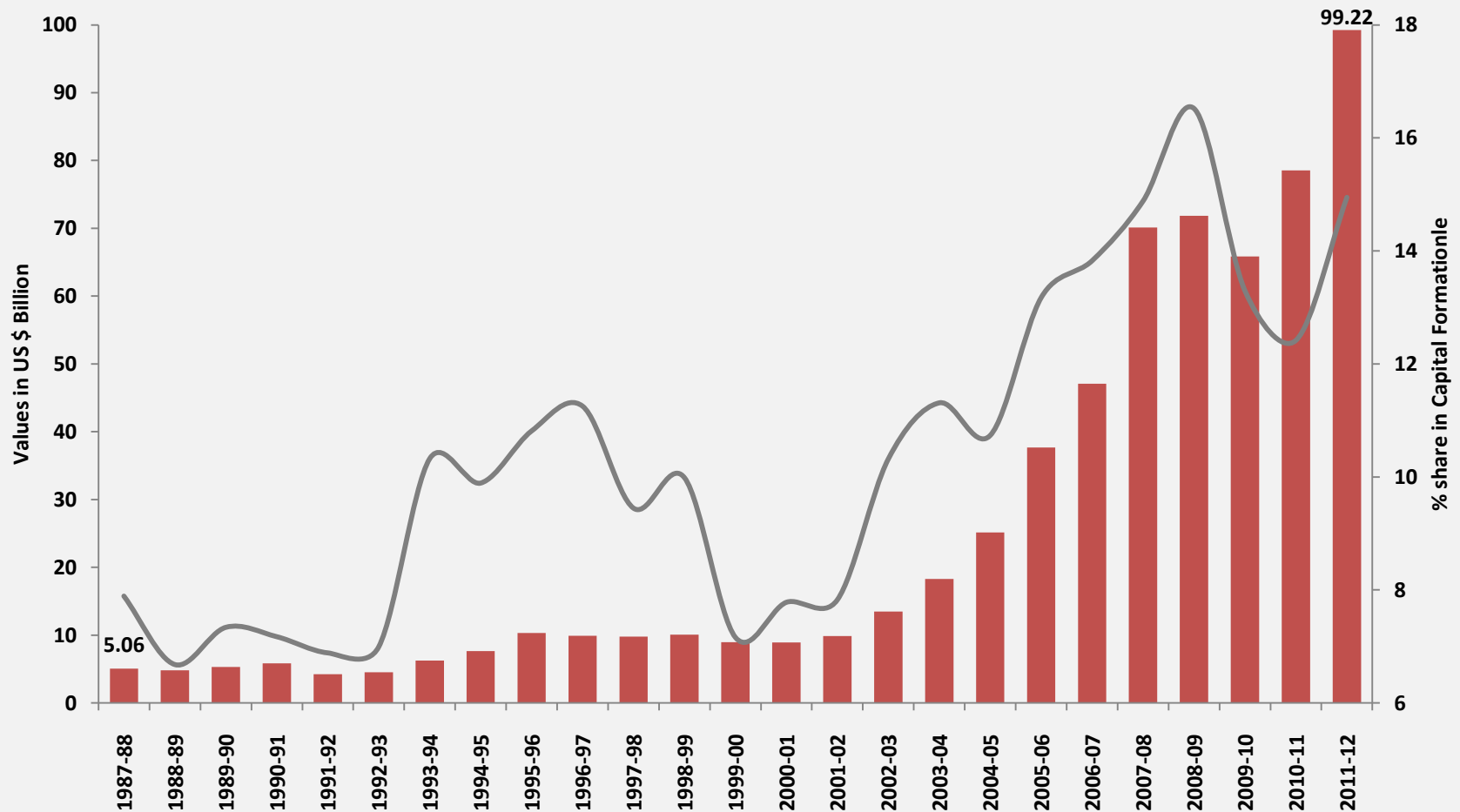
Research and Development Expenditure in India



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 |

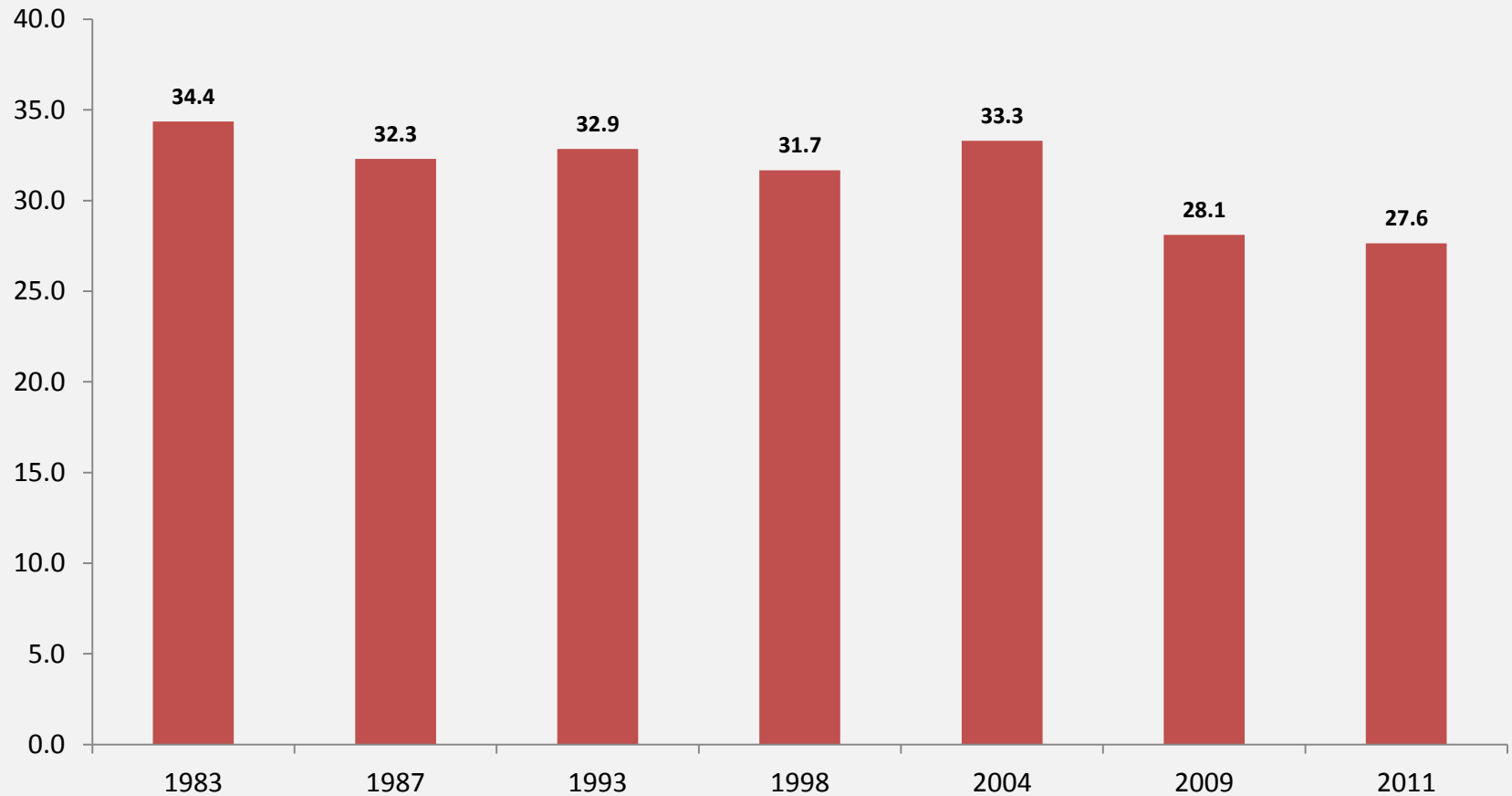
Source: Own calculation from NSSO data

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