TECHNOLOGY OR UPSKILLING? TRENDS IN THE TASK COMPOSITION OF JOBS IN CENTRAL AND EASTERN EUROPE

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We analyse the changes in the task content of jobs in the CEE countries between 1998 and 2013. We follow the approach of Acemoglu & Autor (2011). We find that the CEE countries saw similar trends of rising non-routine cognitive tasks, and a decreasing manual tasks, but they differed with regards to changes in the routine cognitive tasks. We assess the relative role played by education, technology and structural change in the development of task contents.

INTRODUCTION AND MOTIVATION

A **task** is a "a unit of work activity that produces output" (Acemoglu and Autor 2011). **Skills** are worker's abilities to perform various tasks. Workers need a range of skills to perform various tasks. In the US computerisation was associated with a decline in **routine manual** and **routine cognitive** tasks, growth in **non-routine cognitive** tasks, and hollowing-out of middle-skilled employment - **job polarisation** (Autor et al., 2003).

Non-routine cognitive (analytical and personal)	Routine cognitive or manual	Non-routine manual
• High-skilled workers • Abstract thinking, creativity, problem solving • Complementary to computers • Managers, designers, IT specialists	• Middle-skilled workers • Accuracy, following explicit rules • Computers may substitute for people in these tasks • Clerks, bookkeepers, assemblers	• Low-skilled workers • Situational adaptability, social interaction • Non replaceable by machines so far • Drivers, waiters, construction workers

Few studies investigated this issue in emerging countries. CEE especially interesting because of:

- Convergence to and integration with Western European countries
- Demand-side changes: Agriculture ↘ (especially in Poland, Baltic States and Romania), Services ↗, Manufacturing still quite large (deindustrialisation notable in Slovenia and Hungary)
- Supply-side changes: educational upgrading & rising number of graduates, especially in younger cohorts

METHODOLOGY AND DATA

- EU-LFS data for 10 CEE countries: Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. Our data cover period 1998-2013.
- EU-LFS merged with O*NET – US database which contains data on the task content of occupations. We use 2003 and 2014 editions of O*NET to catch the within-occupation changes at ISCO 3-digit level.
- Five task content measures (as in the Table above) after Acemoglu & Autor (2011).
- For each country, task contents are standardised over time.
- Panel fixed-effects regressions to analyse the relationship between tasks, education and technology.
- Shift-share decomposition to disentangle the structural, educational and occupational effects.

RESULTS

- **Increasing** non-routine cognitive tasks in all countries (similar to the US and EU15)
- **Plunging** manual tasks in all countries (similar to the US and EU15)
- **Rising** routine cognitive tasks in most countries (contrary to the US and EU15)

Figure 1. Evolution of the task content of jobs in the CEE countries, 1998-2013, weighted average

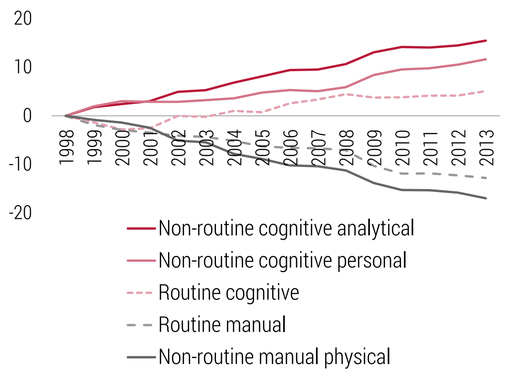
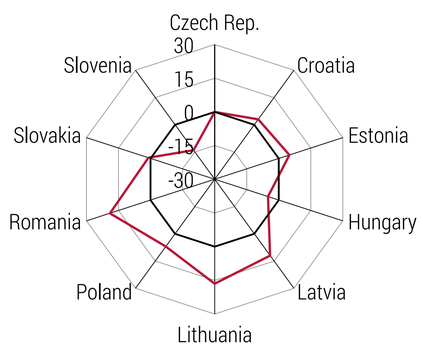


Figure 2. The change of routine cognitive tasks in the CEE countries between 1998 and 2013



RESULTS (CONTINUED)

What were the interactions between the evolution of tasks, and education and technology?

Workforce upskilling

- positively related to non-routine cognitive tasks
- negatively related to manual tasks
- no relationship with routine cognitive tasks

Technology (proxied by R&D)

- positively related to non-routine cognitive tasks
- negatively related to manual tasks (only routine)
- no relationship with routine cognitive tasks

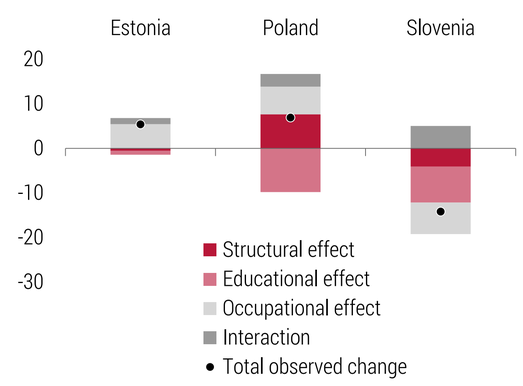
Table 1. Panel fixed-effects regressions of task content measures in CEE, 1998-2012

	Non-routine cognitive analytical	Non-routine cognitive personal	Routine cognitive	Routine manual	Non-routine manual physical
Share of persons with tertiary education	1.49***	0.82***	0.74	-1.18***	-1.74***
Share of persons with secondary education	0.71***	0.01	0.60	-0.33	-1.17*
R&D spending / GDP	3.73*	3.04*	-4.71	-3.01*	-1.81
R^2 (between/within)	0.01/0.84	0.01/0.75	0.03/0.20	0.00/0.8	0.04/0.82

So what were the main forces shaping routine cognitive tasks in CEE region?

- Structural changes and occupational changes
- Routine cognitive tasks **grew** most in countries where agriculture shrank strongly (Poland, Latvia)
- Routine cognitive tasks **declined** only in countries that deindustrialised (Hungary, Slovenia)
- Workforce upgrading **compressed** the routine cognitive tasks
- Structural change also raised the non-routine cognitive tasks, but to a smaller extent

Figure 3. The shift-share decomposition of routine cognitive tasks change , 1998 to 2013.



CONCLUSIONS

- Growth of non-routine cognitive tasks and decline of manual tasks in Central & Eastern Europe
- Prevailing increase in routine cognitive tasks
- Changes largely attributed to workforce upskilling
- Structural change most important for the rise of routine cognitive tasks
- Technology (R&D) was positively and significantly correlated with the intensity of non-routine cognitive tasks, and negatively with the intensity of routine manual tasks
- No significant relationship between technology and routine cognitive tasks

REFERENCES

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2. Autor, D., Levy, F., Murnane, R., The Skill Content of Recent Technological Change: An Empirical Exploration. Quarterly Journal of Economics 118, 4, 2003