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Technology, skills, and the changing nature of work

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1. Introduction

Understanding the impact of technological progress and globalisation on the labour market has been one of the most flourishing and policy-relevant fields of labour economics since the early 2000s. Technological advancements such as automation and artificial intelligence have led to the automation of routine jobs, creating a shift in demand for skills in the labour market (Autor, 2019; Autor et al., 2003; Spitz-Oener, 2006). This shift has led to a growing demand for workers with skills conducive to performing non-routine cognitive and social tasks (Deming, 2017). In addition, globalisation has increased competition in the labour market, leading to outsourcing jobs to lower-wage countries (Hummels et al., 2018). In developed countries, these forces led to job polarisation and widened wage inequality (Autor et al., 2006; Goos et al., 2014). However, past research has focused mainly on the most developed countries. Moreover, it studied labour market outcomes and skills mainly through the lens of occupations, usually assuming that occupations are identical worldwide and can be quantified with the US data. This assumption is almost certainly problematic for less developed countries, given significant differences in workers' skills, technologies, and economic activities, which leads to large labour productivity differences across countries (Eden and Gaggl, 2020; Hsieh and Klenow, 2010). Moreover, globalisation is expected to lead to outsourcing routine-intensive tasks from high-wage to low-wage countries (Grossman and Rossi-Hansberg, 2008; Hummels et al., 2018). Structural changes such as industrialisation and the growth of services alter the demand for goods and services, which alter the demand for different types of jobs (Bárány and Siegel, 2018). Finally, poorer countries' labour force is often much less educated, which could influence the optimal assignment of routine and non-routine tasks (World Bank, 2019).

The five articles in this thesis discuss various aspects of the changing nature of work and job tasks in Europe and globally, making two key contributions. First, they study countries across the development spectrum, both in Europe and worldwide, providing a much richer and more nuanced view of labour market effects of technological progress, globalisation, and changes in the skill supply. Second, using survey data, they develop new methodologies to measure the task content of work at a worker level in various countries. They also establish new stylised facts on the global division of labour and show the contribution of worker tasks to wages.

I am a principal investigator in all articles. My contribution includes conceptualisation, methodology, analysis, and writing. All articles involve co-authors who also contributed to these aspects. Articles three and four required survey data collection in China, and involved co-authors oversaw these data collection efforts. Articles three to five include international co-authors. The collaborative process contributed to scientific excellence by identifying blind spots, enhancing the reliability and validity of the findings, and ensuring the overall scientific rigour of the research. This facilitated publishing articles in leading field journals such as the World Bank Economic Review (top 5 in development economics) and Labour Economics (top 5 in labour economics). Importantly, my contribution was instrumental in designing, conducting, writing, and publishing all articles. None of them would have been published without my involvement.

2. Theoretical and empirical background

The transition from routine work to non-routine work is a common trend in developed countries (Acemoglu and Autor, 2011). It has been attributed to the 'routine-biased technological change' hypothesis (RBTC), which argues that recent technological progress has increased demand for high-skilled workers who can perform non-

routine cognitive work (which to date cannot be replaced by machines, for instance, architects, IT specialists, managers), while it has decreased the demand for middle-skilled workers performing routine work (already replaceable by machines, for instance, bookkeepers, clerks, assemblers). It also indirectly increases employment in simple yet unstructured jobs (for instance, drivers, waiters and waitresses, hairdressers). Understanding these changes is critical to ensuring that workers are equipped with the skills they need to remain competitive in the labour market and to support the growth of industries that drive economic growth.

The dominant approach in the literature on developed countries is to use the methodologies proposed by Autor et al. (2003) or Acemoglu and Autor (2011). These approaches distinguish between three (abstract, routine, manual) or five work contents (non-routine cognitive analytical, non-routine cognitive interpersonal, routine manual, non-routine manual). They are operationalised with the US data on occupations: the Dictionary of Occupational Titles (DOT) dating back to 1939, and since 2003 through the Occupation Information Network (O*NET). These databases provide detailed, periodically updated descriptions of the specific tasks associated with each occupation in the US. These descriptions combine expert assessments and survey inputs. The task content measures combine several descriptions of job demands in particular occupations.

This operationalisation complements the theoretical arguments on how modern technologies affect the demand for labour. On the one hand, technologies based on algorithms, such as software or industrial robots, substitute people in performing structured, repetitive activities – routine tasks. On the other hand, they complement people in creative and interpersonal activities – non-routine tasks. Several studies used this approach successfully to shed light on the evolution of occupational structures, unemployment dynamics, and wage polarisation in the US and other developed countries (Autor et al., 2003; Cortes, 2015; Fonseca et al., 2018; Goos et al., 2014). Most existing research on the task content of jobs is focused on the most developed OECD countries, while studies of emerging economies are rare. Aedo et al. (2013) showed that, between the early 1990s and the middle 2000s, non-routine cognitive tasks grew at the expense of manual tasks in seven emerging economies worldwide. Hardy et al. (2016) found that the cognitive task content of jobs, especially the non-routine one, has increased in Poland, while the manual task content has declined.

However, cross-country studies covering a range of emerging or transition economies, and using methodologies like those in the seminal studies of the developed economies, were lacking. The first two articles in this thesis fill this gap by applying O*NET measurements to European countries, including in Central and Eastern Europe.

In recent years, the emergence of survey data on adult skills, skill use at work, and task demand, has enabled measuring the task content of jobs worldwide. These survey databases are:

- the Survey of Adult Skill within the OECD's Programme for the International Assessment of Adult Competencies (PIAAC), covering high- or middle-income countries,

- the World Bank's Skills toward Employment and Productivity (STEP) surveys, conducted in middle- and low-income countries,

- the China Urban Labor Survey (CULS), collected by the Institute of Population and Labor Economics of the Chinese Academy of Social Science; CULS included a module based on STEP.

Three articles in this thesis developed approaches to measure country-specific, worker-level job tasks using these harmonised survey data.

3. Aims, research questions and hypotheses

Technological progress and globalisation have brought about significant changes in the labour market. Automation has become increasingly prevalent, displacing many jobs that humans once did. This trend has particularly affected routine jobs, which can be easily automated. At the same time, non-routine jobs, especially those that require complex cognitive skills, have become more valuable in the labour market. Additionally, globalisation has enabled outsourcing jobs to countries with cheaper labour, which has further impacted the labour market. However, most studies focused on the most developed countries with high technology adoption, which tend to offshore jobs. They assumed that occupational task demands are identical to those in the US.

This thesis addresses two critical knowledge gaps on the effects of technological progress and globalisation on the labour market. First, it studies a wide set of countries across the development level, establishing new facts on the labour market developments also in countries that lag in technology adoption and tend to receive offshored jobs, but also have lower levels of skill supply. It also accounts for worker heterogeneity, primarily related to age. Second, it develops new methodologies to measure job country-specific, worker-level task content, quantifying cross-country differences in task demand in seemingly identical occupations worldwide and assessing the contribution of technology, skill supply, and globalisation to these gaps. It also evaluates the role of worker heterogeneity in job tasks for earnings.

Specifically, the articles in this thesis answer five research questions:

RQ1. Is the evolution of the task content of jobs in a group of Central Eastern European upper-middle income countries consistent with trends observed in the most advanced economies and often attributed to the RBTC, and what is the role of skill upgrading, occupational, and structural change in this process?

RQ2. Are there substantial differences between younger and older workers in de-routinisation of jobs, and its implication for unemployment risk?

RQ3. How to measure routine task intensity using survey data around the world? What is the role of technology, skill supply, globalisation for cross-country differences in the task content of work?

RQ4. Are less developed countries converging to the high-income countries regarding routine task intensity of jobs and their role in the global provision of routine and non-routine work?

RQ5. What is the role of worker-task for earnings, and how labour market institutions mediate it?

I formulate five hypotheses that pertain to particular research questions:

H1. The evolution of the task content of jobs in a group of Central Eastern European upper-middle income countries differs from trends observed in the most advanced economies. Different pattern of structural change play a significant role in this process.

H2. There are substantial differences between younger and older workers in the de-routinisation of jobs, with younger workers experiencing larger shift from routine to non-routine work, and stronger increases in the unemployment risk related to routine task intensity of jobs.

H3. Survey data can be used to measure routine task intensity worldwide and quantify cross-country differences in occupational tasks. Cross-country differences in technology use, skill supply, and participation in globalisation contribute to cross-country differences in the task content of work.

H4. Less developed countries are barely converging to high-income countries in terms of routine task intensity in jobs and remain the main provider of routine work.

H5. Performing more abstract, less routine, and less manual intensive tasks is associated with higher earnings, both between and within occupations, while labour market institutions mediate this relationship.

4. Data and methods

4.1. Data and measurements

All articles collected in this thesis combine microdata from labour force surveys with other data sets that quantify worker tasks, exposure to technology (industrial robots), globalisation (backward and forward participation in global value chains).

The first two papers use the EU Labour Force Survey microdata for 1999-2018. They combine them with the Occupational Information Network (O*NET) database as a source of information on the task content of occupations, merge with individual EU-LFS data based on occupations. Two distinct editions of O*NET (2003 and 2014) account for possible changes in the task content within occupations.

All articles apply the widely used task approach of Autor et al. (2003) and Acemoglu and Autor (2011) based on O*NET data and distinguish five tasks: non-routine cognitive analytical, non-routine cognitive interpersonal, routine cognitive, routine manual and non-routine manual physical. Table 1 presents the specific definitions.

Table 1. Set of O*NET items, used in Acemoglu and Autor (2011) task contents measures

Task content measure (T)	O*NET task items (J)
Non-routine cognitive analytical	Analysing data/information
	Thinking creatively
	Interpreting information for others
Non-routine cognitive interpersonal	Establishing and maintaining personal relationships
	Guiding, directing and motivating subordinates
	Coaching/developing others
Routine cognitive	The importance of repeating the same tasks
	The importance of being exact or accurate
	Structured vs. unstructured work
Routine manual	Pace determined by the speed of equipment
	Controlling machines and processes
	Spending time making repetitive motions
Non-routine manual	Operating vehicles, mechanised devices, or equipment
	Spending time using hands to handle, control or feel objects, tools or controls
	Manual dexterity
	Spatial orientation

Source: own elaboration based on Acemoglu and Autor (2011).

The next three papers take advantage of recent advancements in the collection of data on adult skills, skill use at work, namely the OECD's Programme for the International Assessment of Adult Competencies (PIAAC), which covers high- or middle-income countries, the World Bank's Skills toward Employment and Productivity (STEP)

surveys, which covers middle- and low-income countries, and the China Urban Labor Survey (CULS), collected by the Institute of Population and Labor Economics of the Chinese Academy of Social Science; which included a module based on STEP. The final country sample includes 47 countries.

The third article develops harmonised task measures of non-routine cognitive analytical, non-routine cognitive interpersonal, routine cognitive, and manual tasks (Table 2) and routine task intensity (RTI). This composite measure increases with the importance of routine work content and decreases with the significance of non-routine content.[1] These measures are consistent with the Acemoglu and Autor (2011) measures based on the O*NET data, ensuring that the concept of the routine intensity of work as measured with survey data is in line with that in past literature on developed countries (Acemoglu and Autor, 2011; Autor and Handel, 2013). The critical difference is that the survey-based measure allows for quantifying differences in occupational task demand across countries. The fourth article expands on these survey-based task measures to predict RTI measures for countries which do not have the required survey data yet. It also merges them with ILO occupational employment structure data to study the evolution of routine task intensity and the distribution of routine and non-routine work across 87 countries that cover 75% of global employment.

The fifth article uses PIAAC worker-level data to study the relationship between worker- and occupation-level task contents, and earnings.

Table 2. Survey task items from PIAAC selected to calculate task content measures consistent with O*NET occupation task measures

Task content	Non-routine cognitive analytical	Non-routine cognitive interpersonal	Routine cognitive	Manual
Task items	Solving problems Reading news (at least once a month) Reading professional journals (at least once a month) Programming (any frequency)	Supervising others Making speeches or giving presentations (any frequency)	Changing order of tasks – reversed (not able) Filling out forms (at least once a month) Making speeches or giving presentations – reversed (never)	Physical tasks

Notes: the cut-offs for the 'yes' dummy are in parentheses. See chapter 3 for more detail on the full wording of questions, the definitions of cut-offs, and the criteria for selecting task items.
Source: own elaboration.

4.2. Methodology

All articles in this thesis combine statistical methods, such as shift-share decompositions, and econometric methods. Econometric methods include OLS regressions, logistic regressions, wage regressions (Roy, 1951), and regression-based decompositions of of outcome variable variance using a covariance-based procedure (Morduch and Sicular, 2002). All articles that use PIAAC and STEP data account for the fact that PIAAC and

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[1] Formally, $RTI = ln(r_{cog}) - ln\left(\frac{nr_{analytical} + nr_{personal}}{2}\right)$, where r_{cog}, $nr_{analytical}$ and $nr_{personal}$ are routine cognitive, non-routine cognitive analytical, and non-routine cognitive personal task levels, respectively.

STEP include multiple plausible values of the literacy proficiency variables. To this aim, the Rubin (1987) combination methods which are commonly used in the skill assessment literature, are implemented.

5. Results

Across the five articles, there is a consistent finding of a shift away from routine and manual work towards non-routine cognitive work, with technological change being a key driver of this trend. The articles also examine differences across countries in the content of work within occupations and find that workforce upskilling and changes in economic structure are important factors in explaining these differences. There is also evidence that the shift away from routine work has been slower in low- and middle-income countries compared to high-income countries, which has widened the nature of work gaps. Finally, the studies highlight the importance of task heterogeneity in explaining wage differences within and across countries.

5.1. Educational upgrading, structural change and the task content of jobs in Europe

This paper studies the evolution of job task content and the structural forces driving these changes in 10 Central and Eastern European countries (CEE10) and 14 advanced European Union member states (EU14) from 1998 to 2015. The task approach of Autor et al. (2003) and Acemoglu and Autor (2011) is applied, distinguishing between non-routine cognitive analytical, non-routine cognitive interpersonal, routine cognitive, routine manual, and non-routine manual physical tasks. The study also employs a shift-share decomposition to quantify the contribution of sectoral developments and educational upgrading to the changes in job task content.

The contribution of this study is two-fold. Firstly, it provides empirical evidence on the evolution of task content of jobs in upper-middle income countries and tests whether it is consistent with patterns observed in advanced economies. Secondly, it offers a new perspective on secular changes in post-transition CEE economies, examining both supply and demand-side changes in the task content of jobs framework. It finds that all CEE countries experienced an increase in non-routine cognitive tasks and a decrease in manual tasks, consistent with patterns observed in advanced economies. However, routine cognitive tasks increased in seven CEE countries, contrary to patterns observed in the US and Western European countries and at odds with the routine-biased technological change hypothesis. The shift-share decomposition reveals that diverse patterns of structural changes in the CEE can be attributed to the varying developments in routine cognitive tasks. The workforce upskilling in CEE countries contributed to the compression of routine cognitive tasks, while diverse patterns of sectoral developments were found to be responsible for the increase in routine cognitive tasks.

5.2. Ageing of routine jobs in Europe

This study explores how the de-routinisation of jobs affects workers of different ages across 12 European countries representing different economic and labour market models from 1998-2015. The research uses O*NET occupation content data and EU-LFS individual data to measure task content across five categories: non-routine cognitive analytical, non-routine cognitive interpersonal, routine cognitive, routine manual, and non-routine manual physical tasks. The study finds that the shift towards non-routine work and away from routine

work occurred faster among younger workers aged 15-44 than older workers. In most countries, the ageing of the workforce occurred more quickly in occupations that were initially more routine-intensive.

First, the article documents the diverging trends in the task content of jobs performed by young and older workers. The study finds that the shift from manual tasks to cognitive tasks and from routine tasks to non-routine tasks occurred much faster among prime-aged and young workers than among older workers. Moreover, the importance of routine cognitive tasks declined among prime-age workers but increased among workers aged 55 or older. In most countries, the average age of workers in the more routine-intensive occupations increased faster than in the less routine occupations.

Second, the article establishes the relationship between the routine intensity of jobs and the unemployment risk among various age groups of workers. The study finds that higher routine intensity of jobs is associated with a higher unemployment risk in most European countries studied. The study also provides evidence that this effect is stronger among young workers than among older workers, and in many countries, this gap between the young and the older has increased over time. In many European countries, a large share of unemployment increases among young workers can be attributed to rising unemployment risk related to routine task intensity. The authors show that the increase in this risk was larger in countries where the stock of ICT capital per worker increased faster and in countries that did not increase their participation in global value chains.

5.3. Technology, Skills, and Globalisation: Explaining International Differences in Routine and Non-routine Work Using Survey Data

The paper investigates the global differences in job tasks and their association with technology, globalisation, supply of skills, and structural change. Using worker-specific data collected from surveys in 47 countries, it constructs harmonised routine task intensity (RTI) measurements that mirror task measurements proposed by Acemoglu and Autor (2011). The study provides new stylised facts about cross-country differences in the task content of jobs and shows that workers in developed countries perform less routine-intensive work on average.

The study constructs worker-specific task measures consistent with O*NET, covering low-, middle-, and high-income countries. It captures both within-occupation and cross-country differences in job tasks, which is key to understand the role of the four fundamental forces – technology, skills, globalisation, and structural change – for job tasks worldwide. Its second contribution is to document new stylised facts about cross-country differences in routine task intensity. Workers in the more developed economies perform less routine-intensive work. The relationship between routine task intensity and country GDP per capita is particularly strong for high-skilled occupations, with work being more routine-intensive in poorer countries. However, for middle-skilled occupations like clerical workers and low-skilled occupations like plant and machine operators and assemblers, the authors find a flat or an inverse-U-shaped relationship between the relative routine intensity of tasks and a country's level of development.

The third and most important contribution of this study is to quantify for the first time how the four fundamental forces are associated with cross-country differences in the task content of jobs. Previous research has documented associations between specific factors for subsets of countries, often assuming that tasks within occupations are identical across countries. This study is the first to examine the role of these factors in a comprehensive framework and for countries that span low-, middle-, and high-income countries, using survey-

based measures. Technology, globalisation, and structural change are associated with significant changes in routine task intensity in all countries. In contrast, the supply of skills is essential only in high-income countries. The authors also find that the associations between these fundamental forces and routine task intensity vary widely across different occupations.

5.4. Global Divergence in the De-routinisation of Jobs

This study, published as a book chapter, relaxes further the assumption that occupational tasks are identical worldwide. It studies the global distribution and evolution of routine and non-routine work from 2000 to 2017. To achieve this, a regression-based methodology is developed to predict country-specific task content by occupational group in countries without task survey data, and merge country-specific occupational task measures with employment structure data for 87 countries.

The research identifies three key stylised facts. First, the reallocation of labour away from routine and toward non-routine work has occurred slower in low- and middle-income countries compared to high-income countries. Second, the gap in average routine task intensity between low- and middle-income countries and high-income countries is much larger than suggested using O*NET, and has widened over time. Third, high-income countries have remained the dominant provider of non-routine work, while routine work has remained concentrated in low- and middle-income countries.

The findings corroborate theories of allocation of tasks that suggest a higher level of technology and a more sophisticated role in global value chains is associated with less routine-intensive work. They also show that ignoring cross-country within-occupation differences in tasks would underestimate the role of routine work in low- and middle-income countries. Slower de-routinisation of work in low- and middle-income countries is attributed to differences in technology, and between- and within-occupation effects.

5.5. Job Tasks and Wages in Developed Countries: Evidence from PIAAC

This article investigates the empirical relationship between job tasks and wages across a harmonised sample of 19 countries, using individual-level PIAAC data to account for task heterogeneity within occupations. It aims to estimate task prices and explore country differentials in task prices and their potential drivers.

The study shows that using workplace-level rather than occupational-based data is more accurate in measuring job tasks, primarily if the aim is to estimate task prices precisely. The study provides evidence of the importance of within-occupation variation of task measures across countries. It relates those task disparities across countries with variables reflecting country development such as GDP per capita, ICT capital stock, or numeracy skills. The results show that a one standard deviation increase in abstract tasks is related to a 3 log point wage premium. In contrast, a 3 (2.7) log point wage penalty is associated with each standard deviation of routine (manual) tasks within occupations. The study finds suggestive evidence of supply and demand factors in explaining task returns. The higher the task endowment in a country, the more attenuated the positive or negative return to that task. Development factors play a role in the variance of all three task prices, whereas labour institutions only seem to matter for differences in manual prices.

6. Contribution to economic literature

Economists have fruitfully used occupational tasks to understand the impact of technological progress and globalisation, particularly offshoring, on labour market outcomes. However, in doing so, they focused on the most developed countries and often assumed that occupations are identical worldwide. This assumption is problematic for most countries as large cross-country differences in technology use and skill supply persist. Moreover, countries that receive offshored jobs probably specialise in different tasks than countries that offshore jobs and have been the focus of most literature. This thesis fills the gap in economic literature by providing novel results for countries across the development spectrum, mainly accounting for the cross-country differences in job tasks. It makes five key contributions:

First, it provides empirical evidence on the evolution of task content of jobs in low- and middle-income countries and tests whether it is consistent with patterns observed in advanced economies. It identifies substantial differences; specifically – the role of routine tasks and jobs in low- and middle-income countries has not declined as in high-income countries. Globally, de-routinisation of work is less pronounced than would appear based on findings for the most developed countries.

Second, it offers a new perspective on secular changes in post-transition CEE economies, examining supply and demand-side changes in the task content of jobs framework. It shows that patterns of structural changes in CEE differed from those in the EU15 countries, which slowed down the de-routinisation in CEE. It also stresses that the post-transition education boom played a key role in the CEE's growth of non-routine cognitive tasks.

Third, it highlights the importance of considering age when studying the de-routinisation of work and job polarisation. The study's findings have important policy implications, suggesting that de-routinisation may disproportionately affect younger workers, who may be at a higher risk of unemployment due to their routine-intensive occupations.

Fourth, it develops novel approaches using survey data to measure country-specific, worker-level tasks. They show that the assumption that occupations are identical worldwide is wrong in the case of low- and middle-income countries as jobs in poorer countries are substantially more routine-intensive than jobs in the most developed countries. It also quantifies the role of fundamental forces to cross-country differences in worker tasks, arguing the differences in technology use play the primary role, followed by differences in skills supply and participation of global value chains. It shows that accounting for these differences, low- and middle-income countries remain the dominant global supplier of routine work.

Fifth, it illustrates the critical role of job tasks in wage differences, especially within occupations, as performing more abstract / non-routine tasks is strongly associated with higher earnings. In contrast, the opposite is true for manual and routine tasks. It argues that development factors, such as technology adoption and labour institutions, such as minimum wage, mediate the relationship between worker tasks and earnings.

7. Conclusions

These five articles all focus on studying changes and differences in the task content of jobs in countries at different development levels and their implications. The first two articles use similar methodologies of combining O*NET occupation data with individual data from European countries. They find that non-routine cognitive tasks are increasing while manual tasks are declining. However, routine cognitive tasks increased in Central Eastern Europe while they declined in Western Europe. This shift and differences between country groups is attributed to workforce upskilling and structural changes, confirming hypothesis H1. They also find that the transition from routine to non-routine work is happening faster among younger workers, with implications for unemployment risk – confirming hypothesis H2.

The third article investigates the global differences in job tasks and their association with technology, globalisation, supply of skills, and structural change. Using worker-specific data collected from surveys in 47 countries, the study constructs harmonised routine task intensity (RTI) measurements that mirror task measurements proposed by Acemoglu and Autor (2011). The research provides new stylised facts about cross-country differences in the task content of jobs and shows that workers in developed countries perform less routine-intensive work on average. The most important contribution of the paper is to quantify, for the first time, how the four fundamental forces are associated with cross-country differences in the task content of jobs. The results indicate that technology, supply of skills, and globalisation all contribute to worldwide differences in routine task intensity, confirming hypothesis H3. The fourth article provides a more global perspective by analysing the distribution of routine and non-routine work across 87 countries, finding that low- and middle-income countries remain dominant providers of routine work, and the shift away from routine work is much slower in these countries than in high-income countries. They also emphasise the importance of accounting for differences in occupation-specific job tasks across countries to avoid overestimating the role of non-routine tasks in less developed countries. This confirms hypothesis H4.

The final article focuses on the relationship between job tasks and wages across 19 countries, using individual level data to compute task measures and estimate task prices. They find that abstract tasks are related to a wage premium, while routine and manual tasks are related to wage penalties, in line with hypothesis H5.

Overall, these articles highlight the importance of understanding changes in job tasks and their implications for workers and economies across different countries and regions. They provide new algorithms and measurements, which can trigger more research. The method to map O*NET with European survey data – elaborated in the first article in this collection- is open to use by the scientific community and has already been used by dozens of researchers. The survey-based, country-specific measures of worker tasks are also available to other researchers and have been used by other researchers to study wage inequality in a dozen low-or middle-income countries (Gradin et al., 2023).

Directions for future research may include the investigation of other types of skills (for instance, managerial skills) and institutions as drivers in cross-country and between-worker differences in tasks. They may also include studying the gender gap in allocating tasks, its drivers and implications for gender pay gaps. Another strand of research may study how changes in globalisation and the emergence of new technologies affect workers' tasks and labour market outcomes.

Articles that constitute the doctoral thesis

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