A framework for measuring tasks across occupations

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A tasks approach to labour market analysis can contribute to a better understanding of structural change and employment trends. However, its narrow focus on a few specific types of task content and its neglect of the social aspects of production can limit the usefulness of this approach. This column presents a new framework for conceptualising and measuring tasks, and discusses an application to Europe.

In recent years, a 'tasks' approach has been proposed for a better understanding of some contemporary developments in labour markets, particularly for the phenomenon of 'job polarisation' (see Autor 2013 for an overview). In this approach, tasks are understood as units of work activity that produce output, while skills are human capabilities to perform tasks. The effect of technical change on labour demand depends on the type of task content involved. In particular, routine tasks which are easier to codify and automate are more likely to be replaced by machines. Since those tasks are assumed to be more frequent in the middle of the occupational structure, the result would be job polarisation (see Fernández-Macías et al. 2012 for a discussion of this).

This new approach provides a richer understanding of the effect of technical change on production and employment than the traditional notion of skills, but it has some limitations. First, it has tended to focus on particular types of task content (most importantly, cognitive and routine tasks) rather than attempting a comprehensive typology. Second, it maintains a narrowly technical perspective of the production process, neglecting the social aspects of production.

Workers' input in production requires their active cooperation, which not only generates specific task input (managerial, supervisory and control tasks), but also means that work organisation mediates the impact of technical change on tasks and the production process. Furthermore, the social organisation of production is a driver itself of change in tasks and technology. For instance, the (organisationally driven) 'routinisation' of work tasks carried out by Taylorism in the early 20th century was a prerequisite of the automation in industry in earlier waves of 'routine-biased technical change' (Braverman 1976).

In a recent report (Eurofound 2016), we present a tasks framework that tries to be more comprehensive and bring work organisation into the picture (Table 1). It classifies tasks along two main dimensions. The first one refers to the content of the tasks themselves (what people do at work), and the second one refers to the methods and tools used to perform those tasks (how people work).

The task content depends mostly on what is being produced (or rather, transformed in the production process), and therefore also on the structure of demand. The type of task content will tend to be associated, therefore, to the economic sector in which the work activity belongs. Our framework differentiates three sub-dimensions of task content: physical, intellectual, and social (each with different lower-level indicators).

In addition, our framework differentiates between the methods and tools of work, which are less dependent on what is being produced and more on the technology and social organisation of production. Therefore, they are more historically and institutionally contingent. For the production of the same goods or services, different societies or organisations can use significantly different methods and tools.

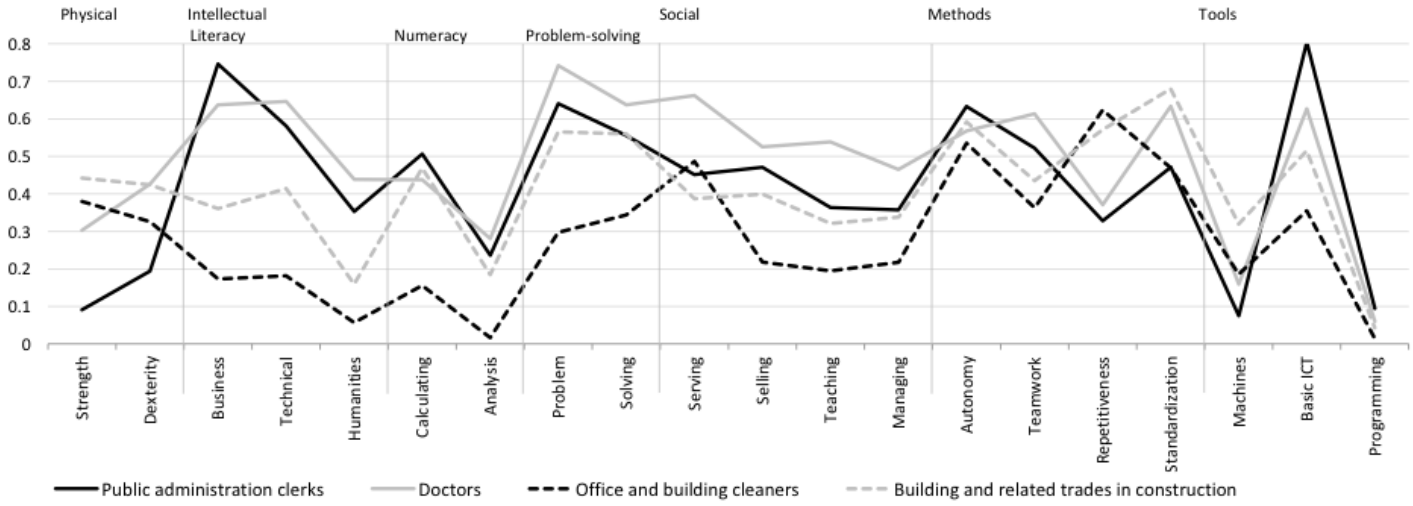
Using data from different international sources (Eurofound´s European Working Conditions Survey, the OECD's Survey of Adult Skills PIAAC, the American ONET database and the European Labour Force Survey), we constructed a database containing scores for all the elements in our framework for all the two-digit occupation-by-sector combinations in Europe (see Fernández-Macías et al. 2016 for details of the methodology). In other words, this database contains standardised measures of what tasks workers do at work in each specific occupation in each specific sector of European labour markets. This database can be freely downloaded from our website, as well as the Stata routines used to generate them.

Table 1. A classification of tasks according to their contents and methods

A. In terms of the content:	B. In terms of the methods and tools of work:
1. **Physical tasks:** aimed at the physical manipulation and transformation of material things: a. *Strength* b. *Dexterity* 2. **Intellectual tasks:** aimed at the manipulation and transformation of information and the active resolution of complex problems: a. *Information processing:* I. Literacy: i. Business ii. Technical iii. Humanities II. Numeracy: i. Accounting ii. Analytic b. *Problem solving:* I. Information gathering and evaluation of complex information. II. Creativity and resolution. 3. **Social tasks:** whose primary aim is the interaction with other people: a. *Serving/attending* b. *Teaching/training/coaching* c. *Selling/influencing* d. *Managing/coordinating*	1. **Methods:** forms of work organisation used in performing the tasks: *a. Autonomy* *b. Teamwork* *c. Routine* *I. Repetitiveness* *II. Standardisation* 2. **Tools:** type of technology used at work: *a. Machines* (excluding ICT) *b. Information and communication technologies.* I. Basic ICT II. Programming

Figure 1 shows the standardised task scores (in a 0/1 scale representing the intensity to which each type of task is carried out) for four specific occupation/sector combinations in Europe. In broad terms, the results fit expectations. For instance, office and building cleaners carry out more physical than intellectual or social tasks, with a high degree of repetitiveness (though not so much standardisation) and limited use of machines or ICT, whereas public administration clerks carry out mostly business-related information processing tasks, with some problem-solving and a significant use of basic IT. But being able to inspect the whole range of task categories across different types of jobs reveals some interesting patterns. Some task categories are relatively high in most occupations (problem-solving), while others are generally low (use of machinery, or analytic numeracy), and some are high in some cases and low in others (physical tasks and information processing). Contrary to what is often assumed, physical and intellectual tasks are not always inversely correlated. For instance, doctors show high values for both physical and intellectual tasks, and a job as typically physical as building trades involves relatively high levels of some types of intellectual tasks (such as technical literacy information processing or problem-solving). Social tasks are relatively widespread in the jobs shown in Figure 1 (all jobs involve some degree of social interaction), but they also clearly differentiate categories of workers (selling and serving discriminate jobs which involve less or more direct contact with customers, for instance).

Figure 1. Task profile of 4 big jobs (2014 EU15 LFS weights)



These results suggest that each job is characterised by a particular combination of tasks across all the different dimensions, rather than by any one or two of them. A detailed correlation analysis between the different task dimensions and indicators (Eurofound 2016) reveals that indeed, the different categories of tasks in our framework tend to bundle together in systematic ways. First, intellectual and social tasks often go together, with some exceptions (such as serving and calculating tasks). Second, physical tasks are negatively correlated to intellectual tasks, again with some important exceptions (for instance, manual dexterity often goes together with technical literacy; and problem-solving is relatively high even for physically-demanding jobs). Finally, physical tasks are associated with the use of machines and routine methods (both in terms of routine and standardisation), whereas intellectual literacy and numeracy tasks tend to be associated with use of ICT and a relatively high degree of standardisation (not repetitiveness).

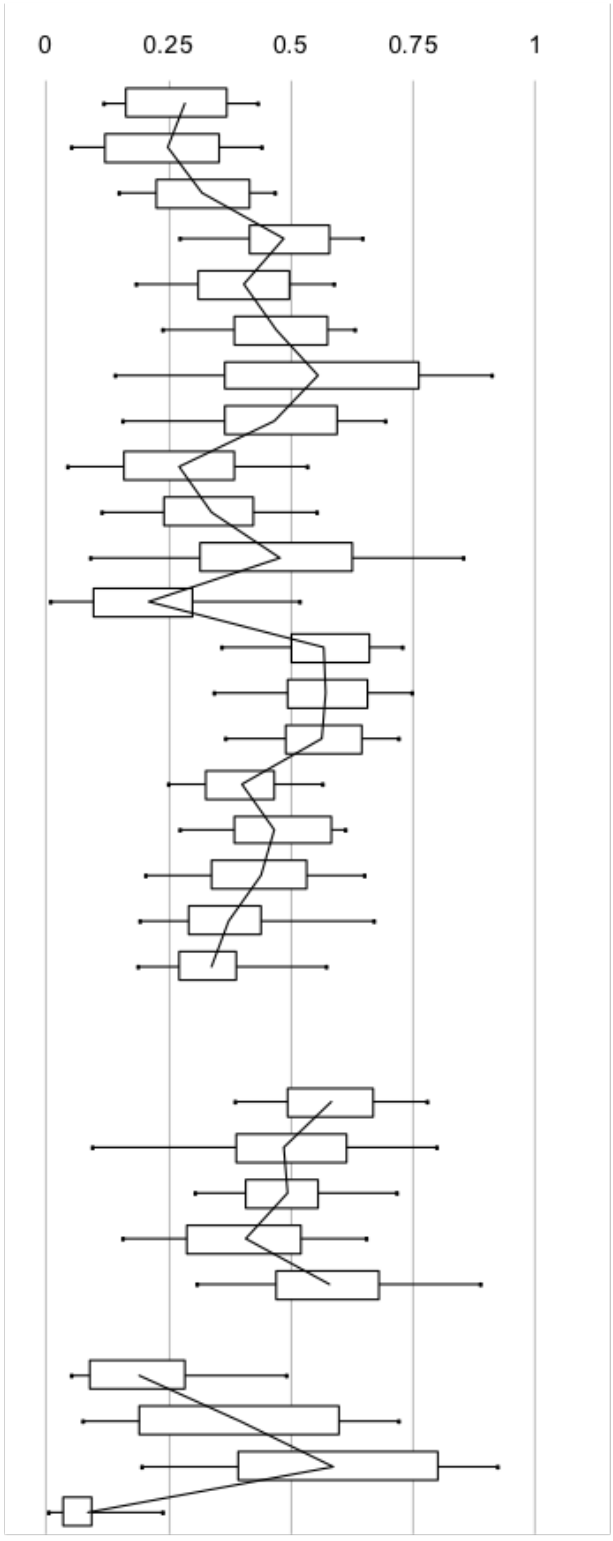
This framework also allows us to evaluate the task profile of the average European job (weighting the scores computed for each occupation/sector according to its overall employment share). Figure 2 shows the average scores for our indices for the whole economy, as well as the dispersion in the scores across different jobs (with the interquartile range shown as a box around the average). According to this approach, the average European job would involve:

- A high level of intellectual tasks (particularly the processing of business-administrative information and problem-solving), a mid-high level of social tasks (particularly serving and selling), and a low level of physical tasks.
- In terms of the task methods and tools, it would involve relatively high levels of autonomy, some degree of routine (particularly in terms of standardisation), and more ICT (basic office applications) than machinery use.
- The most widespread task categories are problem-solving, serving and selling, autonomy and routine. Business-related task content shows a more polarised distribution (some jobs involve a lot, some very little of this kind of work). And physical strength, humanities, and technical task content are the rarest categories.

Figure 2. Average task scores for EU15, 2014 (EU-LFS weights)

Task indices	Summary statistics		
In terms of the object of work/task:	**Mean**	**Std dev**	**CV**
1. Physical	0.28	0.11	0.39
a. Strength	0.25	0.13	0.52
b. Dexterity	0.32	0.10	0.33
2. Intellectual	0.49	0.11	0.22
a. Information processing	0.40	0.12	0.30
i. Literacy	0.47	0.12	0.26
-Business	0.55	0.24	0.44
-Technical	0.47	0.16	0.35
-Humanities	0.27	0.15	0.56
ii. Numeracy	0.34	0.13	0.39
-Accounting	0.48	0.23	0.47
-Analytic	0.21	0.16	0.74
b. Problem solving	0.57	0.11	0.20
i. Information gathering & evaluation	0.57	0.12	0.22
ii. Creativity	0.56	0.11	0.19
3. Social	0.40	0.10	0.26
-Serving/attending	0.46	0.12	0.26
-Selling/persuading	0.44	0.14	0.32
-Teaching	0.37	0.13	0.36
-Managing	0.34	0.11	0.33
In terms of the methods and tools used in the work/task			
1. Work organization			
a. Autonomy	0.58	0.12	0.21
b. Teamwork	0.48	0.20	0.41
c. Routine	0.49	0.13	0.25
i. Repetitiveness	0.41	0.16	0.39
ii. Standardization	0.58	0.17	0.30
2. Technology			
a. Machines	0.19	0.14	0.71
b. ICT	0.39	0.22	0.55
-Basic ICT	0.59	0.24	0.41
-Programming	0.08	0.10	1.20

Distribution (percentiles 5, 25, 75, 95).
(lines link average values)



A tasks approach allows for a better understanding of the effects of technological change on production and employment. But a narrow focus on some specific types of tasks and a neglect of the social aspects of production may seriously limit the usefulness of this approach. As we have shown, tasks do not exist in isolation, nor can jobs be characterised by one or two categories of task. Rather, jobs are socially embedded, coherent bundles of many different types of tasks often in idiosyncratic combinations.

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