

Bertschek, Irene et al.

**Research Report**

## The division of tasks, offshoring and efficiency gains

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# ZEW policy brief

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## The Division of Tasks, Offshoring and Efficiency Gains



### Essential Issues

Recent developments in information and communication technologies (ICT) and the growth of emerging economies such as China and India have not only increased international trade but have also led to offshoring of activities away from Europe. A firm's decision to move production away from Europe is based on cost-benefit considerations and comparative advantage. Effective policy responses call for a sound understanding of what types of activities are subject to relocation and of the relative strengths of the European knowledge economy. A project, funded by the SEEK research programme, aims to improve our understanding of the mechanisms of company decision making and their labour-market consequences. A team of researchers examined the role of technological change and globalisation for workers' jobs and firms' competitiveness. Based on the idea that occupations are bundles of tasks, they model the bundling and unbundling of tasks and analyse the factors determining their tradability. They examine whether individuals react to offshoring by switching the tasks that make up their occupation. Finally, taking a firm-level perspective, internationally active firms are compared to domestic firms with regard to ICT use and productivity.

### Research Question and Relevance

Tradability of job tasks is determined by characteristics such as interactivity and proximity needs. Moreover, interdependencies between different tasks and the need to execute them in a bundled manner matter for the relocation decision. Modern knowledge economies display their core strength precisely here – in jobs that intensely rely on these tasks.

Offshoring changes workers' tasks packages within occupations and provides incentives to focus on specific job tasks and invest in them through on-the-job training.

Firms actively engaged in international trade differ significantly from their purely domestic counterparts in terms of both technology and productivity. Among exporters only the larger and more productive firms use advanced ICT. By further liberalising international trade, which lowers export market entry barriers, more firms can become large enough to profit from more advanced technologies.

### Key Messages

## Key Messages

Information and communication technologies make it possible to break down jobs into tasks, changing how worker skills are assigned to production tasks. The improved production technologies increase efficiency, with each worker performing more tasks than before, while improved communication technologies allow for a much finer division of labour. It is the latter that leads to outsourcing and offshoring of activities. Depending on comparative advantages of workers in different countries and local production structures, labour demand and wages may change.

- Empirical results confirm the labour-market impact of this development in Germany and the United Kingdom. They show that effects on employment and wages are determined by how easily tasks and the output of occupations are traded internationally. Tradability is determined by characteristics such as interactivity and proximity needs. Interdependencies between different tasks and the need to execute them in a bundled manner matter for the relocation decision as well.
- Increased offshoring changes workers' tasks packages within occupations and provides incentives to focus on specific job tasks and invest in them through on-the-job training. In addition, offshoring has accompanied skill "upgrading" not only within occupations because more routine and less crucial tasks have been computerised or sent abroad. This represents yet another step towards a more knowledge-intensive labour market. At the same time, low-skilled service jobs must still be performed on the local level. These developments could polarise job opportunities in western economies, increasing demand for low-skilled workers in low-end service jobs and for high-skilled workers at the top, but hollowing out demand for medium-skilled workers, whose tasks are being sent abroad.
- An investigation of firms engaged in international trade shows that not all firms are equally technology intensive. ICT intensity is higher for internationally active firms than for purely domestic ones and even within the group of exporting firms, productivity and ICT are positively correlated. This suggests that international market entry and trade liberalisation are additional drivers of technology intensification and a more sophisticated and knowledge-based economy.

**Interactivity and Proximity Needs Determine Tradability of Tasks**

**Offshoring Sets Incentives for On-the-Job Training**

**Higher Productivity Related to ICT Intensity and Exports**

## Research Question and Relevance

Revolutionary progress in ICT has enabled the break-up of the production process into finer and finer levels, while the increase of international trading opportunities has led to a significant reallocation of employment around the globe. From 1995 to 2005, offshoring in the manufacturing industries increased by more than 20 per cent in both Germany and the United Kingdom. This has a large impact on employment structures across Europe's modern economies. Jobs will be reallocated around the globe and tasks will be distributed according to their separability from each other and an economy's comparative advantage. Detecting possibilities for new reallocations of labour on the levels of occupation, industry and country is a key to future growth in modern economies; understanding the effects on workers is crucial to the people living in these economies. The purpose of this project was to answer the following questions:

- How can we model the bundling and unbundling of tasks and how can we understand the international division of labour within a task framework?
- Do the possibilities and effects of offshoring vary across countries (Germany vs. United Kingdom)?
- Do individuals react to offshoring by switching the tasks that make up their occupation?
- How do globally active firms and firms with domestic sales alone compare with regard to ICT use and productivity?

**ICT and Trade Opportunities as Enabler of Offshoring**

## Research Results in Detail

Our approach builds on the idea that occupations are bundles of tasks. The organisation of these tasks is determined by a variety of forces. Whether tasks are separated into different occupations or not depends on the trade-off between coordination and production costs. When coordination becomes easier it might be beneficial to separate tasks into different occupations. When tasks can be separated from occupations, they might as well be performed at a different company, which is to say, they might be outsourced. Whether or not this happens depends on the make-or-buy trade-off. Carrying out tasks in-house has a coordination advantage, whereas outsourcing tasks may have a cost advantage. Finally, when tasks are outsourced, they might be performed in a different country, which is to say, they might be offshored. Whether or not this happens depends on proximity vs. cost advantages.

For the empirical analysis, we rely on data from the German BIBB/IAB Surveys (Bundesinstitut für Berufsbildung BIBB, Institut für Arbeitsmarkt- und Berufsforschung IAB) and the British Skills Surveys (BSS). These surveys provide detailed information on work content and task importance. With this data, it is possible to measure the task content of occupations, industries or countries and to analyse the interdependence, or connectivity, of tasks within occupations. For the analyses conducted in this project, we use the waves from 1997/98 and 2005/06.

Offshoring indicators are constructed with the help of input-output tables for imports from the National Statistical Offices. Additional data on wages and employment from several standard sources complete the database used for the majority of the analysis.

In Borghans et al. (2013) we find that for Germany and the United Kingdom increases in the level of offshoring seem to correlate with the amount of direct interaction within occupations, with interactions between workers posing a high barrier to offshoring. In Germany, moreover, there is some evidence that the connectivity of tasks within occupations – and thus the strength of the initial bundling of tasks – correlates negatively with offshoring. This observation may point to greater employment protection effects changing work content and the employment mix.

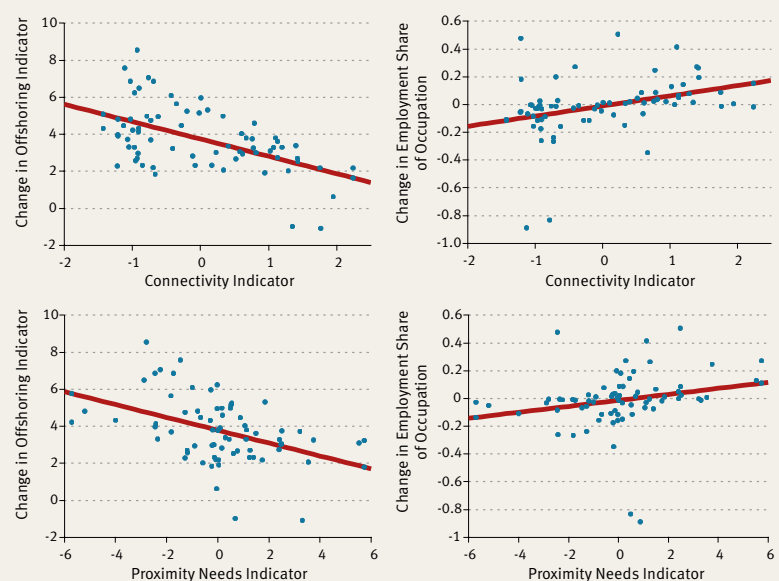
Figure 1 shows these connections for Germany. The graph links occupational task characteristics in 1998 to changes in offshoring and employment shares between 1998 and 2005. The panels on the left show the relationship between the respective indicators and offshoring; the ones on the right show the relationship between indicators and employment.

Hogrefe and Wrona (2013) show evidence for individuals' switching of task sets in response to increased offshoring in their industry. What this means is that they "upgrade" their job contents through on-the-job training. This is an important finding since the academic literature often assumes individuals do not endogenously react to offshoring. In a theoretical analysis we show that by increasing rewards for switching to a more demanding task set, individual training efforts can indeed be an optimal reaction. Hence, at the aggregate level more offshoring

**Occupations are  
Bundles of Tasks**

**BIBB/IAB Surveys  
and British Skills  
Surveys – Worker  
Level Data**

**Occupational Tasks, Offshoring and Employment in Germany**



The figure shows how fixed occupational characteristics such as connectivity and proximity needs impact on the growth of offshoring and employment in Germany over the period 1998 to 2005. Sources: BIBB IAB Survey 1998/99, BA Statistics, O\*NET data base and own calculations.

## ZEW ICT Survey – Firm Level Data

## Productivity Sorting along Technology and Exports

should lead to more training and task upgrading. We confirm these outcomes empirically by estimating the likelihood for on-the-job training participation based on offshoring growth by industry. Taking a firm-level perspective, Bertschek et al. (2013) extend the analysis of the link between firms' international activity and their productivity by the aspect of technology choice. The analysis is based on ZEW's ICT survey 2010. The survey focuses on the diffusion of ICT among German manufacturers and service firms. The classification of firms as either low-tech or high-tech is based on an index variable that measures the use of advanced information technology systems. The results show that firms actively engaged in international trade differ significantly from their purely domestic counterparts in terms of both technology and productivity. Moreover, among exporters only the larger and more productive firms use advanced ICT intensively. This confirms the ascending sorting pattern for productivity along the dimensions of export status and technology intensity suggested by recent models of heterogeneous firms and technology choice: High-tech exporters are more productive than low-tech exporters. An important implication is that by further liberalising international trade, which lowers export market entry barriers, more firms can become large enough to profit from more advanced technologies. These developments can increase an economy's technology intensity and result in higher competitiveness.

## Project Profile

### Research Team

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### References

**Bertschek, Irene, Jan Hogrefe and Fabienne Rasel (2013)**, "Trade and Technology: New Evidence on the Productivity Sorting of Firms", ZEW Discussion Paper No. 13-042, Mannheim.

**Borghans, Lex, Jan Hogrefe, Suzanne Kok, Marianne Saam, Bas ter Weel (2013)**, "Offshoring and Unbundling at the Task Level", mimeo.

**Hogrefe, Jan and Jens Wrona (2013)**, "Trade, Tasks, and Training: The Effect of Offshoring on Individual Skill-Upgrading", in Hogrefe, Jan: Income and Employment Effects of Trade and Offshoring in Modern Labor Markets. Dissertation, University of Tübingen, Chapter 5, Tübingen.



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