



## Technological change and outsourcing: an illustration through broadband Internet access in France

The work organisation in companies is increasingly “fragmented” due to the growing use of outsourcing of activities that are not considered as “core business”. Outsourcing is the process whereby a company separates itself from an activity that was previously carried out in-house and allocates it to a specialised external service company. This article summarises a recent study (Bergeaud et al., 2021) conducted at the Banque de France on the role of technological change in the outsourcing process. The authors study the impact of broadband Internet access in France between 1999 and 2007 on the work organisation in companies and on workers. They conclude that this technological shock triggered a reorganisation of companies and contributed to the rise of outsourcing. For workers directly affected by this outsourcing process, the impact on wages depends on their level of technical qualification.

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**+4%**

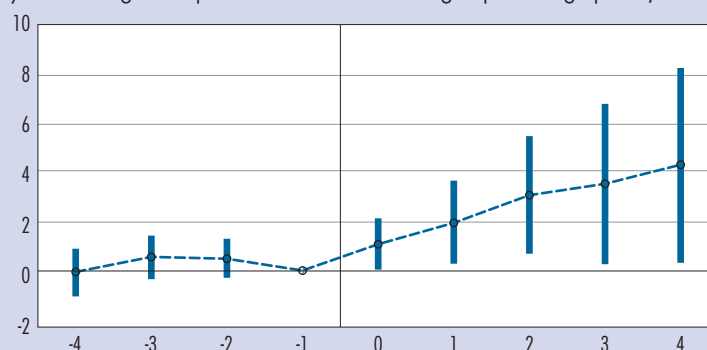
rise in outsourcing expenditure after connection to ADSL

**+0.15 point**

increase in the job concentration index of companies in a municipality newly connected to ADSL

### Changes in expenditure on subcontracting to specialised service companies, before and after connecting to ADSL

(x-axis: gap in years with the connection date of the municipality to ADSL; y-axis: change in expenditure on subcontracting in percentage points)



Source: Bergeaud et al. (2021).

Key: Four years after the ADSL connection date, business expenditure on outsourcing activities increases by about 4%.

Note: The vertical bars indicate the confidence interval of the estimated value ( $\pm 2$  standard deviations).



### 1 The context: fragmentation of work organisation and technological change

Outsourcing is the process whereby a company separates itself from an activity that was previously carried out in-house and allocates it to a specialised external service company. This is particularly the case for activities considered to be peripheral and which are entrusted to outsourcing partners which offer similar services with greater flexibility. The activities traditionally concerned correspond to support functions, as diverse as IT, human resources, accounting, marketing, communication, security and cleaning. The company can thus restructure and focus on its core competences: its “core business”, i.e. the activities directly concerned by its production process.

Recent academic work on European companies emphasises the development of the fragmentation of work organisation in Europe. In France, Le Moigne (2020) shows that support functions are less and less carried out in-house and are often entrusted to external service companies, which suggests strong reorganisations within companies. In the United Kingdom, Aghion et al. (2019) show a link between the outsourcing of activities, such as cleaning and security, and corporate productivity. Finally, Goldschmidt and Schmieder (2017) analyse the process of fragmentation of work organisation in Germany, where companies increasingly have recourse to service companies, temporary employment agencies and external service companies rather than hire employees.

One of the determinants of this fragmentation process in the workplace could be technological change (Weil, 2017): new information and communication technologies offer many possibilities for coordinating and controlling work inside and outside the company. In this article, we

present the results of a recent article (Bergeaud et al., 2021), in which the authors test this hypothesis by studying the effect of technological change on the outsourcing decision, and the consequences for workers. To this end, they mobilise a large-scale technological shock: the gradual roll-out of broadband Internet (via ADSL) in France, from 1999 to 2007.

#### A technological shock: the development of ADSL in France

France Telecom launched ADSL commercially in 1999. Thanks to this technology, it is possible to use the pre-existing telephone network to transmit digital data. Its roll-out was very gradual: the major urban centres were equipped from the early 2000s, while rural and remote areas were not equipped until ten years later (see Chart 1). One of the reasons for this gradual roll-out is the eligibility of telephone network for this new technology. In 2000, only one third of the network could be equipped with this technology and significant infrastructure investments were required to modernise the rest of the network. The first municipalities to have access to ADSL were the most densely populated. In 2002, 20% of municipalities were equipped, accounting for 70% of businesses and 85% of the population. However, as it depended on a series of demographic, political and geographical variables, the timing of ADSL connection can basically be considered random.<sup>1</sup>

The very gradual roll-out of ADSL thus provides an ideal empirical framework for studying the impact of this technological shock on companies. The significant spatial and time variations in the introduction of broadband Internet, even within the same *département*, make it possible to compare companies that have access (treated companies) with those that do not (the control group).

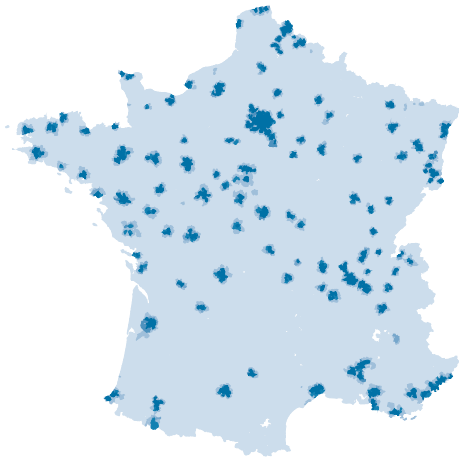
<sup>1</sup> The authors confirm this hypothesis through statistical analysis. In particular, they show that only the invariant characteristics of cities (e.g. its rural rather than urban aspect) and not the local economic dynamics (employment, industrial composition, etc.) explain the date of connection to ADSL.



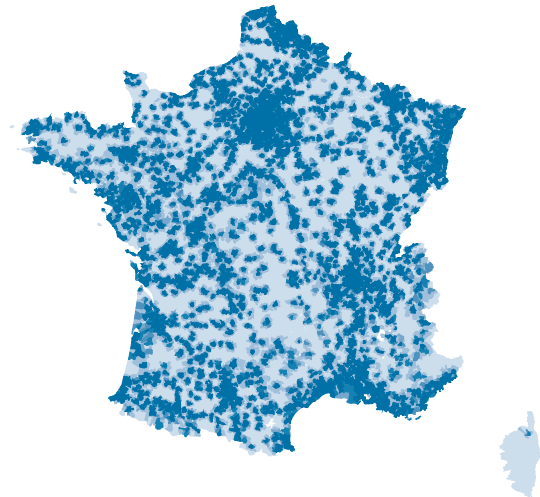
**C1 A decade of gradual roll-out of broadband Internet**

(ADSL coverage rate in %)

a) 2001



b) 2003



c) 2005



d) 2007



Sources: Malgouyres et al. (2021) and authors' calculations.

Note: A percentage between 0% and 100% indicates that a municipality is partially covered or that it only received broadband Internet access during the year.

**What does the theory tell us about the effects of this technological change?**

Before looking at the empirical results, it is worth considering what the economic theory predicts about the effects of such a technological change. Access to ADSL is a specific shock because it affects both corporate productivity (positively) and communication costs

(negatively). In both cases, the economic theory enables us to understand why this shock may encourage companies to transfer part of their workforce and concentrate on their core business. On the one hand, the balance of power in the labour market, which governs relations between employers and employees (in-house workers), leads to a certain sharing of the income between them, despite the absence of explicit negotiation.



This sharing provides an incentive for companies to outsource certain services to external contractors, as the market price for these services does not depend on the company's possible income, which is partly redistributed as wage increases to its employees. However, the analysis does not take into consideration the impact of the technology shock on the economies of scale of core business activities. Companies' incentive to outsource naturally increases as they become more productive or enjoy higher income. On the other hand, the specific nature of the technology shock studied (which combines facilitated trade and lower communication costs) should amplify this phenomenon by reducing the relative cost of an outside ("outsourced") worker compared to an in-house (salaried) worker.<sup>2</sup>

## 2 The effect on companies: rise in outsourcing and concentration of activities

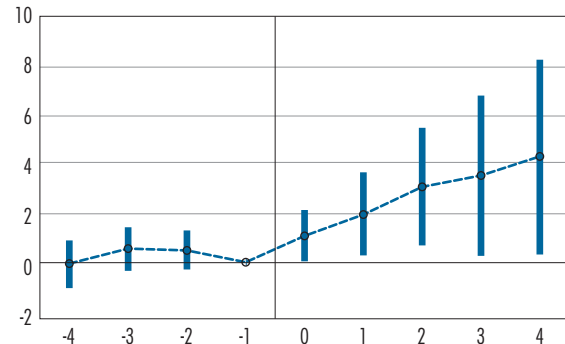
### Measuring recourse to outsourcing: an empirical difficulty

It is difficult to identify empirically the changes in companies' outsourcing strategy, as outsourced workers<sup>3</sup> do not generally appear in the Social Security data, which is the administrative source most regularly used to study the labour market.<sup>4</sup> To get around this methodological difficulty, the authors use data from companies' profit and loss accounts, and in particular the accounting item "expenditure on personnel outside the company".

"Treated" companies, i.e. those located in a municipality connected to ADSL, have progressively increased their expenditure on outsourcing to specialised service companies (see Chart 2). This expenditure is 4% higher four years after the connection date than before<sup>5</sup> and its share of the wage bill is also higher.

### C2 Changes in expenditure on subcontracting to specialised service companies, before and after connecting to ADSL

(x-axis: gap in years with the connection date of the municipality to ADSL; y-axis: change in expenditure on subcontracting in percentage points)



Source: Bergeaud et al. (2021), based on the FIBEN company database of the Banque de France.

Key: Four years after the ADSL connection date, business expenditure on outsourcing activities increases by about 4%.

Note: The vertical bars indicate the confidence interval of the estimated value ( $\pm 2$  standard deviations).

The rise in outsourcing expenditure should be accompanied by a restructuring of employment in companies, which are refocusing on their core business. To test this hypothesis, the authors look at an index known as the Herfindhal Index, which measures the concentration of business types in companies. If the index is close to zero, it means that companies employ workers in a wide range of activities, i.e. they are not very specialised. If it is close to one, it means that there is a high concentration of the same jobs.

For treated companies, which are located in municipalities connected to ADSL, the one percentage point increase in the index confirms the hypothesis of a concentration of employment on companies' core business activities (see Chart 3a). From a macroeconomic point of view,

<sup>2</sup> However, the fall in communication costs is likely to affect some types of occupation (such as human resources, accounting) more than others (such as cleaning).

<sup>3</sup> More precisely, these workers are administratively attached to the company that employs them (the service company) and not to the company where they actually work (the company that contracts them).

<sup>4</sup> On the basis, in France, of the annual declaration of social data (DADS), which is a formality to be completed by any company with employees.

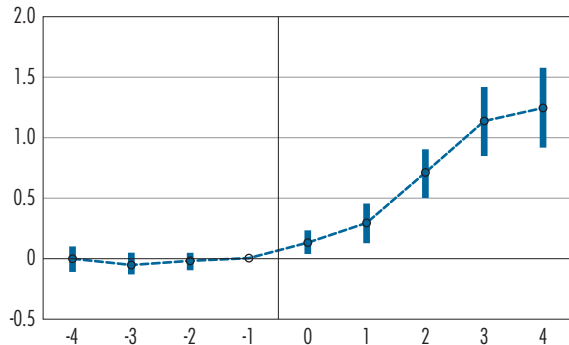
<sup>5</sup> This chart and the following ones are based on an estimation of a staggered difference-in-differences model, i.e. adapted to a treatment that affects all observations but at different periods. Each year, the coefficient displayed is therefore obtained by using the municipalities not yet connected as a control group – see Bergeaud et al. (2021) for more details.



### C3 Job concentration index in companies, before and after connection to ADSL

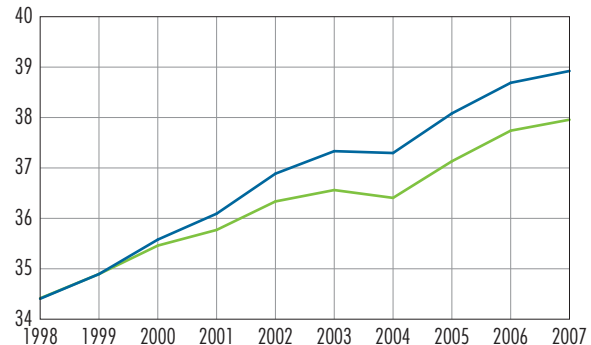
(x-axis: gap in years with the municipality's ADSL connection date; y-axis, job concentration index in percentage points)

a) For treated companies



b) On average at national level

— Observed values with ADSL  
— Expected values without ADSL



Source: Bergeaud et al. (2021), based on annual declarations of social data (DADS, Insee).

Key: Four years after the ADSL connection date, the job concentration index increases by about 1 percentage point (Chart a). Chart b) shows the aggregate change in job concentration observed in metropolitan France and as it would have been without ADSL. In order to measure this counterfactual, the authors use the estimated effect of ADSL on each municipality and the year of its connection.

the average concentration at national level, which was already on an upward trend (by 3.5 points over nine years), accelerated significantly after connection to ADSL (see Chart 3b) and reflects the extent of the change that has taken place.

### The mechanisms of outsourcing skilled and low-skilled functions

The first empirical results presented above confirm that a technological change can trigger a major reorganisation in companies, which refocus on their core business and make greater use of outsourcing. In order to identify the types of activities outsourced following the roll-out of ADSL, Bergeaud et al. (2021) use individual data on workers. In particular, they check that the outsourced activities are indeed those considered as “peripheral”, i.e. those can be more easily allocated to external partners, notably because they do not require the development of the company’s specific know-how. To this end, they observe the population of workers in each municipality who perform outsourceable functions, and, within this municipality, the evolution of the share of workers actually employed by specialised service companies. They also classify into two groups the

activities identified as likely to be outsourced: i) the so-called skilled tasks, such as human resource management, IT, accounting, marketing and communication; ii) the so-called unskilled tasks, such as transport, security and cleaning. The analysis shows that the outsourceable jobs are increasingly performed by specialised service companies after the switch to ADSL (see Chart 4 below). However, the effect is more pronounced – and more precise – for low-skilled workers.

### 3 The consequences for “outsourced” workers: greater income disparities according to technical qualification

Beyond the documented structural changes in work organisation and the fragmentation of production, the authors of the study look at the consequences for workers directly affected by the outsourcing process.

#### An increase in income inequalities: the “skill-biased technological change”

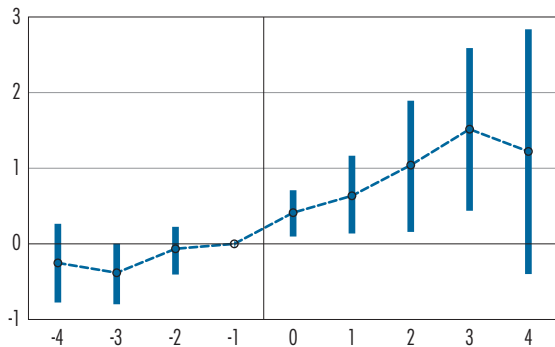
The economic literature has extensively studied the effects of technological change on wages: it converges on a result known as “skill-biased technological



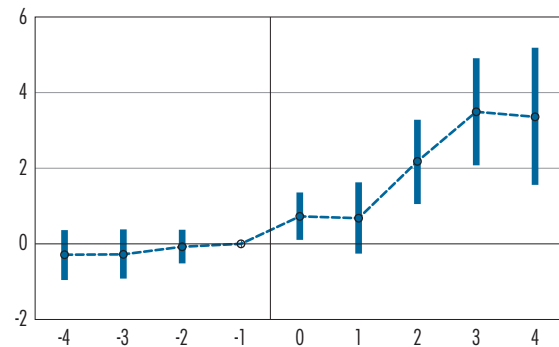
**C4 Share of employees of specialised service companies among the employees of a municipality in an outsourcable function**

(x-axis: gap in years with the municipality's ADSL connection date; y-axis: share of employees of service companies in %)

a) Skilled employees



b) Unskilled employees



Source: Bergeaud et al. (2021), based on annual declarations of social data (DADS, Insee).

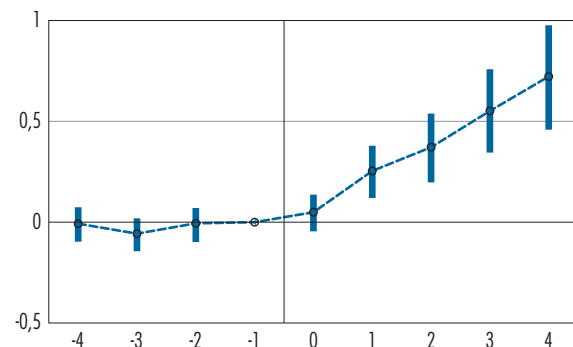
Key: Four years after the ADSL connection date, the share of employees who occupy outsourcable functions and work in specialised service companies increases by 1.5 percentage points for skilled workers (Chart a) and by almost 4 percentage points for unskilled workers (Chart b).

change". The intuition is that information and communication technologies are labour-saving and therefore "biased" in favour of the most skilled workers. In practice, following a technological change, the demand for workers with technical skills increases immediately, while training workers in order for them to acquire these skills takes time. Demand therefore exceeds supply, which is slow to adjust: as a result, the wages of skilled workers rise. Conversely, low-skilled workers are likely to be downgraded by the changes introduced by this technology, especially if they do not receive professional training to adapt. This formally results in an increase in the wage gap between skilled and unskilled workers. Akerman et al. (2015) confirm this effect in a similar context of broadband Internet diffusion in Norway.

The authors check these results for France and show that the outsourcing process is a catalyst of the skill-biased technological change. Access to broadband Internet has indeed increased the share of skilled workers in the total employment of connected municipalities (see Chart 5), thus raising the hourly wage of the average worker by 3%, a rise that mainly benefits skilled workers.

**C5 Share of skilled workers in a municipality, before and after the arrival of ADSL**

(x-axis: gap in years with the municipality's ADSL connection date; y-axis: share of skilled workers in %)



Source: Bergeaud et al. (2021), based on annual declarations of social data (DADS, Insee).

Key: Four years after the ADSL connection date, the share of skilled workers in a municipality increases by about 0.8%.

**Inequalities remain after a transfer to a service company**

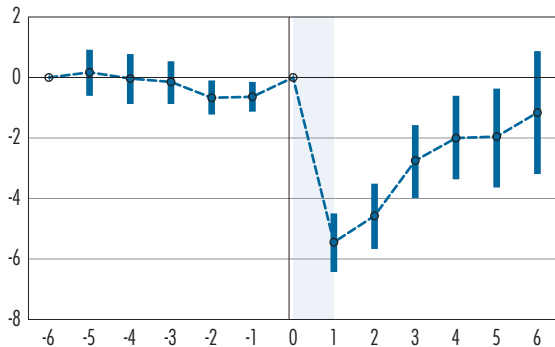
Using data from a panel of social security declarations, the authors followed workers after a change of employer, when they joined a service company (cleaning, security, logistics, etc.), and assessed their wages before and after this change. The results depend on the level of



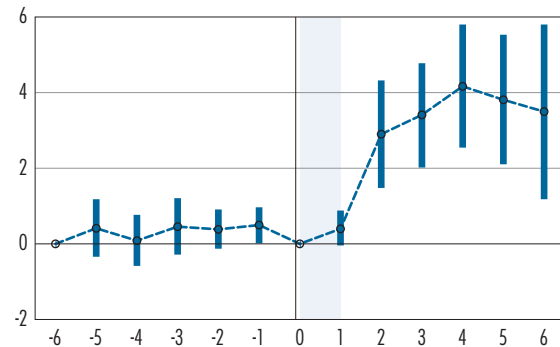
## C6 Change in wages of employees transferred to service companies

(x-axis: gap in years with the date of outsourcing; y-axis: change in hourly wages in %)

a) Skilled employees



b) Unskilled employees



Source: Bergeaud et al. (2021), based on a panel of annual declarations of social data (DADS, Insee).

Key: After transferring to a service company, a skilled employee sees his or her hourly wage increase by 4% on average (Chart a), while an unskilled employee sees his or her hourly wage fall by 6% before gradually rising again (Chart b).

Note: The shaded area corresponds to the year in which outsourcing takes place, and for which tax data may not be reliable.

qualification of the task that is outsourced. Indeed, although the outsourced activities are mostly low-skilled, some require a high level of education (IT, accounting). For the first group, the average effect on wages is negative and workers suffer a loss of 1% of their hourly wage by joining a service company. In contrast, for highly skilled workers, the effect on wages is positive with an average increase of 4% (see Chart 6). The fragmentation of work organisation in companies is therefore also accompanied by an increase in wage inequality in the labour market.

These findings have a particular resonance today: the Covid-19 pandemic has indeed changed the way we work and caused the massive adoption of new information and communication technologies. Thus, the widespread recourse to teleworking is a shock that has many similarities with the spread of ADSL: increased productivity (Bergeaud et al., 2021) and reduced communication costs, in particular thanks to the massive digital investments that accompany it. This shock could lead companies to reorganise and to promote the outsourcing of new activities.

## 4 Similarities with the current situation of massive teleworking

The spread of new information and communication technology has a causal effect on the outsourcing and subcontracting of activities considered as peripheral. These activities are diverse: IT, human resources, accounting, communication, transport, security, cleaning. Companies are able to restructure and focus on their "core business". The consequences for workers moving to a service company are heterogeneous, with an increase in hourly wages for skilled workers and a decrease for low-skilled workers.



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