

## Can electricity consumption by businesses help improve forecasts of activity, especially in a period of crisis?

The electricity consumption of businesses connected directly to the RTE (Electricity transmission network) represents a source of data available at high frequency and which, during 2020, demonstrated a strong correlation with economic activity. However, these businesses are essentially industrial and, because of their status as large electricity consumers, they are not necessarily representative of all enterprises in their sector. At a more detailed sectoral level, the match between electricity consumption by these companies and activity in the sector therefore appears more varied. In particular, it reflects the fact that this indicator is more efficient when monitoring activity that is particularly irregular, as in 2020, than activity in times of weaker fluctuations.

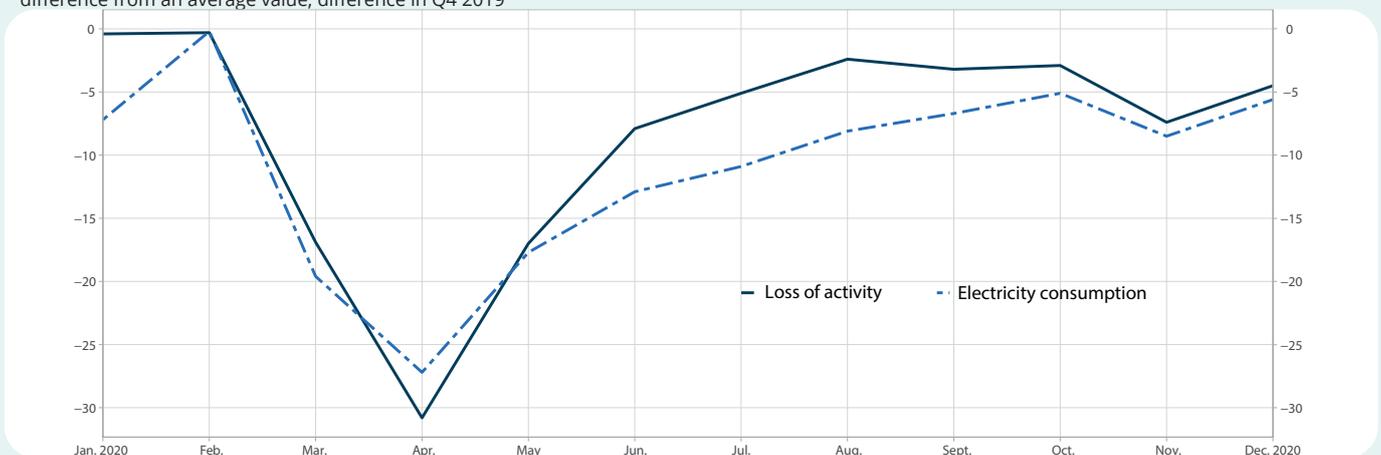
### Electricity consumption<sup>1</sup> by businesses connected directly to RTE was strongly correlated with economic activity in 2020

The daily electricity consumption of businesses acts as an indicator of their economic activity, since electricity is one of the main inputs in the production process. This is all the more so for the 400 enterprises (within the meaning of SIREN) connected directly to the Electricity Transmission network (RTE): they are connected at high voltage, as their electricity needs are greater than those of other businesses. They represent about 15% of total electricity consumption.

<sup>1</sup> This refers to electricity withdrawals, i.e. consumption net of any electricity production that may take place on site: cogeneration, solar power, etc.

These data are of particular interest in a period of crisis, when movements in economic activity are on a large scale. Between February and December 2020, total electricity consumption by businesses connected directly to the RTE (adjusted for months of the year and working days) correlated very well with overall economic activity, measured as the deviation from GDP in Q4 2019 (► **figure 1**), at around 96%. The changes in these two amounts appeared to be particularly close between March and May, i.e. during the first lockdown, and from October, a period affected by the second lockdown. However, the rebound in economic activity in the summer was a little less brisk in terms of consumption by companies connected directly to the network.

► **1. Electricity consumption by companies connected directly to RTE and economic activity**  
difference from an average value, difference in Q4 2019



How to read it: in November 2020, electricity consumption by companies connected directly to RTE was 8.5% less than the average level for a month of November in 2018-2019, while activity was down -7½% compared to the pre-crisis level (Q4 2019).

Source: RTE, INSEE calculations

# French economic outlook

## The sectoral structure of this electricity consumption differs from that of economic activity

The correlation between electricity consumption by companies connected directly to RTE and overall economic activity was certainly very good between February and December 2020, but the sectoral structure of this electricity consumption differed quite considerably from that of value added (► **figure 2**). Industry obviously needs electricity to operate their machinery, and not only to light and heat their premises and power their computer systems; in fact, it represents about 80% of the electricity withdrawn by companies connected to RTE, for less than 15% of the economy's total value added. Conversely, services account for a small proportion of electricity consumption by companies connected directly to RTE, whereas they represent almost 80% of total value added; however, the transport and storage services branch represents about 15% of electricity withdrawn, for 5% of total value added.

Within the manufacturing industry, electricity consumption by companies connected to RTE is due largely (over 60% in 2018) to the metallurgical and chemical industries. Again, the sectoral structure of electricity consumption by these companies differs considerably from that of value added (► **figure 2**). It also appears relatively stable over time and, notably,

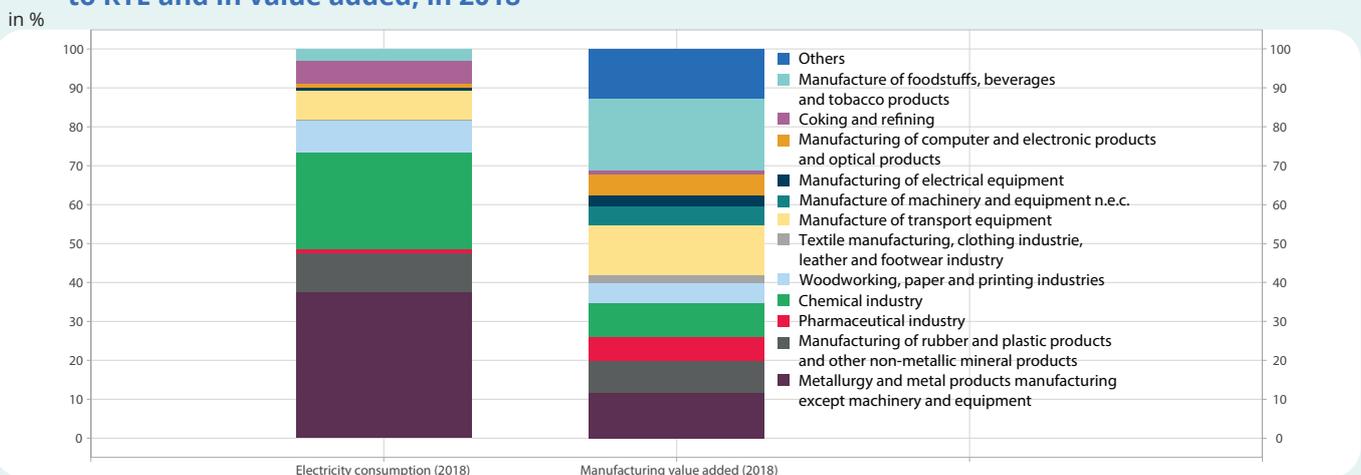
the effect of the health crisis is hardly visible (apart from transport services), which perhaps reflects the fact that overall, industry was less affected than services and the effect was in any case more evenly distributed.

More generally, the number of companies connected directly to RTE necessarily means that their turnover only approximately matches that of the branch to which they belong (the degree of coverage is measured here by the ratio of the turnover of available SIRENS to the total turnover for their branch). However, at a more detailed level of the classification of activities (NAF), some sub-branches are well represented, even very well represented among companies connected to RTE. This is particularly so for sub-branches within the chemical industry, the manufacture of rubber and plastic products and within metallurgy, the food industry and transport: here, companies connected directly to RTE represent a turnover of more than 60% of that of the sub-branch, and almost 90% in some branches of the chemical industry or transport services.

## Data on electricity withdrawal are an additional indicator for forecasting activity in industry and transport services

Given the nature of these data, using them as an aid for forecasting or instant estimates of activity means focusing on the industrial branches, manufacturing in particular, and transport services. This field seems to

### ► 2. Weight of manufacturing branches in electricity consumption by companies connected directly to RTE and in value added, in 2018



How to read it: in 2018, metallurgy represented 37% of electricity consumption by companies connected directly to RTE and 11% of value added in the manufacturing industry in value.

Source: RTE, INSEE, INSEE calculations

complement that of other high-frequency data sources (bank card transactions, searches on the Google search engine or indicators based on Google Mobility Reports), which are oriented more towards consumption than production and more towards branches of services than of industry.

Electricity withdrawals are very well correlated with monthly indicators of activity, i.e. the industrial production index (IPI) and the turnover index (ICA).<sup>2</sup> In industry, correlation with the IPI is generally similar to or better than that with the ICA (► **figure 3<sup>3</sup>**), which may reflect the fact that the IPI aims precisely to measure a concept that is closer to “production” than to turnover, which can be affected by, among other things, time lags related to billing and to inventory.

<sup>2</sup> We examine the period from January 2018 to January 2021 at the 17-branch level of the NAF classification, taking into account monthly seasonality and the number of working days.

<sup>3</sup> For parsimony, here we show only a selection of branches of industry, those with the best correlation with the IPI.

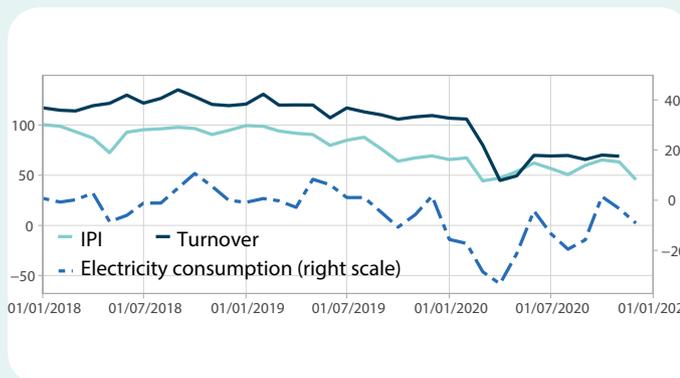
Across the whole of the period covered by the data (January 2018 to January 2021), this correlation is strongest for transport equipment (95%, ► **figure 3.c**) then for “other industrial products” (89%, figure 3.c) and coking and refining (79%, ► **figure 3.a**). In the other branches of manufacturing industry (at level A17, i.e. agrifood industry and manufacture of machinery and equipment), correlations are much weaker. In the case of transport services (► **figure 3.d**), there was not much fluctuation in the ICA before the health crisis, unlike electricity consumption by companies connected to RTE, but nevertheless it did reflect the collapse in activity in Q2 2020 and at the end of the year; the dip linked to the strikes in December 2019 is also visible.

## ► 3. Electricity consumption by companies connected directly to RTE, industrial production index and turnover index according to branch A17

100 = average value

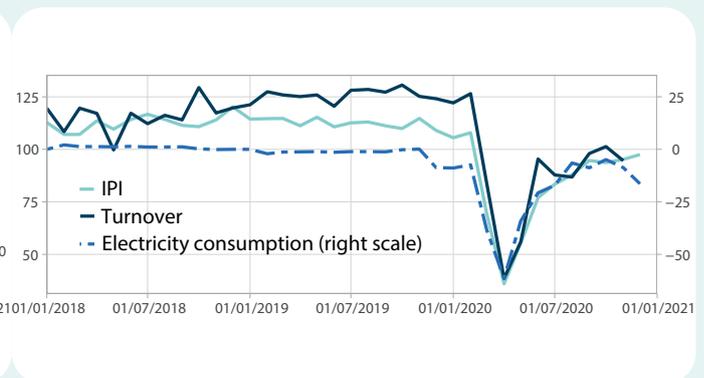
### a – Coking and Refining

CA correlation = 73%, IPI correlation = 79%



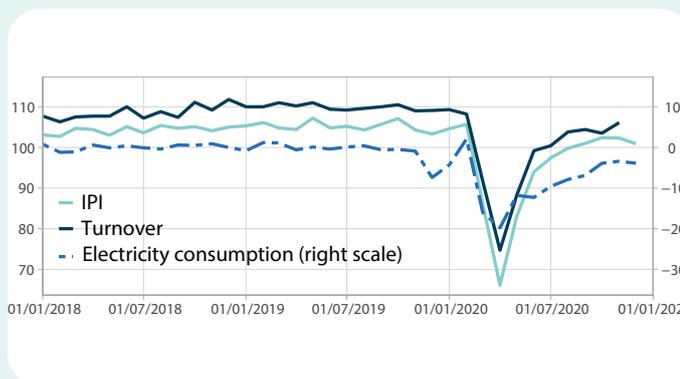
### b – Transport equipment

CA correlation = 86%, IPI correlation = 95%



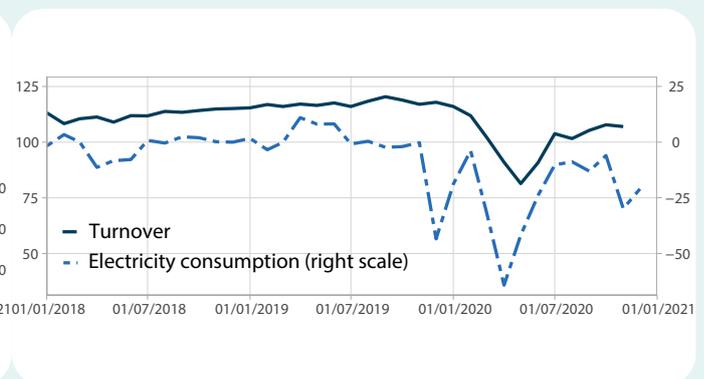
### c – Other industrial branches

CA correlation = 89%, IPI correlation = 89%



### d – Transport and storage services

CA correlation = 69%



How to read it: in the transport equipment branch, in November 2020, electricity consumption was 9% less than in an average November in 2018-2019; the industrial production index was 95. The correlation between these two monthly series was 95%.

Source: RTE, INSEE, INSEE calculations

# French economic outlook

At the more disaggregated level of 38 branches in NAF (► **figure 4**), this comparison shows very strong correlations for textiles-clothing-footwear at 92%, rubber and plastic products at 97%, and, to a lesser extent, metallurgy and metal products at 86% and machinery and equipment at 85%<sup>4</sup>. We should also mention the chemical industry and work with wood and paper, with correlations of around 60% and 50% respectively.

These strong correlations should be considered with caution, however. The relationship between economic activity in a sector and electricity withdrawals by companies in the sector (directly connected to RTE) has been particularly strong since the start of the health crisis. However, it was less so previously: between

January 2018 and February 2020, these correlations were much lower. They remain significant in some branches, however: this is notably the case in coking refining, chemicals and rubber and plastic products, and to a lesser extent in transport equipment, with correlations ranging from 35% to 50%, depending on the case.

It is interesting to see that the branches where correlations for the period January 2018-January 2021 are highest are also where the drop in electricity consumption was greatest in Q2 (► **figure 5 and 6**) and has then been absorbed relatively little (remaining at a level below 10% in 2020, compared to 2019). When shocks are great, extraneous noise (statistical, measurement, etc.) is dominated by variations, hence the increased interest in these data in times of crisis.

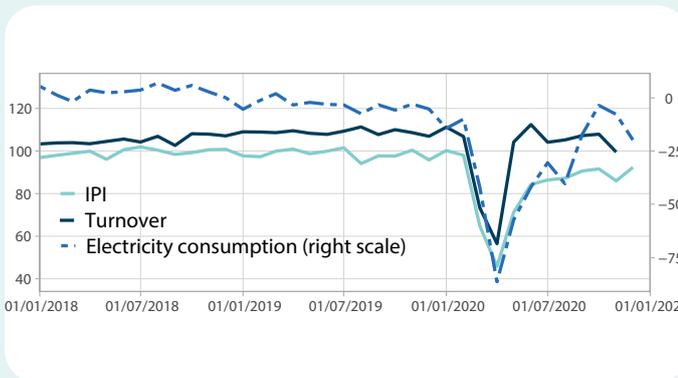
<sup>4</sup> At level A17, this branch is included in equipment (electrical, computer, etc.) and machinery, a branch where the correlation with the IPI is weak; disaggregation to level A38 is therefore especially useful.

## ► 4. Electricity consumption by companies connected directly to RTE, industrial production index and turnover index according to branch A38

in difference to a mean value

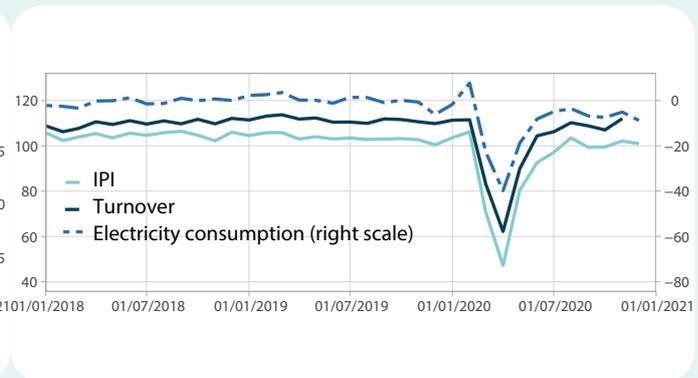
### a – Textile-clothing-shoe

CA correlation = 67%, IPI correlation = 92%



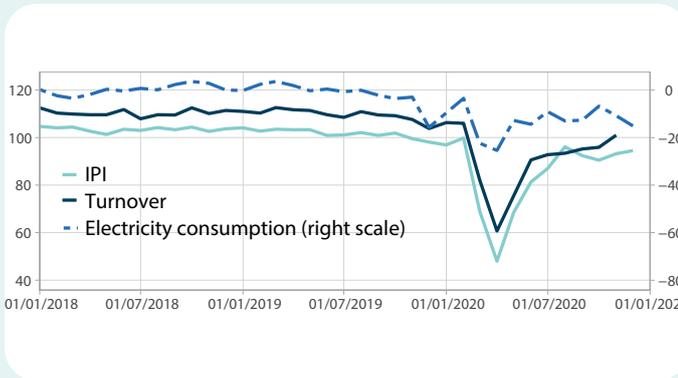
### b – Rubber and plastic products

CA correlation = 96%, IPI correlation = 97%



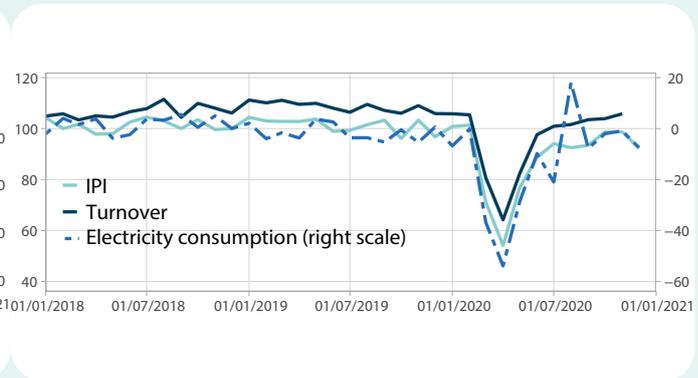
### c – Métallurgie et produits métalliques

CA correlation = 88%, IPI correlation = 86%



### d – Machinery and equipment

CA correlation = 87%, IPI correlation = 86%



How to read it: in the rubber and plastic products branch, in November 2020, electricity consumption was 5% less than in an average November in 2018-2019; the industrial production index was 103. The correlation between these two monthly series was 97%.

Source: RTE, INSEE, INSEE calculations

## Since the end of 2020, daily electricity withdrawals<sup>5</sup> have shown stability in other industrial products and have increased in transport services

As feedback from statistics on economic activity in January and February 2021 is still only partial at this stage of the quarter, data on electricity consumption provide advance information and at high frequency on activity in the sectors (at level A17) where the correlation with activity appears to have been strongest in 2020: manufacture of transport equipment, “other industrial branches” (textiles, metallurgy, chemicals, etc.) and transport and storage services.

Thus in January, in “other industrial branches”, electricity consumption by companies connected to RTE appeared to have increased compared to December (► **figure 7**), which is consistent with the rebound in the IPI in this branch (+4% in January after -1% in December). In transport services, the consumption of companies connected to RTE reflects the decline in activity in 2020 associated with the two lockdowns, with the second lockdown having had much less of an impact than the first. Electricity consumption in January remained below the average for 2018-2019. The manufacture of transport equipment, on the other hand, has a profile

that is much more difficult to interpret in relation to electricity consumption by companies connected to RTE: although production in this branch declined in January (-3% according to the January IPI), the sharp decline in electricity consumption by companies connected to RTE seems to be due more to a seasonal phenomenon<sup>6</sup>. In February, the electricity consumption of companies in this branch connected to RTE was nevertheless at a level still well below the pre-crisis level.

## Can this indicator be used to improve short-term forecasting in times of crisis?

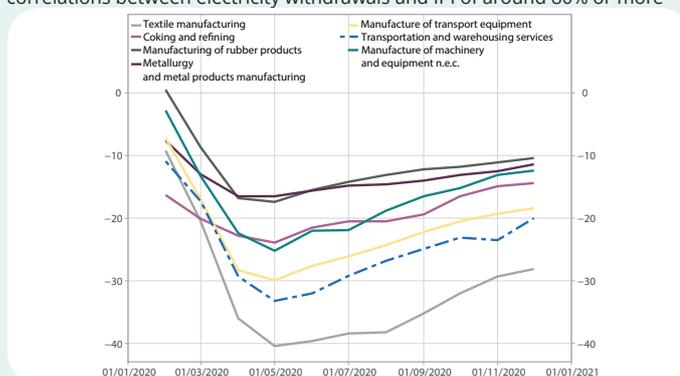
By way of illustration, we propose to use the electricity consumption of companies connected to RTE to forecast monthly losses of activity<sup>7</sup> from January to February,<sup>8</sup> in two sub-branches with strong correlations between activity and electricity consumption: “other industrial branches” and manufacture of rubber and plastic. The forecast covers October 2020 to February 2021 and was carried out in real time, i.e. the forecast of loss of activity for a given month is produced by estimating the forecasting model up to the previous month.

The forecasting model is expected to suggest an increase in activity in the “other industrial goods” branch in January (► **figure 8**. dotted line), then a decline in

- 5 Daily electricity withdrawals are adjusted for the effect of the months of the year and days of the week, by calculating the difference between the observed electricity consumption and average consumption for a similar month and day of the week. These effects are estimated from monthly data for 2018-2019 and daily data for 2020.
- 6 The seasonal variation adjustment method used for these data does not take this into account sufficiently, because the time perspective is too small. We observe the same phenomenon in the summer (in particular, the highest peak should be considered as an outlier).
- 7 The difference in activity (within the meaning of GDP) compared to its Q4 2019 level.
- 8 The latest available electricity consumption data go up to 21 February 2021.

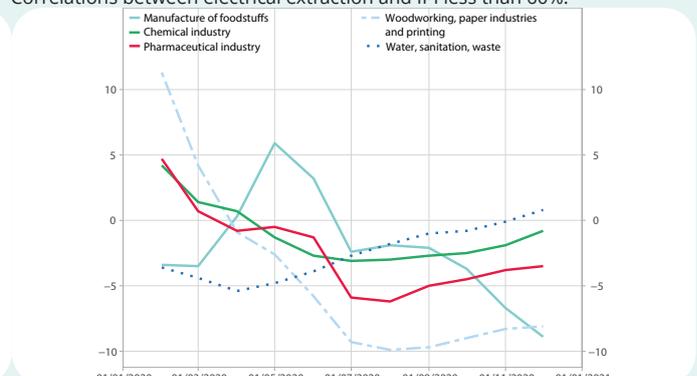
### ► 5. Cumulated withdrawals (year-on-year change): sharp decline in Q2

correlations between electricity withdrawals and IPI of around 80% or more



### ► 6. Cumulated withdrawals (year-on-year change): smaller decline in Q2

Correlations between electrical extraction and IPI less than 60%.



How to read it: in the manufacture of rubber and plastic products branch, in November 2020, cumulated electricity consumption (from January to November 2020) was 11% less than cumulated electricity consumption from January to November 2019.

Source: RTE, INSEE, INSEE calculations

# French economic outlook

February but to a higher level than in December (which is consistent with the other available indicators, especially the IPI for January). In the manufacture of rubber and plastic goods branch, the model suggests a rise in activity in January (although not as strong as that forecast, especially with regard to the IPI), before returning to its December level in February.

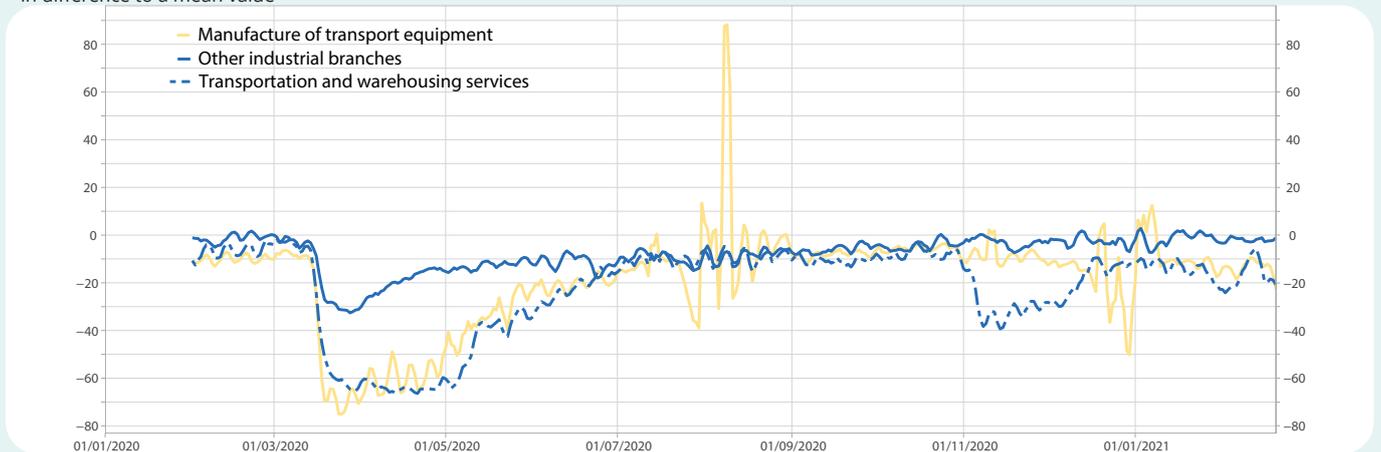
In view of the short time coverage of the series, we must be cautious in our interpretation. However,

in the period limited strictly to the health crisis, the model's statistical properties are better than with a traditional short-term indicator, like the business tendency surveys, the composite indicator for these branches. The difference between observation (solid line) and simulation (dotted line), although sizeable, is fairly stable; taking this into account, the additional information provided on the direction and extent of changes can be useful for forecasting. ●

*Aliette Cheptitski, Mathilde Poulhès*

## ► 7. Daily electricity consumption by companies connected directly to RTE

in difference to a mean value



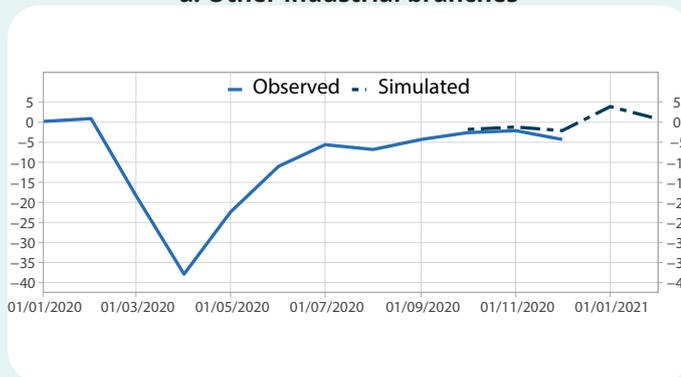
How to read it: on 15 November 2020, electricity consumption in the transport and storage branch was 39% less than the average consumption for an equivalent month and weekday.

Source: RTE, INSEE, INSEE calculations

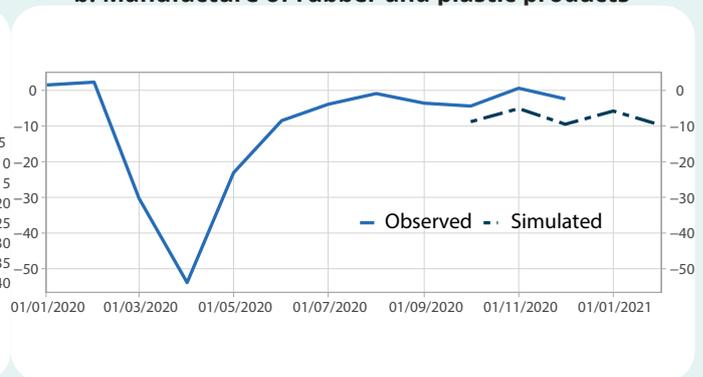
## ► 8. Estimated and forecast monthly activity

(in difference Q4 2019)

**a. Other industrial branches**



**b. Manufacture of rubber and plastic products**



How to read it: in the other industrial goods branch, calibrating activity on electricity consumption forecasts a difference in activity of about 3% in January.

Note: the forecast for activity in a given month is produced with an econometric model estimated over the period that goes up to the previous month; despite the short temporal coverage, the model is relatively stable when new points are added to the estimate. The last simulated point is that for February 2021.

Source: RTE, INSEE, INSEE calculations