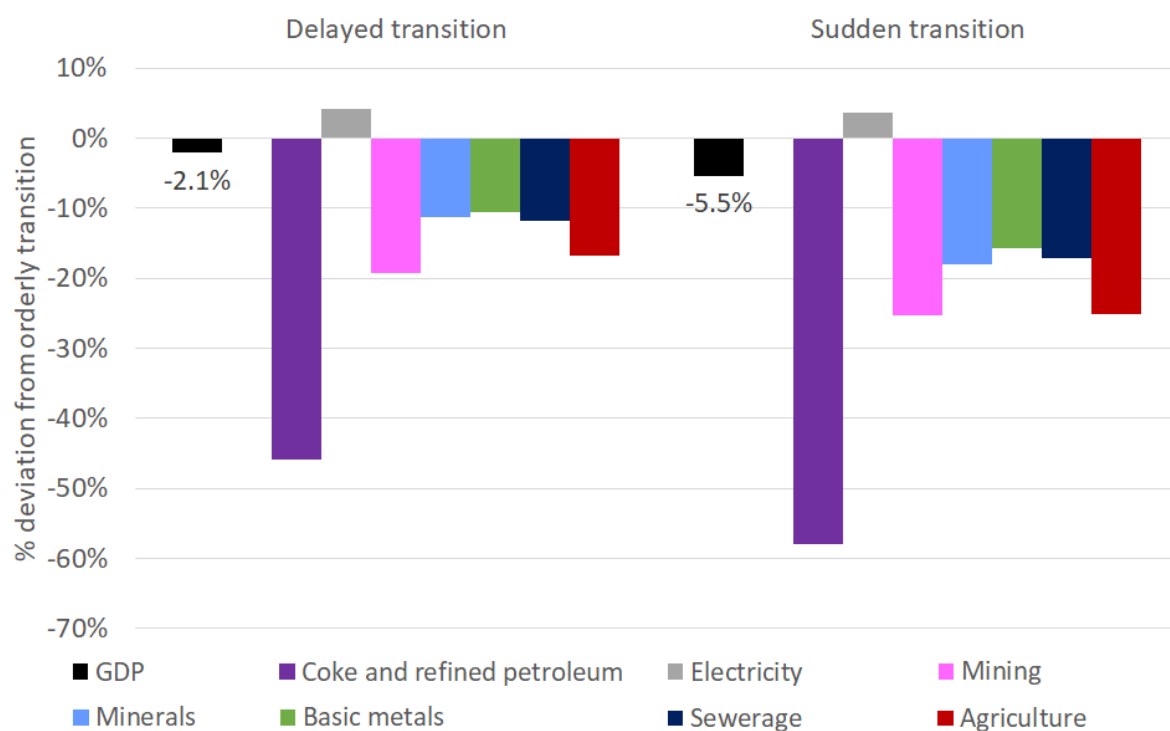


# “Too little, too late”: Impact of a disorderly climate transition

By Annabelle de Gaye and [Noémie Lisack](#)

*In order to evaluate the financial risks linked to climate change, the Banque de France and ACPR have developed a suite of models that quantify adverse low-carbon transition scenarios for France. While the short-term macroeconomic effect is limited, the key impacts are located at the sector level and are strongly heterogeneous. A second blog post will examine the issue of financial stability.*

**Chart 1: Impact of disorderly transitions on total and sectoral activity in France in 2050 (compared with an orderly transition)**



*Source: Authors' calculations*

*Note: Impacts in deviation from the orderly transition. For example, in the event of a sudden transition, the GDP and value added of the “Mining” sector in 2050 would be 5.5% and 25% lower respectively than under an orderly transition.*

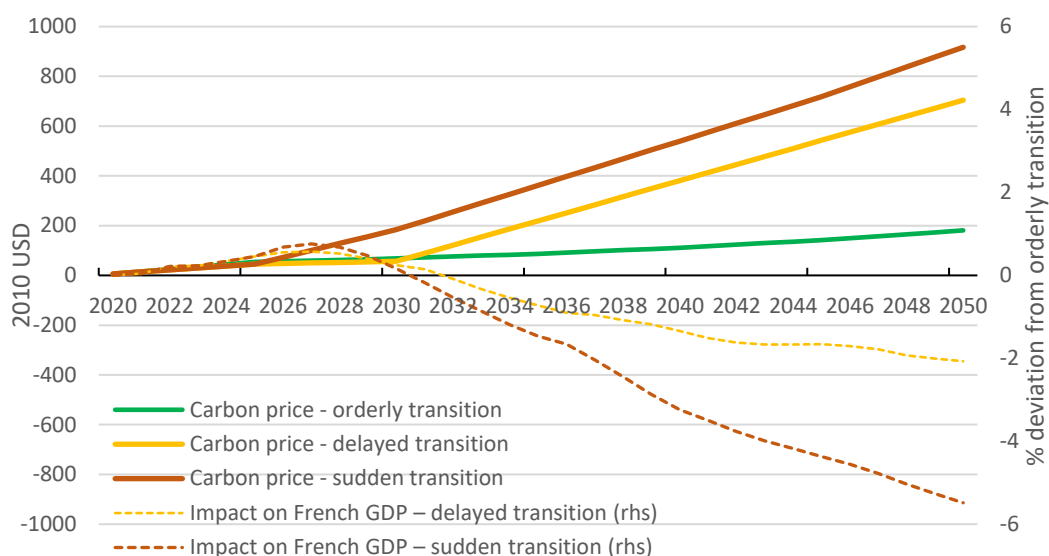
Although there is still some debate over the best way of achieving an efficient climate transition, the risks of a “disorderly” transition (for example acting too late or, conversely, too suddenly) are far less contested. It is nonetheless important to quantify these risks, in order to better anticipate the resulting economic and financial challenges. So-called “orderly” transition scenarios, where economies succeed in making the shifts needed to meet the Paris Agreement goals, frequently anticipate that the costs to the economy will be low (see the French [National Low-Carbon Strategy](#) or the [Central Banks and Supervisors Network for Greening the Financial System's orderly transition scenario](#), which estimate that the final impact on French GDP by 2050 will be negligible). One possible criticism of these analyses is that they take insufficient account of certain macroeconomic costs during the transition phase ([Pisani-Ferry, 2021](#)). The aim of this blog post is not to discuss these scenarios but rather to underline the risks associated with a disorderly transition, using as a basis the climate pilot exercise conducted by the ACPR in 2021. For this exercise, the Banque de France developed a suite of models that disaggregate the effects of the low-carbon transition at the national, sectoral and infra-sectoral levels. There are specific requirements for the exercise, notably a very long time horizon and high degree of granularity in order to capture disparities that are invisible at the macroeconomic level.

## Transition scenarios

Within the framework of the ACPR's pilot exercise, [Allen et al. \(2020\)](#) describe three types of climate transition: (i) an “orderly” transition where public policy action and technological change reduce carbon emissions in line with the goals of the Paris Agreement, with minimum macroeconomic damage; (ii) a “delayed disorderly” transition involving delayed policy action and disruptive effects on the economy; and (iii) a “sudden disorderly” transition where the late and abrupt (to make up for the delay) implementation of the transition is not accompanied by technological advances, leading to significant disruptive effects.

In this blog post, we present the two latter scenarios (Chart 2), with a particular focus on the “sudden” adverse transition. The impacts of the two transitions are measured as deviations from the orderly transition, i.e. the one that meets the Paris Agreement goals with no major disruption, and where the carbon price rises from EUR 54 per tonne of CO<sub>2</sub> equivalent (tCO<sub>2</sub>eq) in 2025 to EUR 180 in 2050. The “sudden” transition scenario is based on a rise in the carbon price, via increased taxes, from EUR 45 tCO<sub>2</sub>eq in 2025 to over EUR 900 in 2050, which is nearly EUR 700 higher than in the orderly transition. It can therefore be considered to be strongly adverse, as this carbon price shock is only accompanied by minimal technological progress.

**Chart 2: Carbon price (level) and impacts on French GDP (deviation from an orderly transition) under the disorderly transition scenarios**



*Sources: NGFS, BdF, authors' calculations*

*Note: Carbon prices (in 2010 USD, left-hand scale) are in levels, and impacts on French GDP (in %, right-hand scale) are measured in deviation from the orderly transition scenario.*

## Coupling of two models

In order to simulate the aggregate change in the French economy and the sector-level change in output, we couple two models with different attributes. We first simulate the impact of the disorderly transition using [the neo-keynesian multi-country model NiGEM](#) developed by the National Institute for Economic and Social Research, which provides aggregated results for a large number of countries and for a wide range of variables. We then couple this model with a multi-country, multi-sector model developed by [Devulder & Lisack \(2020\)](#) which breaks down the aggregate impact across 55 productive sectors.

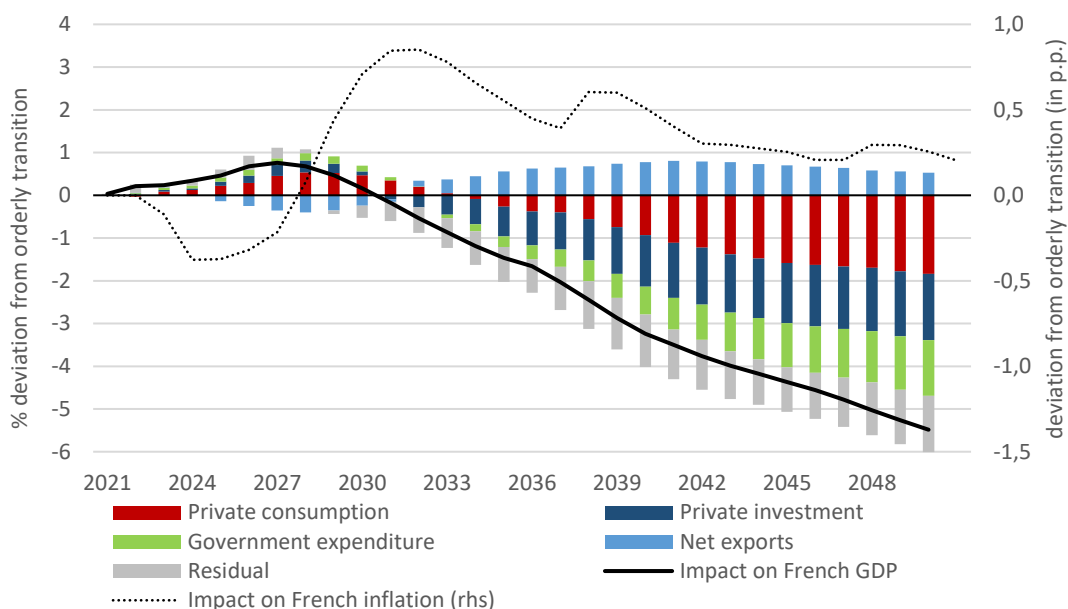
## Limited aggregate impacts up to 2050...

The “delayed” and “sudden” adverse transition scenarios lead respectively to impacts of -2.1% and -5.5% on French GDP in 2050 (Chart 2). As the adverse transitions begin later than the orderly transition used here as a baseline, the aggregate impact on French GDP is initially slightly positive, but subsequently deteriorates significantly.

At the macroeconomic level, the sharp rise in the carbon tax and lack of technological progress described in the adverse scenario imply a negative supply shock: French output contracts. On the demand side, as tax receipts are redistributed to households while the effects on supply are transmitted more slowly, the scenario initially tends towards the positive side for consumption. However, the rise in inflation caused by the higher carbon tax

leads to an erosion of household purchasing power which eventually outweighs the positive effect of the income redistribution as of 2035. Real gross disposable income declines, leading to falls in private consumption and investment (Chart 3), which in turn push up unemployment. The impact on the external balance is positive as imports decline to a greater extent than exports. The government budget balance deteriorates in line with these recessionary effects, although the impact of the carbon tax alone is neutral since the tax receipts are redistributed. The increase in inflation (compared with the orderly transition scenario) occurs fairly rapidly under this scenario: in France, the inflation rate is 0.6 percentage point higher per year on average between 2030 and 2040. The rise (versus the baseline) is then kept to 0.3 percentage point per year on average between 2040 and 2050 thanks to the monetary policy response.

**Chart 3: Impact of the sudden transition on French GDP, its components and inflation (deviation from an orderly transition)**



*Source: Authors' calculations*

*Note: Impact on GDP measured in % deviation from the orderly scenario. Bars: contributions to this impact. Impact on inflation (right-hand scale) measured as the difference (in percentage points) between the rates of inflation under the sudden and orderly scenarios.*

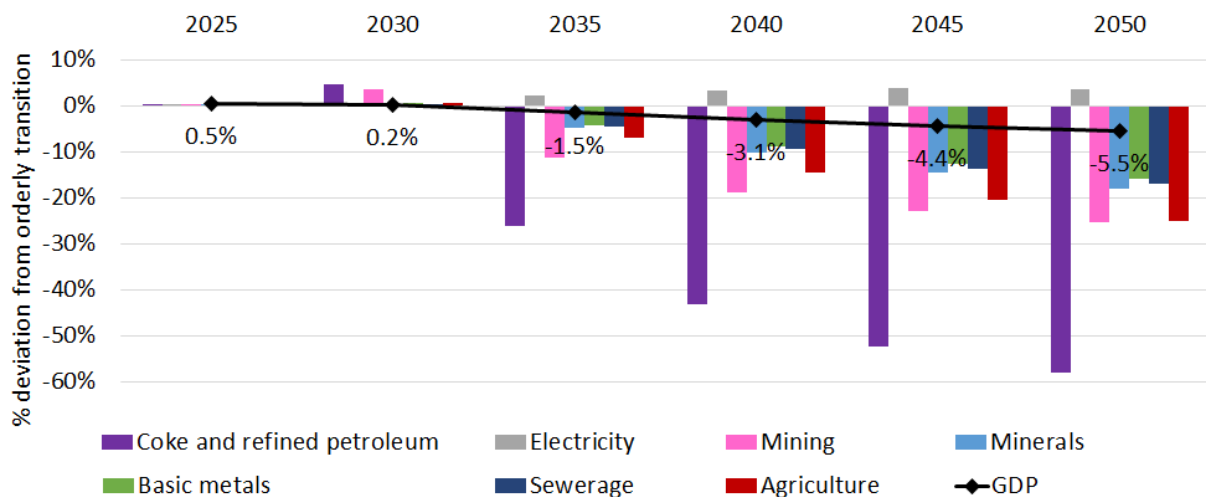
### ... which mask strong sectoral heterogeneity

The aggregate impacts in 2050 appear relatively limited considering the sharp rise in the carbon price. They nonetheless mask considerable disparities between sectors, underlining the importance of using a sufficiently high level of granularity. Although services and the public sector account for half of the decline in GDP due to their high weight in the French economy, they are only affected to a limited extent, and their impacts are fairly homogeneous. In contrast, a very small number of sectors – accounting for barely 5% of the

French economy and contributing just 0.6 percentage point to the decline in GDP in 2050 – are severely affected and could cause disruption due to the major changes that they undergo (Coke and refined petroleum, Mining, Agriculture, etc. See Chart 4).

Prior to the launch of the transition (i.e. up to 2030), polluting sectors benefit from a slightly lower carbon price than under the baseline scenario, and their value added therefore rises. However, from 2035 onwards, the coke and refined petroleum sector is particularly badly hit as high taxes are levied on the use of its products (e.g. petrol), implying a decline in demand and a drop of around 60% in its value added by 2050. The collapse in output in this sector transmits upstream in the value chain to the mining industry, where value added falls by 25%. Furthermore, sectors where the production process emits high levels of greenhouse gases (minerals, basic metals and sewerage) see their value added fall by between 15% and 18%, while value added in agriculture falls by 25%. In contrast, the electricity and gas sector benefits from the energy transition with a 4% rise in value added.

**Chart 4: Trajectory of the impact of a sudden transition on French GDP and on value added in selected sectors**



*Source: Authors' calculations*

*Note: Impacts in deviation from the orderly transition. For example, in the event of a sudden transition, the GDP and value added of the "Mining" sector in 2050 would be 5.5% and 25% lower respectively than under an orderly transition.*

One of the main lessons to draw from these disorderly transition scenarios is the importance of sectoral and infra-sectoral granularity. The sectoral shocks described above affect companies heterogeneously, modifying their probability of default and, through this channel, affecting the financial stability of the entire economy. These issues are studied in a second blog post.