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Assessing short-term and long-term economic and environmental effects of the COVID-19 crisis in France

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Context/motivation (June 2020)

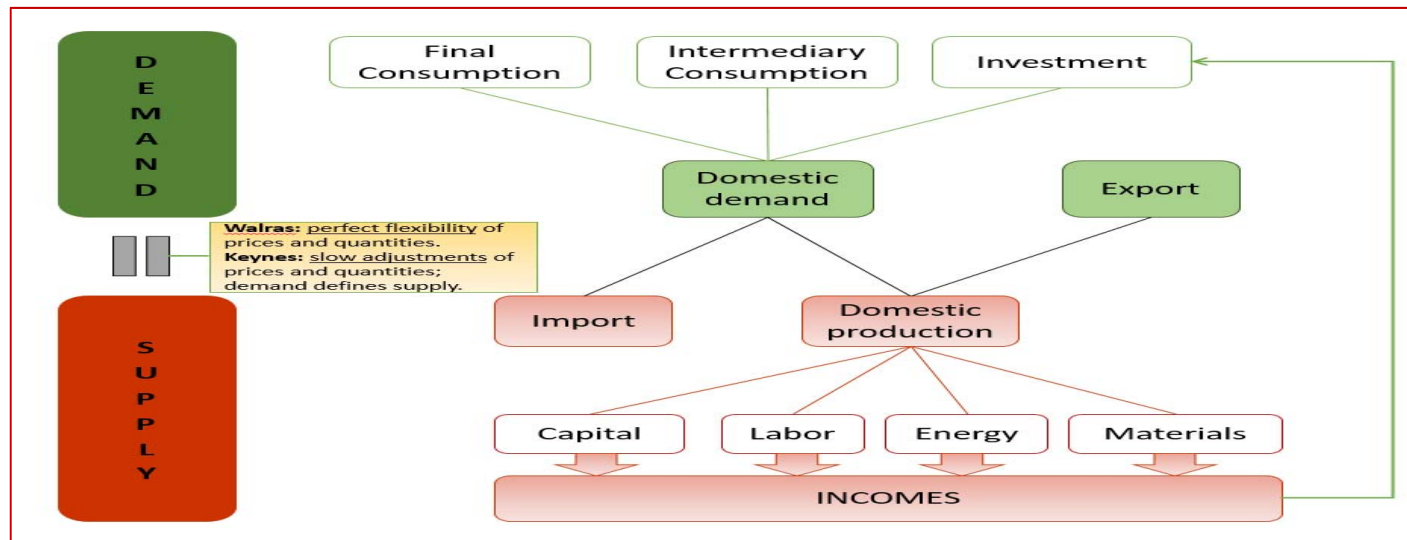
- Appearing in China in late 2019, the COVID-19 outbreak has spread extremely rapidly throughout most countries in the world over the first months of 2020
- To slow down the rate of its spread, most countries have imposed severe measures that can go as far as complete country-wide lockdown (case of France: 55 days strict lockdown)
- These unprecedented measures have had a significant impact on the economy and the environment at the global and national levels - at least in the short term.
- However, the environmental and economic impact of this crisis over the medium and long run remains unclear (Helm, 2020).
- Furthermore, the economic impact of climate policies, often thought to be positive, may be substantially modified in the context of the COVID-19 crisis.

Context/motivation (June 2020)

- Appearing in China in late 2019, the COVID-19 outbreak has spread extremely rapidly throughout most countries in the world over the first months of 2020
- To slow down the rate of its spread, most countries have imposed severe measures that can go as far as complete country-wide lockdown (case of France: 55 days strict lockdown)
- These unprecedented measures have had a significant impact on the economy and the environment at the global and national levels - at least in the short term.
- However, the environmental and economic impact of this crisis over the medium and long run remains unclear (Helm, 2020).
- Furthermore, the economic impact of climate policies, often thought to be positive, may be substantially modified in the context of the COVID-19 crisis.
- This paper seeks to address two main questions:

- (i) What are the economic and environmental effects of the COVID-19 crisis,
in the short, medium and long term ?
- (ii) What is the macroeconomic impact of climate policy in the post-COVID recovery?

The ThreeME model



- Country-level
- Multi-sector
- Hybrid
- Dynamic
- Open source
- CGE model

- Hybrid Social Accounting Matrixes in Money values and physical quantities secure the consistency of the engineering based and economically based analyses
- Dynamic trajectories (2010-2050):
 - Annual time step – Recursive succession of static equilibria
- “Second best” nature of economic interactions
 - ➔ Prices don’t adjust instantaneously to clear markets (prices and quantities adjust slowly)
 - ➔ Producers adjust their supply to the demand. This has the advantage to allow for situations of market disequilibria (in particular the presence of involuntary unemployment ➔ Philips curv)
 - ➔ Imperfect foresights for investment decisions

ThreeME ... 5 scenarios

- (i) what are the economic and environmental effects of the COVID-19 crisis?*
- (ii) what is the macroeconomic impact of climate policy in the post-COVID recovery?*

➔ Five scenarios:

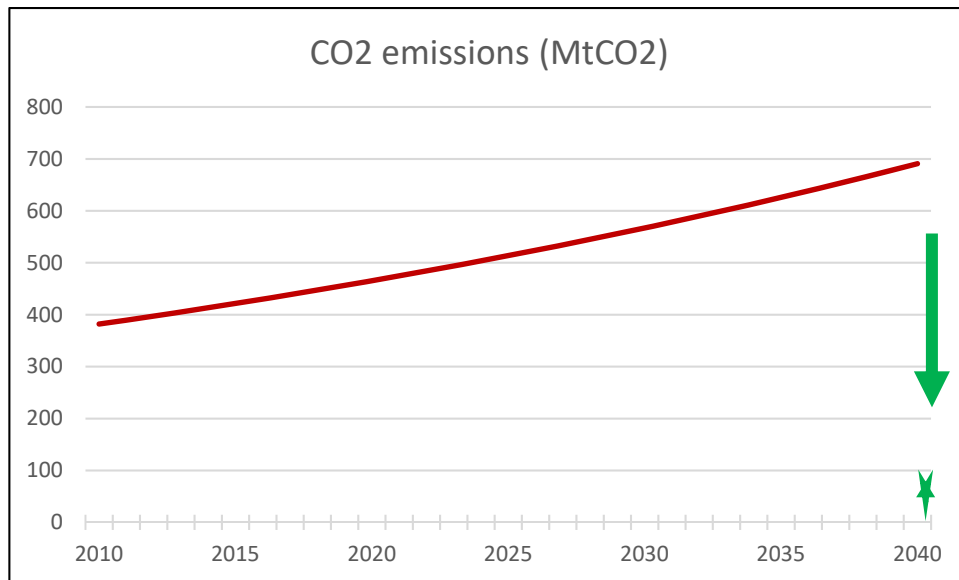
- Baseline (benchmark)
- Climate policy scenario (carbon tax) ➔ counterfactual
- Covid-19 scenarios:
 - COVID
 - COVID & Low Oil
 - COVID & Low Oil & Climate Policy

Baseline (main assumptions)

- In accordance with the assumptions used in the energy scenarios of the French Department of Climate and Energy (CGDD), we assume:
 - Productivity gains: constant annual rate of 1.7%
 - Population: 0.29% growth
- ➔ Annual natural growth rate of 1.99%
- The prices of imported petroleum products and gas is expected to increase at the same rate as the inflation rate:
 - an average price increase of almost 2% per year.
- There are no climate policy instruments (there is no carbon tax)
- We assume zero exogenous energy efficiency gain

Baseline CO₂ emissions

- With these assumptions the resulting CO₂ emissions:
 - 80% increase over 2010-2040
 - from 382 MtCO₂ to 692 MtCO₂

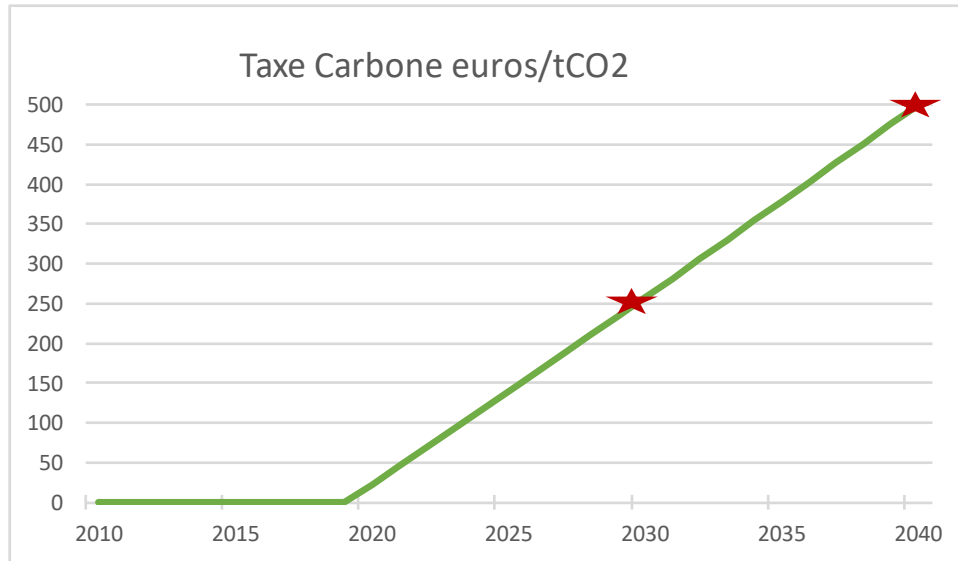


- Far from the objective of carbon neutrality (Paris agreement) estimated at 37 MtCO₂ in 2050 (Ministry of Ecological Transition and Solidarity)

>90% reduction to reach the SNBC objective

Climate Pol

➤ Implementation of a carbon tax:



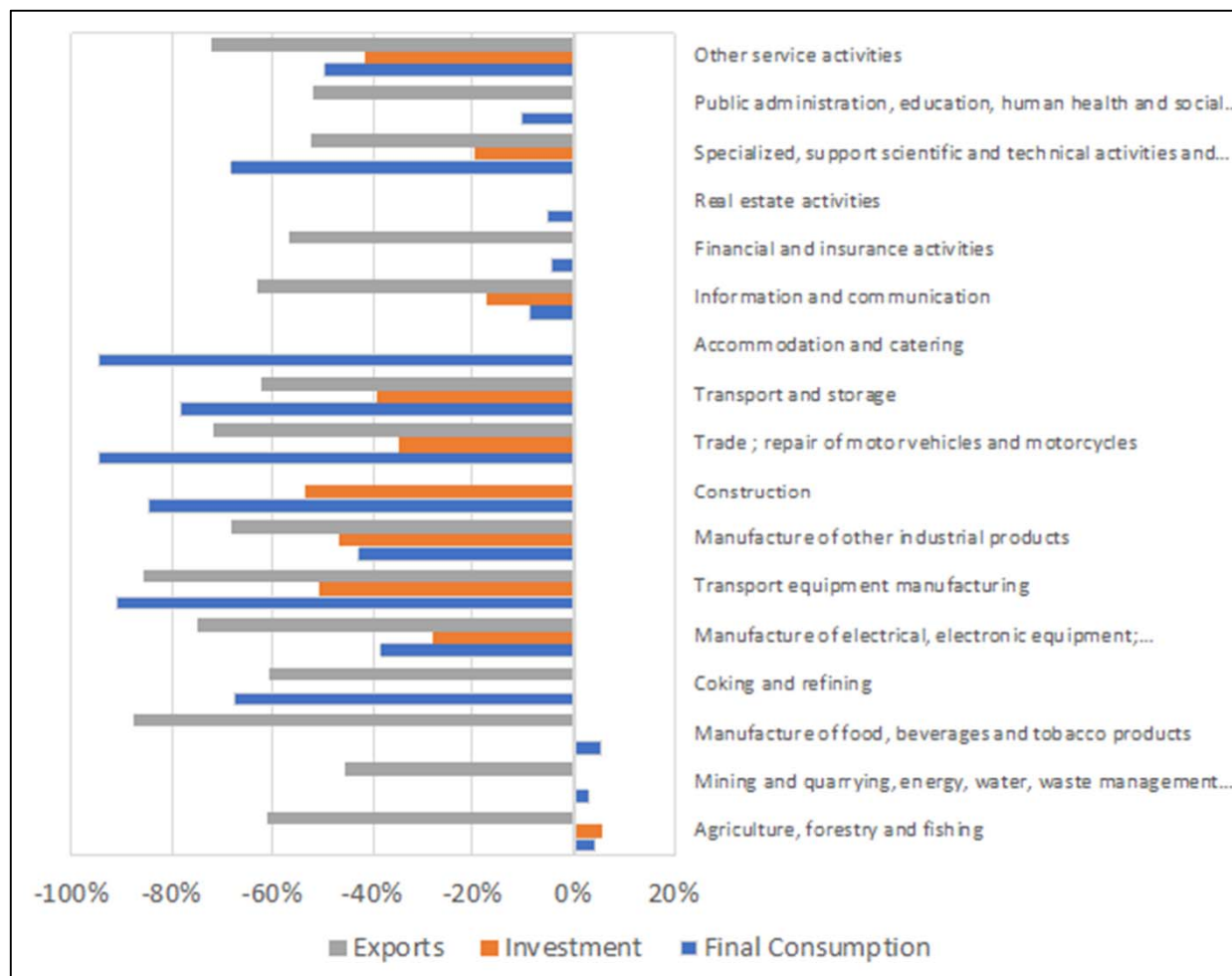
- 250 € in 2030 - 500 € in 2040
(Commission Quinet sur la Valeur tutélaire du carbone
(*France Stratégie*, 2019))
- Designed to be compatible with the French government's economy-wide carbon neutrality objective by 2050

- Receipts are **fully redistributed** to households and firms through **lump sum tax credits**.
- There are no monetary transfers between households and firms:
 - proceeds of the carbon tax paid by households are redistributed to them,
 - each sector receives a share of the carbon tax paid by the private sector proportional to its share of total employment.

COVID

- The 55 days of strict lockdown has led to a **negative demand shock**, with a very significant reduction in all components of final demand – **households consumption, investments and exports**.
- We simulate this drop in final demand in 2020, then assume a return to normal levels of economic activity thereafter.

COVID: Demand shock during the lockdown period



➤ Calibration of this demand shock is based on estimates provided by DAP OFCE (2020)

➤ Detailed by sector

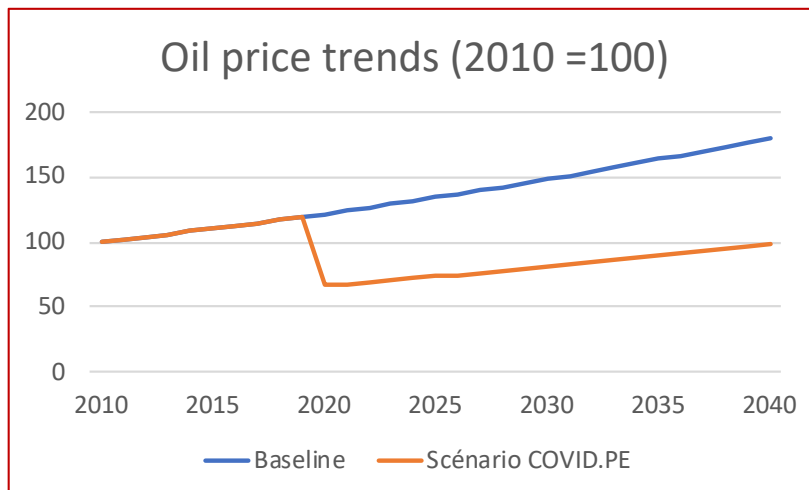
Shock Covid

##! Effective households final consumption of commodity \$c\$

@over CH[c] = CH1[c] + shock_CH[c]*(@elem(CH[c], 2020)) if CH[c] <> 0

COVID & Low Oil

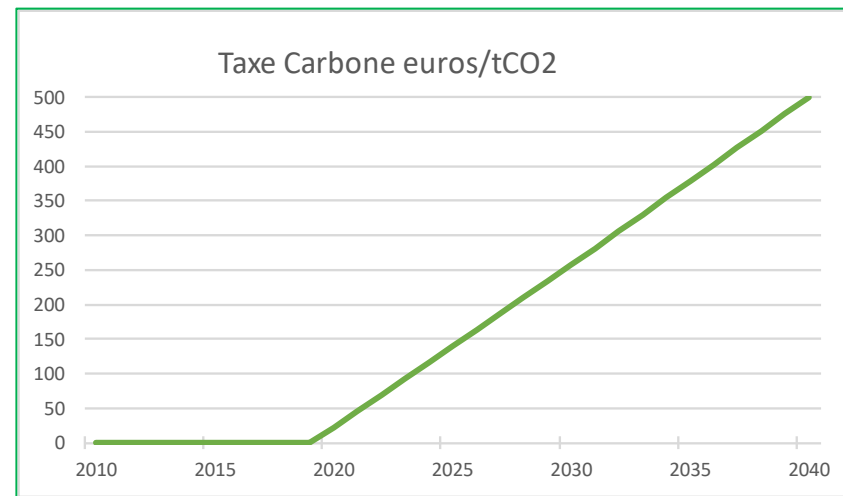
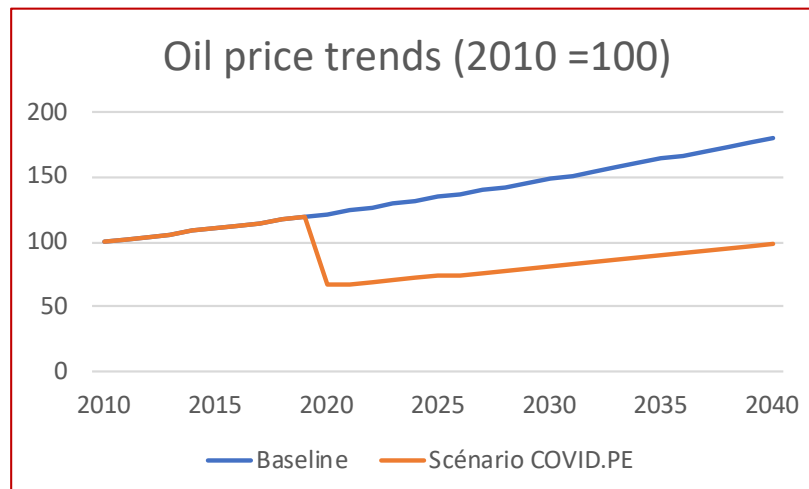
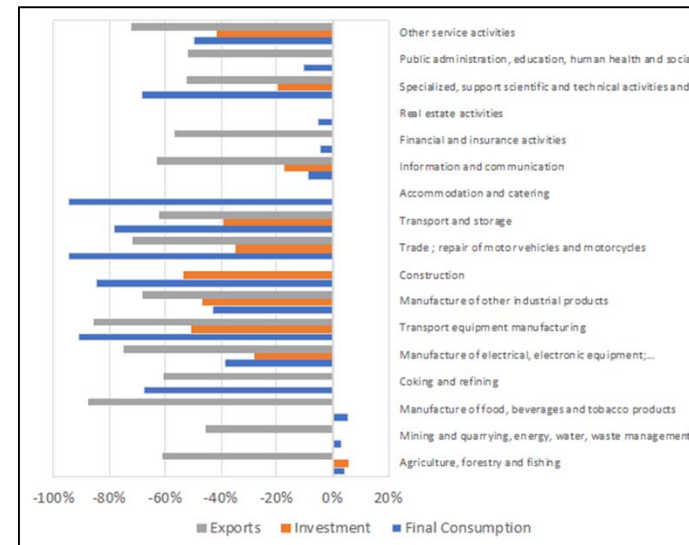
- Covid crisis + preexisting international context of oil markets
 - ➔ a dramatic decrease in oil price, which could be nearly 50% lower in 2020/2019 (World Bank, 2020; IEA, 2020)
- the combination of structural over-supply and global efforts toward decarbonization may significantly depress oil prices in the medium to long term (Helm, 2020)



We assume a sharp decrease in the international oil price followed by a slow recovery: **a 50% drop in 2020 followed by a 2% a year increase**

COVID & Low Oil & Climate Pol.

- COVID shock
- Low oil prices
- Carbon tax

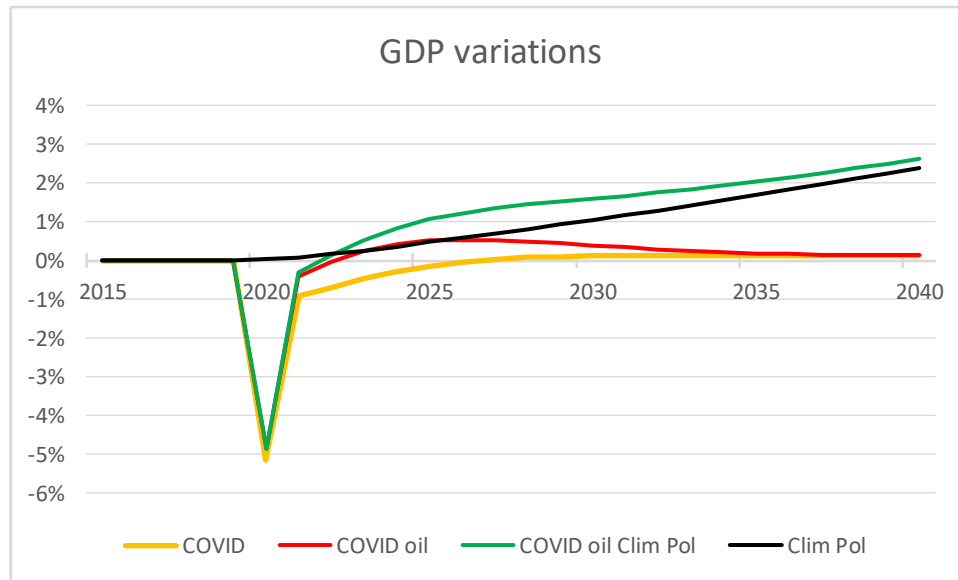


Results

	<i>COVID-19 crisis</i>	<i>Persistent low oil price</i>	<i>Recycled carbon tax</i>
<i>Climate Pol.</i>			✓
<i>COVID</i>	✓		
<i>COVID & Low Oil</i>	✓	✓	
<i>COVID & Low Oil & Climate Pol.</i>	✓	✓	✓

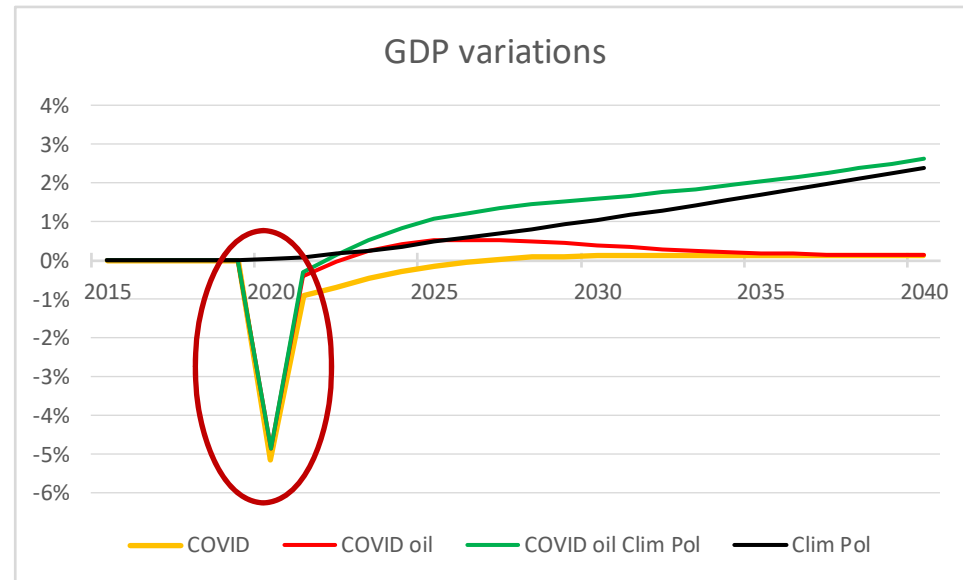
➤ All simulation results are presented in terms of deviation to the baseline scenario

COVID



GDP Relative variations with respect to the reference scenario

COVID

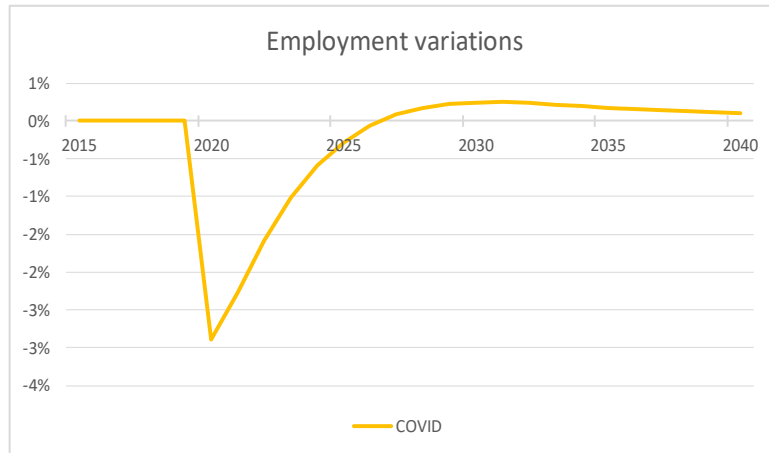


- Significant short-term losses in all COVID scenarios : -5%

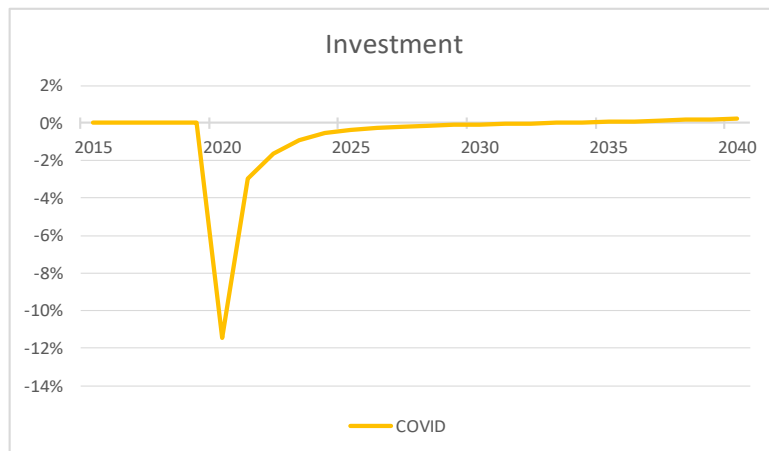
COVID scenario: -5.1% very close to the OECD (-5.3%) and Banque de France (-6%) projections (at the same time (June 2020))

- Direct consequence of the sharp drop in demand triggered by the lockdown
- In the COVID scenario: **temporary damage** with a return to the pre-crisis growth path after 6 years

COVID

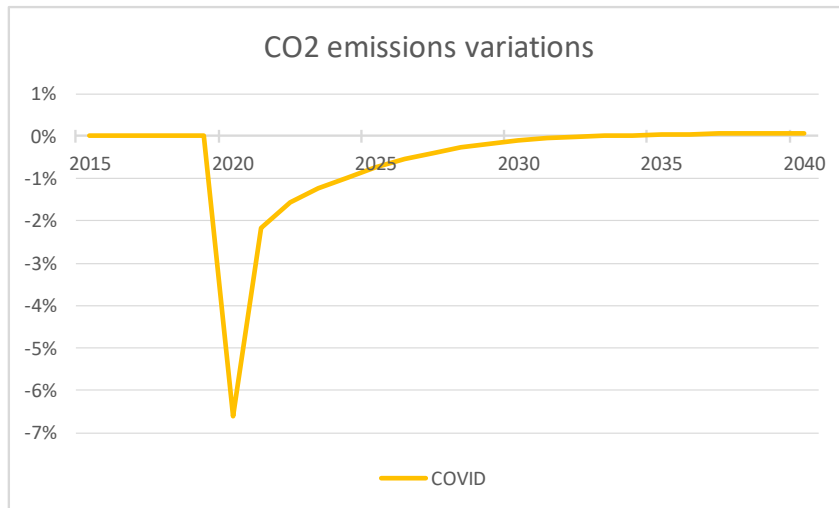


- Drop in employment -2.9% in 2020
- transitory peak: employment returns to its pre-crisis level in the following decade



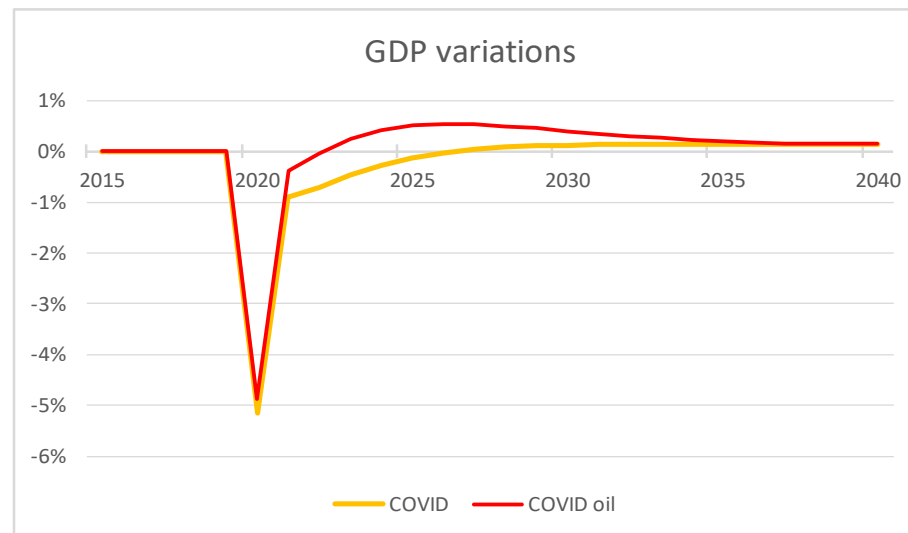
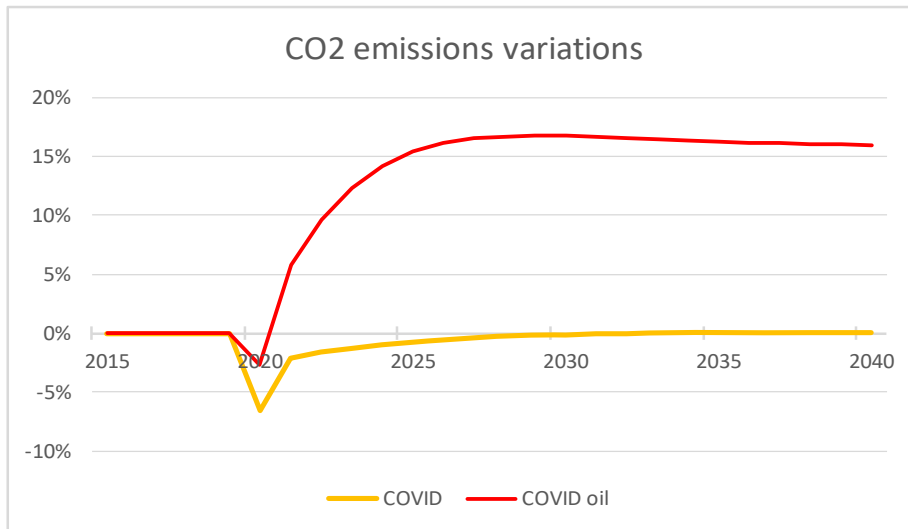
- Fall in aggregate investment: -11% in 2020
- This is offset by a much faster recovery: investment rebounds to 2.5% below its reference level in 2021 and quickly returns to its pre-crisis trajectory.

COVID



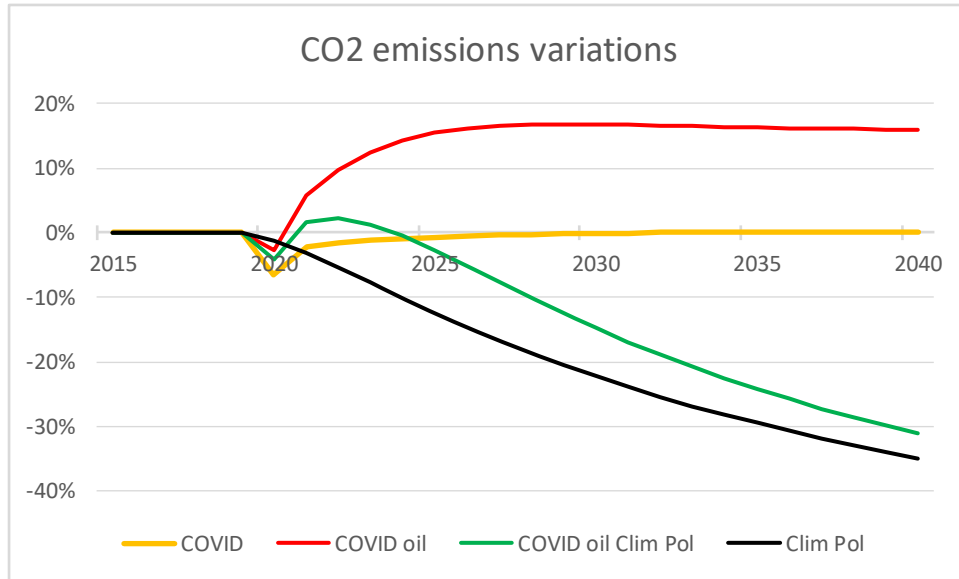
- Significant economic slowdown
- ➔ an instantaneous decrease in CO2 emissions: -6.6% in 2020
- Back to the ref level in 2030

COVID & low oil



- The CO2 emissions trajectory is very sensitive to oil prices.
- The collapse of oil prices in 2020
 - ➔ an increase in energy intensity and carbon intensity
 - ➔ but stimulates economic activity.
- ➔ A higher level of emissions from 2020 and sustained until 2040 (+16%)
- ➔ The economic stimulus received from lower oil prices is, however, transitory and peaks at 0.5% of GDP in 2026 (significant sectoral differences: see the paper)

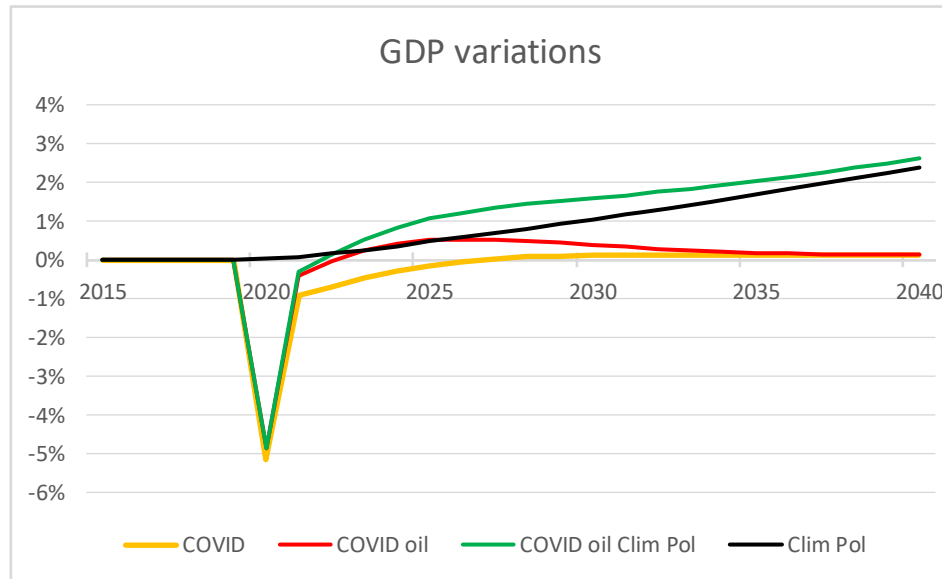
Climate policy scenarios



- Long-term trends in **emissions** are determined by changes in **relative energy prices**, which depend (among other things) on changes in **international oil markets** and/or the introduction of a **carbon tax**

- Decline in oil prices → increase in emissions
- Carbon tax → reduction in emissions
- Decline in oil prices + High carbon tax → carbon tax “wins”: lower emissions
- Carbon tax + recycling of tax revenues → double dividend

COVID & Low oil & Clim Pol

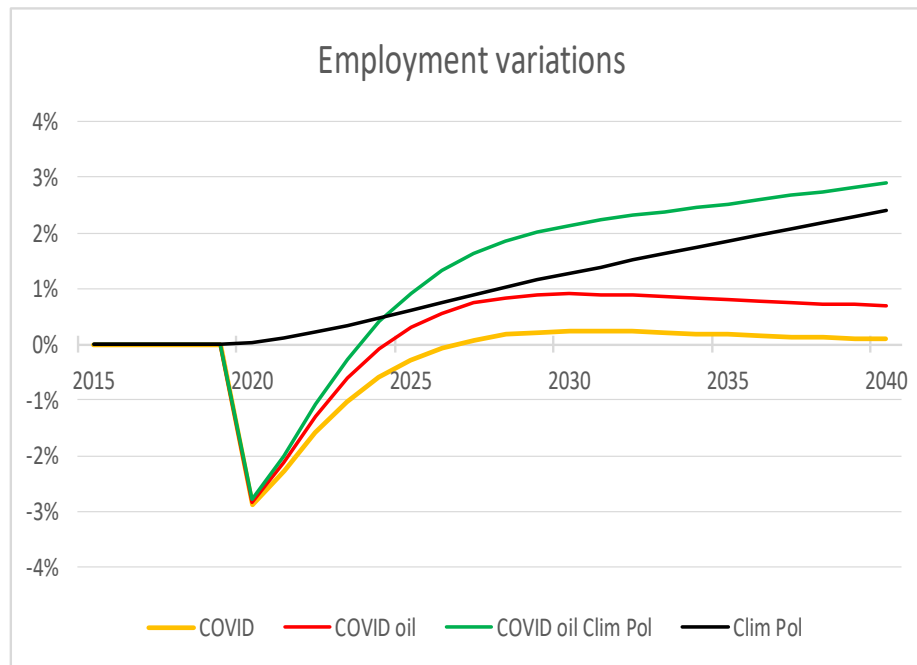


GDP and employment both increase above their baseline levels **as early as 2023**, compared to 2024 and 2026 in the no climate policy scenarios

Increasing carbon pricing

- ➔ Promotes energy efficiency improvements (Energy/Capital substitution)
- ➔ Discourages the use of fossil resources.
- ➔ Improves the trade balance of a net importer of fossil fuels like France
- ➔ Stimulates investment in energy efficiency
- Generates a macroeconomic advantage.... **Helped by the recycling of the carbon tax revenues**

COVID & Low oil & Clim Pol



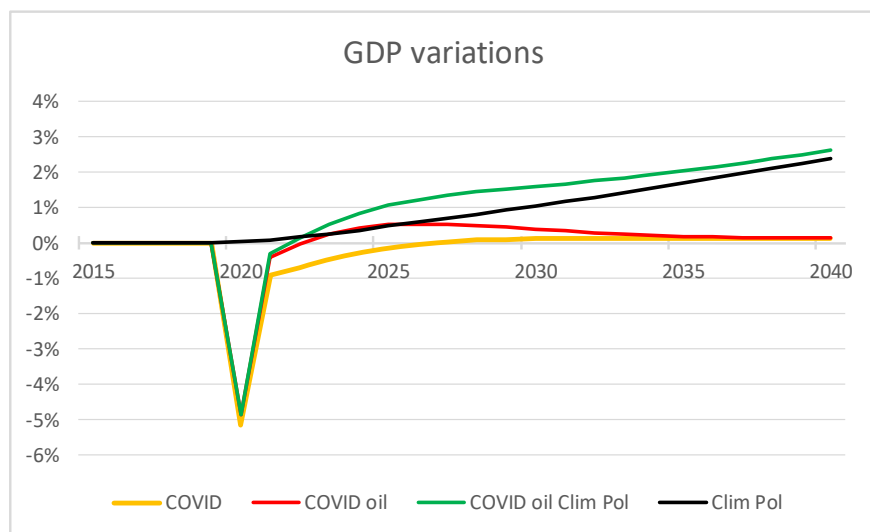
➤ Recycling of tax revenues :

In the private sector, recycling is implemented **in proportion to the sector's share of total employment.**

Such a regime favors **labor-intensive industries**

➔ Increase in global employment
(sectoral disparities. Job losses in the energy sectors: see the paper)

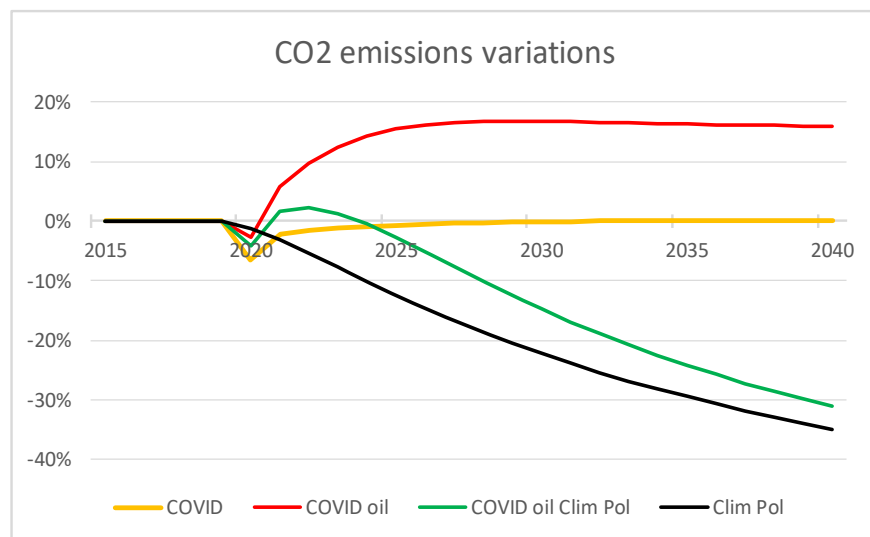
COVID & Low oil & Clim Pol



- Despite the deep downturn related to COVID, carbon taxation still produces a macroeconomic co-benefit in the medium and long term.
- The impact on GDP is even higher :
+2.6% in 2040 / climate policy counterfactual (+2.4%).

This is explained by:

- ➔ The sustained drop in oil prices over the period: reduces the energy bill of households and firms.
- ➔ Fully recycled carbon tax acts as an additional economic stimulus ➔ reinforces the expansionary impact of lower oil prices while preventing an increase in CO2 emissions



- CO2 emissions: +5% / Clim Pol counterfactual due to prolonged decline in oil prices

Conclusion

- Temporary Negative economic and positive environmental impacts
 - ➔ the economy gradually returns to its reference path during the following decade
 - ➔ CO2 emissions rapidly catch up to their baseline trajectory

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 - ➔ In the medium to long term, CO2 emissions eventually exceed their baseline trajectory as lower oil prices allow for a **faster economic recovery** while encouraging the development of carbon-intensive technologies

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- Ambitious carbon pricing accelerates economic recovery by stimulating jobs and investment while significantly reducing CO2 emissions - even when combined with sustained low oil prices.

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- Ambitious carbon pricing accelerates economic recovery by stimulating jobs and investment while significantly reducing CO2 emissions - even when combined with sustained low oil prices.
- However, low oil prices delay and weaken the CO2 emission reductions achievable for a given level of carbon taxation.
 - This highlights the need for higher carbon pricing if oil markets remain low
 - Our results support strengthening climate policies at a critical time when mismanagement of the post-COVID recovery could have dramatic consequences for GHG mitigation efforts.



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Thank you for your attention!

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ThreeME

- ThreeME is a country-level, hybrid, dynamic, open source CGE model
- Its sectoral disaggregation allows for analyzing the transfer of activities from one sector to another, particularly in terms of employment, investment, energy consumption or balance of trade
- Sectors can arbitrage between capital and energy when the relative price of energy increases, and substitute between energy vectors. Consumers can substitute between energy vectors, transportation modes or consumption goods.
- ThreeME is a neo-Keynesian model: prices do not adjust instantaneously to clear markets.
 - ➔ The model is dynamic, and prices and quantities adjust slowly.
 - ➔ Producers adjust their supply to the demand. This has the advantage to allow for situations of market disequilibria (in particular the presence of involuntary unemployment).
- This framework is particularly well suited for policy analysis.
 - ➔ In addition to providing information about the long term, it allows for analyzing transition phases over the short and medium terms, which is especially relevant when assessing the implementation of climate policies.