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# An Ex Ante Macroeconomic Assessment of the France 2030 Investment Plan

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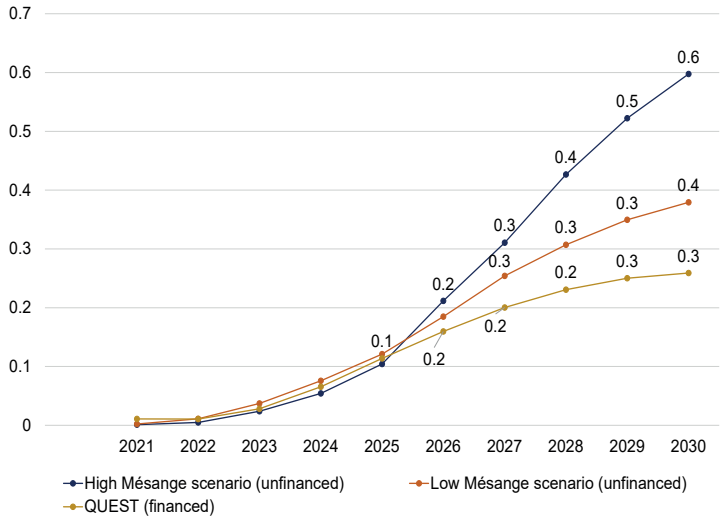
- The France 2030 Investment Plan supplements and incorporates the fourth *Plan d'investissement d'avenir* ("Invest for the Future Programme", PIA) to bolster French innovation capabilities and technological excellence. With €54bn in appropriations rolled out starting from 2021, this plan aims to extend the changes triggered by the *France Relance* Recovery Plan and the PIA by boosting industrial competitiveness and emerging technologies, supporting the move to a low-carbon economy and underpinning technological sovereignty.

- The macroeconomic impact of France 2030 manifests itself through four channels: fundamental research, private-sector R&D, industrialisation and employee training. In the short term, the research-support measures will increase demand-driven economic activity through a Keynesian approach. In the medium and long term, these measures will spur businesses' innovation-driven productivity and competitiveness. The purpose of the support measures for industrialisation is to fast-track the take-up of new technologies and improve inter-business competitiveness. Lastly, the training measures will provide for a better match between workers' skills and businesses' requirements.

- Two models were used to conduct an ex antre macroeconomic assessment of the plan: the Mésange Model, a joint French Treasury (DG Trésor) and Insee development, to assess the effects of economic policies and shocks, and the European Commission's QUEST III R&D Model for more granular modelling of innovation.

- According to the assessment carried out using the Mésange Model, GDP growth should be around 0.4 to 0.6 percentage points by 2030. It is estimated that the plan will lead to between 25,000 and 58,000 jobs being created within the same timeframe. The QUEST III R&D Model also confirms this positive scenario. This ex ante macroeconomic assessment needs to be supplemented with ex post microeconomic analyses in order to gauge the effect on the other aspects covered by France 2030 such as industrial and technological sovereignty or vocational qualification courses.

**Impact of the France 2030 Investment Plan on GDP under three scenarios (in % deviation from a baseline scenario)**




*Sources: Data from the Secretariat General for Investment (SGPI); authors' calculations; Mésange and QUEST III R&D Models.*

Note: "Unfinanced" assessments mean that the source for funding the France 2030 Investment Plan's measures is not factored into the assessment, unlike with the QUEST III R&D Model where an ad-hoc tax has to be added to maintain fiscal balance.

# 1. France 2030 essentially focuses on R&D, industry and future jobs

France 2030 reflects a dual objective. First, to lastingly transform the French economy's core sectors (automotive, aeronautics, digital technology and space) through innovation and industrial investment. Second, to make France a forerunner in tomorrow's economy.[1] From fundamental research to the birth of an idea up until production of a new good or service, the plan buttresses the entire innovation life cycle until rollout and industrialisation, steps that were not covered by the PIA in the past.[2]

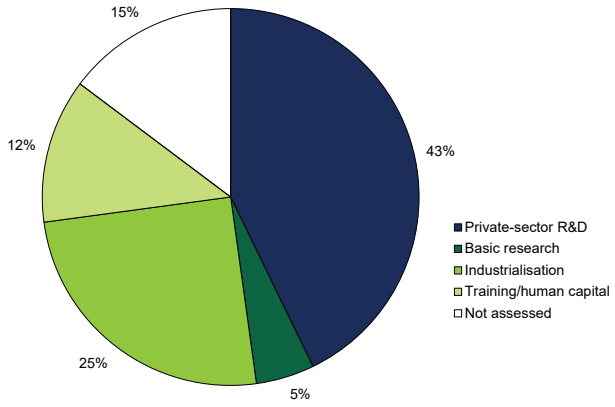
From a macroeconomic standpoint, the plan's measures can be broken down into four channels according to underlying mechanisms: (i) support for fundamental research (€2.9bn), (ii) support for private-sector R&D (€22.7bn), (iii) industrialisation (€13.2bn) and (iv) employee training (€6.6bn) (see Chart 1).[3] The measures that are included in the macroeconomic assessment set out in this paper account for slightly under €45.4bn, i.e. 1.4 percentage points of GDP, out of a total of €54bn.[4] Each component called for a separate assessment approach.

In the medium term, additional public- and private-sector research expenditure will foster fresh innovations, allowing for an increase in total factor productivity growth.

The purpose of the measures in favour of industrialisation is, *inter alia*, to fast-track the take-up of new technologies and the production of innovations. This therefore involves encouraging businesses to invest to improve their productivity and competitiveness in the long run.

Lastly, the training-related measures aim to better match supply and demand for qualifications on the skilled labour market. In the short term, these measures should therefore heighten labour market fluidity for skilled workers and cut hiring costs for businesses, thus stimulating demand for skilled labour and jobs. In the medium term, the resulting drop in actual labour costs for businesses should buoy up economic activity through increased competitiveness. In macroeconomic terms, these measures take the form of a reduction in real wage rigidity on the skilled labour market.

**Chart 1: Breakdown of France 2030 by macroeconomic channel (as a % of the total amount, SGPI data)**




*Sources: Data from the Secretariat General for Investment (SGPI); authors' calculations.*

(1) French Government (2023), "France 2030 : un plan d'investissement pour la France" (in French only).
(2) Since being unveiled 10 years ago, the *Plan d'Investissement d'Avenir* (PIA) have financed promising and innovative investments throughout France and in the country's strategic sectors such as the green transition, business competitiveness, higher education and research, industrial sovereignty and the digital economy. There have been four successive programmes representing the commitment of new appropriations in order to continue to unlock France's potential for innovation and growth.
(3) These channels were identified in conjunction with the *Secrétariat Général for Investment* (SGPI) which is tasked with implementing and monitoring the plan.
(4) The unassessed measures include amounts allocated in equity investments, part of the amounts not yet broken down, as well as management expenses for a total of €8.6bn.

## 2. Assessment method and modelling channels

France 2030 was subject to an *ex ante* assessment[5,6] so as to quantify its impact on the main macroeconomic aggregates, GDP growth and employment. The assessment used two different macroeconomic models, Mésange[7] and QUEST III R&D,[8] that both provide a picture of how the French economy functions. Each model gave rise to an specific assessment strategy.

### 2.1 The models used provide complementary approaches

The Mésange (*Modèle Économétrique de Simulation et d'ANalyse Générale de l'Économie*) Model, a joint French Treasury and Insee development, is used to assess the effects of economic policies and structural shocks. It is a quarterly macroeconometric model in which the French economy is represented as a small open economy that is influenced by the international context without changing it. The economic agents (households, businesses and general government) are modelled on the basis of their consumption, investment, price and wage determination patterns. The Mésange Model uses a Keynesian approach in which demand trends take precedence in the short term whilst supply conditions shape the long term. It offers robust modelling of the French economy's momentum.

The European Commission's QUEST III R&D is a Dynamic Stochastic General Equilibrium (DSGE) model. In the same way as the Mésange Model, it takes account of sticky prices and wages, the level of which in euros at current prices only imperfectly adjusts, or nominal rigidities on investments. It provides more granular modelling of the behaviour of the economic agents and is tellingly able to clearly model innovation and its impact on productivity within the model ("endogenous" growth).

Concurrent use of these two models therefore enables the intrinsic limits of each of them to be offset (see sub-section 3.1 below on the complementary nature of the Mésange and QUEST III R&D Models).

### 2.2 Two scenarios for the impact of France 2030 were modelled using the Mésange Model

In the Mésange Model, innovation leads to an increase in businesses' productivity. The productivity gains that France 2030's support measures should drive are then calibrated outside the model ("exogenous" calibration).[9]

The support measures for fundamental research are modelled through an increase in productivity via the efficiency of labour and the wage bill in the public sector. In the short term, the uptick in payroll expenditure results in an immediate rise in demand which underpins economic activity through standard Keynesian mechanisms.[10] In the medium term, these measures create new innovations that boost labour productivity and improve businesses' price competitiveness, thereby providing lasting support to activity. Calibration of the public-sector wage bill shock is carried out directly on the basis of amounts disbursed. Calibration of the productivity shock requires assumptions as to the elasticity of total factor productivity (TFP) to public sector R&D. The value was selected after a review of the literature of empirical works aimed at estimating this parameter (see Box). The elasticity chosen for a first "low" scenario constitutes the median of TFP elasticities to the public-sector R&D capital stock identified in the literature, whilst a second "high" scenario uses the third quartile. This means that the low scenario represents a situation in which the productivity gains resulting from the innovation made possible by the "fundamental

(5) French Treasury (2026), "Rapport d'évaluation macroéconomique ex ante du plan d'investissement France 2030" (in French only).
(6) The macroeconomic assessment of a public policy measure is said to be *ex ante* when it is carried out before being able to note and gauge its actual effects. In this case, it involves comparing the predictive scenario with measures and a so-called "counterfactual" scenario in which the assessed measure would not have been implemented. It differs from an ex post assessment which is based on observed data.
(7) J. Bardaji, B. Campagne, M-B Khder, Q. Lafféter and O. Simon (Insee), A-S Dufernez, C. Elezaar, P. Leblanc, E. Masson and H. Partouche (French Treasury) (2017), "Le modèle macroéconométrique Mésange : ré-estimation et nouveautés", *DG Trésor working document* no. 2017-04 (in French only).
(8) W. Roeger, J. Varga and J. Vel (2008), "Structural Reforms in the EU: A simulation-based analysis using the QUEST model with endogenous grow", European Commission, *Economic Papers* 351.
(9) See Box 2 of the above-mentioned assessment report for further details of the calibration methods.
(10) The increase in expenditure reflects a rise in household consumption that, in turn, supports GDP growth owing to demand for businesses' goods and services.

research" component would be median in relation to past experiences of investment in public-sector research. In the high scenario, these gains would be placed in a higher bracket of potential gains in relation to past estimates. This choice is justified by the fact that expected productivity gains are shrouded in uncertainty, in particular with regard to upward gains in the event of a structural break (e.g. the invention of GPS) which is unforeseeable by definition.

Support measures for private-sector R&D may result in a temporary reduction of the cost of R&D expenditure, both that of skilled labour and capital, on a pro-rata basis of the respective proportion of these two items in total R&D expenditure. This cost-reduction causes businesses to increase their demand for skilled labour and their investments in R&D expenditure, and allows for a drop in production prices. In the medium term over the period under review, this additional R&D expenditure also leads to fresh innovations that in turn increase labour productivity. Businesses' heightened competitiveness and the fall in prices drive demand. In the medium and long term, the impact of increased productivity is predominant and buttresses economic activity, using the same mechanisms as for fundamental research measures. Calibration of the productivity shock is carried out using the same method as for fundamental research by taking the median and third quartile of the elasticity values of productivity to private-sector R&D resulting from a review of empirical literature for the low and high scenarios respectively.

The support measures for industrialisation are modelled by a reduction in the cost of capital that should encourage businesses to invest and produce more, thereby leading to a rise in employment rates. Falling costs also allow for a gain in competitiveness through lower production prices which tends to improve the trade balance. These supply-side support measures ramp up fairly slowly in the Mésange Model but have a significant impact over a 10-year timeline by supporting business investment.

### Box: Review of the literature on the elasticity of productivity to private- and public-sector R&D

To calibrate the productivity shock related to support measures for private- and public-sector R&D, a review was conducted of the literature on empirical analyses aimed at estimating the elasticity of productivity to R&D. This review covered articles setting out similar estimation methods, only using aggregated data, in order to be consistent with the macroeconomic assessment that was carried out.[a]

The private-sector R&D component covers eight articles published between 2001 and 2020 with estimates of 94 elasticities. The values selected for the low and high assessment scenarios using the Mésange Model relate to the median (0.05) and the third quartile (0.08) of this dataset respectively, i.e. a 1% increase in private-sector R&D leads to a 0.5% and 0.8% rise in productivity, respectively, over time.

The fundamental component concerns seven articles published between 2014 and 2022 with estimates of 62 elasticities. The values selected for the low and high assessment scenarios are also the median (0.039) and the third quartile (0.08) of this set of elasticities.

These elasticities were estimated on the basis of historical data and therefore do not predict the effectiveness of the projects supported by France 2030 in terms of productivity gains. This work to assess the impact of innovation support measures on businesses' productivity includes microeconomic analyses which will therefore provide supplementary results in relation to the macroeconomic approach (see also sub-section 3.2 below).

a. See appendices B and C of the report for details of the relevant articles.

As regards the support measures to train workers for jobs of the future (e.g. in quantum technology or healthcare for the production of biomedicines), two approaches are examined. In the low scenario, initial and in-service training are modelled differently. Initial training is deemed to be geared towards increasing skilled workers' productivity and is therefore modelled by a rise in productivity.[11] On the other hand, in-service training is modelled as a reduction in real wage rigidity for skilled workers so as to capture a better match between supply and demand for skills on the labour market, resulting in heightened employability of the people who are trained. With the second approach, both initial and in-service training are modelled by a fall in rigidity on the labour market for skilled workers. In the short term, these measures apply downward pressure to the cost of labour thus stimulating demand for both labour and jobs. In the medium term, the reduction in businesses' production costs fosters competitiveness which stimulates household income and economic activity.

As a result, there are three dimensions to the differences between the low and high scenarios (not taking financing into account, see below). First, as mentioned above, the training component was subject to two modelling processes. Next, the sensitivity of businesses' productivity to innovation support measures (fundamental research and R&D) was calibrated on the basis of elasticities that were chosen to be consistent with existing empirical studies. Lastly, the assessment called for an assumption to be made on the pace of impairment of R&D investments, which governs the impact of the assessed measures on businesses' productivity, on the basis of the literature. The value chosen for the low scenario was 15% whilst that for the high scenario was 20%. The use of two scenarios reflects the uncertainty surrounding the expected impact of France 2030.

## 2.3 The QUEST III R&D Model allows innovation to be modelled on the basis of internal momentum

With the QUEST III R&D Model, three separate strategies are used covering R&D (grouping together – in comparison to the Mésange Model's modelling – fundamental research and private-sector R&D), industrialisation measures and, lastly, training and human capital. Unlike the Mésange Model, the QUEST III R&D Model has an endogenous R&D "block" which enables support for R&D to be directly reflected without the need for an assumption as to an increase in productivity calibrated exogenously.

Support measures for public-sector research and those for private-sector R&D are modelled via a reduction in the cost for businesses of acquiring new patents. So, demand for new patents increases thus stimulating R&D and leading, incidentally, to the reallocation of highly-skilled workers – whose supply of labour is constrained in the model – from the production sector to research. The latter aspect slows down the scaling up of the impact on GDP by generating short-term losses when final goods are produced. In the long term, like with the Mésange Model's results, both productivity and GDP increase.

Support measures for industrialisation are modelled by a reduction of the cost for businesses of acquiring productive capital. This decrease in cost therefore encourages more investment which supports both demand, via standard Keynesian mechanisms, and supply, by raising production potential over time, and thereby also boosting employment. The dynamics of this modelling are similar to the reduction of the cost of capital used to model the industrialisation component using the Mésange Model and its impact in the QUEST III R&D Model is identical from a qualitative standpoint.

Support measures for training and human capital are modelled as an increase in the proportion of highly-skilled workers. In the QUEST III R&D Model, this channel enables both the aggregated productivity of labour in production to be increased and more workers to be deployed in the R&D sector. This therefore mitigates the crowding-out effect owing to the lower cost of acquiring new patents as mentioned above. Skilled workers have higher levels of productivity in the productive sector, which increases the aggregated productivity of workers, as well as production in the R&D sector; this in turn enables productivity to be further increased. The impact on economic activity is positive in the short and long term, and demand for labour rises which consequently buoys up employment.

(11) In this case, the productivity shock is calibrated using the same methodology as for the R&D support measures through a review of specific literature (four articles, 38 elasticities estimated) on the elasticities of productivity to academic R&D by taking the median (0.039) for the low scenario and the third quartile (0.071) for the high scenario. See appendix C of the report for details of the articles consulted. This shock has no major effect on employment; it primarily leads to an increase in workers' productivity.

# 3. A positive macroeconomic impact to be placed in context with the plan's other contributions

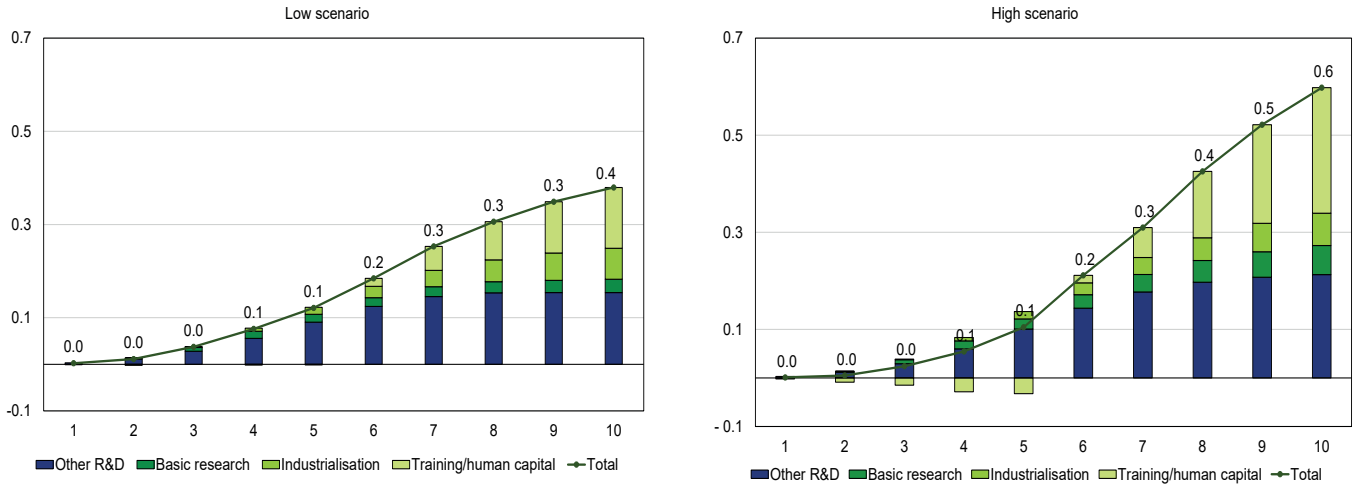
## 3.1 Positive medium-term results according to both models

Between 2021 and 2030, drawing on the modelling assumptions chosen on the Mésange Model's measurements, France 2030 should provide aggregate GDP growth of between 1.7 and 2.3 percentage points compared to a counterfactual scenario in which there is no plan. The effects should ramp up gradually reaching a peak of between 0.4 and 0.6 percentage points in 2030 (see Chart 2). In the longer run, it is estimated that these effects will progressively diminish and become negligible. This is due to the decline, over time, of the relative size of the productivity gains made possible by France 2030 in relation to a scenario without the plan. It is thought that the impact of the plan on employment will be positive but limited with between 25,000 and 58,000 jobs having been created in 2030, after a peak of between 37,000 and 70,000 in 2027, mainly driven by the training component.

This means that France 2030 could lead to a cumulative multiplier effect of between 1.1 to 1.5 by 2030, so one euro coming from the plan could generate between €1.1 and €1.5 in terms of GDP growth. Nevertheless, the cumulative multiplier continues to increase when the following years are included owing to the ongoing impact of innovation support measures on productivity.

According to the QUEST III R&D Model, France 2030 should allow for an extra 1.3 percentage points of aggregate GDP growth between 2021 and 2030 whilst creating around 10,000 additional jobs in 2030, after a peak of 13,000 in 2027. The effects on economic activity should ramp up as from 2024, peaking in 2031, before diminishing to become negligible. It is estimated that the impact on employment will be less than with the Mésange Model's assessment. The cumulative multiplier for the QUEST III R&D Model stands at 0.9 in 2030 but continues to increase in the long run due to the scaling up of productivity made possible by innovation, as with the Mésange Model.

**Chart 2: Results of the assessment of the effects of France 2030 on GDP growth according to the Mésange Model (in percentage points of GDP)**




*Sources: Data from the Secretariat General for Investment (SGPI); authors' calculations, Mésange Model.*

The combined use of the Mésange and QUEST III R&D Models partly offsets the intrinsic limits of each of them. However, their results are not directly comparable due to their different natures. The QUEST III R&D Model imposes the financing of the reform, meaning that it is deemed to be neutral with regard to the government deficit, but, on the other hand, it allows for modelling of the R&D sector which is the key target of France 2030. For its part, the Mésange Model models innovation through exogenous calibration of productivity shocks, which is a commonplace and reliable approach. So as to assess the comparability of results, simulations were carried out by correcting the difference related to the factoring in of financing between the two models. Two additional scenarios were assessed, with the Mésange Model taking account of a fiscal rule similar to that of the QUEST III R&D Model. The impact on GDP was then reduced to –0.1 percentage points when compared with the initial simulation,[12] which brings the results of these two models more into line with each other.

## 3.2 This macroeconomic modelling does not provide an exhaustive assessment of the plan

The results from the combined use of the Mésange and QUEST III R&D Models show an improvement in both GDP growth and employment by 2030, and highlight the imperatives of supporting innovation and disseminating it throughout the productive economy.

Nevertheless, this assessment only covers macroeconomic aggregates without addressing essential issues such as industrial and technological sovereignty, targeted sector-based effects and access to vocational qualification courses. These aspects are also central to France 2030 and the macroeconomic assessment is unable to quantify all the projected positive effects.

Therefore, a macroeconomic assessment alone cannot cover all these objectives. In addition, neither the Mésange Model nor the QUEST III R&D Model allow for granular analysis of the sector-specific details of France 2030 as the former only provides a breakdown of the market sector into four sub-sectors whilst the second only encompasses the entire economy. The assessment presented in this paper only partially captures the sector-specific variants and fails to take account of the plan's regional and local dimensions. The same applies to the issue of a low-carbon economy which is not raised in this assessment.

This ex ante macroeconomic assessment could be supplemented by microeconomic and ex post ones. It is based on average macroeconomic effects taken from the literature whereas the impact of France 2030 is contingent on the effectiveness of the conditions in which it is implemented, which can only be estimated by a microeconomic assessment. Furthermore, these assessments should rely on actual collected data enabling the ultimate impact of the plan to be gauged.[13] Lastly, this assessment cannot factor in the repercussions of an accumulated technological gap in the event of a counterfactual scenario without France 2030.

(12) For further details on the comparability of the results of the Mésange and QUEST III R&D Models, see Part 5.3. of the assessment report.

(13) An impact review based on performance indicators and interviews with the ecosystem's stakeholders was conducted by the C*omité de surveillance des investissements d'avenir* (CSIA), see CSIA (2026), "France 2030 : un déploiement massif et rapide à pérenniser, un impact à renforcer" (in French only). Additional quantitative and qualitative analyses, entrusted to external assessors under the aegis of the *Secrétariat Général pour l'investissement* (SGPI), were also carried out. All the results will be published by autumn 2026.

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