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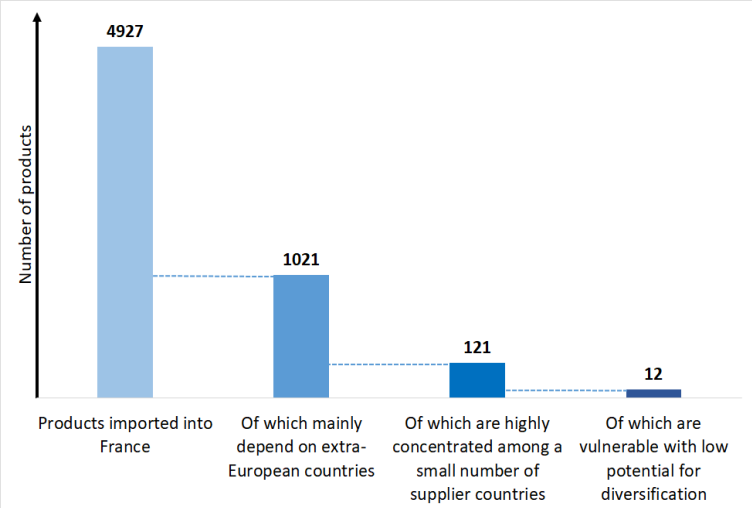
Vulnerability of French and European imports

Christophe Bonneau, Mounira Nakaa

- The COVID-19 crisis has revived the debate on the vulnerability of global value chains, particularly the dependence on imports for domestic production.
- Over the past 20 years, France has gradually integrated itself into global value chains: its manufacturing production directly uses nearly 40% foreign inputs, more than half of which come from European countries. This phenomenon is common to all European countries and France is less dependent than Germany on foreign inputs.
- In order to identify which goods are "vulnerable", we analysed the extra-European imports of about 5,000 product categories, taking into account (1) the concentration of imports of each product based on the number of non-EU supplier countries, and (2) the centrality of the product, i.e. whether alternative sources exist in other countries.
- According to this methodology, the vulnerability of French imports from outside the EU appears to be low: we counted 121 products for which imports appear to be concentrated (see chart on this page), including chemicals and pharmaceuticals, metals and some capital goods (e.g. LED lamps, machine tools, accumulators, etc.). Among these concentrated products, we identified 12 vulnerable products, i.e. with low diversification potential. France has a lower number of vulnerable products than its main European neighbours. For a quarter of these products, the main non-European supplier is China.
- The identification of these vulnerabilities should not obscure the advantages of sourcing from abroad, both in terms of economic efficiency and security of supply, including in times of crisis.

French imports by vulnerability



Sources: BACI (2020) data for 2018 on a total of around 5,000 products (HS6), and DG Trésor calculations.

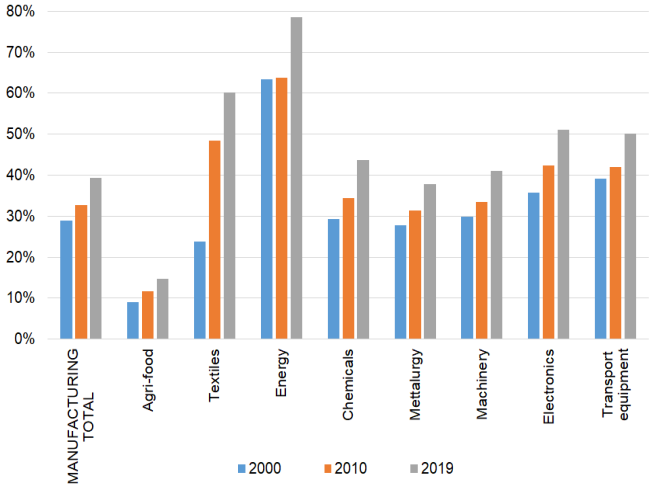
1. France's production, like that of its neighbours, mostly depends on EU suppliers

1.1 France's participation in global value chains has generated both benefits and dependencies

Like all major economies, France has gradually become part of global value chains (GVCs), in which production process are broken up between several countries and involve products crossing an increasing number of borders during manufacturing.[1] Participation in GVCs has led to higher competitiveness for firms, since outsourcing some segments of production has allowed them to focus on higher value-added activities, such as R&D, design and some manufacturing activities, and has increased their competitiveness on both the export and domestic markets.[2] Increasing integration into GVCs has also resulted in gains in purchasing power for French consumers.[3]

This development has also pushed up the share of foreign inputs in manufacturing production from 29% to 39% over the last 20 years (see Chart 1). The sector most dependent on foreign input is the energy sector, which relies on commodities such as crude oil, followed by the textile industry, which has experienced the largest increase in dependency over the past 20 years (from 24% in 2000 to 60% in 2019). Conversely, the food industry relies mostly on French-made inputs. In addition to the loss of manufacturing jobs, which has partly been caused by the increase in imports over recent decades,[4] this trend raises questions about how exposed the French industrial sector is to risks of disruption of supply from abroad.

Chart 1: The share of foreign inputs in France's manufacturing production[5]



Source: MRIO[6] and DG Trésor calculations.
Note: The share of foreign inputs corresponds to the volume of imported intermediary goods used in manufacturing production.

1.2 This increased reliance on foreign inputs is also observed in France's European neighbours

France's industrial manufacturing production for 2019 was more dependent on foreign inputs than that of Italy and Spain, but less than that of Germany, Poland and the Netherlands (see Chart 2).[7] These six countries have experienced a significant increase in their dependence on foreign inputs over the past 20 years.

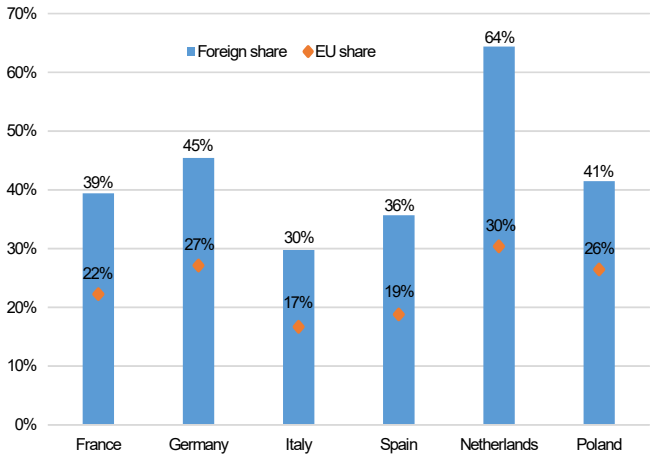
European countries are first and foremost integrated into European value chains:[8] the EU-27 is the direct source of the majority of foreign inputs for five of the six countries in our sample (the Netherlands being the exception). Despite the rising participation of emerging countries in global trade flows, this share has remained stable over the past 20 years,[9] and has even increased

(1) Berthaud, F., "France's Trade in Value Added", *Trésor-Economics* No. 207, October 2017.
(2) World Bank, "Trading for Development in the Age of Global Value Chains", *World Development Report*, 2020, p. 67.
(3) Emlinger, C. and Fontagné, L., "(Not) Made in France", La Lettre du CEPII N° 333, June 2013. Estimate computed from the 2010 database.
(4) Malgouyres, C., "The Impact of Chinese Import Competition on the Local Structure of Employment and Wages: Evidence from France", *Journal of Regional Science*, 57(3), 2017.
(5) For the sake of readability, some industrial sectors (such as paper, leather, plastics and wood) are not detailed in the breakdown but are included in the total.
(6) Asian Development Bank, "Compilation and Uses of the Multi-Country Input-Output Tables: Lessons from the ADB MRIO Database", July 2019.
(7) The data in this study on the exposure of some countries to foreign supply may be overestimated because of the "Rotterdam effect", by which some goods are counted as imports (and then exports) by simply passing through the country in question, a phenomenon which is particularly marked in countries with large logistics hubs. In addition, relatively smaller economies naturally rely on more external supply to meet their demand.
(8) The geographical origin retained in this study is that of direct imports into the countries studied, and not the ultimate origin of the value-added through the value chains. See section 2.1.
(9) Comparisons with 2000 are based on the current perimeter of the EU-27.

for France, Germany, Italy and Poland. As regards inputs imported from China, value-added trade data show a limited level of dependence in 2019, between 1.4% and 2.0% for every European country in our sample, with the notable exception of the Netherlands (4.7%). Even taking into account indirect dependencies (e.g. electronic goods imported from Germany but which incorporate Chinese components), studies showed the actual level of French dependence on Chinese inputs to be 3.2% in 2014.[10]

Analysing trade in value-added terms makes it possible to highlight a country's sectoral dependencies on its partners. However, it does not allow for an identification of the supply disruption risks which might hamper production, including when the products in question only represent a small part of production.

Chart 2: The share of foreign inputs in manufacturing production in 2019



Source: MRIO and DG Trésor calculations.
Note: The share of foreign inputs corresponds to the volume of imported intermediary goods used in manufacturing production.

2. France's supply vulnerabilities are limited compared to its main neighbours

2.1 An analysis of the vulnerability of imports at a granular level

Through an analysis of bilateral trade data[11] at a disaggregated level (about 5,000 products),[12] it is possible to identify the degree of vulnerability of each imported product.[13]

A product is considered vulnerable if its imports are concentrated among a limited number of third countries (those outside the EU-27) combined with low potential for diversifying supplier countries[14] (see Box 1 for a methodological overview). One limitation of this methodology is that it is based solely on import data and does not include country-specific production data. Indeed, using both trade and production data would not allow for vulnerability analysis at such a detailed level,[15] or for comparative analysis with other countries. Another limitation lies in the impossibility of isolating re-export flows in these data, and thus of detecting indirect vulnerabilities through Tier 2 or higher suppliers.[16] The results presented below therefore constitute a preliminary approach to the analysis of supply vulnerabilities, which in some aspects might be overstated (in particular because of potential local production) and in others understated (in particular because of indirect vulnerabilities).

(10) Gerschel E., Martinez A. and Méjean I., "Propagation of Shocks in Global Value Chains: The Coronavirus Case", *IPP Policy Brief* No. 53, March 2020.
(11) Guillaume Gaulier and Soledad Zignago, (2010) "BACI: International Trade Database at the Product-Level. The 1994-2007 Version", *CEPII Working Paper* 2010-23. The data used is for 2018.
(12) Products are defined using the Harmonized System (HS) nomenclature at the 6-digit level. Even at this granular level of disaggregation, each category may still contain products with different technical characteristics.
(13) The present analysis focuses on imported products regardless of their final use (intermediate consumer goods, final consumer goods or capital goods).
(14) Throughout this study, the term "supplier" refers to countries rather than firms, as global trade data do not allow for individual firm data to be distinguished.
(15) Concordance tables match one category of production activity to several categories of imported goods, resulting in a loss of detailed information.
(16) For example, if France imports a good from Germany, these data do not make it possible to distinguish whether it is the same good from China, imported into Germany and re-exported to France, or a good produced in Germany and exported to France.

Box 1: Vulnerability analysis methodology for imports

The vulnerability of a country's imports is assessed here in relation to non-EU-27 countries for each imported product. The products examined in this analysis are solely those with low availability on the European market, which is measured by extra-European imports above 50% of total imports. The analysis is based on two indicators:

1. The degree of concentration of non-EU-27 supplier countries in the product's imports. Concentration is measured using the Herfindahl-Hirschman Index (HHI).[a] The higher the index value, the more imports are concentrated among a small number of trading partner countries.

2. The diversification potential of the product in the short run, measured as the risk of "centrality"[b] of the product, or how dependent the global supply is on a limited number of supplier countries. The centrality risk of a product is considered to be high when it is above 2.5 (the level at which the leading exporter of a given product supplies about two-thirds of global exports).

We looked at HHI values above 0.5 to identify the most concentrated and therefore most vulnerable imports.[c]

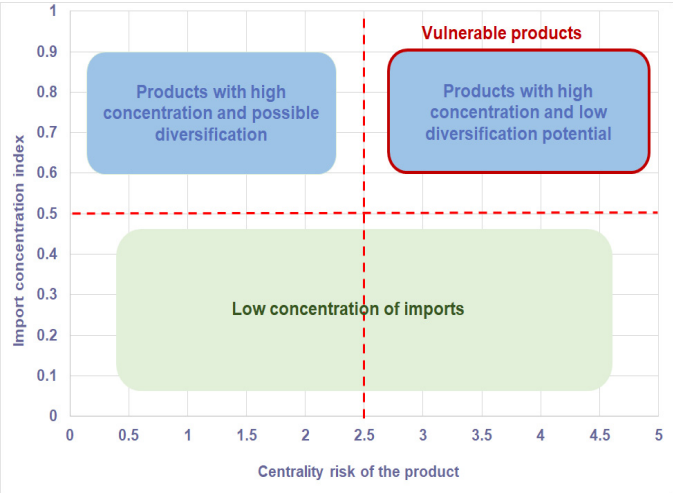
Representing products according to their levels of concentration and centrality makes it possible to establish a mapping of imported products (see Figure 1):

- Products which are vulnerable because of a high level of concentration and a limited potential for diversification: the concentration and centrality indices are both high (respectively above 0.5 and 2.5), reflecting a high concentration of imports with limited scope for diversification with other supplier countries.

- Products with a high concentration level for which diversification is possible: the concentration index is high (above 0.5), but the level of centrality is low to moderate (below 2.5). In the event of a shock, therefore, even if imports are highly concentrated, there are alternative supplier countries, making diversification possible. This potential for diversification does not eliminate the risk of disruptions in the imports of this category of products in the short term, as sourcing from new suppliers may require additional time and costs.

- Products with limited concentration: these are imported products with a low to moderate concentration index (less than 0.5).

Figure 1: Map of products according to their levels of concentration and centrality



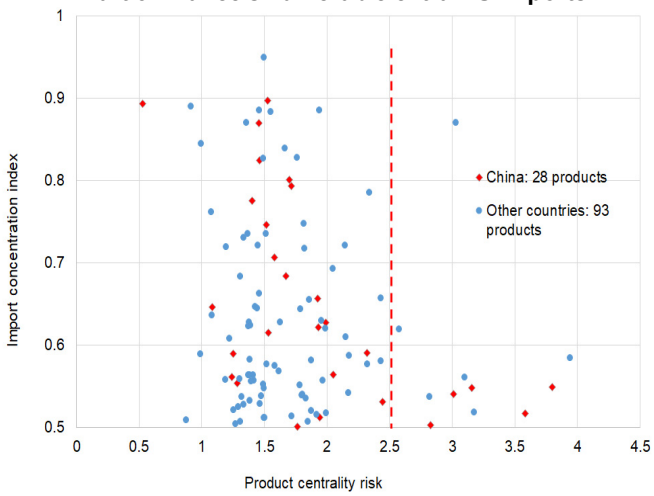
Source: DG Trésor calculations.

a. The HHI is calculated for each product as the sum of the squares of the market shares of each partner country. It varies between 0 and 1.
b. Centrality is measured by comparing the export flows of the supplier countries for each product. For more details regarding the construction of the index, see Y. Korniyeko, M. Pinat and B. Dew (2017), "Assessing the Fragility of Global Trade: The Impact of Localized Supply Shocks Using Network Analysis", *IMF Working paper* No. 17/30. Centrality risk is measured for each product independently of the country studied.
c. As an illustration, an import HHI of 0.5 may correspond to a situation in which the two main non-EU suppliers account for about 75% of total extra-European imports.

2.2 The vulnerabilities of France's imports are limited

An analysis of vulnerabilities in French imports from outside Europe (using the method detailed in Box 1) identifies 121 highly concentrated products out of some 5,000 imported products, i.e. nearly 1% of the total value of imports in 2018 (see Chart 3). These products include chemicals and pharmaceuticals such as some antibiotics,[17] metallurgical products including some rare-earth metals[18] and capital goods such as accumulators and some machine tools.[19] China is most often the leading supplier of these vulnerable products, followed by the United States and Switzerland.

Chart 3: France's vulnerable extra-EU imports



Source: BACI (2020) data for 2018 and DG Trésor calculations.
Note: The higher the concentration index, the more imports are concentrated among a small number of partners. The higher the risk of centrality, the more the global supply of the product depends on a limited number of supplier countries (see Box 1). The "China" dots refer to products for which China is France's main supplier.

The average centrality risk of these concentrated products is fairly low, which means that the global supply of these products is ensured by a sufficient number of countries and that it would therefore be possible to diversify supply sources if necessary. Nevertheless, we count 12 concentrated products which also have a high level of centrality.[20] Among these products, which can be labelled as "vulnerable", are some categories of LED lamps for which China is the main global supplier, which constitutes a high risk of shortage in case of a shock.

2.3 France is less vulnerable than its European neighbours in terms of imports from non-EU countries

France's imports include relatively fewer vulnerable products (in number) than the imports of its main European partners (see Table 1). From a sectoral point of view, agri-food products, chemicals and pharmaceuticals account for a significant share of vulnerable imports from the six countries under study. Italy has a significant proportion of vulnerable products in textiles, and Spain is highly vulnerable when it comes to construction materials and metallurgical products. Approximately 10% of the concentrated products of each of these six countries show low potential for diversification, and therefore greater fragility in the event of failure of the supplier country or countries.

For each of the six countries, China is the main non-EU supplier of concentrated products. For Italy, Poland and the Netherlands in particular, and Spain to a lesser extent, China is the main non-EU supplier of virtually all vulnerable products.

However, this comparison must take into account the economic characteristics of each country. The moderate number and volume of vulnerable imports in France and Germany are mainly explained by their larger share of intra-EU imports, which automatically reduces their vulnerability to non-EU imports. Other factors, such as a country's openness rate and sectoral specialisation, also account for the differences.

Comparing the data between these six countries reveals some common concentrated products and some risks of indirect concentrations due to re-export flows. Approximately 20% of France's concentrated products are also vulnerable for three or more other countries (including phosphorus and some magnesium derivatives). In addition, the Netherlands' concentrated products include approximately 20 products for which the Netherlands is also France's largest supplier. These products could therefore also constitute, indirectly through Dutch re-exports, an additional concentration risk for France.

(17) Streptomycin and chloramphenicol.
(18) Scandium and yttrium, which are used in advanced electronics.
(19) Devices used to manufacture tires.
(20) The 12 vulnerable products identified are LED lamps, flight simulators, synthetic fibre blankets, two categories of decorative artificial plants, some garden furniture, four types of clock products, engravings and antiques.

Table 1: Key figures on countries' vulnerabilities

	France	Germany	Italy	Spain	Netherlands	Poland
Openness rate, extra-EU (% GDP)	13%	19%	16%	19%	65%	23%
Total imports of goods (€bn)	573	1,087	426	330	547	228
Number of concentrated products	121	166	227	269	390	199
Number of concentrated products in common with France	/	34	29	39	42	20
Number of concentrated products for which China is the largest supplier	28	55	85	88	127	68
Number of vulnerable products (concentrated and with low diversification potential)	12	19	24	37	36	15

Sources: BACI (2020), World Development Indicators, Eurostat and DG Trésor calculations. Data is for 2018.
Note: The openness rate corresponds here to imports of goods and services as a share of the country's GDP. Vulnerable products are identified for each country using the method detailed in Box 1.

2.4 Vulnerability is lower at European level than at country level

If we replicate the previous analysis at the consolidated EU-27 level, we find that, out of more than 5,000 imported products, 483 of them[21] (or 7% of the volume of imports from non-EU countries) have a high dependency on a small number of non-EU countries.[22] China is the main supplier of approximately 40% of these products, including laptops, antibiotics, some rare-earth metals and magnesium derivatives. The latter two have been identified by the European Commission as critical commodities for strategic sectors (3D printing, the defence sector, etc.).[23]

Half of the products which are concentrated at the individual level for the six countries studied are not concentrated for the EU-27 as a single trade entity (of the 121 concentrated products identified for France, 66 are not concentrated at the EU-27 level). This indicates a potential for diversification with other non-EU countries which France is not exploiting but its neighbours are.

3. Securing supply chains is a concern for firms, governments and the European Union

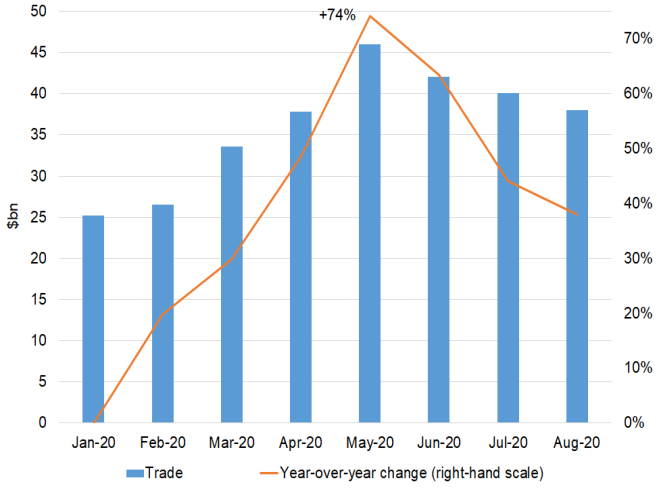
3.1 The COVID-19 crisis has highlighted the importance of global supply chains

Although we do not yet have the benefit of hindsight, the COVID-19 crisis does not appear to have fundamentally challenged the organisation of production and trade in value chains. The ability of countries to procure from multiple foreign supply partners has contributed to resilience in the face of an explosion in demand for certain goods, as the differentiated exposure of countries to the pandemic and the spread of the shock over time also helped supply adjust to demand (see Chart 4).

With regard to healthcare goods, the previous analysis does not identify any vulnerabilities among COVID-19 medical supplies,[24] which shows that the supply disruptions observed at the beginning of the crisis were more related to a surge in global demand for these goods than to a pre-existing fragility related to the geographical organisation of GVCs for these products.[25]

(21) The number of concentrated products for the EU may seem large compared to that of the six countries studied, but it reflects the shift from 6 to 27 countries, which do not necessarily have many concentrated products in common. In addition, a number of products which are concentrated at the country level are reflected at the EU level because of the country's weight in the EU's international trade (e.g. Germany and France). Finally, some countries are the only importers of certain concentrated products, which effectively increases the number of products at the EU level.
(22) Measured by an HHI of non-EU imports greater than 0.5 (as in the analysis of country vulnerabilities).
(23) European Commission (2020), Study on the EU's list of Critical Raw Materials – Final Report.
(24) List of 44 goods established by the World Customs Organization, including masks, gowns, testing materials, etc.
(25) This observation remains limited by the lack of analysis of national production data for all countries.

Chart 4: The global trade of COVID-19 medical supplies in 2020



Source: UNCTAD,[26] estimated data.

This crisis nevertheless highlights the vulnerabilities created by GVCs, in a context of increasing risks of external shocks likely to disrupt supply chains (shocks due to public health, protectionism, environment, climate, technology, etc.).

The previous analysis provides a first level of reading, offering a disaggregated diagnosis on a product basis and suggesting possible answers based on the potential for diversification of highly concentrated imports. This analysis could be expanded, first by having industrial stakeholders identify which inputs are considered critical among vulnerable imports, and second by cross-referencing trade data with country-specific (or European) production data in these critical sectors. A mapping of the various indirect suppliers along the production chain would also be useful.

3.2 There are several ways to reduce supply chain vulnerabilities

The risks which weigh on supply chains must first of all lead firms to implement strategies to secure them, including diversifying their suppliers.[27] Government should also play a role in sensitive sectors where supply chain disruptions would cause negative externalities for society as a whole (e.g. health and security).

A public strategy for securing these sensitive goods or sectors could combine searching for greater diversification of supply channels and suppliers (for example through public procurement for some goods), building up safety stocks, developing recycling (for example for raw materials), and if necessary providing public support for the development of new domestic productive capacities. In this respect, the *France Relance* recovery plan includes a €600m measure called "Relocate: securing our strategic supplies" whose objective is to support private investment, targeted to certain sectors (such as health, agri-food, telecommunications, electronics and critical industrial inputs).[28] These principles also guided the design of the action plan to relocate research projects and production sites of healthcare products to France, a plan which was presented by the government on 18 June 2020.

At European level, a concerted approach makes sense, particularly given the strong interdependencies between Member States and the economic security which the single market offers in the face of rising protectionism across the globe. The European "open strategic autonomy" initiative, launched by the European Commission in spring 2020, provides a framework for consultation on the issue of supply vulnerabilities and could lead to the development of a common definition of goods and services deemed "critical". Similar consultations could take place at the multilateral level (e.g. OECD, WTO) in order to ensure that initiatives to secure supply chains comply with world trade rules guaranteeing fair and equitable competition between countries. To do otherwise would work against the primary objective of ensuring sufficient availability of critical supplies at the global level and for each country.

(26) UNCTAD, "Global Trade Update", October 2020.
(27) Manyika, J, Smit, S. and Woetzel, J., "Risk, Resilience, and Rebalancing in Global Value Chains", *McKinsey Global Institute*, August 2020.
(28) www.gouvernement.fr/france-relance

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(01 44 87 18 51)
tresor-eco@dgtresor.gouv.fr

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