A negative shock for Chinese domestic demand is expected to have limited effects on French GDP

Since 2021, the slowdown in the Chinese economy compared to its pace of growth before the pandemic has been confirmed: activity grew by 5.2% in 2023 and the IMF is expecting growth of 4.6% in 2024 against +7.7% per year on average in the 2010s. This slowdown is partly structural, linked to the ageing population and the catch-up dynamic that is losing momentum. In addition, China is suffering from some more short-term factors affecting growth, such as the real estate crisis, trade risks and even financial risks. This Chinese slowdown may have differing effects on its partner economies. On the one hand, a slowdown in Chinese domestic demand would negatively affect growth in the rest of the world, via the trade channel: this would be of particular concern to countries with strong commercial dependence on China, starting with the Asian economies. Conversely, such a slowdown would result in a decline in global demand for commodities and especially petroleum products, which would lower prices: this effect would benefit other economies importing petroleum products, especially European economies.

The transmission of the shock via the trade channel is analysed using an OECD Inter-Country Input-Output (ICIO) Table. This study shows that the effects of the slowdown in Chinese domestic demand vary depending on the products concerned: as long as the negative demand shock remains confined to the construction sector, its effect on China's partners is likely to be limited. An investment shock, which would have the effect of reducing Chinese demand for manufactured products, could have more serious consequences. Irrespective of the shock considered, the Asian economies would be the first to be affected, due to their degree of dependence on the Chinese economy. As for the main European economies, a 5% shock on Chinese domestic demand would cost France between 0.1 and 0.2 points of GDP via the trade channel alone, and twice that for Germany. This effect would therefore be contained.

By taking the commodities channel into account these effects can be further qualified because the Chinese slowdown would generate a drop in prices, particularly oil prices, which would in turn have a positive effect on French growth. A 5% shock on Chinese demand via a combination of the trade channel and the commodities channel would thus have a weak and ambiguous effect on France: depending on the assumptions made for each of these two channels, the net effect would either be slightly positive, or slightly negative. These simulations do not take into account a possible financial channel: the direct exposure of the French economy to the Chinese financial sector appears limited and an indirect effect routed through an uncertainty shock seems difficult to quantify.

Raphaele Adjerad, Mathilde Niay with the contribution of Alexandre Wukovits

Since 2021, Chinese growth has settled into a slower pace than before the pandemic, partly due to structural factors

Despite the lifting of health restrictions in China at the end of 2022, which could in theory have offered catch-up potential for the Chinese economy, the growth in activity in China remains below its pre-pandemic trend (►**Figure 1**). While the Chinese economy grew at an average pace of 10.6% from 1990 to 2010 then by 7.7% in the 2010s, growth stood at +5.2% in 2023 after +3.0% in 2022. The IMF forecasts a slowdown in Chinese growth to +4.6% in 2024 (as in ►**OECD, 2023**) and expects growth to slow to +3.4% in 2028 (►**IMF, 2024**).

►1. Growth of activity in China remains below its pre-pandemic trend
(base 100 in Q4 2019)
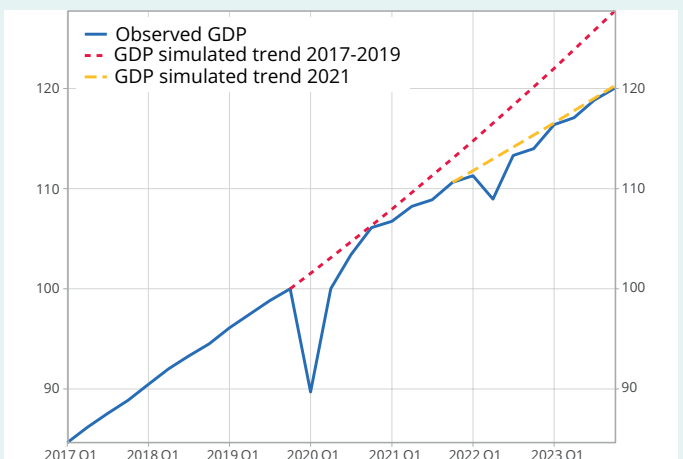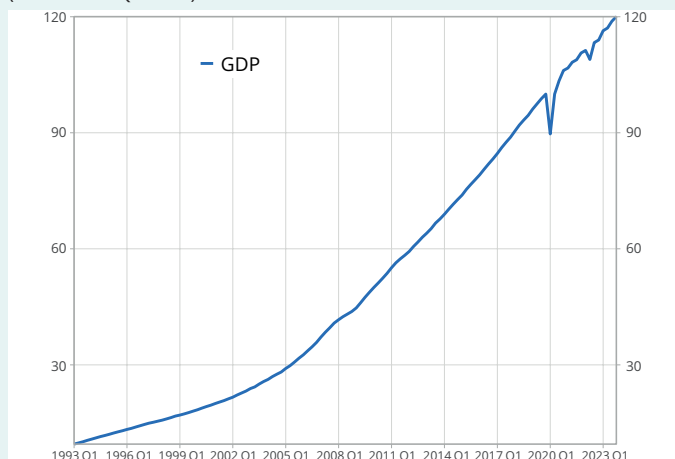
Last point: Q4 2023.
Note: data used up to and including 2010 are calculated from the year-on-year non-seasonally adjusted variation published by the NBSC, which is then seasonally adjusted. From 2011, GDP is calculated from the quarterly seasonally adjusted variation published by the NBSC.
How to read it: in Q4 2023, GDP was 20% higher than its level in Q4 2019.
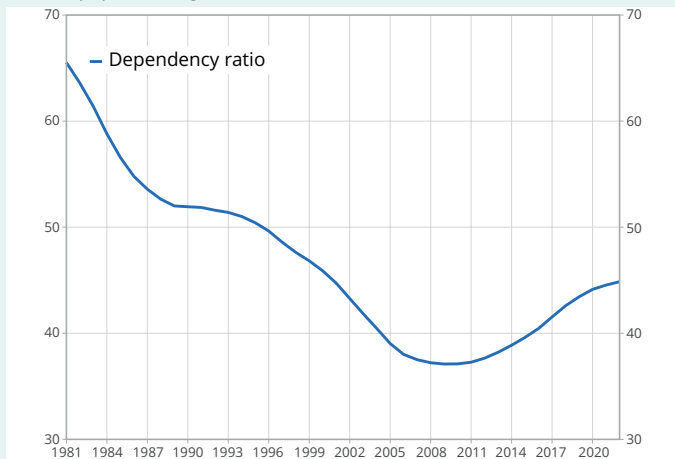**Source**: National Bureau of Statistics of China, INSEE calculations.

There are several major structural factors that can account for this slowdown, which are holding back the Chinese economy, notably the ageing population. Until 2011, China benefited from a "demographic dividend": restrictions on the birth rate resulted in a sharp drop in the dependency ratio making it possible to finance investment (►**Figure 2**, left). Since 2011, due to the ageing of the population, the dependency ratio has started to rise again and, since 2016, the working-age population has been decreasing (►**Figure 2**, right), thus weighing on growth potential. These demographic challenges would also seem to be aggravated by poor social protection safety nets, holding back private consumption by reducing household confidence. The savings ratio, which was already high before the pandemic, would appear to have increased, reaching 33% of disposable income, according to the ►**World Bank, 2023**.

In addition, the sources of Chinese growth have evolved. Until 2012, activity was supported by the increase in industrial capacity: since then, the share of manufacturing activity in the GDP and industrial investment has seen a regular decline (►**World Bank, 2023**). From this date, activity has been driven mainly by construction, of which the share in value added increased gradually until the health crisis. However, this share has since decreased, and has now returned to its level of the early 2010s (►**Figure 3**). Thus activity since the health crisis is now

►2. The working-age population has declined since 2016
(as % of population aged 15-64)   (in annual growth rate, %)
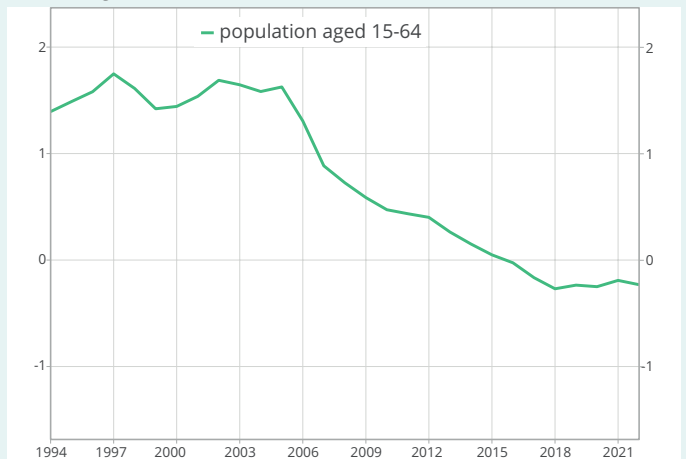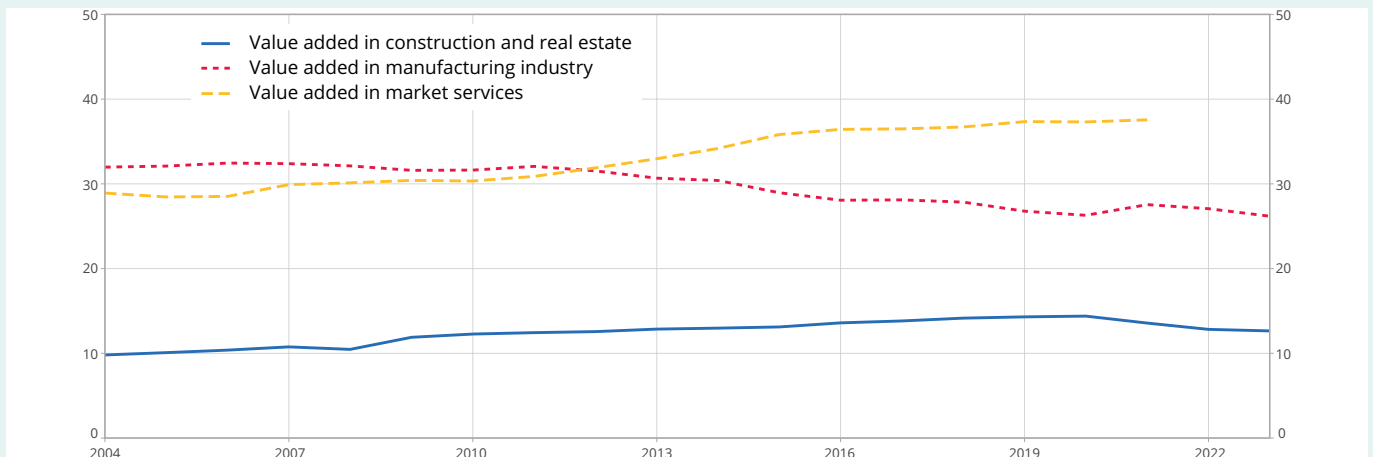

Last point: 2022.
Note: here, the dependency ratio corresponds to the ratio of people under 15 and over 64 to people aged 15 to 64. The population between 15 and 64 refers to the entire resident population regardless of legal status or citizenship.
How to read it: in 2022, the Chinese dependency ratio was 44.9% and the population aged 15 to 64 decreased by 0.2% compared to 2021.
Source: World Bank.

►3. Value added in construction, industry and services
(as % of GDP)

Last point: 2023 for manufacturing industry and construction, 2021 for market services.
Note: value added in construction and real estate includes the activities "construction" and "real estate".
How to read it: in 2023, the share in GDP of the value added from construction and real estate was 13%.
Source: National Bureau of Statistics of China, INSEE calculations.

mainly driven by services as well as by those industrial segments where China is at the technological forefront (electric vehicles, renewable energy); these segments require significant intangible investment and generate less in productivity gains than during the catch-up phase. In addition, since the health crisis, the share of private investment has declined, crowded out by the increase in investment by State-owned companies, which may be less efficient (▶**Huang and Veron, 2024**).

Certain short-term factors are also hampering Chinese growth, such as the real estate crisis and trading risks

The current real estate crisis is also likely to intensify the slowdown. The construction and real estate sector, which represented about 14.3% of GDP in 2019 (against 12.7% in 2023), is raising concerns, mainly due to the financial difficulties encountered by large developers such as Country Garden or Evergrande (the latter was placed into compulsory liquidation by a Hong Kong court in January 2024) and potential contagion effects weighing down the rest of the economy via balance sheet or wealth effect channels. In fact, since 2021, real estate transactions have continued to fall: in December 2023, they had dropped to around 55% below their pre-pandemic level (▶**Figure 4**). Yet real estate is estimated to represent 65% of the wealth of Chinese households (▶**IMF, 2020**) and "shadow banking" (non-bank financial intermediaries) is very exposed to this sector. Financial risks are thus increasing, according to the IMF (▶**Article IV IMF, 2024**), as shown by the payment incidents involving certain large trust companies (such as Zhongrong Trust or Zhongzhi), even if they still remain contained, since the debt is mainly financed by domestic savings and the banking system supported by the authorities. In addition to households, the crisis in the real estate sector particularly affects the Chinese provinces, mainly because of their excessive indebtedness and their high exposure to this sector: they would appear to have accumulated off-balance sheet debts, mainly to finance infrastructure construction.

These difficulties have prompted the Chinese government to introduce support measures to stimulate this sector. At the end of 2023, the People's Bank of China increased its support for the economy by mobilising loans through strategic banks for the construction of affordable housing, urban renovation and public infrastructure. At the same time, measures to ease property purchases were taken by the cities of Beijing and Shanghai, such as reducing down payment requirements and extending loan maturities.

Among the drivers of the Chinese growth model, exports are also under threat from increasing trade tensions (▶**Alonso et al., 2023**). The trade and technology war between China and the United States has impacted international trade in recent years. Since the Trump administration came to power in the United States, the two countries have gradually increased their customs tariffs on a series of products, and the change in political power experienced by the United States in 2021 did not fundamentally change this state of affairs. In 2023, despite attempts to ease relations, some of this trade is still subject to significant amounts of customs duty. These tensions have had a significant effect on bilateral trade. Trade relations with the European Union have also often been tense, as can be seen, for example, in the persistent concerns about China's trade practices (product dumping, restrictions on access to the Chinese market, subsidies to companies). Thus the rate of trade openness in the Chinese economy is tending to decline: imports of goods fell in 2022 (-5.5%) and rebounded moderately in 2023 (+2.9% ▶**Figure 5**).

▶4. Weakness of the real estate market
(base 100 in 2019)
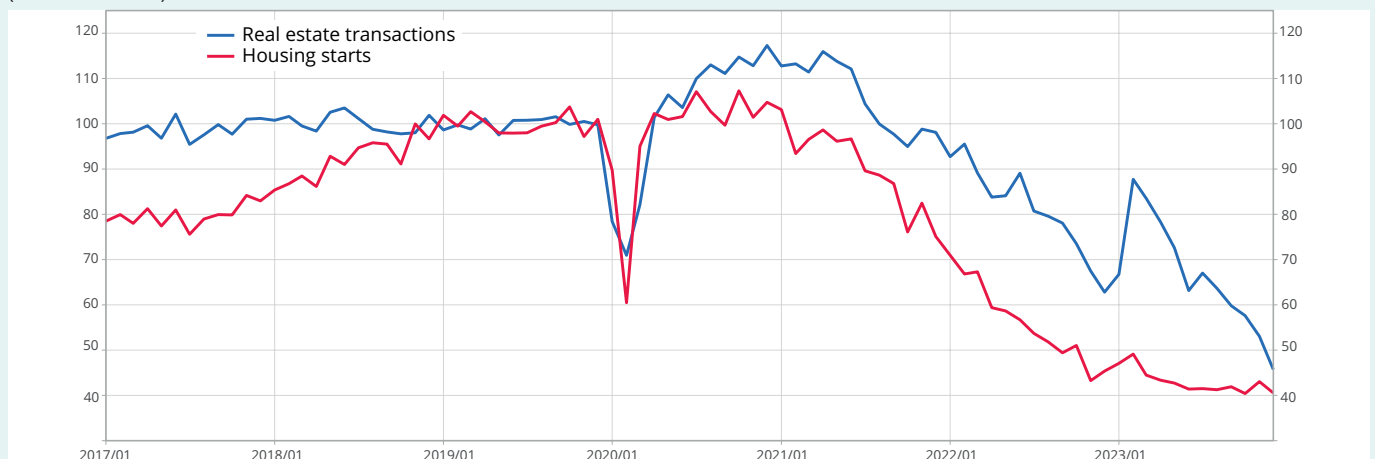
Last point: December 2023.
How to read it: in December 2023, real estate transactions were almost 55% below their pre-pandemic level.
Source: National Bureau of Statistics of China, INSEE Calculations.

The slowdown in Chinese domestic demand is likely to affect the rest of the global economy via several channels

According to ▶ **Alonso et al., 2023**, due to its weight in the global economy, a slowdown in China affects the activity of European economies via three main channels.

First, a negative effect via the trade channel: a reduction in Chinese demand reduces partner countries' exports to China. Due to the size of the Chinese economy and its integration into world trade, the economic slowdown in China is likely to affect all economies, to a greater or lesser extent. The Asian countries that are most firmly integrated into the region's value chains as well as those that have invested hugely in the "New Silk Road" programme are the most likely to be affected. The countries of South-East Asia play a major role in serving Chinese final demand, in addition to their place in regional value chains and their share in the Chinese economy's "processing trade" (▶ **IMF, 2023**). More generally, most of the world's economies are concerned by the slowdown in Chinese domestic demand, either directly, or indirectly, for those economies that are not exposed to China directly (or only slightly) but whose exports are oriented towards countries that are themselves directly affected by the Chinese slowdown.

Second, a positive effect via the commodities channel: China is one of the main consumers of many commodities, especially oil. As the supply of commodities is relatively inelastic in the short term, a negative shock to activity in China leads to a drop in prices, which translates on average into an improvement in the terms of trade for Europe.

Finally, a financial channel, both direct (which depends on the degree of exposure of the European financial system to China) and indirect (via uncertainty and the flight to quality that a Chinese slowdown can cause). This channel is not dealt with here: the direct channel is negligible, as the Chinese financial system is relatively compartmentalised. The indirect channel is difficult to quantify: on the one hand, a rise in interest rates has a negative impact on activity, and on the other hand, European countries could conversely benefit from a flight to quality and distrust investments in the emerging economies.

The OECD highlights the risk that the Chinese slowdown represents for global growth (▶ **OECD, 2023**): a drop of 3 percentage points in the growth of Chinese demand is likely to result in a drop of 0.6 points in global growth and up to 1.1 growth points in the case of contagion effects on international financial markets. For the European economies, however, the net effect is not obvious: they are less connected via trade to the Chinese economy and they would certainly benefit from a drop in commodity prices.

Trade links between the Chinese economy and other countries can be explored using data from an Inter-Country Input-Output Table

The scale and nature of trade links between the Chinese economy and other countries can be explored using data from the OECD's Inter-Country Input-Output Table (ICIO, ▶ **Method box**), based on 2019. It shows that South Korea was China's leading supplier in 2019, with South Korean products accounting for 8.9% of Chinese imports. It was closely followed by the United States, with 8.5% of Chinese

▶ 5. Chinese imports of goods
(year-on-year change, in %)

Last point: Q4 2023.
Note: the import series is derived from Chinese customs data deflated with the import price index for goods produced by the Netherlands Bureau for Economic Policy (CPB) and seasonally adjusted.
How to read it: in Q4 2023, according to Chinese customs, imports of goods increased by 3.7% year-on-year.
Source: National Bureau of Statistics of China, Netherlands Bureau for Economic Policy Analysis (CPB), INSEE Calculations.

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imports and Japan, whose products represented 7.9% of Chinese imports (►**Figure 6**). Among European countries, Germany stood out as China's most important partner country: in 2019, German products represented 5.0% of Chinese imports, with France at 2.1%.

By comparing with several years of customs data published by the National Bureau of Statistics of China, which only present trade in goods, the robustness of the ICIO data can be verified (►**Figure 7**). These data can also be used to check whether China's main partners remain relatively stable over time: this is indeed the case, although some changes can be observed, mainly due to recent trade tensions. The decline in the United States' share between 2014 and 2023 is an example of this, as is the increase in some Asian economies such as Vietnam and Indonesia, or even partners such as Russia and Brazil. These

developments also reflect the geographic refocusing reflected in particular by the "New Silk Roads" initiative. According to ►**Bertrand, Villani, 2024**, trade relations with Asian countries should be strengthened even further in the next few years with the Regional Comprehensive Economic Partnership, a free-trade agreement that came into force in 2022. Other differences emerge between the OECD's ICIO 2019 and the customs data: Singapore thus appears to be one of the main countries of origin for products imported into China for goods and services, but is less predominant for goods only.

Using the OECD ICIO data it is also possible to construct a breakdown by product for each country of origin of Chinese imports (►**Figure 8**). Overall, Chinese imports consist mainly of manufactured products and services. The main exporters to China, namely South Korea, the United

►6. Chinese imports (goods and services) by country of origin in 2019
(share of imports from the country of origin in total Chinese imports, in %)
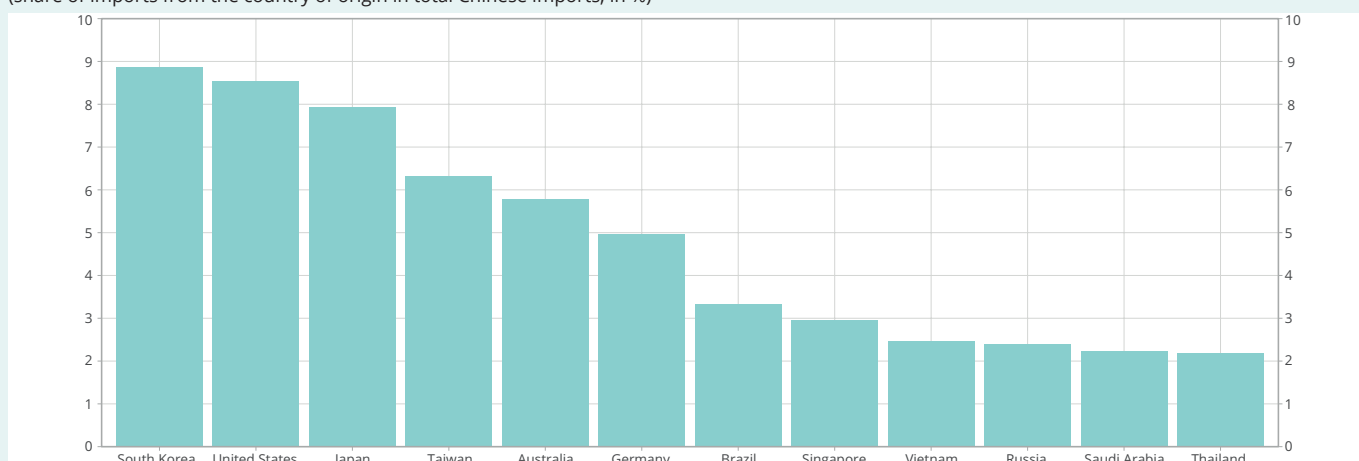
How to read it: South Korea represented 8.9% of Chinese imports of goods and services in 2019.
Source: OECD 2019, INSEE calculations.

►7. Chinese imports (of goods) by country of origin in 2014, 2019 and 2023
(share of imports from the country of origin in total Chinese imports, in %)

Note: only the top 10 countries in Chinese imports for the year considered are shown in this graph.
How to read it: South Korea represented 6.4% of Chinese imports of goods in 2023.
Source: National Bureau of Statistics of China, INSEE calculations.

States and Japan (►**Figure 6**), are differentiated by the profile of their exported products: South Korea and Japan export mainly manufactured goods to China. On the other hand, the United States exports mainly services. In Europe, France and Germany have quite different export profiles: Germany exports mainly manufactured goods, in similar proportions to Japan, whereas the products exported from France have a fairly similar profile to imports from the United States, with a majority of services.

Exports to China play a major role in the economies of several countries that are strongly integrated into Asian value chains. Economies such as Taiwan, Vietnam, Singapore, South Korea, Hong Kong, Australia and Thailand rely heavily on exports to China, which is reflected in

the significant weight of these exports in their GDP (►**Figure 9**). Conversely, for the United States, which is nevertheless one of the leading countries of origin for Chinese imports, exports to China have a relatively low weight in its GDP (1% in 2019). For Germany, this weight is almost 4% while for France, it is around 2% of GDP.

Via the trade channel, a -5% shock in domestic demand in China, depending on its composition, would have an impact of between -0.1 points and -0.2 points on change in French GDP

To go further, the OECD ICIO tables can also be used to measure the impact of a slowdown in Chinese final domestic demand on the main world economies. The estimation method proposed here (►**Method box**) to

►8. Chinese imports by product and by country of origin
(in %)
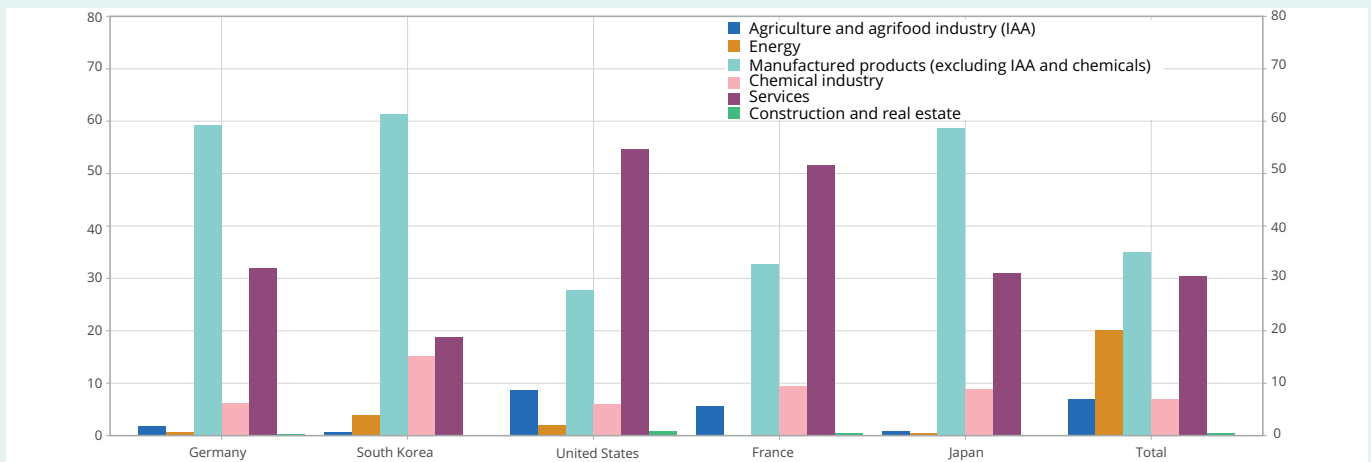
How to read it: for all countries, total Chinese imports of goods and services in 2019 consisted of 7% of agricultural and agrifood products, 20% of energy sector products, 35% of manufactured products (excluding agrifood products and chemicals), 7% of chemicals sector products, 0.4% of construction and real estate products and 30% of services. Imports from Germany consisted of 59% manufactured products.
Source: OECD 2019, INSEE calculations.

►9. Share of exports to China in the GDP of the country of origin in 2019
(in %)
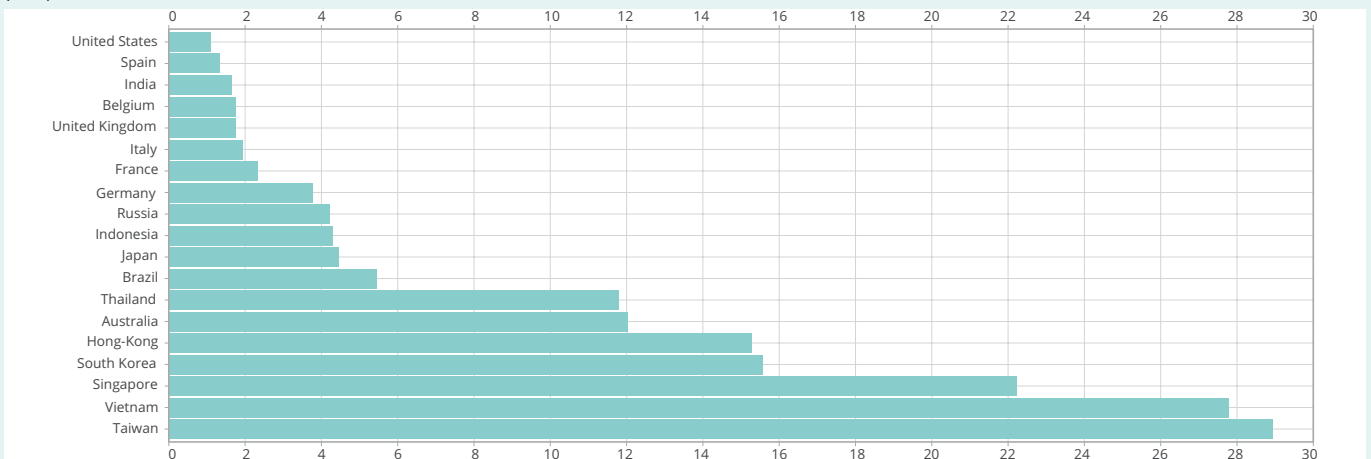
Note: by approximation, GDP is calculated as the sum of the value added of the different sectors. Vietnam has a higher ratio with the OECD data than when taking GDP from the IMF source.
How to read it: exports of goods and services from Australia to China represented 12% of Australian GDP in 2019.
Source: OECD 2019, INSEE calculations.

simulate a Chinese final domestic demand shock on its trading partners can identify transmission of shocks by country and by product along the value chains.

The richness of the ICIO table means that it can be used to study the effects of the slowdown in Chinese final domestic demand depending on the products concerned. The impact of this slowdown on China's main partners will not be the same if it is only a shock on construction (which at first will mainly affect the national economy, with limited transmission via the trade channel to the rest of the world) or on investment, which mainly concerns final demand for manufactured products, or even if there is a general slowdown in final domestic demand. Three scenarios are therefore studied in this analysis: a uniform drop in Chinese final domestic demand in all sectors, a drop in Chinese final domestic demand only in the construction and real estate sector, and finally a drop in Chinese final domestic demand in the manufacturing sector. In order to compare these three shocks as they are transmitted to the rest of the world economy, they are all assumed to be of a similar size, corresponding to 5% of Chinese final domestic demand. The impacts of the Chinese slowdown on the rest of the world economy measured here can however be considered as lower bounds: in fact, the methodology used suggests that a shock in activity in China results in a contraction of imports with unitary elasticity. In the short term, however, elasticity of imports to GDP may be higher: this is the case, for example, for France in the Mésange model (▶**Bardaji et al., 2017**), where imports of goods overreact in the short term to a variation in domestic demand. However, the OECD ICIO is available for 45 products only and has been simplified to 6 products for the purposes of this analysis. Thus for certain products, the methodology cannot be used to make a fine distinction between imports intended to serve Chinese domestic demand and those intended for assembly and

re-export ("processing trade"): as a result, the impact of the slowdown in Chinese domestic demand on Asian economies could be slightly overestimated.

If this shock were concentrated in the construction and real estate sector, final domestic demand in this sector would decrease by 16.2%: in fact it represented around 30% of total Chinese final domestic demand in 2019. Given the decline in real estate transactions and building starts (of the order of 50%), a decline of this magnitude is not excluded. Such a shock would have a limited impact on the rest of the world economy: in fact, it is primarily a domestic sector, and does not give rise to significant direct trade flows (▶**Figure 8**). This shock would therefore have a much greater effect on Chinese GDP (-4.4 points) and little effect on its trading partners, even taking into account imported inputs from the sector (▶**Figure 10**). In Europe, the impact would be -0.1 points on change in the German GDP and lower than this threshold for the other countries, including France. The economies most affected would be those that are most integrated into Asian value chains: Taiwan with -0.6 points of GDP, Vietnam or Singapore with -0.5 points of GDP. The direct diffusion effects of a Chinese real estate crisis would therefore be contained, if this crisis remains confined to the construction sector with no transmission to other components of the Chinese economy.

The contagion effects of a crisis in Chinese final domestic demand could be greater for the rest of the world in general and for European countries in particular if the real estate crisis in China were to lead to an investment shock that could be modelled as a negative shock of Chinese demand on manufactured products. A shock on the same scale, but concentrated on demand for manufactured products (i.e. around -30% on these products), would have much more pronounced effects for China's trading partners. This shock would result in a drop in Chinese GDP of 3.7 points (▶**Figure 10**). Germany would be the western country most

▶**10. Effect of a Chinese domestic demand shock (-5 %) on change in GDP in the partner countries, according to three scenarios**
(in % points by country)
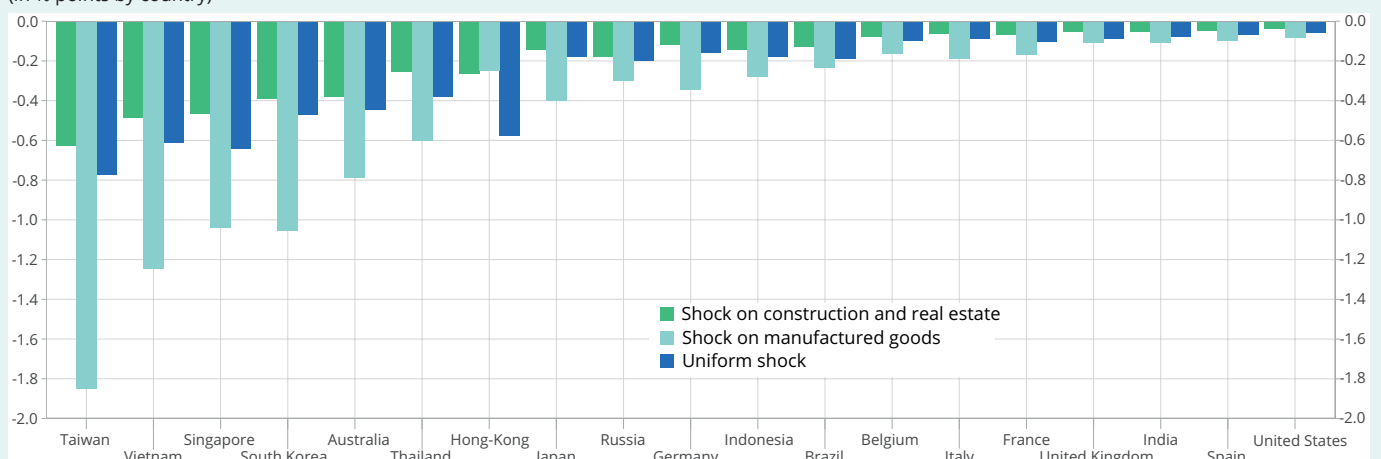
Note: by approximation, GDP is calculated as the sum of value added across all sectors of a country.
How to read it: a uniform shock of -5% on Chinese final demand would ultimately result in a 0.8 point drop in GDP growth for Taiwan.
Source: OECD 2019, INSEE calculations.

affected (-0.35 points of GDP), with an effect double that of France. Japan (-0.4 points) and South Korea (-1.1 points), which are mainly exporters of products manufactured in China, would also be affected.

Finally, a shock uniformly affecting the entire Chinese final domestic demand of -5% for all products would be equivalent to a drop of 4.3 points in Chinese GDP. The partner economy most affected would be Taiwan, with a drop of 0.8 points in its GDP, followed by Vietnam, Hong Kong and Singapore (-0.6 GDP points), South Korea and Australia (-0.5 GDP points) and Thailand (-0.4 GDP points). This result is consistent with the observation by ►Bertrand, Villani, 2023 on the dependency of Asian economies on Chinese growth. In addition, exporters of commodities to China, such as Australia (-0.4 points) would be significantly affected. For other countries, especially in Europe, the scale of the shock would be less. The effect on Germany (-0.2 GDP points) would be almost twice as great as for France (-0.1 GDP points).

Thus, depending on its composition, a decline in Chinese final domestic demand of 5%, via the trade channel alone, would have a limited impact on change in French GDP, of between -0.1 and -0.2 points. This order of magnitude is lower than that presented in ►Alhenc-Gelas, 2014, which estimated that a 1% drop in activity in all the emerging countries (i.e. an impact of approximately half that estimated here) had an impact of -0.2 points in the long term on French GDP. There are several factors that can account for this difference in magnitude: on the one hand, in this earlier study, the elasticity of imports to GDP was assumed to be equal to two, whereas a unitary reaction is assumed here (which tends to lessen the impact of the Chinese slowdown on the rest of the world economy via the trade channel). On the other hand, China's openness rate has decreased since 2014, going from 22% to 17% in 2021 (according to the OECD).

The decline in the price of oil caused by a drop in Chinese final domestic demand would benefit the French economy and compensate for the negative effect of the trade channel

For a fuller assessment of the impact of a Chinese slowdown on the French economy, we must also take into account its effect on commodity prices, especially oil. A decline in Chinese GDP growth could bring prices down, which in turn would have effects on China's economic partners and especially on France.

In fact, oil consumption in China has increased sharply for several decades (►Du et al., 2010). China is the main player in many of the commodities markets. In 2022, it represented 55% of global coal consumption (►GSA, 2023), 80% of aluminium ore imports, around 70% of nickel and iron imports, and 58% of copper (►Figure 11). China is also the second largest consumer of oil in the world, after the United States, and its consumption is constantly increasing: in 2023 it represented 16.1% of global oil consumption. For simplification, this study focuses on the effect of Chinese growth on the price of oil, as in macroeconomic models it is often thought to represent commodity prices in the broad sense.

Due to the weight of the price of oil, several articles highlight a positive elasticity between it and Chinese growth, but its extent is debated (►Figure 12). According to ►Bernard et al., 2013, in the short term, a drop in global activity of 0.5% would reduce the price of oil by about 3%. Since China represents between 16% and 17% of the world economy (►IMF, 2023), a 0.5% drop in global activity would therefore be equivalent to a 3% drop in activity in China, i.e. an elasticity of the price of oil to Chinese activity of 1. However, this first analysis does not take into account the particularly strong Chinese activity in

►11. China's share in world imports of commodities by value in 2022
(in %)
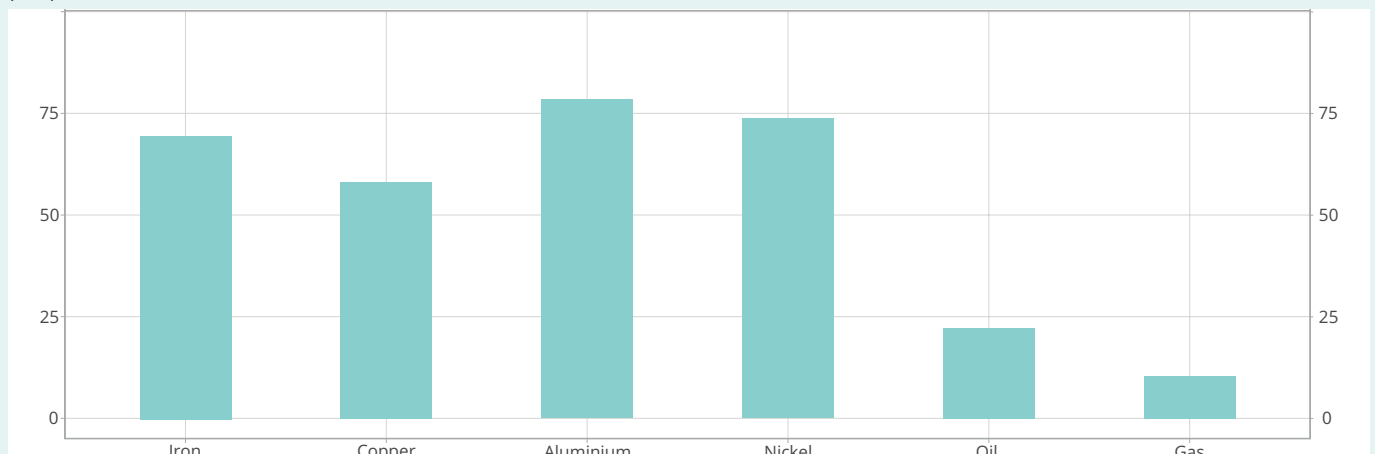
How to read it: in 2022, Chinese iron imports represented 68.9% of world iron imports.
Source: Trademap.

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commodities, especially oil. According to ►Roache, 2012, the elasticity of the price of oil to Chinese activity is likely to be a little over 2, whereas according to ►Cashin et al., 2017, it is 2.8. In a recent simulation exercise using the Nigem macroeconomic model, ►Alonso et al., 2023 used an elasticity of 9 for the price of oil to Chinese GDP. ►Kolerus et al., 2016 obtained an oil price elasticity to Chinese industrial production of around 7 (and 5 to 7 for metal prices). Conversely, some articles show up no effects of Chinese growth on oil prices ►Mu and Ye, 2011, ►Ahuja and Nabar, 2012, ►Hongzhi, 2016 and ►Ghoshray and Pundit, 2020.

By assuming an elasticity of the price of oil to Chinese activity of around 3, a drop of 5 points in Chinese domestic demand would correspond to a decline of 15% in the price of a barrel of oil, or around 12 dollars at the current price (for a price of 82 dollars a barrel). In France, the Mésange model ►Bardaji et al., 2017 is able to quantify the effect of such a drop in the price of oil on activity: it would result in an increase of 0.1 points of GDP in one year and 0.3 points of GDP in two years.

Thus, if we combine the effects of a 5% drop in Chinese final demand via the trade channel and via the commodities channel, the Chinese slowdown would have a weak and ambiguous effect for France. Depending on the assumptions made for each of these two channels, this net effect would be either slightly positive or slightly negative. If we assume that Chinese imports react in the short term with supra-unitary elasticity to a contraction in Chinese domestic demand, then the negative impact of the Chinese slowdown via the trade channel would be more significant for France and could surpass the positive effect via the price of commodities. Conversely, this price could be revised upwards if a value greater than three were chosen for oil price elasticity to Chinese demand (some articles highlight values of up to 7 or 9): with such an assumption, the impact of the Chinese slowdown on France could even be slightly positive.

This result is similar to that obtained by ►Alonso et al., 2023: according to these authors, for the Eurozone countries, the favourable effects of the slowdown in the Chinese economy on the decline in commodity prices outweigh the unfavourable effects via the trade channels. ●

►12. Elasticity of the price of oil to Chinese activity
(in %)

Bibliography	Elasticity of the price of oil to Chinese activity (in %)
IMF (2011)	6
Roache (2012)	2
Bernard et al. (2013)	1
Roache and Rosset (2015)	7-9
Kolerus et al. (2016)	7
IMF (2016)	7.5
Alonso et al. (2023)	9
Mu and Ye (2011)	not significant
Ahuja and Nabar (2012)	not significant
Hongzhi (2016)	not significant
Ghoshray and Pundit (2020)	not significant

Source: INSEE.

Method: Modelling from the Inter-Country Input-Output Tables

The OECD Inter-Country Input-Output (ICIO) Tables are a database covering production in 77 countries of 45 types of product, their resources and their intermediate and final use. The year used for this Focus is 2019.

Each row describes the possible uses of a (product x country) pair, i.e. a product manufactured in a country. The ICIO is composed mainly of the Inter-Country Table of Intermediate Inputs (ICII), which describes the intermediate uses of the 77×45 = 3465 (countries x products) pairs in the production of these 3465 pairs of (countries x products), and a matrix of 77 columns describing final demand in each country for each of these 3465 pairs (with each pair on a separate row). Thus, imports and exports do not appear directly in the ICIO for each country x product pair, as these flows are processed "transparently": a country's production of a product is directly linked to the use (final or intermediate) of this product, within the national economy or abroad. It is nevertheless possible to reconstitute net exports for a country x product pair, from the sum of uses abroad.

The ICIO originally contained 77 countries and 45 products, but is here reduced to 21 countries and 6 products/sectors, i.e. 126 (country x product) pairs. The 21 selected countries are China, its main trading partners and the main advanced economies: Australia, Belgium, Brazil, Germany, Spain, France, United Kingdom, Hong Kong, Indonesia, India, Italy, Japan, South Korea, Russia, Singapore, Thailand, Taiwan, United States, Vietnam and the rest of the world. The 6 sectors considered are the following: agriculture and agrifood industry, energy, chemicals, manufacturing (excluding agrifood and chemicals), construction and real estate and, finally, the rest of services.

The OECD ICIO Tables can be used to measure the impact of a slowdown in Chinese domestic demand on the main global economies using a methodology similar to ►**Cornuet F. et al., 2019** : this estimate is carried out with the structure of world trade unchanged, as in ►**Cornuet F. et al., 2019**, as the drop in Chinese final demand does not take into account possible reorganisations of production chains and demand for goods and services.

The resources-uses balance of a (country x product) pair i is therefore written as equality of production of i with the sum of its final uses (denoted EFi) and its intermediate uses. We can rewrite the sum of intermediate uses using production X and technical production coefficients (contained in a matrix denoted A):

$$X = EF + A.X, ie\ X = (id - A)^{-1}EF$$

X is the 126x1 column vector of productions for each (country x product) pair;
A is the 126x126 square matrix of technical coefficients;
EF is a 126x1 column vector, where each row corresponds to final demand, all countries combined, for each country x product pair. This vector may be interpreted as the product of the 126x21 matrix of final demands in the 21 countries, multiplied (on the right) by a 21x1 column vector filled with 1.
To assess the effect of a drop in Chinese final demand on production in the partner countries, the equality above is rearranged as follows:

$$X = (Id - A)^{-1}EF$$

To move from production to value added, it is possible to rewrite: $VA = V(Id - A)^{-1}\ EF$
or $V = VA/X$, is a diagonal matrix of size 126x126 containing the value added/production ratios of each country x product pair.

$$\Delta VA = V(Id-A)^{-1}\Delta EF$$

Thus to obtain the effect of a drop in Chinese final demand on a country's GDP, take the sum of the resulting variations in value added across all sectors.

Three shock scenarios are simulated for Chinese domestic demand to estimate their impact on the main world economies: (i) a homogeneous shock of -5% on Chinese final demand, obtained by applying a drop of -5% to all of Chinese final demand (one of the 21 columns in the matrix of final demand); (ii) a shock to Chinese domestic demand in construction and real estate, and (iii) a shock to Chinese domestic demand in manufactured products. The last two shocks were obtained by applying a reduction to Chinese final demand, but only in the sectors considered (i.e. only certain rows in the column associated with China in the final demand matrix, corresponding for all countries of origin to country x construction and country x manufactured products pairs respectively), by calibrating this drop so that it is the same size as a 5% shock on all domestic demand. ●

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