



Price and non-price competitiveness: Lessons from global value chains

The role of prices and other so-called non-price factors, such as quality and brand image, are commonly highlighted in analyses of export competitiveness. However, the increasing internationalisation of production within global value chains reinforces the dependence of export prices on the prices of imported inputs. Taking into account this phenomenon, this bulletin shows that non-resident sectors are a determinant factor in export cost developments, accounting for about three quarters of their growth in France. Thus, in the evolution of competitiveness, domestic factors may weigh comparatively less than external ones, which domestic policies can nevertheless not control. In this context, price competitiveness is decisive for the United States, while non-price competitiveness is more important for China and Spain. As for France and the United Kingdom, both price and non-price effects offset each other.

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JEL codes:
E31, F10,
F31

-1.9% and +2.2%

respective contributions of price and non-price competitiveness factors to France's exports between 2000 and 2014

+32%

contribution of demand to changes in French exports over this period

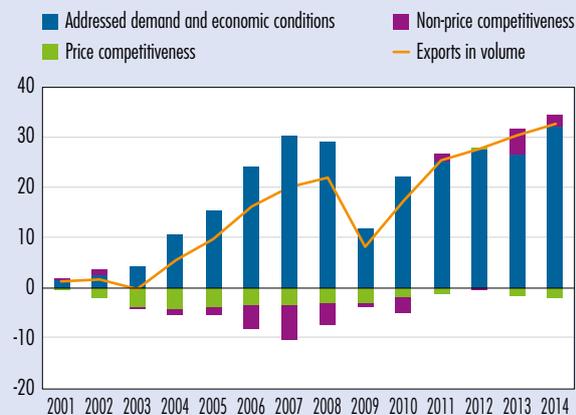
+16%

contribution of foreign sectors to the rise in labour costs in France compared to + 5% for domestic sectors

Price and non-price competitiveness

Breakdown of the variation in real exports of goods and services since 2000 for France (on a cumulative basis)

(%)



Sources: WIOD project (World input-output tables and Socio Economic Accounts), Banque de France calculations.



One of the aspects of countries' competitiveness lies in their ability to acquire, or at least maintain, market shares abroad. For this reason, factors related to price, and therefore mainly to production costs, are important. However, qualitative aspects also come into play, such as product quality, innovation, brand strength, and government-led trade policies (bilateral agreements, etc.). All of these factors related to the ability to export independently of price are commonly referred to as "non-price" competitiveness, as opposed to "price" competitiveness which refers to the ability to export at lower prices than competitors.

The objective of this article is to identify the respective shares of these two factors of competitiveness in the variations in exports of a set of countries. To do this, the methodology used here consists in determining non-price competitiveness from the price factor. The originality lies in the method used to calculate the price factor which takes into account not only the exporting sectors, but also all the sectors that indirectly contribute to exports, whether resident or not.

This approach seems more suited in a context of increasing international fragmentation of production within global value chains (GVCs).¹ As a result, since the 1990s, the share of imported intermediate goods and services (inputs) in the production of exports has increased. The iPhone, for example, designed in California, incorporates various components produced worldwide, which are then assembled in China. The final cost of production therefore depends on the cost variations in all the countries involved in the production chain and is therefore not limited to that of the Chinese industry, which exports the finished product.

The changes that have occurred in France since the 1990s illustrate this phenomenon: the import content in French exports increased from 20% to 30% between 1995 and 2011, while the indirect value added derived

from the resident services sectors accounted for 54% of the country's manufacturing value chain in 2011, up from 45% in 1995 (Cezar et al., 2017).²

In view of these transformations, it seems more relevant to take into account in the calculation of the price component of competitiveness the cost variations in all sectors, whether resident or not, which participate downstream (producers of final goods and services) or upstream (input producers) in production within value chains. Yet all these sectors export directly or indirectly: their production costs therefore affect the costs of exports.

Hence, the two price and non-price components of competitiveness presented in this bulletin reflect this relatively recent development in GVCs.

1 Labour costs after taking account of integration into global value chains

In order to measure the impact of the international fragmentation of production on the price component of competitiveness, we begin by building a unit labour cost indicator sensitive to the integration into global value chains (ULC-GVC). This indicator weights domestic and imported costs against the participation of each resident and non-resident sector in the production of exports (see Box 1 below).

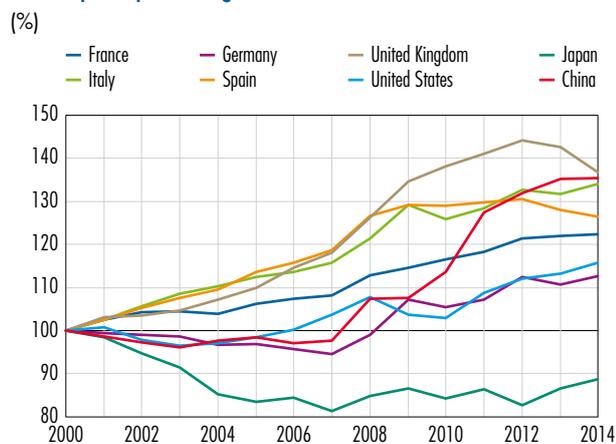
The ULG-GVC rose in all the countries of the sample on a cumulative basis between 2000 and 2014, with the exception of Japan. Three groups emerge from the analysis. The United Kingdom, China, Italy and Spain show the largest increases. France comes in next with an intermediate profile. Finally, the United States and Germany show the most moderate changes. These two countries either managed to better control their wage costs in terms of their productivity, or benefited more from their integration into GVCs to stabilise their costs.

¹ GVCs refer to all production tasks performed in several countries to bring a product from its design stage to its end user. This includes activities such as research and development, production, marketing, distribution and after-sales service.

² Resident services are incorporated indirectly into manufacturing value chains through national value chains, which refer to the fragmentation of production among several firms resident in the same national territory. Examples of these services are design, research and development, logistics and marketing.



C1 Unit labour cost in exports of goods and services adjusted for participation in global value chains (2000 = 100)



Sources: WIOD project (World input-output tables and Socio Economic Accounts), Banque de France calculations.
Note: The ULC is calculated as a weighted average of all the agri-extractive, manufacturing and service sectors.

More precisely, the United Kingdom ended the period with the largest increase: in 2014, its indicator reached 137% of the level recorded in 2000 (base 100). China comes in next with a very significant growth of its ULC-GVC since 2005, while until then the evolution had been moderate, even negative.

Among euro area countries, Italy and Spain posted the largest increase over the period. This upward trend continued until 2009, when the financial crisis broke out, with their indicators reaching 130% of the level observed in 2000. Spain subsequently managed to better control its costs, while those of Italy continued to rise, albeit more weakly. Developments in France were steady, with a cumulative growth of 22%, 10 percentage points above that of Germany, whose labour costs are the best controlled among the major European countries.

BOX 1

Unit labour costs adjusted for participation in global value chains (ULC-GVC)

The unit labour cost (ULC) measures the change in labour costs for a unit of real value added produced. It provides a measure of the change in costs while taking into account that of productivity (Gächter et al., 2013).

If wages follow productivity, ULCs remain stable. If not, ULCs increase or decrease depending on whether the change in wages is higher or lower than that of productivity. With the value added being constantly shared between capital and labour, an increase in ULCs leads to higher production costs and may result in a loss of price competitiveness.

In this article, the unit labour cost in exports of goods and services is adjusted for participation in global value chains (ULC-GVC), by weighting the change in the costs of all resident and non-resident sectors involved in the production of exports (agri-extractive, manufacturing and service sectors). Resident sectors are both direct exporters and indirect exporters that provide intermediate goods and services (inputs) used in the production of exports. Non-resident sectors also contribute indirectly to exports with the supply of imported inputs (see Appendices A and B).¹

¹ Producing a car, for example, uses domestic inputs, such as financial or logistics services, and foreign inputs, such as spare parts.



The United States recorded a cumulative increase of 15% in its ULC-GVC over the fifteen years. Japan stands out with a near-continuous decrease in its costs between 2000 and 2007, then a certain stability, between 80% and 90% of its initial level.

Imported costs are a determinant factor in the evolution of export costs

In order to understand the underlying causes of their evolution, unit labour costs are broken down according to their geographical origin. This breakdown makes it possible to determine the origin of the contribution, whether domestic or foreign, to the aggregate variation of the indicator³ (see Appendix B for the methodology and for the detail of the geographical areas).

Imported costs often account for more than half of the ULC-GVC increase, the only exception being China after 2009. **Integration into global value chains thus appears to be a determinant factor in the evolution of costs and hence of price competitiveness.**

The domestic contribution to changes in the ULC-GVC also varies across countries. On a cumulative basis over the period, it contributed to the rise in costs in China and the United Kingdom; and marginally to the rise in Spain and France. In contrast, the domestic contribution had a negative effect on costs in Germany and Japan, while it was rather neutral in Italy and the United States.

In Germany, domestic factors contributed to the decline in unit labour costs and partly offset imported inflation

C2 ULC-GVC: geographical breakdown, on a cumulative basis since 2000

(%)



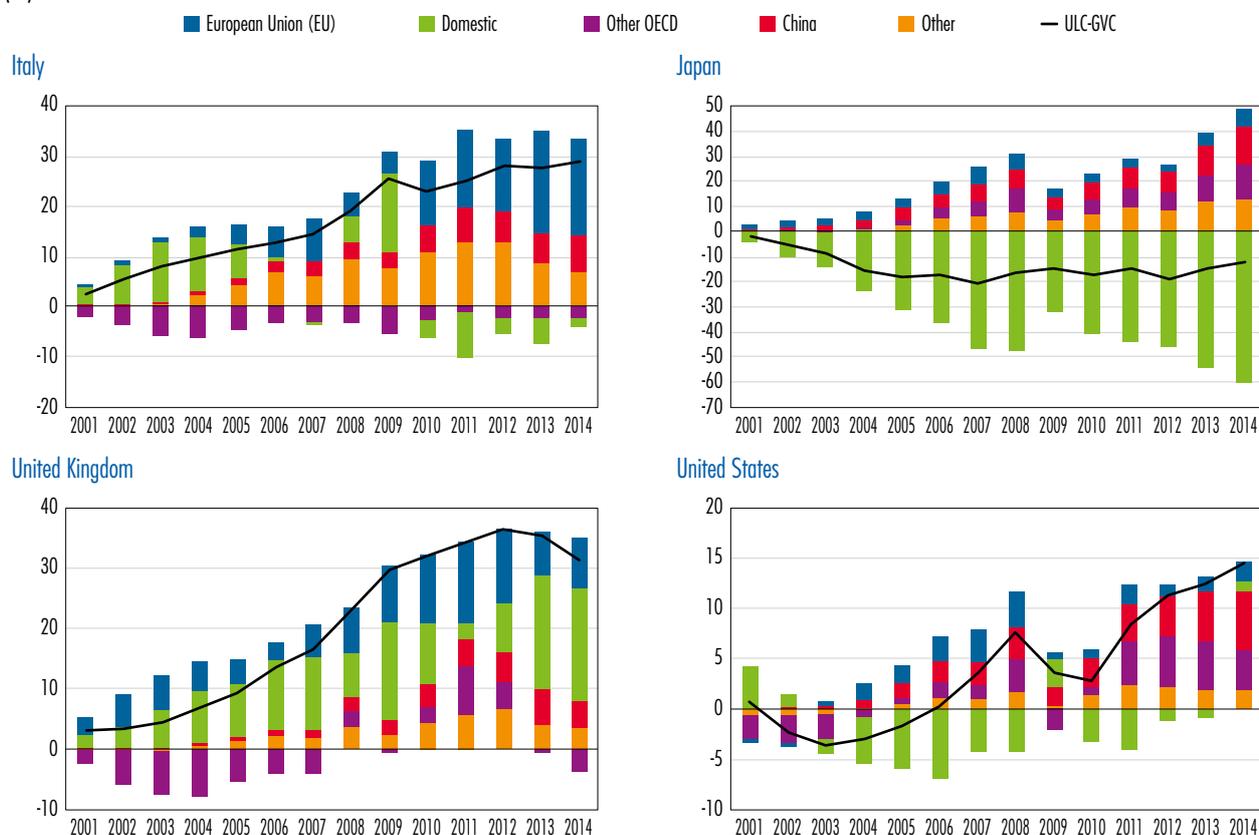
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³ It should be noted that geographical contributions are themselves dependent on changes in their own ULCs, in their (direct and/or indirect) shares in export production and in exchange rates.



C2 ULC-GVC: geographical breakdown, on a cumulative basis since 2000 (cont'd)

(%)



Sources: WIOD project (World input-output tables and Socio Economic Accounts), Banque de France calculations.

Key: The charts represent the breakdown of the cumulative variation of the countries' aggregated ULC-GVC. This is represented by the black curve. The bars represent the net contribution of each geographic area to this variation. At each date, the sum of the contributions equals the black curve. The contribution of an area is explained by the changes in its weight and its labour costs over its productivity (ULC) and adjusted for exchange rates. A variation in the contribution of an area can thus be explained by a variation in the weight of this area, by a variation in its ULC or by a relative change in the exchange rate compared to the currency of the country considered.

Note: For each country, "Domestic" refers to the costs of the country itself, which are then excluded from the other aggregates.

on these costs. Indeed, the entire increase in German costs stems from its main production partners within GVCs. European Union countries contributed the most to this development, accounting for more than half of the upward pressure. The remaining half is split between China, whose weight and costs increased significantly, and other emerging countries.

In the case of France, changes in domestic costs contributed to the increase in aggregate costs, but in a rather marginal way: they account for about a quarter of the total increase. The remaining three quarters are

imported. China contributed the most, in the same way as in Germany. Similarly, European suppliers and the main emerging countries also raised the French ULC-GCV.

The initially strong role played by domestic factors in the evolution of labour costs in Italy and Spain decreased after the 2008 financial crisis. At the end of the period, almost all the cumulative cost increase in Italy was imported and stemmed from European countries, which conversely brought down costs in Spain. This difference is mainly due to a composition effect between their European partners.



Most of the increase in labour costs of exporters in the United Kingdom is attributable to domestic factors; in contrast to Japan, where domestic factors contributed significantly to the decline in aggregate costs. The latter country imports inflation, which is, however, not enough to offset its internal deflation. The United States also imports most of the rise in its production costs, especially from China.

Service sectors drive up costs, unlike manufacturing sectors

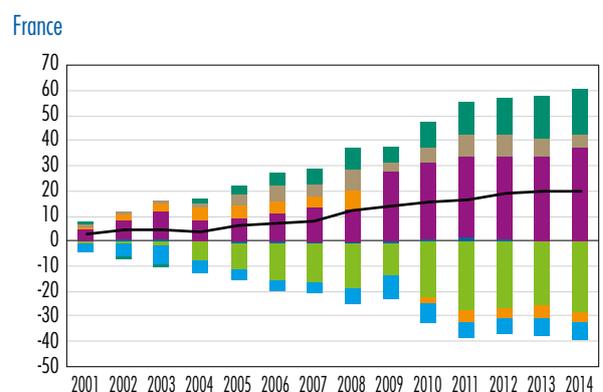
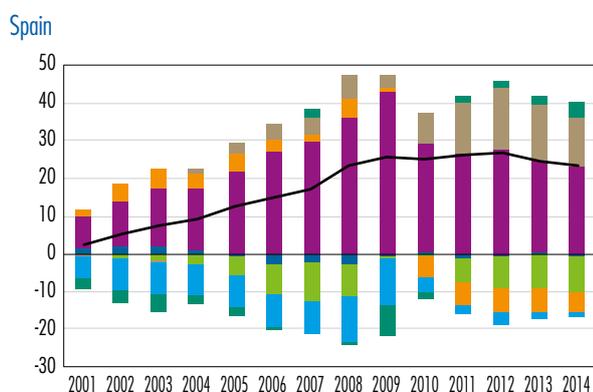
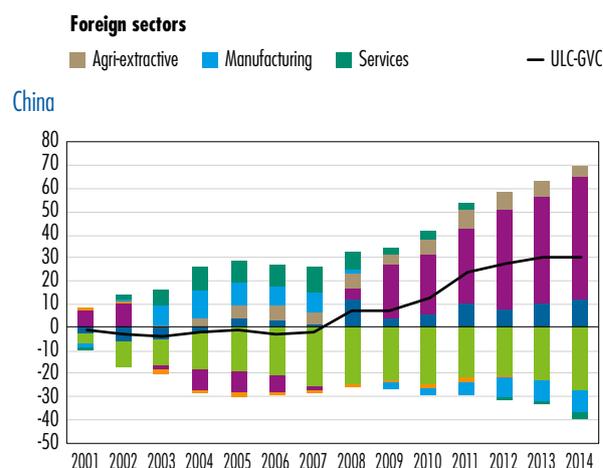
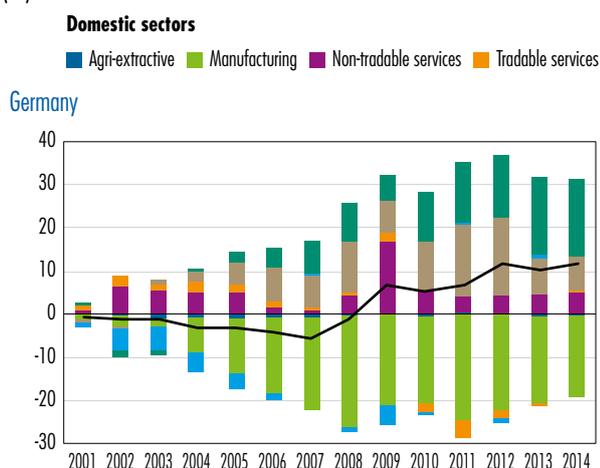
The variations in the ULC-CGV are then broken down according to their sectoral origin. Resident service sectors are broken down between tradable and non-tradable services using the method presented by Frocrain and Giraud (2017), which consists in measuring the degree

of concentration of a sector's production relative to the demand that is addressed to it (see Annex B for the methodology and details of the sector groups).⁴

For almost all countries a general trend emerges: **manufacturing sectors contribute to lowering costs, whereas service sectors contribute to raising them.** This trend often reflects an increase in the share of service sectors in export production, especially in Western countries. Indeed, these countries are increasingly specialising in services upstream in value chains, such as research and development, logistics or head office activities (see Cezar, 2016b). In addition, labour costs rise more sharply in service sectors, driven in particular by more moderate growth in productivity.

C3 ULC-GVC: sectoral breakdown, on a cumulative basis since 2000

(%)



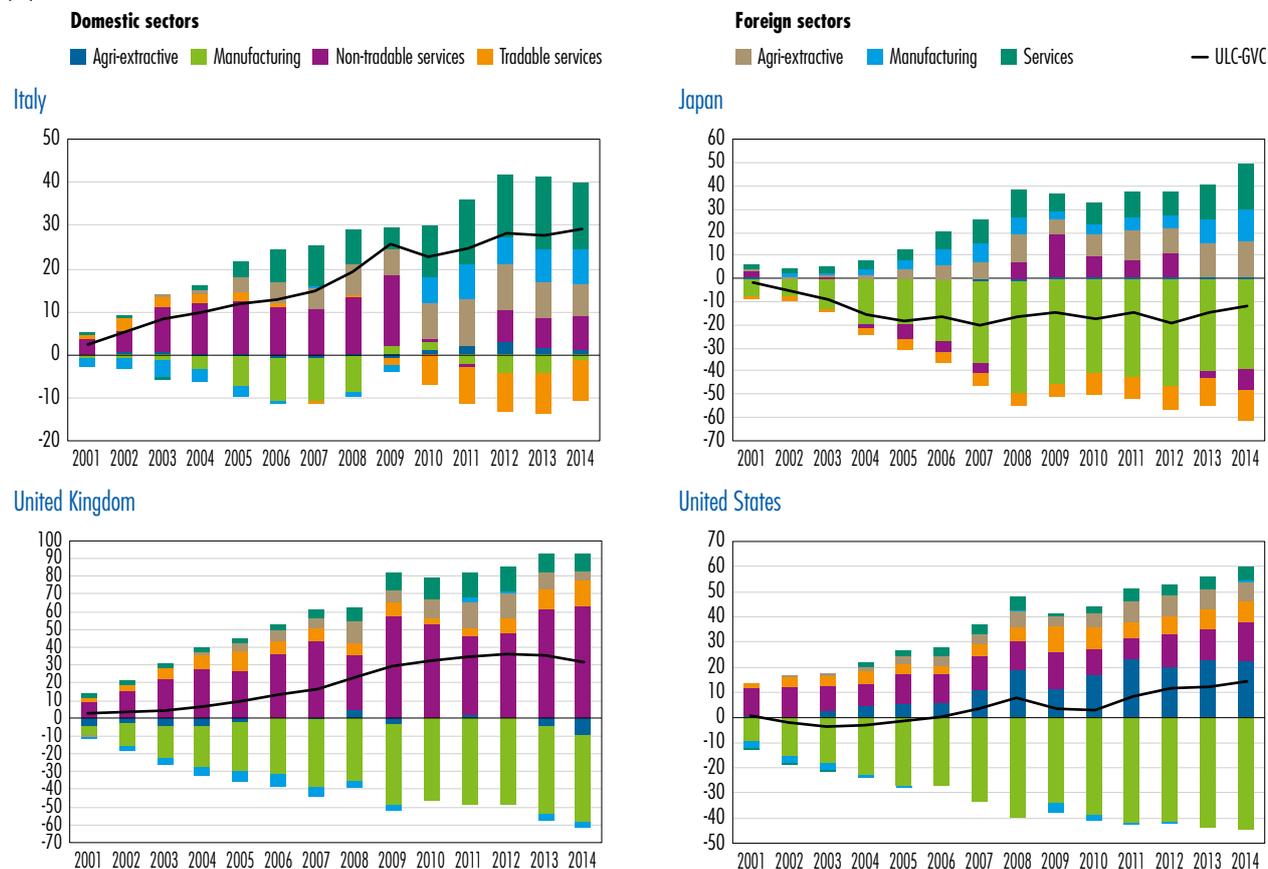
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⁴ As with the geographical breakdown, the variation in sectoral contributions is explained by the variation in sectors' ULCs, in their weights and in exchange rates.



C3 ULC-GVC: sectoral breakdown, on a cumulative basis since 2000 (cont'd)

(%)



Sources: WIOD project (World input-output tables and Socio Economic Accounts), Banque de France calculations.

For example, in the euro area, manufacturing sectors contributed to the decline in the German ULC-GVC by almost 20 percentage points and to that in French costs by almost 30 percentage points. This decline stems in particular from the decrease in the share of domestic manufacturers in the value chain of their exports, even though the changes in their ULC also contribute to it.

The greatest divergence between the two countries stems from the role of the service sectors. In Germany, foreign service sectors account for almost all of the rise in labour costs, while domestic services manage to keep their costs under control. In France, foreign services also contribute to raise the ULC-GVC; but most of the increase comes from domestic service sectors, especially non-tradable sectors (which are mainly indirect exporters), due to the rise in both their ULCs and their weight in the value chain of French exporters.

The United Kingdom and Spain have a similar profile to that of France, which is characterised by a predominant role of non-tradable services in the evolution of aggregate costs. Italy, on the other hand, appears as an exception: foreign manufacturing sectors raise the ULC-GVC, even though service sectors remain the main contributors to the overall increase.

China follows the global trend from 2007, after posting stable costs in the first half of the period. Non-tradable services account for almost all the increase in Chinese ULC-GVCs. They replace domestic manufacturing sectors, whose costs decline sharply. In the United States, domestic agri-extractive sectors are the largest contributors, followed by domestic and foreign services. For Japan, all domestic sectors pull ULC-GVCs down, unlike all foreign ones.



2 Relative costs for measuring price competitiveness by taking account of the participation in GVCs

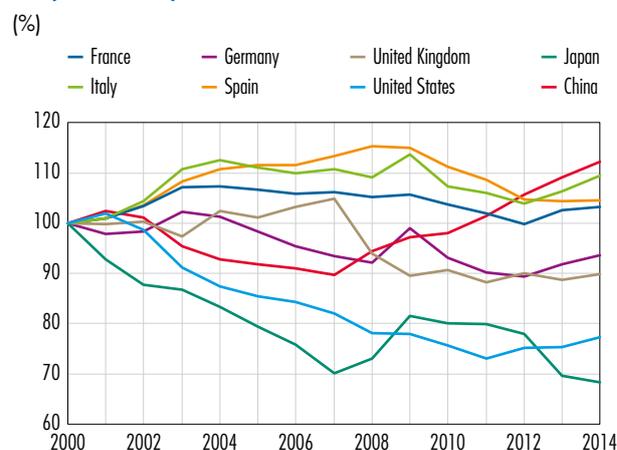
The indicator studied above measures costs in an absolute manner. However, for a competitiveness analysis, it is important to have a relative measure that takes into account the changes in a country's costs relative to those of its competitors.

To this end, the unit labour cost indicator in the previous section is used to construct a relative cost indicator. In order to compare the costs of individual countries, the indicator is adjusted for the exchange rate. Finally, each country is weighted in relation to the intensity of its bilateral trade. Indeed it is a real effective exchange rate indicator, sensitive to participation in global value chains (REER-GVC).⁵ This rate can be interpreted as an indicator of the changes in the costs of a relatively small country relative to those of its trading partners, adjusted for nominal exchange rates (see Appendix C).

With the REER-GVC, a rise in costs impacts the competitiveness of country *i* through two channels. The first, more traditional, is unfavorable to its competitiveness since the country sees an increase in its relative costs. The second is that of GVCs: this same increase in costs upstream of the production chains can be transmitted to countries downstream because they use inputs from country *i* in the production of their exports. This increase raises the costs of trading partners and therefore reduces the relative costs of country *i*. Countries are no longer just competitors, but also interdependent because of their interactions within GVCs.

In general, the positive values of the REER-GVC are considerably attenuated compared to those of the ULC while the negative values are amplified. This is notably the case for the United Kingdom and the United States, whose relative costs were down by 7% and 23% respectively, unlike their absolute costs (ULC). This can largely be explained by a depreciation of the

C4 Real effective exchange rate adjusted for participation in GVCs (2000 = 100)



Sources: WIOD project (World input-output tables and Socio Economic Accounts), Banque de France calculations.

dollar over the entire period for the United States and a fall in the pound in 2007 for the United Kingdom. These movements in nominal exchange rates dampen the rise in domestic costs.

The situation in the euro area is mixed. Germany is the European country that best controls its costs: its REER-GVC fell by 12% between 2000 and 2014. Conversely, costs rose sharply in Italy and Spain until 2009 (by 13 and 15 percentage points respectively). Subsequently, these two countries saw their relative costs decrease, recording a more moderate growth over the entire period (up 9% in Italy and 5% in Spain). France displays an intermediate profile, although it has converged towards that of its two southern neighbours since 2012, with costs rising by 3% in 2014 compared to 2000.

In China, relative costs rose sharply after 2007 (up 22 points up to 2014), after decreasing by 10% between 2000 and 2007. This increase coincides both with that of the ULC-GVC and with the appreciation of the yuan, since 2007 in both cases. For Japan, costs fell by more than 30% in 2014 compared to 2000. The decline in costs was amplified by the depreciation of the yen.

⁵ Patel et al. (2014) have built a similar indicator.



3 Price and non-price competitiveness are determinant factors in the evolution of exports

At this stage, the evolution of real exports is broken down into the price and non-price components of competitiveness. The first component determines the variation in exports due to the evolution of relative prices, as measured by the REER-CVM presented above. The second component, the non-price component, qualifies the variation in exports explained by elements other than price competition, such as quality, brand, innovation and design, to name just a few. The breakdown is performed using an export equation (see Box 2 below).

The evolution of a country's exports is primarily due to fluctuations in foreign demand and the effects of

global economic conditions. These exogenous factors account for between 50% and 85% of the cumulative growth in exports by country between 2000 and 2014. Competitiveness, however, plays a determinant role, its price and non-price components being of comparable importance in general.

The respective roles of the two components of competitiveness vary across European countries. For France, they both contributed negatively to export growth until 2007, before being more favourable. The non-price component changed sign in 2011 and had a positive, albeit marginal, impact on the evolution of French foreign trade, while the impact of the price component, always negative, was lower at the end of the analysis. On a cumulative basis over the entire 15 year period, the effects of the two components cancel each other out.

BOX 2

Export equation and price and non-price components

The export equation below breaks down the variation in real exports according to the price and non-price components in order to determine the role of these factors in the trade dynamics (see Ca'Zorzi and Schnatz, 2007):

$$X_{vol,it} = \beta_1 K_{it} + \beta_2 P_{it} + \varepsilon_{it}$$

Where $X_{vol,it}$ are real exports (in volume) of country i at time t ; K_{it} are control variables; P_{it} are relative prices; and ε_{it} residuals. From this formula, the variables are expressed in log form and in first difference, and thus as rates of change.

The variation in real exports is thus explained by the change in the control variables which are the addressed demand and the global cyclical effects,¹ as well as by the change in relative costs used as proxy for the price component of competitiveness. The residuals in the equation express the contribution of the non-price component to the change in exports, i.e. everything that is not explained by price, demand and world economic conditions.

¹ A country's addressed demand is calculated by the variation in the total real imports of its trading partners weighted by their weight in the total imports of this same country based on IMF data deflated by the World Bank import value index. The overall cyclical effects common to all countries in a given year are controlled by fixed time effects.



Germany, unlike France, gained an advantage in terms of both price and (especially) non-price competitiveness in the first half of the period. Subsequently, these two components were remarkably stable. They accounted for an additional 14 percentage point increase in the already high growth of German exports between 2000 and 2014 (up 61%).

Spain relied on a dynamic non-price component over the entire period, which supported the growth of its exports, despite an unfavorable price component (which nevertheless improved at the end). In Italy, the two components of external competitiveness depressed exports, although this negative effect was attenuated from 2011.

In the United Kingdom, the non-price component contributed to the rise in exports at the beginning of the period, but has become negative on a cumulative basis since 2013; the price component strengthened from 2008 onwards under the effect of the depreciation of the pound the previous year. The United States and Japan both registered a positive and increasing price competitiveness, which is consistent with their performance noted in the previous section, due to the real effective exchange rate. Indeed, over the 15 years under review, relative costs drove export growth up by 15 percentage points in the United States and 20 percentage points in Japan. However, this increase was more than offset by a drop in non-price performance in Japan. This component remained negligible in the United States.

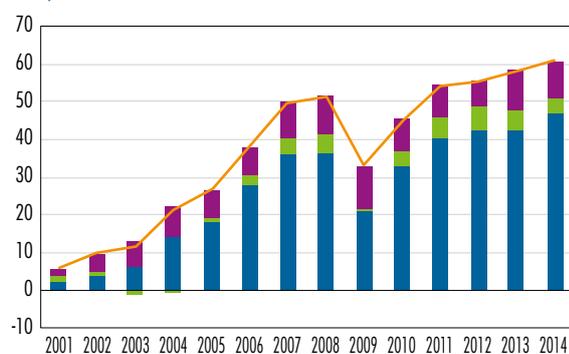
C5 Price and non-price competitiveness

Breakdown of the variation in real exports of goods and services, on a cumulative basis since 2000

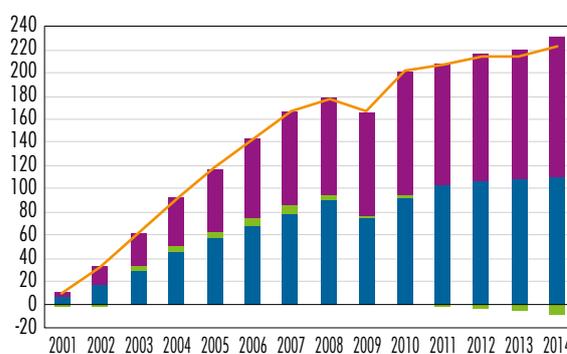
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■ Addressed demand and economic conditions ■ Price competitiveness ■ Non-price competitiveness — Exports in volume

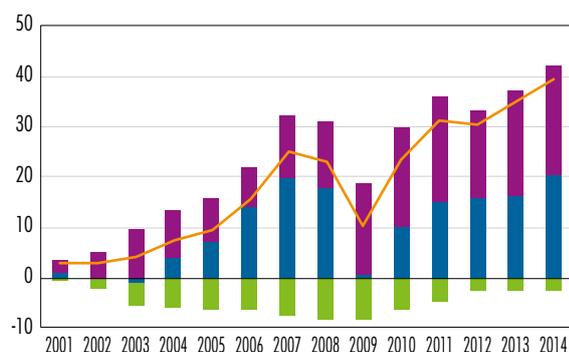
Germany



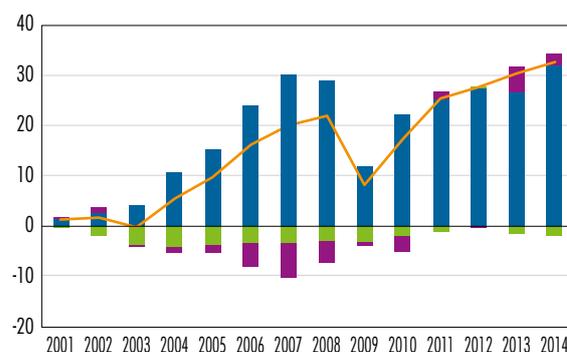
China



Spain



France



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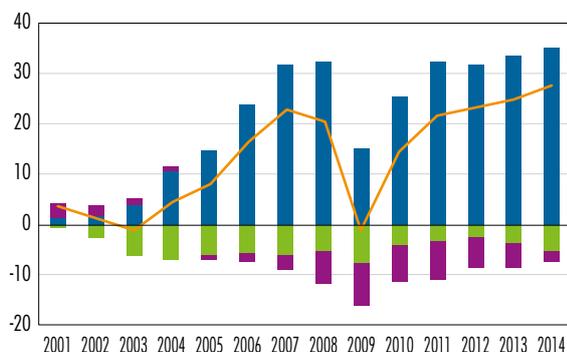
C5 Price and non-price competitiveness (cont'd)

Breakdown of the variation in real exports of goods and services, on a cumulative basis since 2000

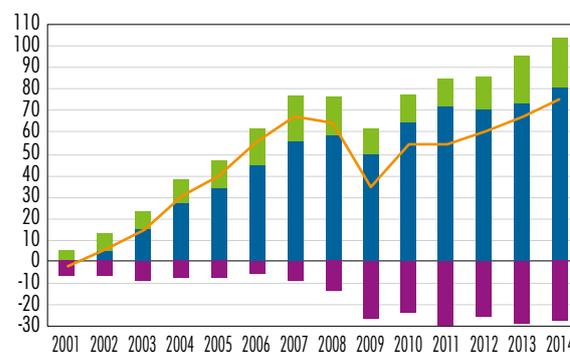
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■ Addressed demand and economic conditions ■ Price competitiveness ■ Non-price competitiveness — Exports in volume

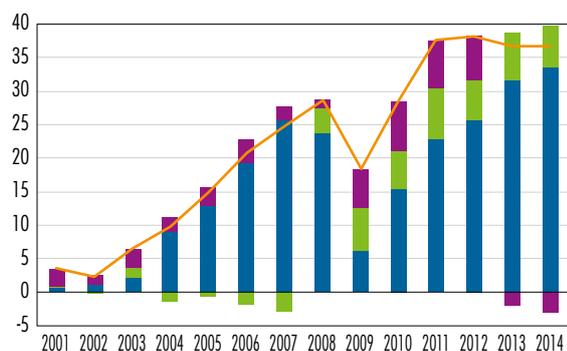
Italy



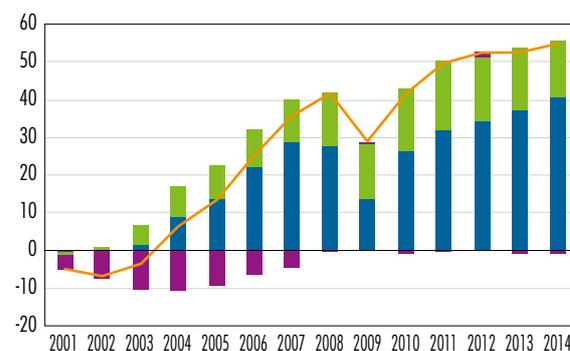
Japan



United Kingdom



United States



Sources: WIOD project (World input-output tables and Socio Economic Accounts), Banque de France calculations.

Finally, China relied on a strong non-price component, which added 120 percentage points to export growth over the period. If the only factors of demand and economic conditions had been at play, Chinese exports would have grown by "only" 110 points between 2000

and 2014, compared with an actual increase of 230%. However, the country's price competitiveness aspects were marginal but positive for almost all years, contributing 8 percentage points to growth in 2007.



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Appendix Methodology

A Data

The unit labour cost indicators and the breakdown of exports by sectoral and geographical origin of value added are calculated from the 2016 version of the World Input-Output Database (WIOD). This dataset includes international input-output tables (IOT) and socio-economic data in the Socio Economic Accounts (SEA) tables. They are produced by a consortium of institutions, mainly academics, funded among others by the European Commission (see Timmer et al., 2015).

International IOT are built from harmonised national IOT from 43 countries, plus a residual for the rest of the world, thus covering all international trade. They show, according to a breakdown of 56 sectors, the amounts of gross output and value added sold (exported) by each sector of each country to each sector of each country, as an intermediate good and towards final consumption. The data cover the fifteen years between 2000 and 2014.

These tables are used to deduce, by matrix calculations, the composition of a country-sector pair's gross output in terms of the origin of its value added. In fact, the output of a country-sector is broken down as the sum of the value added of each domestic and foreign sector taking part in its production, whether directly or indirectly by producing an intermediate good or service used in production.

The data provided by the WIOD project can also be used to calculate the unit labour costs of each country-sector pair from the SEA database. It includes, for the same countries and according to the same sectoral breakdown as the TES, data on employment, labour compensation and value added prices.

In the construction of SEA databases, data sources vary by country. WIOD imputes and harmonises the data in order to publish data for each country according

to a uniform sectoral breakdown. For the labour factor, Eurostat data are used for the countries of the European Union, those of national accounts or supply and use tables for other countries, or other statistical outputs when these traditional sources are not available. For data on price indices, the sources are Eurostat, the OECD STAN database and national statistical institutes for countries not included in these two databases, such as the BEA for the United States.

B Unit labour costs

The unit labour cost is an index that measures the variation in the cost of labour for a given productivity. It is obtained by calculating the ratio of the total remuneration of labour to the value added in volume (adjusted for the change in prices) in a given sector, as follows:

$$ULC_{i,k,t} = \frac{\text{Total remuneration of labour}_{i,k,t}}{\text{Real value added}_{i,k,t}} = \frac{TRL_{i,k,t}}{\frac{VA_{i,k,t}}{VAPI_{i,k,t}}}$$

With i , k , t representing respectively country, sector and year of the indicator, and TRL, VA and VAPI the total remuneration of labour, value added and the value added price index.

The ULC-GVC is an indicator that aims to reflect the change in exports labour costs for a given level of productivity; taking into account both the costs of the direct exporting sectors, but also of all the other sectors downstream involved in export production, through global and national value chains. To do this, the ULC-GVC of country i aggregates the unit labour costs of the domestic and foreign sectors that directly or indirectly contribute to the production of exports from this country, according to the following formula:

$$ULC - GVC_{i,t} = \prod_{i,k} (e_{i,t}^* \times ULC_{i,k,t})^{W_{i,k,i,t}}$$



With $ULC_{i,k}$ representing the unit labour costs in country j , sector k and $w_{i,k}$ the share of value added produced by country j , sector k in the total export value of i ; and e_i^* represents the exchange rate used in the conversion of imported ULCs in the currency of country i if applicable ($e_i^* = 1$ for domestic inputs). Indeed, exchange rate fluctuations also have an impact on the price of imported inputs and therefore on the total costs of country i .

The weights $w_{i,k,i,t}$ are calculated from the breakdown of the value added contained in exports according to their sectoral and geographical origin (for more details, see Cezar, 2016a). By identifying which country-sector has produced what share of the total value of exports, we take into account the contributions of all domestic and foreign sectors, whether this contribution is direct or indirect (including through the production of imported intermediate goods).

Given that it is an aggregate indicator, the change in the ULC-GVC can be broken down according to the origin of its variations by using the following formula:

$$\Delta \log(ULC - GVC_{i,t}) = \sum_{i,k} w_{i,k,t} \times \log(e_{i,t} ULC_{i,t}) - w_{i,k,t-1} \times \log(e_{i,t-1} ULC_{i,t-1})$$

Where $\Delta \log$ approximates the growth rate of the ULC-GVC. The terms of this sum are grouped according to the geographical component j and the sectoral component k to identify the role played by each area and category of sectors in changes in the ULC-GVC.

The ULC-GVC is an aggregation of costs from 43 different countries, including the exporting country itself. To break down these variations according to their geographical origin, the countries are grouped by economically relevant areas: domestic, European Union, other non-EU OECD, China, and finally the remaining countries (excluding OECD) referred to as "Other", mainly emerging countries. Each time, the country that we consider in the domestic category is removed from the other categories. A list of countries and the group to which they belong are available below:

- **European Union:** Austria, Belgium, Bulgaria, Cyprus, Croatia, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia,

Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, the United Kingdom, Slovakia, Slovenia, Spain, Sweden;

- **Other OECD:** Australia, Canada, Korea, Japan, Mexico, Norway, Switzerland, Turkey, the United States;

- **China;**

- **Other:** Brazil, India, Indonesia, Russia, Taiwan.

We then break down the variations in the ULC-GVC into four categories for the domestic sectors – agri-extractive, manufacturing, non-tradable services and tradable services – and three for the foreign sectors – agri-extractive, manufacturing and services. The breakdown between non-tradable and tradable services is based on the work of Frocraïn and Giraud (2017). Their methodology consists in measuring the degree of concentration of a sector's production according to the demand addressed to it. The idea is that if the local supply of a sector is greater than its local addressed demand, this means that part of its production is consumed elsewhere, i.e. it is tradable.

Composition of the different sectors followed by their CITI-WIOD code:

- **Agri-extractive:**

- Crop and animal production, hunting and related service activities (A01);
- Forestry and logging (A02);
- Fishing and aquaculture (A03);
- Mining and quarrying (B);

- **Manufacturing:**

- Manufacture of food products, beverages and tobacco products (C10-C12);
- Manufacture of textiles, wearing apparel and leather products (C13-C15);
- Manufacture of wood and of products of wood and cork, except furniture (C16);
- Manufacture of paper and paper products (C17);
- Printing and reproduction of recorded media (C18);
- Manufacture of coke and refined petroleum products (C19);



- Manufacture of chemicals and chemical products (C20);
 - Manufacture of basic pharmaceutical products and pharmaceutical preparations (C21);
 - Manufacture of rubber and plastic products (C22);
 - Manufacture of other non-metallic mineral products (C23);
 - Manufacture of basic metals (C24);
 - Manufacture of fabricated metal products, except machinery and equipment (C25);
 - Manufacture of computer, electronic and optical products (C26);
 - Manufacture of electrical equipment (C27);
 - Manufacture of machinery and equipment n.e.c. (C28);
 - Manufacture of motor vehicles, trailers and semi-trailers (C29);
 - Manufacture of other transport equipment (C30);
 - Manufacture of furniture; other manufacturing (C31-C32);
 - Repair and installation of machinery and equipment (C33);
- **Non-tradable services:**
 - Electricity, gas, steam and air conditioning supply (D35);
 - Water collection, treatment and supply (E36);
 - Sewerage; waste collection, treatment and disposal activities; materials recovery (E37-E39);
 - Construction (F);
 - Wholesale and retail trade and repair of motor vehicles and motorcycles (G45);
 - Wholesale trade, except of motor vehicles and motorcycles (G46);
 - Retail trade, except of motor vehicles and motorcycles (G47);
 - Land transport and transport via pipelines (H49);
 - Postal and courier activities (H53);
 - Accommodation and food service activities (I);
 - Financial service activities, except insurance and pension funding (K64);
 - Activities auxiliary to financial services and insurance activities (K66);
 - Real estate activities (L68);
 - Legal and accounting activities; activities of head offices; management consultancy activities (M69-M70);
 - Architectural and engineering activities; technical testing and analysis (M71);
 - **Tradable services:**
 - Other professional, scientific and technical activities; veterinary activities (M74-M75);
 - Administrative and support service activities (N);
 - Public administration and defence; compulsory social security (O84);
 - Éducation (P85);
 - Human health and social work activities (Q);
 - Other service activities (R-S);
 - Activities of households as employers (T);
 - Activities of extraterritorial organisations and bodies (U);
 - **Tradable services:**
 - Water transport (H50);
 - Air transport (H51);
 - Warehousing and support activities for transportation (H52);
 - Publishing activities (J58);
 - Motion picture, video and television programme production, sound recording and music publishing activities (J59-J60);
 - Télécommunications (J61);
 - Computer programming, consultancy and related activities; information service activities (J62-J63);
 - Insurance, reinsurance and pension funding, except compulsory social security (K65);
 - Scientific research and development (M72);
 - Advertising and market research (M73).

C The real effective exchange rate (REER)

The REER is a relative cost indicator that compares the changes in the costs of a country i with those of its trading partners by adjusting for changes in nominal exchange rates. The REER of country i at year t is calculated according to the following formula:

$$REER_{i,t} = \prod_{j=1}^N \left(\frac{C_{i,t}}{e_{j,t} C_{j,t}} \right)^{\rho_{ij,t}}$$

With N the number of trading partners, $C_{i,t}$ the cost index of country i , $e_{j,t}$ the bilateral exchange rate between i and j and $\rho_{i,j,t}$ the weight of country j . This weight depends on the degree of competition between the output of country i and that of country j .



In order to calculate our REER-GVC, we use the ULC-GVC as a cost index. The weights are calculated according to the methodology used by the ECB (Buldorni et al., 2002), which takes into account competition with trading partners in the internal market (through imports) and in foreign

markets (for exports). A double weighting is calculated to measure the exposure to international competition of exported output: in each foreign market, competition with local output and with other exporters present on the market are taken into account.

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