Main CompNet research results

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Introduction

The Competitiveness Research Network (CompNet) was set up by the European System of Central Banks in 2012. Its main objectives were to identify the factors driving competitiveness and productivity in European countries and firms and to describe the relationship between these various competitiveness factors and macroeconomic performance (e.g. exports or growth). It brought together over a hundred researchers from around fifty institutions (central banks, the European Commission, international institutions and universities) with the intention that they should focus on the subject of competitiveness and the analysis and understanding of the development of global production chains. Special efforts were devoted to the creation of new competitiveness indicators. The National Bank of Belgium has made numerous contributions, both in compiling statistics and at the scientific level, as is evident from the list of studies carried out by members of the Bank's staff or with the support of the Bank [1].

In addition to the various research projects, two new analysis tools were devised by CompNet: the diagnostic toolkit on competitiveness and the CompNet database.

The first tool consists of a database encompassing 80 novel competitiveness indicators developed by CompNet, some being macroeconomic indicators (indicators of comparative advantages by type of products – high-technology products, low-technology products, intermediate products – or intra-branch trade indicators), some microeconomic (derived mainly from the CompNet database) and some transnational indicators (measures of participation in global value chains) for EU countries. Each indicator is accompanied by a descriptive data sheet stating the definition, the method of calculation and the possible interpretation. This toolkit is presented in Karadeloglou *et al.* (2015).

The second tool is the CompNet database [2], described in Lopez-Garcia *et al.* (2014 and 2015). This database contains a detailed description of a range of firm-level indicators for 17 European countries (including 13 euro area Member States) [3]. Since there are legal obstacles to the pooling of microeconomic databases from multiple countries, CompNet developed a common methodology for constructing in each participating country a series of aggregate statistics permitting the most detailed possible description of the distribution of a number of economic indicators (total factor productivity, labour productivity, unit labour costs, exports, markups) or financial indicators observed at firm level. Those distributions are available at national or sectoral level, for both industry and services, and for certain categories of firms (small and medium-sized firms, large firms). The various components of this database have given rise to a number of publications, including Berthou *et al.* (2015b) for measures of export performance, Ferrando *et al.* (2015) for financial indicators, and Amador *et al.* (2015a) for markups.

The purpose of this article is to comment in more detail on some of the CompNet findings [4]. It comprises six sections. The first section defines the concept of competitiveness

(1) This list of studies includes Amador *et al.* (2015a), Amiti *et al.* (2014), Ariu (2012), Ariu (2012, 2015), Berthou *et al.* (2015a), Berthou *et al.* (2015b), Decramer *et al.* (2014), Di Comite *et al.* (2014), Dhyne *et al.* (2014), Dhyne *et al.* (2015), Duprez (2014), Vandenbussche (2014) and Verschelde *et al.* (2014).

(2) Under some conditions, this database is available through the ECB (cf. "Internal governance for the use of CompNet produced firm level data", ECB).

(3) The period covered by this database varies from one country to another. These data are updated annually. The latest update of the results for Belgium concerned the period 1996-2013.

(4) The network's final report was published by the ECB (see Di Mauro and Ronchi, 2015).

while the next three analyse the main determinants of competitiveness, namely productivity, cost competitiveness (traditionally measured by unit labour costs) and non-cost determinants of competitiveness (for example, the quality of the export products), and the fifth section examines the contribution of firms' dynamics to competitiveness and to the optimum allocation of resources.

Since the reorganisation of production chains at international level in recent decades has fundamentally altered the structure of world trade, CompNet has also examined the consequences of that in terms of competitiveness. The sixth section presents the main lessons to be drawn from the development of global value chains.

Finally, the conclusion sets out the main lessons for economic policy.

1. Competitiveness: concept and measures

Whether it is viewed in terms of a country, a firm or a product, competitiveness is a relative concept which is defined in comparison with the competitors of the country, firm or product in question. Thus, quite naturally, a country's competitiveness is usually analysed on the basis of its macroeconomic export performance[1], or possibly the competition from imported goods on the local market.

While traditional macroeconomic analysis links external performance to relative cost indicators such as unit labour costs or prices, microeconomic analysis mainly reveals the role of the firm's productivity as a key determinant of its success on foreign markets. The two types of analysis are in reality based on the same theoretical assumptions. Beginning with the observation that not all firms are exporters, microeconomic models have stressed the role of heterogeneity in productivity to explain divergences in firms' export performance (see Melitz, 2003). More generally, prices are determined by the ratio of wages to productivity, or in other words unit labour costs, up to markups. Prices are a vital element of a firm's profitability. These models put the emphasis on productivity gaps because they make the assumption that wages are homogenous between firms.

$$Price = markup \times \frac{Average\ wage}{Productivity}$$

$$Price = markup \times unit\ labour\ cost$$

or

$$p = \mu \frac{w}{\left(\frac{y}{l}\right)} = \mu.ulc \qquad (1)$$

These factors (price, unit labour costs or productivity) play a dual role. On the one hand, entry into a foreign market implies fixed costs, e.g. in connection with exploring a new market or adapting the product to local customer demand and preferences. Therefore, in order to be able to export to a foreign market, the firm has to achieve a level of profitability sufficient to cover these fixed costs. That explains the now familiar conclusion that export firms are generally more efficient (productive) than those which do not take part in international trade. Also, productivity or unit costs are key factors in pricing the firm's product, and consequently, in determining its share of foreign markets. Here we see the relationship between the firm's efficiency (how much it can produce with the quantity of inputs that it uses) and its unit costs which determine both the firm's entry into new markets (extensive margin) and the development of its exports on those markets (intensive margin).

While this cost-effectiveness ratio is a vital determinant of a firm's international performance, other non-cost factors will also influence its profitability, such as the perceived quality of its products or its organisational efficiency. These non-cost factors are likewise crucial for explaining a firm's export performance in the advanced economies.

2. Productivity and competitiveness

As mentioned above, the new international trade theories along the lines of Melitz (2003), which incorporate the heterogeneity of performance at firm level, reveal that productivity is a key determinant of firms' performance on foreign markets. A number of CompNet studies were therefore devoted to measuring productivity and describing the distribution of productivity in the EU countries.

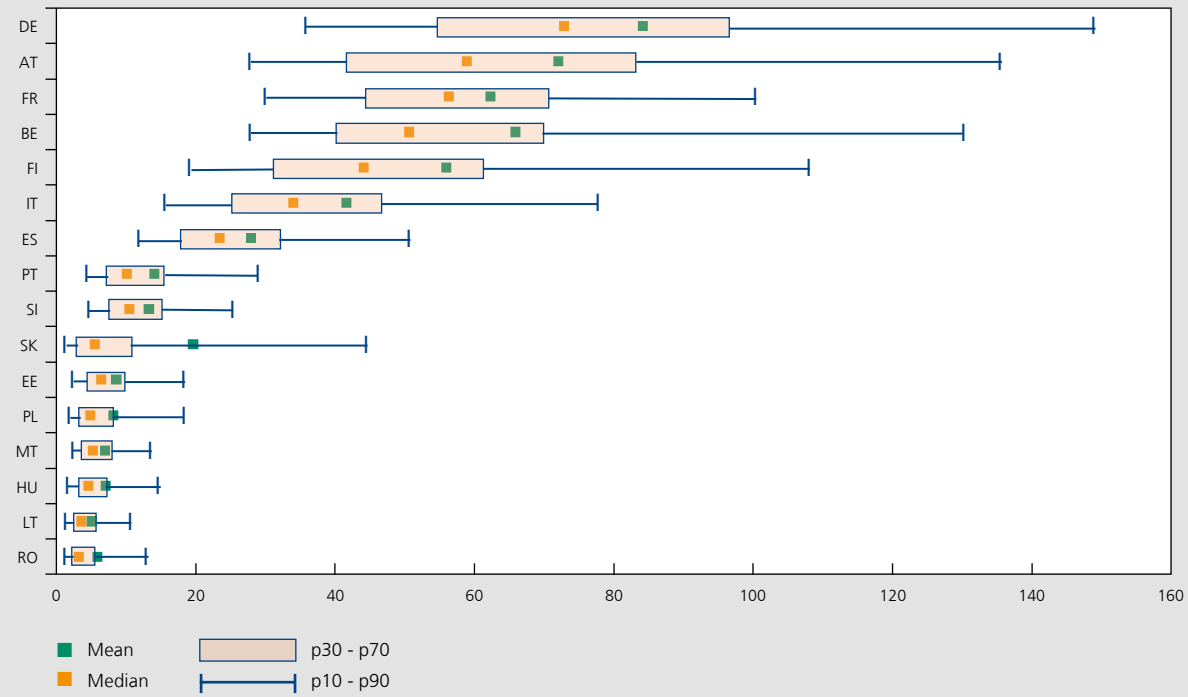
2.1 Firms with widely heterogeneous performance

One of the main CompNet contributions concerns the description of the productivity distribution in the various EU countries.

On the basis of standardised treatment of the microeconomic data available in each country participating in the CompNet database, it was possible to describe the productivity distribution of firms in manufacturing industry and market services in those various countries to arrive

(1) The great majority of microeconomic studies concern trade in goods. Nevertheless, in the case of Belgium, one could mention the articles by Ariu (2012 and 2015) which describe trade in services in Belgium.

CHART 1 DISTRIBUTION OF LABOUR PRODUCTIVITY[1] BETWEEN 2003 AND 2007



Source: CompNet.

(1) Results based on individual data for firms with 20 or more employees, in manufacturing industry and market services (NACE 2008 branches C to N, with the exception of branches D and E). Averages of the various moments of the distribution of apparent labour productivity assessed at the level of NACE 2-digit branches of activity over the period 2003-2007.

at a valid comparison. This exercise was conducted both for labour productivity (measured as the ratio of value added to employment) and total factor productivity (TFP) (calculated as the residual value of the estimation of a production function).

This international comparison shows that, on average, Belgian firms are among the most productive in the EU, but that the productivity distribution is highly dispersed and asymmetric. However, there is a relatively substantial mass of highly productive firms, and it is in this part of the distribution that export firms are mainly found.

2.2 Microeconomic comparative assessment of productive efficiency

The empirical observation of productivity distributions quite naturally casts serious doubt on the classic approach to the economy based on the concept of the representativeness of the average firm, as those productivity distributions are very far from a normal distribution. The average of the distribution is therefore no longer sufficient to describe it. The heterogeneity and form of the productivity distribution are also vital determinants of competitiveness.

In fact, while the average level of productivity is still a determinant of macroeconomic performance, it is not average firms that are active on international markets but firms whose productivity exceeds a certain threshold. Other parameters of the productivity distribution must therefore be taken into account as well in diagnosing an economy's competitiveness, as was shown for example by Barba Navaretti *et al.* (2015) and Benkovskis and Bluhm (2015). These studies reveal that export performance depends not only on the sector's average level of productivity but also on the dispersion and asymmetry of the productivity distribution. In particular, given the same average level of productivity, a sector or country will record better export performances and stronger growth of real GDP and TFP if it has a larger proportion of highly efficient firms.

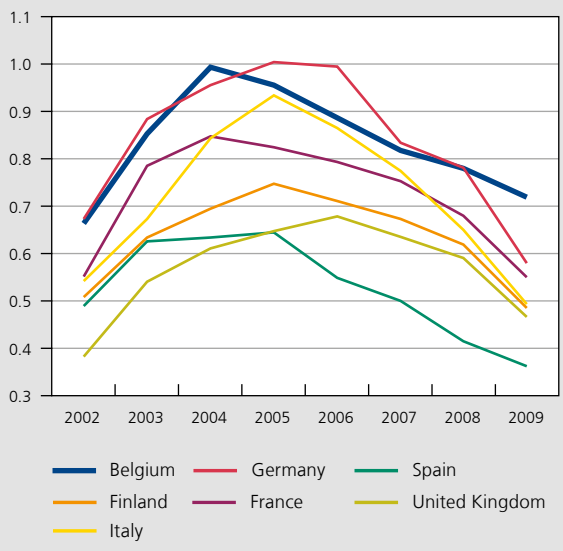
Finally, the values of a series of variables such as productivity per sector or per type of firm may prove

essential for the purpose of microeconomic analysis of competitiveness. As pointed out by Dhyne *et al.* (2014), competitiveness on foreign markets has to be measured in comparison with the competitors present on those markets. An exporter's position in the distribution of its competitors on the export market is the most appropriate measure of competitiveness. In the absence of individual data available at international level, most microeconomic studies were unable to capture competitiveness in such a disaggregated way (by product or by sector).

Verschelde *et al.* (2014) analyse differences in efficiency between firms or countries from the angle of the frontier of production potential. That is defined as the maximum output achievable with a set of given production inputs. On the basis of firm data gathered for seven European countries, they estimate the frontier of production potential for each country and for Europe as a whole. Their findings indicate that, in the metallurgy sector, for example, Belgium and Germany have production frontiers which are higher than those of the other European countries considered. Another noteworthy point is that efficiency gaps between countries did not diminish between 2002 and 2009.

This analysis reveals various possible routes to increase competitiveness: one approach involves being as efficient as possible, taking account of the production technology used (in other words, getting as close as possible to the production frontier); another entails developing more efficient technologies (in other words, moving the production frontier). Improvements to management might be an illustration of the first route, while a technological innovation is an example of the second. Analysis of the potential causes of the productivity slowdown makes this distinction very clear. Recent studies have indicated that the reasons why productivity has slowed more sharply in Europe than in the United States include a less effective dissemination of information technologies rather than the sectoral composition of GDP, the less favourable development of human capital, and openness to international trade. Firm size and managerial model also appear to be key factors in the adoption of new technologies.

CHART 2 ESTIMATION OF PRODUCTION FRONTIERS IN THE METALLURGY SECTOR (1)



Source: Verschelde *et al.* (2014).

(1) Weighted median efficiency frontier per country. A reduction in the frontier indicates a widening of the gap between a small group of highly productive firms and other firms.

2.3 Exports and productivity

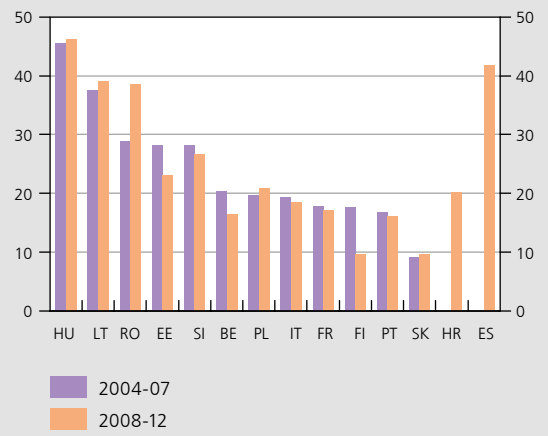
Apart from the distribution of certain indicators such as apparent labour productivity shown in chart 1, the CompNet database also comprises an "International trade" module which describes the export situation of industrial firms in 15 European countries.

The data collected via that module (and discussed in detail by Berthou *et al.*, 2015b) indicate, for example, that in the 15 European countries contributing to the module (1), one in four industrial firms exports at least 0.5 % of its output (Belgium's score is average). In fact, exports represented on average 46 % of the turnover of industrial exporters in 2010 (51 % in Belgium, where firms seem more exposed to international demand). However, a country's exports are highly concentrated. For instance, in Belgium, the ten largest industrial exporters accounted for just over 20 % of total industrial exports in 2008.

Exporters differ significantly from non-exporting firms. On the basis of equation (1), a firm's productivity is clearly a key determinant of its competitiveness. This theoretical relationship, revealed in numerous microeconomic studies, is also illustrated in the CompNet database. On average, for all 15 countries participating in the "International trade" module of the CompNet database, export firms active in industry are 20 % more productive than firms confining their activities to the domestic market. That 20 % productivity gap between exporting and non-exporting firms is also observed in Belgium. In the case of the ten biggest exporters, it is extremely large, at 40 %, and is part of the

(1) Namely Belgium, Croatia, Estonia, Finland, Hungary, Italy, Lithuania, Malta, Portugal, Romania, Slovenia, Slovakia, Poland, France and Spain.

CHART 3 PRODUCTIVITY GAPS BETWEEN EXPORTING AND NON-EXPORTING FIRMS (IN PERCENTAGE POINTS)(1)



Sources: Berthou *et al.* (2015b), CompNet.

(1) The data for Spain are based on export data not adjusted for changes in the thresholds for declaring intra-European transactions during the observation period. For the other countries, the export data are adjusted for those changes. The data for Malta are not included in this chart.

reason for the dynamics of entry/exit and survival of firms on global markets. At the time of their exit, export firms that stop exporting exhibit a level of productivity relatively close to that of non-exporting firms. Conversely, firms that decide to start exporting have an intermediate level of productivity (higher than that of non-exporting firms but lower than that of exporters remaining in business).

Berthou *et al.* (2015b) likewise point out that the level of productivity also has a positive effect on export volumes and export growth. Since exports are heavily concentrated, the competitiveness of a small number of firms therefore becomes particularly crucial. If the productivity, and hence the competitiveness, of these few superstars deteriorates, that may have a serious impact on exports at macroeconomic level.

3. Price competitiveness

3.1 Role of unit labour costs: productivity or unit labour costs as an indicator of competitiveness?

Together with the level of productivity, the second determinant of competitiveness according to equation (1) is the average wage. While the debate among the general public emphasises the wage gap, and particularly the wage skid, to describe the deterioration in the competitiveness of Belgian firms, microeconomic studies focus on productivity and macroeconomic analyses look at unit labour costs. The microeconomic study by Decramer *et al.* (2014) assesses the role of unit labour costs for export performance of Belgian manufacturers over the period 1999-2010. Their findings indicate that the elasticity of net exports value to the firm's unit labour costs is between –0.2 and –0.4, the effect being more pronounced for the most labour-intensive firms. In addition, for a firm of a given size, the probability of starting to export declines as unit labour costs increase, while the probability of ceasing to export increases as unit labour costs rise. More specifically, a 10 % increase in unit labour costs reduces the probability of starting to export by 0.3 percentage point, whereas it increases the probability of ceasing to export by 0.7 percentage point. The effect is therefore relatively small.

The findings of Decramer *et al.* (2014) also show that differences between the export performance of two firms in the same sector during a given year – be it in regard to the intensive margin or the extensive margin – lie in productivity rather than wages(1). These results provide validation and retrospective justification for the dominance of a productivity-based approach in microeconomic research into questions of competitiveness.

In general, the sensitivity of exports to unit labour costs is relatively low. The elasticity of exports to unit labour costs depends on the price elasticity ε_p, of the exports and the elasticity of the selling prices to unit labour costs.

$$\varepsilon_p = \alpha\, p = \alpha.\mu.\beta.ULC \qquad (2)$$

The low estimated elasticity is due either to the fact that the price elasticity of exports α is not very high, e.g. because other product characteristics such as quality are also taken into account, or to the fact that unit labour costs represent only part of the marginal cost, in other words β is low(2). In the latter case, labour costs in fact represent only about a third of the total costs of firms in Belgium. These findings are borne out by other international studies.

3.2 Role of prices as an indicator of competitiveness

A firm's exports, profitability and market shares depend partly on its selling prices. As indicated by equation (1),

(1) That may be due to greater heterogeneity in terms of productivity rather than wages, e.g. because wage bargaining is relatively centralised at sectoral level in Belgium.

(2) The markup μ is in principle greater than or equal to 1.

those prices are equal to the marginal production cost up to the markup[1]. There are two advantages in considering prices rather than unit labour costs as a competitiveness indicator: first, that makes it possible to incorporate differences in terms of market power (markup); also, it means account can be taken of the fact that labour costs do not alone determine the marginal cost.

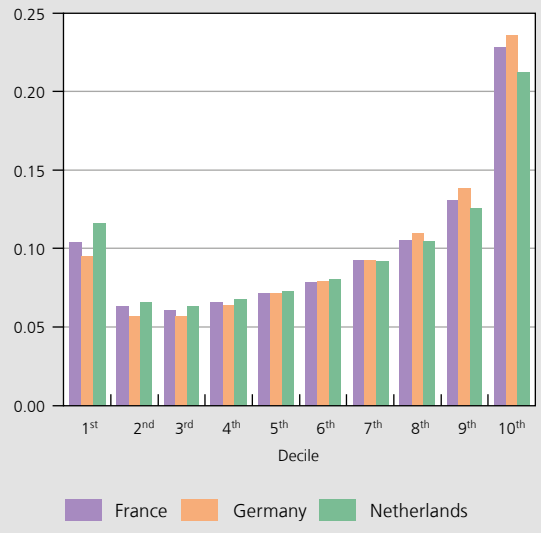
In this connection, the macroeconomic study by Giordano and Zollino (2015), conducted for Germany, France, Italy and Spain, in fact suggests that price-based indicators are more relevant than indicators based on unit labour costs.

At microeconomic level, the study by Dhyne *et al.* (2014) looks at the export performance of French firms on the Belgian market. This analysis proposes a new measure of competitiveness at microeconomic level, which compares the indicators of export firms with those of firms present on the destination market. The authors are particularly interested in the role of unit values (which, for simplicity, we shall call prices). By using French export data and Belgian production and import data, they can assess the position of the prices of French products exported to Belgium in the distribution of prices charged in Belgium by their (Belgian or foreign) competitors. Their results confirm that unit labour costs exert a negative influence on the probability of exporting, and that the relative prices of products exported by French firms to Belgium have a negative influence on their performance on the Belgian market. The estimated price elasticity of the quantities exported is close to 1.

Chart 4 illustrates this method of measuring competitiveness. It considers the unit values of products (defined in a relatively detailed way on the basis of a 6-digit classification) imported by Belgian firms. It ranks those prices in terms of their position in the distribution of prices charged in Belgium by all firms, whether domestic or exporting to Belgium. The chart shows only imports from Belgium's three main competitors. For example, it indicates that the prices of 23.5 % of products imported from Germany are among the highest (in the last decile) compared to those charged in Belgium for the same category of products.

It seems that two kinds of price strategies can be adopted by firms exporting to Belgium. The first consists of a policy of price competition. It appears to be more common for products from the Netherlands than for those from Germany (18 % of products imported from the Netherlands are in the first two deciles, compared to 15 % of German products). There is also an evident peak in the last two deciles of the distribution: a significant number of firms exporting to Belgium charge high prices. That may indicate a strategy of competing on quality or niche products. This second strategy is more common for German and French products (36 and 37 % respectively in the last two deciles of the price distribution) than for Dutch products (34 %). In fact, sales of these products at the top of the price distribution represent only a small proportion of imports in terms of value.

CHART 4 PERCENTAGES OF UNIT VALUES OF FIRMS EXPORTING TO BELGIUM IN THE DISTRIBUTION OF UNIT VALUES IN BELGIUM



Sources: NBB's calculations based on foreign trade data and PRODCOM survey.

3.3 Price elasticity of exports

As mentioned in the CompNet final report (see Di Mauro and Ronchi, 2015), the fact that many European countries had to adjust their current accounts in recent years, sometimes to a substantial extent, has generated renewed interest in assessing the response of a country's exports to changes in relative prices and hence in estimating the price elasticity of exports, defined by equation (2).

On this subject, the empirical findings are relatively divided. Macroeconomic assessments of that elasticity tend to indicate an export price elasticity of less than 1. Conversely, estimates based on disaggregated export data (firms or products) seem to indicate that the response to

(1) The markups are not observed but have to be estimated. Such an exercise was conducted by Amador *et al.* (2015) for 15 countries. The results reveal great heterogeneity in markups. On the one hand, they vary from one firm to another, being higher for older firms and export companies. Also, they may change over time. For example, they diminished during the crisis, particularly in the countries where the impact was greatest.

changes in relative prices is stronger (price elasticity higher than 1, often in the region of 5).

The microeconomic study by Berthou *et al.* (2015a) tries to reconcile the results of these two approaches. On the basis of the CompNet database, the authors show that large firms (or the most productive firms) which account for the bulk of exports are less sensitive to changes in the real exchange rate than smaller (or less productive) firms. That conclusion is consistent with the findings of Amiti *et al.* (2014) for Belgium, showing that the transmission of exchange rate variations to export prices is weaker for large firms because they are typically both exporters and importers. Therefore, an exchange rate depreciation drives up the cost of imported production inputs, partly neutralising the benefits of that depreciation.

This weak response to exchange rate movements on the part of large firms which, since exports are highly concentrated, represent the major part of those exports, permits an understanding of the implications of changes in relative prices for the export performance of European countries. In fact, since the impact of a reduction in the real exchange rate on a country's total exports is determined in the short and medium term mainly by the response of the largest or most productive firms, the adjustment of a country's trade balance requires large changes in relative prices in the euro area. However, these fluctuations in relative prices will have a bigger impact for small exporters. The decline in the exchange rate may compensate for the weak productivity of these small firms and enable them to gain a foothold on the international markets. Nevertheless, owing to their small size, the entry of these new exporters will have a limited impact on the trade balances, at least in the short term. In order to augment the contribution of the extensive margin to the adjustment of the trade balance, structural measures facilitating the entry and growth of young firms on the global markets could increase the macroeconomic response to changes in the real exchange rate.

4. Non-price competitiveness

At both macroeconomic level (see Benkovskis and Wörz, 2014, or Giordano and Zollino, 2015) and microeconomic level (see Decramer *et al.* 2014), the estimates reveal that prices or unit labour costs cannot on their own explain export performance, thus indicating that non-price competitiveness also plays a major role. For example, the analysis by Benkovskis and Wörz (2014) shows that market losses suffered by industrialised countries ("old" Europe, the United States and Japan) compared to those of emerging countries and new European Union Member States are attributable essentially to losses of non-price competitiveness. That non-price competitiveness includes the quality of the products and services offered, reputation, tailoring to consumer preferences on local markets, etc.

4.1 Product quality

The quality of a product is particularly hard to quantify in economics because it is not observable. Numerous studies have tried to propose a quality indicator for exported products. For example, we can simply take a product's price as an approximate measure of its quality. The research by Blinder (1991) on the causes of price stickiness showed that, since a product's price is its main observable characteristic for the consumer, firms use it to signal quality. Since the quality of the production factors (labour and material inputs) has a positive impact on the quality of the end product, a high price accompanied by a high production cost can be interpreted as a guarantee of quality. However, a high unit production cost may also be synonymous with lower productive efficiency. The price is therefore an imperfect indicator of the quality of the end product.

An alternative to the price criterion therefore consists in measuring the quality of a product by the excess demand for it, taking account of its price. On the basis of the estimation of a demand function, the quality of a product can be approximated by the difference between its market share and what that share should be taking account of the product's price. If that gap is positive, the demand for a product is greater than that generated by its price. Consumers therefore have a relative preference for that product, and that reflects high quality. Conversely, if the observed market share is smaller than the share implied by the price, that reflects mediocre quality. This approach underlies the quality measures proposed by Khandelwal (2010), for example.

Di Comite *et al.* (2014) introduce an additional refinement in Khandelwal's approach by taking account of local differences in demand, reflecting consumer tastes, as differences between the market shares of a product sold at the same price in two countries will reflect the fact that consumers may have different tastes. For example, if consumers in country A like chocolate while consumers in country B do not, then – if the price is the same – demand for brand X chocolate will be higher on market A than on market B, even though the product quality is the same. By comparing changes in market shares in a number of countries as a function of export prices, Di Comite *et al.* (2014) propose a method which can be used to construct a quality indicator adjusted for differences in consumer tastes.

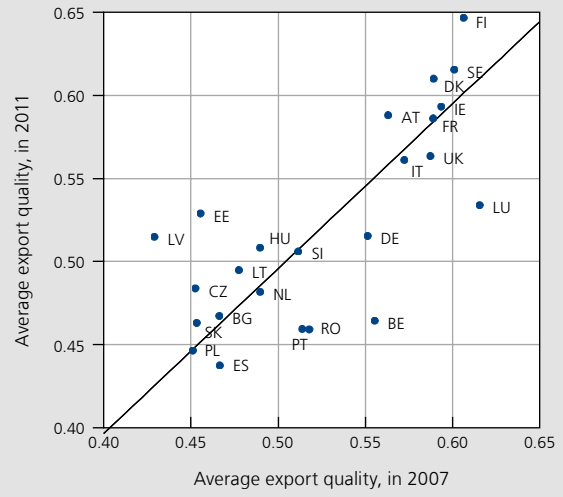
On the basis of that methodology, Vandenbussche (2014) assessed the position of the various European countries on a product quality scale. Her research concludes that Belgian producers, like producers from "old" Europe, tend to make products of intermediate quality while East-European and emerging countries specialise in low-quality segments, and the Nordic countries and Japan occupy the top-quality segments. Since the crisis, the average quality of the products of Belgian exporters – according to the author – has declined compared to other EU Member States, which could indicate a deterioration in the non-cost competitiveness of Belgian exporters. This decline in the relative quality of the products affects most of the advanced economies, but seems to be particularly marked in Belgium.

4.2 Managerial quality

Apart from product quality, one determinant of a firm's non-cost competitiveness is the quality of its management. CompNet has likewise addressed this component of competitiveness. For example, a microeconomic study by Mion and Opromella (2015) concerning Portugal shows that the past experience gained by managers in an export firm can prove beneficial for their new company, especially if the export market in question is of interest to that company, because the costs entailed in market entry and the expansion of market shares are specific to each destination. Firms have to adapt their marketing strategy and their product to each market according to the preferences of local consumers, specific regulations, etc. Knowledge of points specific to each market and the development of distribution channels and personal relationships are therefore a valuable advantage. The study shows that the manager's specific experience increases the probability that the firm begins exporting to that market and continues to do so, and that it has a positive impact on the amounts exported for companies which were already active in that market before the arrival of the experienced manager.

Another study by Berman *et al.* (2015) confirms that experience gained on an export market is a key to successful entry into that market. Exports to a new market are not in fact always successful. Many firms give up after just a few years. Firms which persist in their export business achieve strong growth on these markets, especially if they are young. This study's empirical findings highlight the importance of learning the characteristics of demand on a specific market during the initial years, because that enables firms to maintain and develop their position on those markets.

CHART 5 SHIFTS IN THE QUALITY RANKINGS DURING THE CRISIS[1]



Source: Vandenbussche (2014).

(1) The countries above the 45° line moved up the quality rankings between 2007 and 2011 while countries below the 45° line moved down the quality rankings between 2007 and 2011.

5. Dynamics of firms and resource allocation

5.1 Role of firms' dynamics and age in aggregate productivity

Of course, a country or sector's productivity, and hence its competitiveness, are not static concepts. They can be increased, e.g. by boosting the efficiency of existing firms (via technical progress, for instance). Two other ways of improving aggregate productivity are noteworthy. The first relates to the creation and destruction of firms: productivity increases if new firms are more productive than the ones going out of business. The second concerns the reallocation of resources between firms: aggregate productivity increases if the market share of the most productive firms expands while that of the least productive firms shrinks, in other words if the resources (be it in terms of jobs, capital or finance) are reallocated from the least productive to the most productive firms.

In this connection, as table 1 shows, the microeconomic study by Verschelde *et al.* (2014), covering seven European countries, indicates that in Belgium as in some neighbouring countries – Germany, France and the

TABLE 1 AVERAGE CONTRIBUTION BY FIRMS TO SECTORAL EFFICIENCY GROWTH IN MANUFACTURING

	Belgium	Germany	France	Italy	Espagne	Finland
	Average contribution by firm type (in percentage points)					
Active for more than ten years	0.60	1.14	1.22	0.91	0.68	0.76
Active for six to ten years	3.67	1.17	0.79	0.81	–10.40	0.77
Active for up to five years	–3.24	0.94	1.77	1.22	–1.31	–1.22
New firms	–0.04	–0.03	0.09	0.05	0.02	0.09
Firms ceasing their activity	0.00	0.01	0.02	0.01	0.02	0.04
	Proportion of firms (in % of firms staying in business)					
Active for up to five years	4	13	8	10	8	11
Active for six to ten years	8	14	11	13	16	13

Sources: Verschelde *et al.* (2014) and own calculations.

United Kingdom – the increase in firms' efficiency is the factor that does most to enhance the overall efficiency of the manufacturing sector. The impact of reallocation between firms and net company creations is smaller, and may be positive or negative.

Finally, their results suggest that young firms make a considerable contribution towards the increased efficiency of their sector of activity, as – on average – newly established firms have an efficiency deficit on entering the market. However, their efficiency increases over time and may even exceed that of firms in place for more than ten years. In particular, in Belgium, firms which have been operating for between six and ten years are about 10 % more efficient than those which have been in existence for more than ten years.

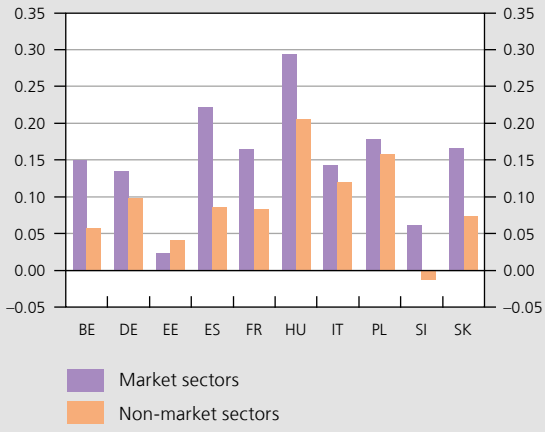
This finding is consistent with the analysis by Berman *et al.* (2015). Their microeconomic results for France show that young firms which manage to stay in business for several years after entering the market record high growth rates, and account for more than half of the exports after ten years.

However, the proportion of young firms (active for less than ten years) is relatively low in Belgium (12 %) compared to neighbouring countries (27 % in Germany).

5.2 Efficiency of resource allocation

As illustrated above, markets are constantly changing and the reallocation of resources between firms – if resources move to the most productive firms – can be a factor contributing to the growth of productivity. Conversely, it may have a negative impact on aggregate productivity if the resources are diverted to the least productive firms. In general, a poor allocation of resources between firms is sub-optimal. Obstacles to reallocation between firms therefore lead to low productivity and reduce the ability of economies to respond to a major economic shock.

CHART 6 RESOURCES ALLOCATION AND EFFICIENCY IN THE MARKET AND NON-MARKET SECTORS (1)



Source: CompNet database.

(1) Data calculated on the basis of samples of firms with 20 or more employees for the period 2003-2007. If the indicator has a positive value, that shows that productive resources are transferred from less productive firms to the most productive firms, and that the resources are being reallocated in the optimum way.

Beginning with the idea that, in theory, given equilibrium in a frictionless market, the allocation of resources is optimal, the signs of a poor allocation of resources are generally associated with the existence of market imperfections (concerning labour, products or financing). It should also be said that the restoration of equilibrium is not instantaneous.

CompNet has focused on an indicator of the sectoral allocation efficiency derived from the decomposition proposed by Olley and Pakes (1996). The average productivity of a sector, y_{st}, is the sum of each individual firm productivity, ω_{it}, weighted by the firm's size, θ_{it}. Olley and Pakes break down this sum into two components. The first is the unweighted average of the productivities of all firms in a sector, $\overline{\omega}_{st}$. The second is the sum of the productivity gaps with respect to the sector average, $\omega_{it}-\overline{\omega}_{st}$, weighted by the firm's size relative to the average size for the sector, $\theta_{it}-\theta_{st}$. This last term, called the OP gap, measures allocation efficiency. It makes a positive contribution to the sector's average productivity if the firms which are more (less) productive than the average are larger (smaller). Conversely, if the least productive firms are larger than the average for the sector, the contribution of this term is negative.

$$y_{st}=\sum_{i\in s}\theta_{it}\omega_{it}=\overline{\omega}_{st}+\sum_{i\in s}(\theta_{it}-\overline{\theta}_{st})(\omega_{it}-\overline{\omega}_{st}) \qquad (3)$$

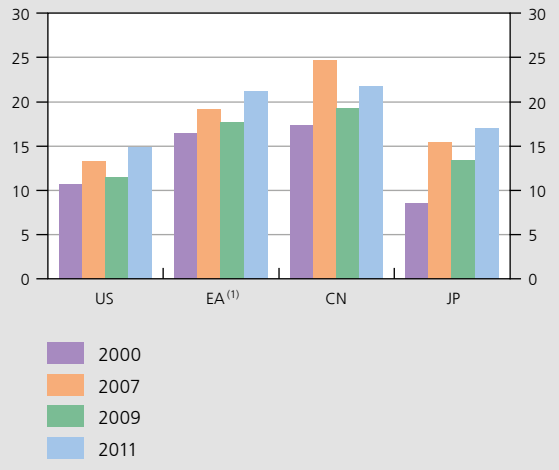
By way of illustration, the above chart shows the OP gaps for the market and non-market sectors. It is evident that allocation efficiency is similar in Belgium and Germany. Except in Estonia, it is systematically greater in sectors subject to competition.

6. Global value chains and the inter-firm network

In recent decades, declining transport and communication costs, technological progress and the lowering of political and economic barriers have led to growth of international trade and foreign direct investment. In a general movement away from compartmentalisation of production chains, firms have made greater use of inputs from other companies, sometimes located in other countries. In the past, the lack of statistics prevented any numerical analysis of this phenomenon, but the creation and recent dissemination of global input-output tables (in particular ICIO tables (OECD) and WIOD) have now rectified that.

Amador *et al.* (2015b) illustrated the fragmentation via the increase in foreign components contained in exports, both in the euro area and in the other main regions of the world[1]. A worrying question underlying these global

CHART 7 FOREIGN VALUE ADDED CONTENT OF EXPORTS (IN % OF EXPORT VALUE)



Source: Amador *et al.* (2015b).

(1) Here the euro area is defined as an entity in itself, i.e. flows within the euro area are disregarded.

trends concerns the repercussions on employment. In an increasingly global context, Timmer *et al.* (2013) show that the fragmentation of production is associated with a decline in industrial jobs in the advanced countries. However, that tendency is counterbalanced by expansion of employment in market services. Moreover, fragmentation seems to reinforce the comparative advantages, not by type of industry but by type of activity. Thus, European countries specialise in production segments requiring more skilled labour.

As pointed out by Richard Baldwin in his address at the CompNet conference, the globalisation of our economies has altered the nature of international trade. The emergence and growth of global production chains requires us to rethink how we measure competitiveness. For example, our reading of trade balances is modified by switching from the concept of trade in goods and services to the concept of traded value added, as one country's trade surplus with another country may be influenced by the composition of its export basket. If the latter contains many imported inputs, that naturally inflates the trade surplus. According to Nagengast and Stehrer (2015), the United States' trade deficit with China in 2011 shrinks by 17 % if it is calculated on the basis of trade in value added, whereas it increases by 39 % in relation to Japan. In addition, the imbalances within the euro area are smaller if they are assessed in terms of trade in value added.

(1) See Duprez (2014) for an analysis of Belgian exports.

Bilateral trade balances calculated from the point of view of trade in value added can shed new light on economic policy in two ways : by placing in perspective the finding concerning trade imbalances between euro area Member States, and by reappraisal of the impact of economic policies.

The crisis in fact revealed that the persistence of a trade deficit and a negative net external position may have unwelcome consequences in the event of serious financial shocks. The temptation to resort to protectionism by targeting the geographical origin of trade deficits with the aid of flows of goods and services may therefore prove dangerous. Not only are protectionist policies highly risky on account of the close direct links between economies, as testified by the many debates on the subject in the WTO, but in addition, insofar as a proportion of trade also comprises indirect trade between countries, a protectionist policy in one country could have repercussions on the production process in numerous countries by blocking the global production chain.

The fragmentation of production chains may explain why import growth has greatly exceeded the growth of GDP in the past three decades. Thus, Al-Haschimi *et al.* (2015) showed that the ratio between import growth and GDP growth averaged 2 between 1981 and 2007. However, that ratio fell sharply during 2011-2013, which could suggest that the fragmentation of production chains has come to a halt.

The analysis from the point of view of the globalised production process also helps to explain the scale of the decline in trade during the economic crisis. Altomonte *et al.* (2012) thus highlight the "bullwhip effect", which suggests that the adjustment of stocks at the various production stages magnifies an initial demand shock. Nagengast and Stehrer (2015) state that during the economic crisis the share of inputs from domestic suppliers increased to the detriment of foreign suppliers, causing a disproportionate slowdown in international trade.

Use of firm data likewise provides lessons which can improve our understanding of global value chains. By refining the traditional gravity model, Altomonte *et al.* (2015) thus showed that exports (and each value added contribution, be it domestic or foreign) between two branches of activity in two countries are higher if the same multinational is established in both countries. On the basis of the Belgian data, Dhyne *et al.* (2015) also created a database reconstructing the inter-firm network for Belgium between 2002 and 2012. According to their findings, 82 % of Belgian firms are involved directly or indirectly in the production of goods and services destined for export, while only 5 % of firms are direct exporters.

Conclusion

One of CompNet's primary contributions is the development of two new tools for diagnosing competitiveness, namely the diagnostic toolkit on competitiveness and the CompNet database. The statistical information that they contain permits a better understanding of the essentially multi-faceted concept of competitiveness. While competing on price may certainly prove to be a vital strategy for withstanding international competition, particularly for certain (low-value or less differentiated) products, alternative strategies based on quality enhancement also play a considerable role (e.g. in the case of niche products). Moreover, it is worth pointing out that price competitiveness depends not only on labour costs but also on the costs of intermediate products, and that for a given cost level, firms can make a difference by improving their productivity. This therefore implies that boosting the competitiveness of a country or firm requires a multi-pronged approach using various instruments and measures. The competitiveness of the European economies must be based not only on wage-setting but also on non-cost factors. There is quite substantial scope for action since non-cost competitiveness concerns both innovation and the quality of goods and services, organisational, managerial and technological capability, the ability to absorb new technologies (which depends, for example, on workforce adaptability), and cumulative experience gained on export markets.

One advantage of the tools developed by CompNet is that they permit an international comparison of each country's performance via a range of competitiveness indicators. An economy's competitiveness is in fact measured in relation to that of its existing or potential competitors. Such an exercise requires the availability of information on other countries or firms which can be used to assess competitiveness. In this connection, the diagnostic toolkit is a single point of access to a series of macroeconomic and transnational statistics relevant for ranking a country in relation to its competitors. These aggregate data are supplemented by the CompNet database which, via the calculation of new indicators based on microeconomic data, permits international comparison of firms' individual performance. In particular, the database comprises the distribution characteristics of a set of variables, such as productivity or unit labour costs, in order to position a firm in relation to a destination market.

Among the many variables analysed in the CompNet database, the shape of the distribution of apparent labour productivity or total factor productivity is a key determinant of a country's competitiveness. On the basis of these

distributions, an improvement in a country's competitiveness does not only entail boosting the average level of productivity, even though that parameter is still important, but also concerns the capacity to increase the mass of firms to the right of the distribution average, because only the best-performing firms can afford to pay the price of entering the global markets and survive there in the long term.

One of the current macroeconomic issues concerns the correction of macroeconomic imbalances. In this connection, the research conducted by CompNet and that done elsewhere indicates that the use of traditional instruments such as exchange rates will not be sufficient on its own to eliminate the imbalances. In fact, this research has shown that exports are not very sensitive to exchange rate fluctuations, partly because exports are concentrated on a relatively small number of firms whose characteristics (size, productivity, involvement in importing as well) reduce their exports' sensitivity to changes in relative prices. It would therefore take very large changes in exchange rates to restore total equilibrium in the trade balances by means of the exchange rate instrument alone. For that reason, it is necessary to rethink other economic policy measures to solve this problem, notably by influencing the extensive margin of export growth (e.g. by encouraging new firms more responsive to changes in relative prices to enter foreign markets).

In order to increase the percentage of export firms in the total population, it is therefore appropriate to conduct structural policies which can either boost the firms' productivity (policies on innovation, training, etc.), or influence the non-cost components of productivity. It is likewise necessary to pursue policies aimed at improving the allocation of productive resources in favour of the most efficient firms.

Finally, via recourse to the databases now available (notably WIOD), CompNet has also contributed to the recent research on value chains. Since the imported content of exports may be significant, we now know that the use of export data on goods and services may be the wrong way to diagnose external competitiveness. By taking account of the globalisation of production processes, the concept of exported value added permits a more relevant measure of a country's competitiveness, in particular because that makes more sense when it comes to determining the impact on employment. More generally, value chain analysis sheds new light on the organisation of production chains. That permits a better understanding of how shocks spread from one economy to another. It likewise provides a better description of the background to any economic policy measures, such as import barriers or the adjustment of the trade balance.

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