1 Measuring competitiveness in a granular and global world

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Competitiveness imbalances between member states have been one of the drivers of the crisis in the European Union. Closing these gaps, and improving 'competitiveness' throughout Europe is thus at the heart of the current policy agenda. The EU institutions increasingly monitor imbalances using quantitative measures of aggregate competitiveness, and these indicators feature prominently in the evaluation of each member state's structural reform policies. For these reasons there is an overall increasing effort to quantify the concept of competitiveness, and even qualitative information about countries' business environments is translated into quantitative indices.

However, one of the most important lessons learned during the crisis is that such an informational toolbox on which policymakers base their decisions can become outdated in terms of both data sources and data analysis. There is in fact no shared definition of competitiveness, let alone a consensus on how to consistently measure it across countries and over time, with a number of aggregate indicators often pointing in different directions. The toolbox is particularly outdated when it comes to tapping the potential of micro data for the analysis of competitiveness – a serious problem given that it is *firms, rather than countries* that compete on global markets.

The aim of the MAPCOMPETE project was to help fill this gap by providing inputs for a thorough assessment of competitiveness indicators and the potential development of new ones. Importantly, for all aspects of competitiveness, a crucial issue for the project has been to comprehensively map data availability and accessibility, and to provide a critical overview of new analytical methods that become possible as new data sources become available to researchers. These new developments in the analysis of competitiveness have been systematically explored by the European Central Bank's Competitiveness Research Network (CompNet), a research network with which the MAPCOMPETE project has worked in close coordination[1].

Capitalising on both projects, this Blueprint provides some concrete applications from recent advances in the analysis of competitiveness. The book is organised around the definition of a competitive economy as one *"in which institutional and macroeconomic conditions allow productive firms to thrive and in turn, the development of these firms supports the expansion of employment, investment and trade"*[2]. Thus three recurrent themes will feature in the different chapters of this Blueprint:

- The analysis of firm-level characteristics, highlighting the role of a small number of highly-productive firms and the importance in general for competitiveness analysis of the concept of 'granularity'.
- The interplay of firms' behaviour with structural economic factors, in particular the capacity of an economy to shuffle labour and capital towards more productive firms, ie efficiency of resource allocation.
- The role of international trade, seen both as the output of competitive firms (exports), and as a structural feature conditioning the same firms, given the recent trends in the international fragmentation of production and the evolution of global value chains (GVCs).

The concept of 'granularity' in the economic literature captures the idea that economic phenomena, rather than being the result of an homogeneous process carried out by atomistic, indistinguishable agents, can be driven to a great extent by a few outstanding individuals or companies that play a dominant role in regional and national economic performance. In most countries, a handful of firms are responsible for a large part of economic activity, including export sales and foreign direct investment. Within narrowly defined (4-digit SIC) US manufacturing industries, Syverson (2004) found that firms in the ninetieth percentile of the (total factor) productivity (TFP) distribution are on average 1.92 times more productive than the tenth percentile. In other words, though producing the same products with the same endowments of labour and capital, the top productive firms are able to produce twice as much as the least productive firms. These within-industry differences are significantly larger than the difference in average TFP measured across industries. The situation is not different in Europe. As shown by Mayer and Ottaviano (2007), in European countries on average about one percent of these 'Happy Few' firms produce more than 75 percent of output or of foreign sales[3].

1. A summary of the results of the CompNet project is provided in Di Mauro, F. and M. Ronchi (2015) *Assessing European competitiveness: the contribution of CompNet research*, available at https://www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher_compnet.en.html.
2. Mario Draghi, speech on 'Competitiveness: the key to balanced growth in monetary union', Paris, 30 November 2012, available at https://www.ecb.europa.eu/press/key/date/2012/html/sp121130.en.html.

The finding that a handful of firms determine to a great extent the aggregate economic outcomes has two important policy implications. First, it underlines how countries are subject to the actions of a few dozen companies. For instance, Gabaix (2011) estimated that even for the US economy, the business cycle movements of the largest 100 firms explain a third of the aggregate movements in output growth. The impact is a fortiori much greater for smaller countries or regions that accommodate only one or a few of those 'top' enterprises. Di Giovanni, Levchenko and Mejan (2014) look at the universe of French firms between 1990 and 2007, decomposing aggregate sales fluctuations (in both domestic and foreign markets) and identifying reactions to macro, sectoral and firm-specific idiosyncratic shocks. Similar to the findings of Gabaix (2011) for the US, they confirm the substantial contribution of firm-specific shocks to aggregate volatility in France, with the magnitude of the effect of firm-level shocks being similar to those of sectoral and macroeconomics shocks, common to all firms. Second, the presence of heterogeneous firms in an economy provides a major additional channel through which aggregate productivity and thus competitiveness can be boosted. Recent literature (Bartelsman *et al*, 2013; Hopenhayn, 2014; Gopinath *et al*, 2015) takes advantage of the availability of cross-country competitiveness indicators built from firm-level data to show that a significant part of the differences in productivity between countries can be accounted for by differences in allocative efficiency. That is, aggregate productivity in a country might, in part, be lagging behind because capital and labour are not allocated efficiently between firms within an industry. In other words, some technology or policy-induced frictions in factor markets might prevent productive inputs from flowing into the firms that would use them in the most productive way.

Removing these frictions thus provides a potential new channel for boosting aggregate productivity, ie the reallocation of resources away from poorly-performing firms towards the most productive firms, with gains that in some cases can be quantified as an additional 30 percent, with proportional impacts on potential output (Bartelsman *et al*, 2013). CompNet research shows that this is particularly the case for the euro area, with major policy implications: *"the type of policies that could release an upward shock to potential growth are not just those focused on price flexibility. They include [...] on the TFP side, policies that encourage the reallocation of resources – which could be powerful in the euro area given the wide and skewed distribution between the least and most productive firms"*[4].

3. An even greater within-industry heterogeneity has been reported in China and India, with average ninetieth to tenth decile ratios in terms of productivity in excess of 5:1 (Hsieh and Klenow, 2009).
4. Mario Draghi, speech on 'Structural reforms, inflation and monetary policy', ECB Forum on Central Banking, Sintra, 22 May 2015, available at https://www.ecb.europa.eu/press/key/date/2015/html/sp150522.en.html.

Beyond granularity and reallocation, another key issue in thinking about national competitiveness is international trade. The world economic picture has been recently characterised by the emergence of global value chains (GVCs), ie the break-up of production processes into ever-narrower discreet activities and tasks, combined with the international dispersion of these activities and tasks[5]. Since the 1990s, international trade has thus increasingly involved multiple flows of inputs and semi-finished products across borders, as different production steps have been moved to different countries. This in turn has led to trade growing much faster than GDP, also as a result of the so-called 'double counting' in gross trade figures: because of the increasing geographic disintegration of production, gross exports from a given country include not only the value added generated domestically, but also the foreign value added generated in any other country, imported into the home country as an intermediate, and then re-exported. Moreover, the figures might also include domestic value added originally embodied in export flows that subsequently returns home and is absorbed in the home country, and value added generated by intermediates crossing borders several times before being finally absorbed. These inputs moving back and forth between countries are counted every time as exports, but they contribute to global GDP only once they are absorbed in final goods. Such double counting, which is essentially driven by GVCs, has been estimated to account for about 25 percent of gross trade flows (Koopman *et al*, 2014). As a result, the gross export figures of any country have become increasingly less informative over time, especially if one is interested in the contribution that exports make to domestic GDP growth and to the transmission of shocks between countries.

As a response, economists have recently devised a methodology for decomposing each trade flow into its different value added components, eg domestic versus foreign value added (Koopman *et al*, 2014; Wang *et al*, 2013). They also have developed new datasets that allow us to better quantify and measure the complex interconnections of the World Input-Output structure, and its implications for national competitiveness[6]. Another key development in the analysis of competitiveness stemming from interna-

5. For a comprehensive review, see *Manufacturing Europe's future*, Bruegel Blueprint, edited by Reinhilde Veugelers (2013) available at http://www.bruegel.org/download/parent/795-manufacturing-europes-future/file/1683-manufacturing-europes-future/, and Amador and Di Mauro (eds) (2015) *The Age of Global Value Chains: Maps and Policy Issues*, a VoxEU.org eBook, available at http://www.voxeu.org/sites/default/files/GVCs-ebook.pdf.
6. A milestone in this process has been the European-sponsored WIOD (World Input-Output Database) research project. See Timmer *et al* (2013) for the methodological details. More information on the WIOD project and the data are available at http://www.wiod.org. The WTO-OECD have also started their own research programme on global value chains: data and methodological details can be found at http://www.oecd.org/sti/ind/measuringtradeinvalue-addedanoecd-wtojointinitiative.htm.

tional trade is related to new findings about the importance of non-price factors in driving exports. The standard price (cost) competitiveness argument states that the lower the unit cost of production of a given good or service, the more competitive the firm/industry that produces it, and thus the higher the exports. Several indicators of standard cost and price competitiveness (which we can refer to as harmonised competitiveness indicators, HCIs) have been developed, including consumer price indices, domestic sales producer price indices and unit labour costs in manufacturing. However, there is no agreement on which of these measures best reflects a country's competitiveness, nor it is possible, from an empirical standpoint, to establish a general ranking of the explanatory power of the different HCIs (Giordano and Zollino, 2015). In particular, in cross-country research within the CompNet project, Christodoulopoulou and Tkacevs (2014) found that in standard export equations, HCIs are normally able to explain between 60 and 70 percent of the export variation, the rest being dependent on competitiveness-enhancing channels that are alternatives to cost reductions, such as investment in research and development (R&D), other technological investments related to foreign technology transfers or the improvements in the quality of products.

This 'non-price' channel tends to generate a positive relationship between competitiveness of firms and the prices charged by firms for final goods, ie the opposite of what typical price-related competitiveness measures would consider a competitiveness-enhancing development. The reason for this apparent paradox is that in the short run, investments in R&D, foreign technology and product quality translate into an increase in the fixed and/or variable costs that firms have to make to upgrade their competitiveness, and thus a necessary increase in the output price. But on the demand side, consumers value quality and are willing to pay a higher price for high-quality goods, which in turns makes these 'quality' firms competitive. As stated by Krugman (2012), when dealing with the measurement of competitiveness and productivity in Europe *"the unit value measure has always been a poor measure, and probably especially so when you're dealing with a country that tries to export high-quality stuff"*[7].

As granularity, resource allocation and trade are all key elements in a proper assessment of competitiveness, the contributions collected in this Blueprint will feature them to different extents. The first chapter, by Barba Navaretti, Bugamelli, Forlani and Ottaviano, reviews a growing literature about how the microeconomic characteristics of a population of firms can significantly affect aggregate outcomes, and how the ensuing granularity affects the impact of policy shocks such as exchange rate fluctuations.

7. A widely used methodology to measure quality is provided by Khandelwal (2010) 'The Long and Short (of) Quality Ladders', *Review of Economic Studies*, *77*(4), 1450-1476.

Specifically, the authors test the empirical relationship between the trade performance of a country/industry and different moments of the underlying productivity distributions beyond the simple average[8]. They find that asymmetry, the third moment of the distribution, is highly and significantly correlated to the competitiveness indicator, especially for large and international economies, consistent with the evidence of few exceptionally productive firms operating within each industry. The main findings are robust to different specifications, and different types of standard error. Most importantly, the results are not affected by sample composition, ie asymmetry (and mean) is significantly correlated with export competitiveness independently of the exclusion of countries from the estimation sample. Dispersion and, especially, rightwards asymmetries are therefore novel key parameters that any policy aimed at fostering competitiveness should take into account.

The second chapter, by Békés and Ottaviano, uses the idea of granularity to explore the relationship between firm-level heterogeneity and regional competitiveness. The authors argue that measuring regional competitiveness should be also based on comparing firm performance in different EU regions, rather than simply looking at average regional performance indicators. Given the available data, the authors discuss a number of indicators linked to the ability of firms to access and penetrate world markets. By also making use of a trade performance measure, they identify a novel index – export per worker from a region to non-EU destinations relative to the EU average – as a novel proxy of a 'regional competitiveness' index. The variable captures the capacity of a region's firms to outperform the firms of the average EU region in terms of exports. As such, it could be conveniently added to the regional policymaker's toolbox.

The key policy message of these chapters is that, because of granularity, country and sector average measurements, which are the parameters on which most policies are generally based, do a poor job of grasping the actual level of competitiveness both within countries (regions) and between them. Even if some countries or sectors might be similar in terms of average productivity, the underlying efficiency distributions could be very dissimilar. As a result, similar sets of policy dictated *ex ante* by similar average competitiveness measures might end up producing very different policy outcomes *ex post*, because of the underlying heterogeneity of firm performance.

The next two chapters look at the interplay of granularity with reallocation of economic activity, and its effects on aggregate productivity and growth, in particular through the

8. In statistical terms, the average of a distribution is referred to as its first moment, the variance is the second moment, the asymmetry the third and so on.

lens of the labour market. The first contribution, by Fontagné, Santoni and Tomasi, shows that labour 'gaps', ie the extent to which firms depart from an efficient use of the labour input, have been increasing over the 2000s in France, leading to a misallocation of resources. Controlling for firm characteristics, the authors observe that most of the adverse evolution falls on the positive gaps, ie that the most productive firms after 2003 have not been able to increase their labour use. Interestingly, the 50-employees discontinuity associated with (stricter) regulations in the labour market in France is one element associated with the misallocation, but does not entirely explain the worsening of the situation. The authors then present a negative correlation between resource misallocation and the trade performance of some selected French manufacturing sectors, concluding from this that a number of subtle micro-economic rigidities (in particular the difficult reallocation of resources between firms within sectors) have contributed to the deterioration of the aggregate performance of French manufacturing.

Micro-economic rigidities in the labour market also feature prominently in the chapter by Di Mauro and Ronchi, who investigate to what extent the labour market bargaining framework in which firms operate has shaped their response to the Great Recession. Using novel firm-level datasets, which combine the CompNet and WDN datasets developed by the European System of Central Banks, the authors are able to exploit the variability in the degree of centralisation of wage-bargaining institutions across firms to explain different firm-level cost-cutting strategies following the Great Recession. They show that wage-bargaining institutions play a statistically significant role in shaping the way in which a negative shock is distributed by firms to their economy. In particular, they find that labour markets with a higher proportion of firms applying centralised collective bargaining are characterised by a greater share of companies reducing the number of employees. Results also suggest that the decision of many EU countries to move, over the last two decades, from fully centralised bargaining to multi-level regimes has not been enough to limit these reductions in employment.

Overall, the second pair of chapters show that heterogeneous firms end up being differently exposed to a number of rigidities in the labour market, generating a misallocation of resources that has a significant effect on competitiveness and employment. In particular, centralised wage-bargaining institutions seem to be associated with a larger share of companies reducing the number of employees during economic downturns. Moreover, to the extent that centralised wage-bargaining institutions hinder a proper alignment of wages to firms' productivity, they might also create a barrier to workers' mobility between firms within sectors, resulting in the sub-optimal trade performance of a country. Labour market reforms that allow wages to be

aligned to heterogeneous levels of firm productivity is thus key to fostering a proper allocation of economic resources and, through this channel, a significant improvement in competitiveness and growth. This is the second policy message of this Blueprint.

Exporting – and more broadly international trade – is another key feature of competitiveness analysed in the third pair of chapters in the Blueprint. As argued by the 'Happy Few' models of self-selection, it is only the most productive firms that will be the exporters, importers or foreign direct investors, and in general part of global value chains. As a result, those firms will be much more likely to innovate and grow. Another important element for national competitiveness is the extent to which institutional conditions allow firms that are currently not exporting to grow to levels of productivity that enable them to tap into international markets. Looking at the dynamics of trade flows and their interplay with firm granularity, it is thus possible to gauge national or regional competitiveness, and how the same interaction ends up with resources being efficiently allocated (or not) between firms.

Bas, Fontagné, Martin and Mayer use detailed data on international trade flows for France to present new evidence on the 'non-price' dimension of competitiveness. The authors show that, in terms of price competitiveness, direct labour costs represent just 23 percent, on average, of the total value of French exports and 44 percent when including the cost of labour for domestic intermediate consumption. Hence the non-price dimension is key to the competitiveness of the country. The authors show that the loss of France's world trade share does not seem to be a result of poor geographic or sectoral specialisation, insufficient exporter support, under-representation of SMEs in exports or credit constraints, but, more fundamentally, is caused on average by an inadequate 'quality/price ratio' for French products. By relying on a novel indicator of non-price competitiveness, the authors show that when products are of high quality, results are exceptional, as demonstrated by the luxury, aeronautical and electrical distribution goods sectors and/or by brands, which appear to play a key role in France's exports. The authors also emphasise the importance of reallocating production factors (labour and capital) to help the most productive companies develop faster and improve quality.

The final chapter, by Altomonte, Colantone and Zaurino, looks at trade dynamics through the lens of global value chains. Starting from the causes of the recent trade slowdown, the authors try to understand whether such a slowdown is a temporary phenomenon related to the economic cycle, or if it represents a 'new normal' resulting from a structural change in global value chains. In particular, they show that those components of trade that are most directly related to GVCs experienced the greatest

drop over the 'great trade collapse' of 2009. Moreover, these components also display the slowest speed of adjustment after an income shock. Taken together, these two pieces of evidence suggest that at least part of a possibly GVC-induced trade slowdown is cyclical in nature, and might be re-absorbed in the coming years. From this, the third set of policy implications points at the importance of undertaking measures to smooth the adjustment of trade back to its long-term relationship with GDP. This entails exerting more political efforts on multilateral negotiations within the Doha round, but also on bilateral agreements such as the US-EU Transatlantic Trade and Investment Partnership (TTIP), as these agreements are instrumental in trade facilitation and the reduction of non-tariff barriers. Another implication for policy is related to the interplay between granularity and GVCs: as GVCs are relatively more important in some industries (eg automotive) than in others, the relative specialisation of countries in GVC-intensive industries might determine a different speed of adjustment of their exports to the long-term average, creating another driver for (at least one element of) competitiveness divergence within the EU.

Another common trait of all the chapters is that they rely to some extent on either novel datasets, or novel analytical methodologies, or both. As such, we hope that, beyond contributing to the policy debate on competitiveness in Europe, the Blueprint could also contribute to measures to improve the quality of the underlying data on which the analyses are based. This is the last, crucial policy message of this Blueprint.

The continuous development and improvement in data gathering and accessibility remains key for both policymaking and research. To give some examples from the previous analysis, the results of the the first two chapters in this volume would soon lose relevance unless firm-level data across countries and regions, complete with the export dimension of firms, are updated and made available to researchers. So far it has been possible to rely on recent data collected within the ECB's CompNet project, but this data need maintenance and updating over time. As documented in the first Blueprint produced by the MAPCOMPETE project[9], however, official cross-country firm-level data at the European level, although it exists, it is for the time being practically inaccessible to the average researcher, and thus has a very limited use in terms of policy-relevant analysis.

In terms of reallocation, the traditional macro stream of literature dealing with the effects of centralisation of wage-bargaining institutions on employment and wage outcomes has generally led to inconclusive results and shallow support for policy,

9. See Castellani and Koch (2015).

because the variation in the level of bargaining used in these papers is exclusively between countries (in general the OECD indicators on Employment Protection Legislation), with no variation at sector or firm level. Hence it becomes difficult to distinguish the impact of these variables from industry time trends, time dummies and country dummies. When data can be brought to the firm-level, by contrast, an entire new range of policy-relevant results emerge, as this Blueprint clearly shows. Despite this, national statistical institutes do not seem to prioritise working towards greater availability of data on collective bargaining regimes, and more in general on labour market institutions at the micro-level.

The results obtained by this volume's last two chapters on the impact of global value chains and non-price factors on growth and competitiveness, crucially rely on the presence of detailed and comparable trade data that goes well beyond average statistics on imports and exports. The continuous availability of updated and detailed Input/Output tables, and reliable information on traded products both in terms of quantity and values (enabling unit export prices to be inferred) also remains central in all future analysis of competitiveness.

References

Bartelsman, E., J. Haltiwanger and S. Scarpetta (2013) 'Cross-country differences in produ ctivity: the role of allocation and selection', *The American Economic Review* vol. 103(1): 305-334

Christodoulopoulou, S. and O. Tkacevs (2014) 'Measuring the effectiveness of cost and price competitiveness in external rebalancing of euro area countries: what do alternative HCIs tell us?', *Working Paper Series* No 1736, European Central Bank

Di Giovanni, J., A. A. Levchenko and I. Mejean (2014) 'Firms, Destinations, and Aggregate Fluctuations', *Econometrica* 82(4): 1303-1340

Gabaix, X. (2011) 'The granular origins of aggregate fluctuations', *Econometrica* 79(3): 733-772

Giordano, C. and F. Zollino (2015) 'Exploring price and non-price determinants of trade flows in the largest euro area countries', *Working Paper Series* No 1789, European Central Bank

Gopinath, G., S. Kalemi-Ozcan, L. Karabarbounis and C. Villegas-Sanchez (2015) 'Capital Allocation and Productivity in South Europe', mimeo

Hopenhayn, Hugo A. (2014) 'Firms, Misallocation, and Aggregate Productivity: A Review', *Annual Review of Economics* vol. 6(1): 735-70

Hsieh, C. and P. J. Klenow (2009) 'Misallocation and Manufacturing TFP in China and India', *The Quarterly Journal of Economics* vol. 124(4): 1403-1448

Koopman, R., Z. Wang and S-J. Wei (2014) 'Tracing Value-Added and Double Counting in Gross Exports', *American Economic Review* 104(2): 459-94

Krugman, P. (2012) 'More about Italy', *The New York Times*, Opinion Pages, 28 November

Mayer, T. and G. I. P. Ottaviano (2007) *The happy few: the internationalisation of European firms*, Blueprint 3, Bruegel

Syverson, C. (2004) 'Product Substitutability and Productivity Dispersion', *Review of Economics and Statistics* 86(2): 534-50

Timmer, M. P., B. Los, R. Stehrer and G. J. de Vries (2013) 'Fragmentation, Incomes and Jobs. An Analysis of European Competitiveness', *Economic Policy* 28(76): 613-661

Wang, Z., S-J. Wei and K. Zhu (2013) 'Quantifying international production sharing at the bilateral and sector levels', *Working Paper* No. w19677, National Bureau of Economic Research, Washington DC