

# Measuring competitiveness in Europe: resource allocation, granularity and trade

CARLO ALTOMONTE AND GÁBOR BÉKÉS, EDITORS

BRUEGEL BLUEPRINT SERIES

## **BRUEGEL BLUEPRINT SERIES**

### **Volume XXIV**

#### **Measuring competitiveness in Europe: resource allocation, granularity and trade**

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# Foreword

This new Bruegel Blueprint, edited by Carlo Altomonte and Gábor Békés, represents an important contribution to the debate on competitiveness. The book compiles the works of a number of eminent scholars who are active in this debate, and stems from ‘Map-Compete’, a Seventh Framework Programme research project that assessed data availability and requirements for the analysis of competitiveness in European Union countries. Three aspects of the debate stand out prominently in this book.

First, looking at the distribution of firms, it is a recurring pattern that only a few firms are key for productivity, influencing the competitiveness of sectors and even entire economies. Trying to understand what drives competitiveness necessarily involves understanding what drives the performance of top companies. What kind of framework conditions do they need in order to strive and prosper? More than cheap labour, the important factors are the quality of human capital, institutional framework conditions and access to markets.

Second, the authors emphasise the need to be able to reallocate resources towards such productive firms. This echoes longstanding demands from macroeconomists. In times of major shocks and major adjustments, it is important to have labour markets that allow people to move from some companies to others. For example, when trying to change current account patterns, it is indispensable to shift some resources from the non-tradeable to the tradeable sector. But the insights here go further: even within industries, it is important that people with certain existing skill sets essentially move from one company to the next, working in the same profession but more productively thanks to the superior organisation of the new firms. Regulations that in certain countries make it difficult for firms to grow beyond a certain threshold size put limits on such productivity growth.

Third, there is the issue of international trade and global value chains. Since production processes are increasingly split across global production chains, competitiveness is not primarily determined by local production costs but rather by the ability of firms to



effectively use this production chain. One contribution in this Blueprint shows that local labour costs are just a small percentage of the overall production cost. Instead, non-price competitiveness, quality and branding become important drivers of competitiveness.

Finally, any informed debate on competitiveness requires availability of, and access to, reliable, up to date and refined data and indicators. A common element of the analyses in all chapters of this Blueprint is that they rely to some extent on either novel datasets or novel analytical methodologies, or both. As such, the continuous development of new data sources and technological improvements in data gathering and accessibility remain key issues for policymaking and research.

This Blueprint will not settle all the questions about competitiveness. But it certainly represents an important step towards gaining a more differentiated understanding of growth, productivity and competitiveness and the important role public policy needs to play.

*Guntram B. Wolff*  
*Director of Bruegel, Brussels, January 2016*



# Executive summary

One of the most important lessons learned during the 2008-09 financial crisis was that the informational toolbox on which policymakers base their decisions about competitiveness became outdated in terms of both data sources and data analysis. 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.

This Blueprint provides some concrete examples from recent advances in the analysis of competitiveness. The book is organised around European Central Bank Governor Mario Draghi's 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". This point of view led us to highlight throughout the book the role of a small number of highly-productive firms as drivers of competitiveness at the country and industry level and, associated with that, the relevance for economic growth of the extent to which an economy is able to reallocate labour and capital towards those more-productive firms. Equally important is the context in which these productive firms operate, and thus the significance of developments in international trade and international fragmentation of production through the changing patterns of global value chains.

There are four main implications for policy from the work outlined in the chapters of this Blueprint:

[1] A few large, very productive and internationally active firms have a great influence on the performance and growth potential of countries, regions and sectors. As a result, average measurements, which are the parameters on which most policies are generally based, do a poor job of grasping the actual level of competitiveness within countries (regions) and between them. Hence, similar sets of policy dictated *ex-ante* by similar average competitiveness measures at the country level (eg unit labour costs) might end up producing very different outcomes *ex-post*, because of the underlying

heterogeneity of firm performance in the different countries.

(2) Rigidities in the labour market affect different firms in different ways and generate 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 greater share of companies reducing the number of employees during economic downturns. Labour market reforms that allow wages to be aligned to heterogeneous levels of firm productivity are thus key to fostering a proper allocation of economic resources and, through this channel, a significant improvement in competitiveness and growth.

(3) Exporting, and more broadly international activities, is another key feature of competitiveness. Being active on global markets is closely associated with innovation and growth. An 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. In addition to exporting to unrelated parties, the emergence of global value chains suggests that selling to multinationals at home or the ability to build up a chain of suppliers are equally important and policy-relevant channels. In turn, as the changing pattern of global value chains is a significant driver of export growth, it is important to work at both the multi-lateral and bilateral level (eg the Transatlantic Trade and Investment Partnership, TTIP) to foster trade facilitation and the reduction of non-tariff barriers.

(4) The chapters of this book relied on either novel datasets, or novel analytical methodologies, or both, and contributed to the development of measures on which future analyses might be based. Developing datasets using firm-level data, matching company information with trade data, deriving evidence about global value chains or elaborating the quality of products will all help better identify competitiveness. Harmonisation of national efforts, and creation of EU-wide datasets are crucial in order to develop and test new measures that policymakers can use in the future.

# 1 Measuring competitiveness in a granular and global world

Carlo Altomonte and Gábor Békés

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<sup>1</sup>.

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”*<sup>2</sup>. 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<sup>3</sup>.

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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](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”*<sup>4</sup>.

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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<sup>5</sup>. 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<sup>6</sup>. Another key development in the analysis of competitiveness stemming from interna-

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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, Christodouloupoulou 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"*.

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.

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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<sup>8</sup>. 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

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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<sup>9</sup>, 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,

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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.

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## 2 The importance of micro data in assessing aggregate outcomes<sup>10</sup>

Giorgio Barba Navaretti, Matteo Bugamelli, Emanuele Forlani and Gianmarco Ottaviano

In recent years, researchers and policymakers have been able to use sophisticated databases to provide insightful economic analysis. The increasing variety of available microeconomic databases and the improvement in the quality of data (in terms of both scope and detail) has provided empirical support to underpin the analysis of the link between microeconomic structures and aggregate fluctuations.

In particular, focusing on firm-level data, an increasing number of studies, both at empirical and theoretical level, underline how micro-level shocks can determine macroeconomic outcomes: changes in aggregate welfare, GDP or trade flows crucially depend on shocks that might occur at firm level.

Macroeconomic analysis would therefore benefit from information on the microeconomic distribution of firms' characteristics. For example, country competitiveness cannot be properly evaluated without an understanding of the microeconomic dynamics relating to firms' competitiveness.

In this chapter, we extensively review the literature on the linkages between microeconomic structure and macroeconomic outcomes, in particular in terms of welfare and trade adjustments. The chapter will show how microeconomic dynamics at firm level have significant implications for aggregate fluctuations.

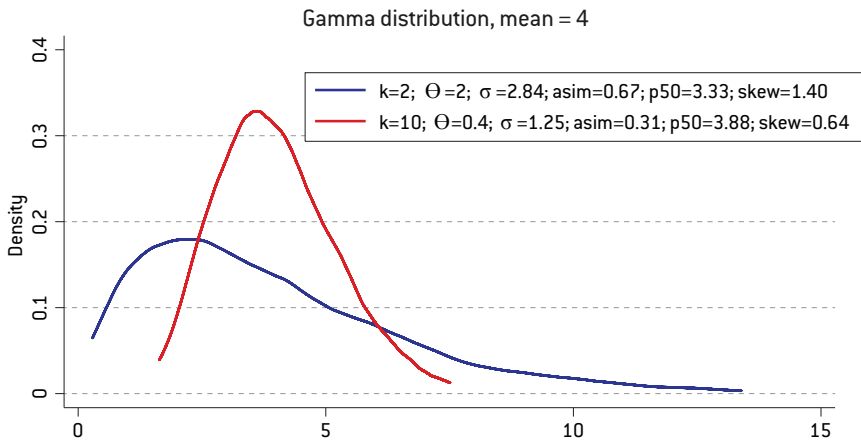
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10. This chapter is based on the authors' research project, 'It takes (more than) a moment: Revisiting the link between firm productivity and aggregate exports'.



*Similar averages hide very heterogeneous higher moments.* Our starting point is the CompNet (2014) project. Its initial results show that firm performance varies enormously (TFP and labour productivity), both within and between countries and sectors. These differences might not be detected in country and sector averages, which are the parameters most used in policy formulation. Even if some countries or sectors are similar in terms of average productivity, the underlying efficiency distributions could be very dissimilar. For example, Figure 1 reports two kernel densities for the same distribution family [Gamma] with equal mean but different standard deviation. It is straightforward to observe that the blue line has a longer and fatter-tailed distribution compared to the red line. If the distribution of firms moves from the red line to the blue line, averages would not detect this change. Thus small variations in the average parameters might hide significant differences in the characteristics of the underlying population of firms. The key question is therefore whether these differences, generally captured by the higher moments of the distributions, affect the aggregate outcomes, and through which channels. In particular, we see that assumptions on population distribution can have a significant impact on the aggregate outcomes.

Figure 1: Simulated distribution



Source: MAPCOMPETE from simulated data (10,000 observations). Note: K: shape parameter,  $\theta$ : scale parameter, asim: asymmetry as Pearson's second skewness coefficient (ratio of mean-median to standard deviation), p50: median, skew: skewness.

*The granular result.* The analysis of business cycles by Gabaix (2011) was an initial very influential contribution on the 'granularity' of macro outcomes, ie on how they can be reconducted to the non-negligible elements of an economy. Most research on business cycles considers the role of idiosyncratic shocks at firm-level to be negligible,

especially in large economies with millions of firms. The main argument in favour of this is that individual shocks cancel out in the economy because of the statistical independence of firm level shocks and because of the large number of firms. Gabaix (2011) shows instead how idiosyncratic shocks affecting large firms also affect aggregate fluctuations and, through general equilibrium channels (input-output linkages), all other firms as well. This outcome holds if firm size distributions are fat-tailed, ie large firms account for a considerable share of the economy, like the blue distribution in Figure 1. The law of large numbers no longer applies if the distribution of firms' sales departs from normality and displays a 'fat tail'. In this case idiosyncratic shocks affecting individual (large) firms do not cancel each other out, and determine aggregate effects. Building on the stylised fact that in the United States, firms' distributions are highly skewed and that the sales of the top 100 firms are equal to almost 30 percent of GDP<sup>11</sup>, Gabaix provides theoretical and empirical evidence that firm-level shocks do not average out as the number of firms increases (in particular in more concentrated sectors). For the US economy, shocks affecting the top 100 firms are responsible for one-third of the country's GDP fluctuations.

Di Giovanni, Levchenko and Mejan (2014) empirically test these results based on the universe of French firms between 1990 and 2007. They decompose aggregate sales fluctuations (in both domestic and foreign markets) and identify reactions to macro, sectoral and firm-specific idiosyncratic shocks. They confirm the substantial contribution of firm-specific shocks to aggregate volatility<sup>12</sup>. The magnitude of the effect of firm-level shocks is similar to that of sectoral and macroeconomics shocks, and affects all firms. Di Giovanni *et al* (2014) also confirm the fat-tail result of Gabaix (2011) that idiosyncratic shocks are especially important when the distribution of firms is highly concentrated and that the input-output linkage is the main channel through which firm-specific shocks propagate<sup>13</sup>. Both papers conclude that shocks at firm level, in particular in highly concentrated sectors, are fundamental to understand aggregate volatility.

*Higher moments and aggregate trade.* A further important question is whether granularity, as captured by different features of size or productivity distributions, is also re-

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11. The proportion is remarkably stable over a period spanning 1975 to 2010.

12. Di Giovanni *et al* (2014) distinguish between the volatility of domestic sales and sales to other destination markets.

13. Considering a similar mechanism, Acemoglu *et al* (2013) analyse how firm-level shocks determine aggregate fluctuations in function of the interaction between different sectors. At a regional level, the same channels might play an even more relevant role. Glaeser (2011), for example, points out how Detroit's economic prosperity was strongly connected to a few sectors and mainly to three firms: Chrysler, Ford and General Motors. Given the highlighted channels and the low industrial diversification, any idiosyncratic shock affecting those firms or their main suppliers has a significant influence on the welfare of the area.

lated to the overall trade performance of countries and sectors. The theoretical and the empirical literature on trade with heterogeneous firms (Bernard *et al*, 2003; Melitz, 2003) highlighted the importance of firm characteristics in trade outcomes and identified the need to dissect the extensive and the intensive margins of trade. In a similar vein, the descriptive evidence in Mayer and Ottaviano (2007) and Barba Navaretti *et al* (2011) showed that granularity is especially important in trade and in international activities in general, where concentration of exports or foreign direct investment among the largest players is larger than concentration of output or employment. For example, Mayer and Ottaviano (2007) show that aggregate exports are driven by a small number of top exporters. On average, the top 10 percent of exporters in Europe account for 80 percent of aggregate exports, and the top exporters export many products to many destinations (75 percent of total aggregated exports come from firms with more than 10 exported products and 10 destination markets).

However, in the standard trade model with heterogeneous firms (Melitz, 2003), the mean productivity of the underlying population of firms is the only parameter of productivity distributions that affects aggregate trade flows. In other words, higher moments of the distributions, catching the granularity of the underlying population of firms, do not affect aggregate outcomes. This results rest on three key assumptions: Constant Elasticity of Substitution (CES) consumers' preferences; iceberg-type trade costs and Pareto productivity distributions (Chaney, 2008).

The average (weighted) productivity remains the only indicator that explains aggregate exports, also in a slightly different framework. Costinot *et al* (2012) developed and tested a model of Ricardian comparative advantage with CES preferences across sectors, Fréchet productivity distribution and iceberg trade costs. First, they defined a theoretical model in which aggregate exports depend on the average productivity and not on the higher moments of the distribution. Second, they found evidence that exports are positively correlated with average productivity (defined as the inverse of weighted producer price index). Also in this framework, the higher moments of productivity distribution seem negligible for aggregated exports.

Barba Navaretti *et al* (2015) apply this prediction of the standard trade model – that only the first moments of the productivity distributions (ie the mean) matter for aggregate exports – to the data, as their null hypothesis to be tested. They find strong and robust evidence rejecting the null hypothesis. The export propensity is positively correlated to the first moment (mean), but also to the asymmetry and dispersion of the underlying productivity distributions<sup>14</sup>. Using the CompNet dataset (2014), this empirical exercise is carried out in two stages. First, a gravity equation is estimated to

calculate the origin fixed effect (ie the multilateral resistance term at origin-sector-year level). The estimated values measure the exporter competitiveness netted out of importing country and country-pair specific characteristics. Second, the empirical relationship between this competitiveness indicator and the different moments of the productivity distributions are tested. Asymmetry, the third moment of the distributions, is highly and significantly correlated to the competitiveness indicator, especially for large and international economies. According to the theoretical model, the estimates also include average wages and number of firms to control for input price bias and market size, respectively. The main findings are robust to different specifications, and different types of standard errors. 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.

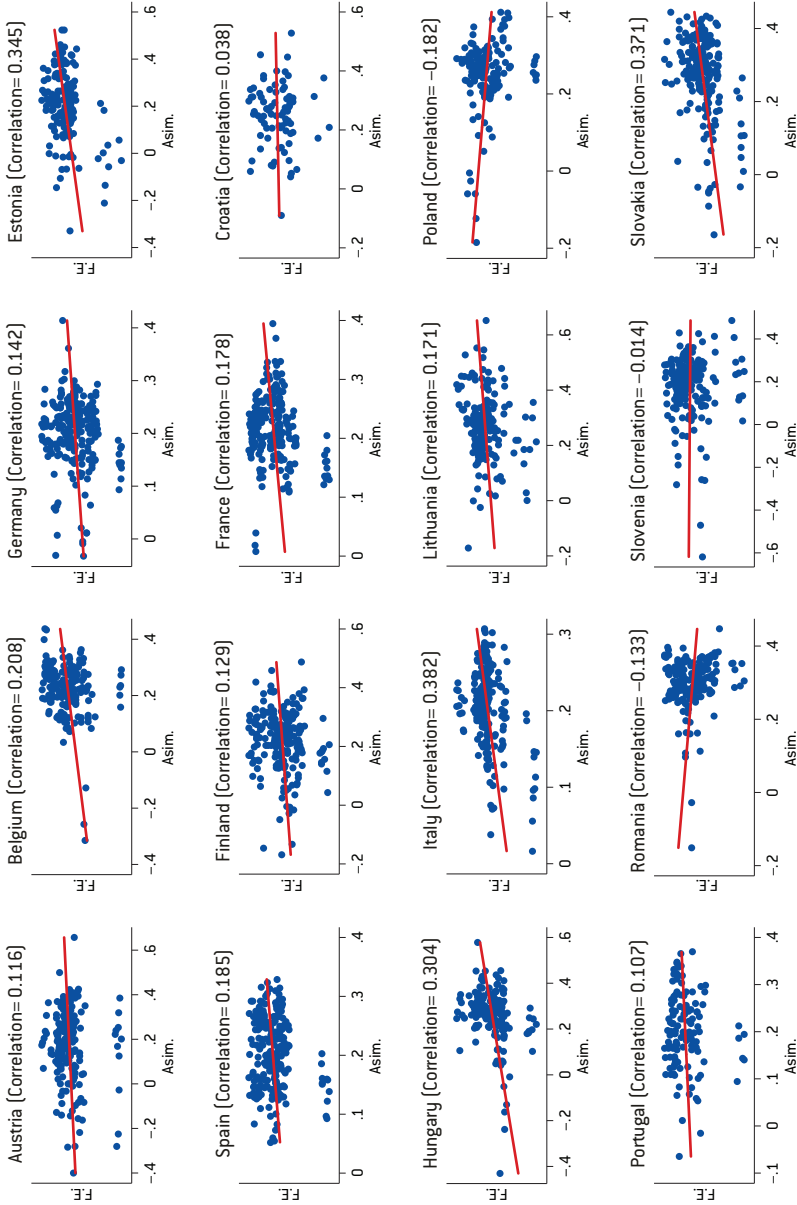
Figures 2 and 3 show unconditional correlations for individual countries and for clusters of countries/sectors based on their being below or above mean productivity. Barba Navaretti *et al* (2015) shows that the average productivity (or size) of firms is not sufficiently informative for analysing aggregate outcomes. Dispersion and, especially, rightwards asymmetries are therefore key parameters that any policy aimed at fostering exports should take into account<sup>15</sup>.

*Trade costs, intensive and extensive margins and aggregate exports.* A further issue is to what extent size and productivity distributions affect the intensive and the extensive margins of international trade. Di Giovanni and Levchenko (2013) examine the welfare gains from trade liberalisation and show how these depend on firms' size distribution, on the basis of a multi-country model of production and trade calibrated to the observed distribution of firm size. If firms are distributed according to Zipf's law, which implies fat-tailed distributions, a reduction in the fixed cost of entry, for example induced by trade liberalisation, has a relatively small effect on welfare. This is so because the extensive margin of trade (new imported goods or new exporters) has a small effect on aggregated welfare, given that marginal firms, those near the exporting cut-off, account for a relatively small share of total output. Most of the welfare gains derive instead from a reduction in iceberg-type variable costs and changes in the

14. Asymmetry is measured at sector level as the ratio of mean minus median to standard deviation. Dispersion is evaluated as the ratio of the productivity value at the 80th percentile to the productivity value at the 20th percentile.

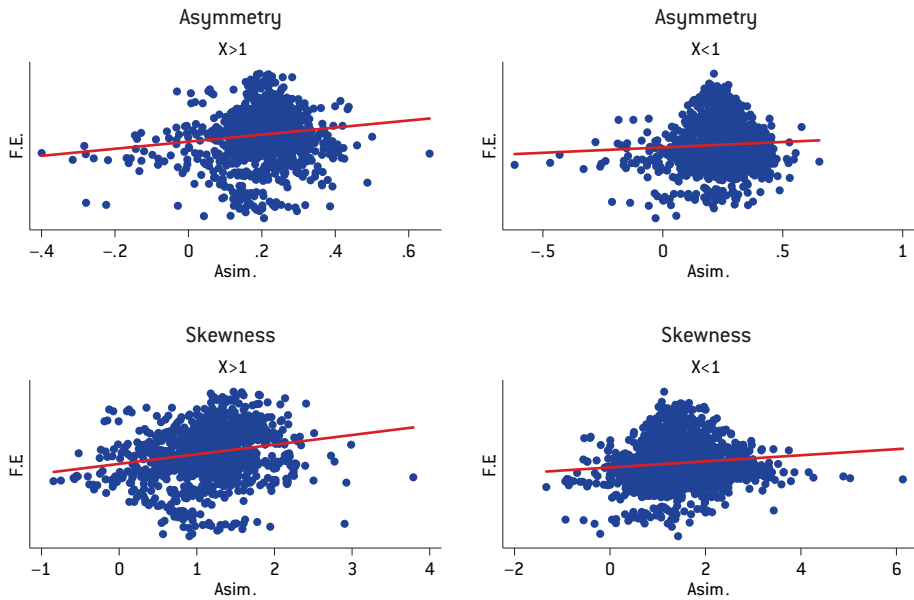
15. In several respects, at the sectoral level the model used by Barba Navaretti *et al* (2015) is observationally equivalent to the Ricardian model of Costinot *et al* (2012). From this viewpoint, Barba Navaretti *et al* (2015) can be interpreted as looking into finer detail at how higher moments of the firm productivity distribution within sector-country pairs might affect revealed comparative advantage across countries.

Figure 2: Unconditional correlation: country fixed effects and asymmetry



Source: Barba Navaretti *et al* (2014). Note: Asymmetry is computed as the ratio of mean minus median to the standard deviation. Unconditional correlation is reported next to the country code.

Figure 3. Unconditional correlation: country fixed effects and asymmetry



Source: Barba Navaretti *et al* (2014) Note: X is defined as the ratio of labour productivity mean (by country sector year from CompNet) to the sector-year sample mean (ie the mean is the same for all the countries in each year-sector pairs). The mean of X-ratio is one. The graphs on the left describe the correlations for the country-sector-year observations which above the CompNet sector-year mean (relatively more productive country-sector in EU). The graphs on the right describe the correlations for the country-sector-year observations below the CompNet sector-year mean (relatively less productive country-sector in EU).

intensive margin of large incumbent firms. If firms are more uniformly distributed, results are inverted. The reduction in fixed costs generates a greater effect on welfare than under Zipf precisely because entry and the extensive margin now influence considerably aggregate output (the relative importance of the intensive margin is unchanged). Note that within this framework, the shapes of the distributions are relevant because of the relative magnitude of the effects on aggregate outcomes that large firms have compared to small firms, and also because the distance from productivity cut-offs and the relative size of marginal firms influence the likely impact of entry and the extensive margins.

Another important factor that influences aggregate trade outcomes is the role of distance from market. Chaney (2013) shows how the discouraging effect of distance is in itself influenced by the characteristics of the underlying size distributions. He shows theoretically and empirically that the negative effect of distance is smaller when firms are large and therefore distributions especially skewed.

The shape of the distributions, though, might matter not only because of the relative magnitudes of the firms engaged in foreign trade, but also because firms of different size or different productivity level might have different strategic behaviour, and therefore react differently to changes in trade costs. This is the key theme of Bermann *et al* (2012), who look at the impact of exchange rate changes on aggregate trade elasticities for a sample of French firms. They first carry out a very detailed analysis of firm-level responses to exchange rate fluctuations, showing that high-productivity firms are more likely to engage in pricing-to-market strategies, and therefore are less likely to pass through exchange rate swings into their final price in destination markets. Consequently, for these firms, export expansion following a devaluation will be more limited than for less productive firms. This result can also be used to analyse the impact of distributions on aggregate outcomes. By aggregating firm-level data at the industry level, Berman *et al* (2014) show that under Pareto distributions, the elasticity of exports (in value here) is lower in sectors with a higher productivity dispersion (the inverse of parameter  $k$ ) or concentration as measured by a Herfindal index. Both measures capture the rightward skew of the productivity distribution.

Their results have also implications for the analysis of the extensive and intensive margins of trade which are consistent with Di Giovanni and Levchenko (2013). When

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16. In most of the international trade models, firms' heterogeneity is described by a Pareto distribution for its tractability and appealing features (Melitz and Ottaviano, 2008).

17. On the other side, the mean and higher moments are defined as a function of the only dispersion parameter (and lower bound).

productivity distributions are especially skewed, a devaluation has also a limited effect on the extensive margins.

The theoretical underpinning of the analysis of the effects of trade costs on margins and how these are affected by the shapes of the distribution is rooted in the earlier theoretical paper by Chaney (2008). He introduces in his theoretical framework a further ingredient, which is the interaction between the shape of the distributions and the elasticity of substitution between varieties. If the elasticity is high under Pareto distributions (fat tails once more), the extensive margin is of limited relevance for aggregate exports. This derives from the common situation that marginal firms are small and account for a small share of aggregate exports, but also from the fact that the market share of these new entrants is depressed even further by the high substitutability of their products with other varieties. In this case, therefore, the effect of the extensive margin is small and most of the adjustment is again on the intensive margin of large firms. In contrast, when elasticity is low, each firm has a large and fairly stable market share; therefore even marginal low productivity firms acquire a relatively large share after entry. The effect of the extensive margin on aggregate exports is in this case more sizeable.

The effect of the extensive margin is more relevant – dominant in Pareto distributions, according to Chaney (2008) – if the elasticity of substitution between domestic and foreign goods is high.

*Beyond Pareto.* Most of the reported findings (especially in international trade) rely on the hypothesis that firms' characteristics (such as size or productivity) are distributed according to a probability function of the exponential family and in particular the Pareto distribution<sup>16</sup>. Pareto distribution has been extensively used by researchers to model firms' heterogeneity because its tractability. Moreover, Pareto distribution seems to approximate quite well the right tail of the observed distribution of firm sizes<sup>17</sup>.

Head *et al* (2014) underline that also the lognormal distribution “(i) maintains some desirable analytic features of Pareto, (ii) fits the complete distribution of firm sales rather than just approximating the right tail, and (iii) can be generated under equally plausible processes”. The authors show that the use of lognormal distribution produces differences in the gains from trade, compared to Pareto distribution.

Bas *et al* (2015) made another attempt to analyse the implications of introducing different distributions. Their main contribution is to show that trade elasticities (with re-



spect to tariffs in this case) vary in different destination markets if the Pareto assumption is dropped. Pareto predicts the same elasticity for all destinations, which is proportional to the dispersion index of Pareto (see also Head and Mayer, 2014). In particular, using lognormal distributions for productivity, Bas *et al* (2015) compute expected bilateral elasticities, and show that productivity heterogeneity (within sector) is crucial to explain the aggregate variations of bilateral exports to trade cost shocks. For example, constant elasticity would underestimate or overestimate the trade impact of tariff liberalisation in function of the initial level of trade.

Moving away from the assumption of (untruncated) Pareto distribution also has strong implications for the measurement of welfare gains arising from trade liberalisation. Under specific assumptions, Arkolakis *et al* (2012) show that welfare gains depend only on the share of domestic expenditure and (constant) trade elasticity. Their outcome is compatible with a Pareto distribution of technology, where the trade elasticity is proportional to the dispersion parameter of a Pareto distribution.

Differently, Melitz and Redding (2015) show that because variations in the theoretical distribution (from untruncated to a truncated Pareto distribution) generate variable trade elasticities across country pairs in the model, changes in welfare are proportional to changes in the domestic productivity cut-off so that welfare gains from trade liberalisation depend on the underlying micro structure. In this framework, it is necessary to analyse adjustments at firm level to properly evaluate welfare gains.

While, in the case of untruncated Pareto distribution, welfare is just defined by constant elasticity and domestic expenditure (as in Arkolakis *et al*, 2012), the introduction of truncated Pareto emphasises the role of bilateral elasticities and changes in productivity cut-off. Melitz and Redding (2015) also suggest that small changes in the shape of firms' productivity distribution (from untruncated Pareto) have a large impact in the evaluation of welfare gains because of variable trade elasticity. Therefore, assumptions about productivity distribution are not insignificant for the computation of welfare gains, and the existence of appropriate data, which allows the description of the underlying micro structure, is crucial.

*Analysis of aggregate outcomes.* The recent literature reveals the existence of two potential approaches to evaluate aggregate shocks from micro level data. First, there is a 'micro' approach that requires knowledge of the full population of firms and their characteristics, such as productivity and exports (Bas *et al*, 2015). Using the full population of firms, this approach allows the underlying distribution to be better characterised (eg Pareto or lognormal) and how shocks in trade costs spread from firm level

to macroeconomic level to be analysed in detail. Even if the micro approach allows the description of the transmission mechanisms (from micro to macro), the data requirement is relatively huge. For example, Bas *et al* (2015) need detailed firm-level data for France and China to compute bilateral trade elasticities for both countries. In addition, the micro approach would be extremely data-intensive for cross country comparisons.

A second approach, 'macro', looks at the moments of underlying distributions using summary statistics. For example, Barba Navaretti *et al* (2015) analyse the export competitiveness of countries using the moments of firms' productivity distributions (eg mean and asymmetry). This macro approach is less data intensive and allows cross-country analysis, but it requires a specific database that reports statistics on the moments of distributions (such as CompNet, 2014).

Even if the micro and macro approaches present advantages and disadvantages depending on the research objective, the two approaches highlight the role of underlying micro structure to properly analyse and estimate aggregate outcomes.

The literature reviewed in this chapter shows that microeconomic characteristics of the underlying population of firms can significantly affect aggregate outcomes. Crucially, features of productivity and size distributions also affect the impact of policy shocks inducing changes in trade costs, such as exchange rate fluctuations or trade liberalisation. In light of this, the availability of micro level data or aggregate statistics that describe in detail the underlying distribution of firms' characteristics (CompNet, 2014) are crucial to provide insightful analysis of macroeconomic shocks to economists and policymakers.

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# 3 Micro-founded measurement of regional competitiveness in Europe

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## 3.1 Introduction

Enhancing ‘competitiveness’ is a popular objective of economic policymaking, both at national and the regional levels. International regional competitiveness recently was developed into the smart, sustainable and inclusive growth objectives of the Europe 2020 policy programme<sup>18</sup>. While a huge amount of development funding is allocated to help meet these objectives, the concept of ‘competitiveness’ remains rather mysterious and is often debated. There is neither any generally accepted definition nor any robust agreement on how to measure it. While this is true for both nations and regions, the focus of this chapter is on the regional level.

The regional level is important because regional diversity within the European Union is substantial, and regional disparities matter at the national level in a context in which GDP per capita differences between regions within EU countries are comparable to the differences between the more- or less-developed EU countries. For instance, while Romania has a per capita GDP that is 32 percent of the per capita GDP of Germany (at PPP), the poorest Romanian region (North-East) has a per capita GDP that is just 26 percent of the per capita GDP of the richest (Bucharest). As a result of pronounced regional disparities, even within the same country, people living in poor regions have much fewer work opportunities and, as long as local services are financed by local governments through local taxation, also much less access to education and health care. This is why measuring ‘regional competitiveness’ as a driver of regional economic performance has been considered an objective worth pursuing.

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18. [http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/priorities/index\\_en.htm](http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/priorities/index_en.htm).

In this chapter we will do three things. First, in section 3.2 we discuss the conceptual underpinnings of why it is interesting to unpack the economic performance of a country into the economic performance of its regions. In particular, based on the academic literature, we will discuss how ‘proximity’ matters in the sense that several key interactions between people and firms that are at the core of economic performance peter out very rapidly as distance increases, making the local context the scale at which most of the action takes place. On the other hand, we will argue that, once the local context is targeted, the economy becomes extremely ‘granular’ in the sense that local economic performance even more than national performance ends up being driven by the fortunes of a handful of firms that are large (at least in the local context). In other words, it is the importance of ‘proximity’ that makes ‘granularity’ more salient.

Second, in section 3.3 we explore the implications of ‘proximity’ and ‘granularity’ for how one may want to think of and measure ‘regional competitiveness’. The basic idea is that, if ‘proximity’ makes the regional dimension crucial and ‘granularity’ implies that a few large firms determine regional destinies, a natural way to assess regional performance is to look at how large firms fare across regions. We will then argue that, given available data, an effective way to gauge how large firms fare is to look at their ability to access and penetrate world markets. In this respect, we will propose a pragmatic definition of ‘regional competitiveness’. This type of firm typically accounts for dominant shares of employment, sales and profits. Such firms are more capital intensive and pay higher wages. They invest more in capital and human resources. They are the main drivers of innovation. Our approach is practical because it measures ‘regional competitiveness’ in terms of actual rather than potential outcomes, and focuses on an outcome variable that is correlated but more easily measurable than several other obvious outcome variables.

Third, in section 3.4 we discuss the data needed to compute our proposed measure of ‘regional competitiveness’, if this data is currently available for EU regions and how its availability could be improved. We note here that the administrative definition of ‘region’ does not necessarily coincide with the relevant definition based on the intensity of actual interactions between people and firms. This is an old issue with a long tradition on which we have little to add, apart from stressing that data is typically collected according to the administrative definition and this is the definition that matters most in terms of regional policies. Section 3.5 offers some conclusions. Two illustrative examples are presented in the Annex.

To our knowledge, the closest research to ours is Konings and Marcolin (2011), who use firm-level data to assess the competitiveness of Belgian and German regions. In

line with our work, the concept that the authors use does not “engage in measuring different potential drivers of productivity (with the risk of omitting some), but will directly capture the productivity level of firms that are active in a particular region”. Similarly, they note the importance of large firms, arguing that by using firm-level data they are “also able to analyse the dependence of regions on a few large firms, which reveals potential vulnerability in terms of relocation threats”. The data is derived from EU company accounts contained in the Amadeus dataset by Bureau Van Dijk (BvD) for 2005 and 2008 for medium and large-sized companies. Konings and Marcolin (2011) compute labour productivity (value added per worker), and calculate the ratio of the average labour cost and average labour productivity, to obtain a measure of the relative cost of a unit produced – the preferred measure of competitiveness. Our method is an alternative that focuses even more on the ‘outcome’ of competition, but is nevertheless likely to be correlated with the Konings and Marcolin measure.

Two caveats are in order in relation to the research in this chapter. First, because the ideal data is not available, this chapter should be taken as a methodological contribution to the policy debate on ‘regional competitiveness’ rather than an attempt to precisely measure ‘regional competitiveness’. Accordingly, we will use the available data to provide specific examples rather than an overall assessment of ‘regional competitiveness’ across the EU. Moreover, our examples serve only to take snapshots of the situation at one point in time, leaving aside the question of how patterns evolve through time. Second, we do not take any stance on the relationship between ‘regional competitiveness’ and ‘regional convergence’ in economic performance. One might want (all) regions to be ‘competitive’ because one wants them to compete. From this perspective, competition between regions might be considered good in itself. However, competition is a dynamic process and one should not expect necessarily a balanced distribution of economic activities at any point in time. Because of the pull of ‘proximity’, one might even expect some degree of (sound) regional imbalances at all points in time.

### 3.2 A new foundation for regional policy: performance of regions is driven by localised externalities and granularity

Why is it interesting to unpack the economic performance of a country into the economic performance of its regions? The answer has to do with the concepts of ‘proximity’ and ‘granularity’.

### 3.2.1 Proximity

Firms compete not only on the basis of their internal capabilities, resources and business networks, but also in the context of the business environments they come from. Institutions, regulations, demand conditions and many other factors in their countries of origin determine the quality and the availability of their inputs (from labour to intermediate goods and services) and their sales opportunities. As suggested by a long line of academic and business consultancy studies, national determinants are essential.

However, several key interactions between people and firms that are at the core of economic performance are effective at a smaller scale than the country level. These processes include labour market interactions, knowledge spillovers, trade transactions between collaborating firms and even mutual trust. The fact that some important economic interactions are constrained by proximity is one of the reasons why the concept of 'regional competitiveness' might be worth exploring. Even within a country, regions can offer rather varied business environments, including variation in labour force quality, in agglomeration and diversity of firms, in research and development infrastructure, and in urban services.

#### Agglomeration forces

Concentration of economic activity in some regions within a country, or in some cities within a region, has been identified as a key driver of economic performance.

Firms agglomerate to benefit from 'Marshallian externalities' such as the spreading of knowledge among similar industries, a greater pool of labour to choose from or the ability to access indivisible goods such as conference venues or airports. Hence, when operating within proximity of each other, firms can save on transaction costs and enjoy greater productivity. This is argued, for example, in so-called 'new economic geography' models (see eg Fujita, Krugman and Venables, 1999; or Baldwin *et al*, 2003) and in models of regional growth with knowledge spillovers (Ciccone and Hall, 1996). These models suggest that interactions between people and firms with a positive value greater than that signalled by market prices ('positive externalities') can arise through several channels, such as sharing indivisible goods, saving on the costs of matching workers with firms, and learning from each other (Duranton and Puga, 2004). When 'positive externalities' require people and firms to be close to each other, they generate 'agglomeration forces' leading to the geographical co-location of economic activities. At the same time, competition between co-localised people and firms for locally scarce

resources generates 'dispersion forces' that cut into the benefits of agglomeration.

In 'new economic geography' models, proximity has several major implications. First, when firms co-locate, they offer more job opportunities and hence attract people. This increases the size of the local market and reduces the need to import final goods from elsewhere, thus reducing the average transport cost embedded in the consumption bundle of local residents. Second, proximity also entails cheaper transport between firms, because the producers of intermediate goods are located closer to their end users. Third, the total factor productivity (TFP) of firms (ie their efficiency in using given amounts of inputs to produce output) might also increase because of knowledge spillovers from other producers. As long as all these effects entail some degree of 'externality', the impact of proximity on income will be more than proportional to the number of co-located firms.

A fourth implication is related to labour productivity in larger and denser areas, particularly in cities (Puga, 2010). This greater efficiency of labour might be partly explained by productivity gains at the firm level translated into gains of marginal labour productivity. It is also explained by 'spatial sorting' as richer job opportunities where firms co-locate are disproportionately seized by more talented people. Several studies find that about half of the earning surplus achieved in denser areas comes from spatial sorting. However, there are some aspects of larger and denser urban areas that are conducive to learning and personal improvement fostered by peer pressure, more valuable experience and easier access to a variety of educational services.

Agglomeration and dispersion forces are in practice quite hard to disentangle. However, their combined effect on labour productivity can be estimated and has been found to be positive. For example, Ciccone and Hall (1996) and Ciccone (2002) find that the elasticity of labour productivity to people's density is 6 percent and 5 percent on average in the US and the EU respectively. These early findings are in the ballpark of recent estimates for European countries that control for firm selection and the exogenous attributes of different urban areas (Duranton *et al*, 2012).

Both agglomeration and dispersion forces may strengthen each-other back and forth. This 'cumulative causation' – as devised by Myrdal in 1957 – may be present between agglomeration and innovation as this is stressed by models of regional growth. These models add to the 'new economic geography' perspective a dynamic dimension in terms of endogenous growth spurred by technological progress and localised knowledge spillovers. From this perspective, innovation is key, with agglomerated production and agglomerated innovation reinforcing each other. For example, Minerva



and Ottaviano (2009) provide a model in which economic interactions between regions are affected by both the transport costs of exchanging goods and the communication costs of exchanging knowledge. When innovation takes place in a region, this generates faster growth and higher income, which in turn increases demand and local profits. But higher profits make additional innovation more attractive. This leads to faster growth so that cumulative causation between agglomeration and growth kicks in.

### Distance decay

By now there is a large body of evidence suggesting that the impact of agglomeration decays rapidly with distance. This pattern is observed for various types of economic interactions such as trade in intermediate inputs or knowledge cross-fertilisation spillovers in academia or business.

Firms trade with one another by buying and selling raw materials, intermediates or capital goods ('demand and cost linkages'). To save on transport costs, they often cluster together, especially within sectors. Duranton and Overman (2005) consider manufacturing sectors in Britain and investigate the extent of co-location of firms within sectors and the role of distance. They find that about half of the four-digit sectors are localised and localisation mostly takes place at small scales below 50 kilometres.

Gains from proximity to other companies are localised – also when considering trade relationships. For instance, Amiti and Cameron (2007) use the theoretical framework developed by Fujita, Krugman and Venables (1999) to estimate the benefits of agglomeration arising from vertical linkages between Indonesian firms using a manufacturing survey of firms at Indonesian district level. Their results show that positive externalities arising from demand and cost linkages are quantitatively important and highly localised. Strengthening cost linkages (through better access to suppliers) or demand linkages (through closer proximity to corporate customers) from the 10th to the 90th percentile raises wages and thus labour productivity by more than 20 percent. These productivity gains are, however, highly localised, spreading over only a short distance: 90 percent of the spillover is observed in close proximity to the firm (within 108km for proximity to customers and within 262km for proximity to suppliers).

Spatial concentration enhances productivity and drives wages higher – but only when there are productivity shocks. Using US data, Rosenthal and Strange (2008) estimate the relationship between agglomeration externalities related to human capital and workers' wages at Metropolitan Statistical Area (MSA) level with 1239 spatial units at hand. First, the spatial concentration of employment is found to be positively related

to wages, with the urban density premium being driven by proximity to college-educated workers. Second, these effects decline sharply with distance: benefits of education and gains from being close to educated people fall dramatically with distance. In particular, the wage-increasing effect of being close to educated people falls by 75 percent as the distance rises from 5 to 15 miles.

Knowledge spillovers – the transfer of scientific or practical information between companies – is a key motivation for investment support programmes offered in most countries and regions. Lychagin *et al* (2010) measure spillovers from knowledge laboratories in the US. They use a measure of geographic proximity based on the distribution of the locations of inventors working for firms instead of the firm HQ addresses to better capture the flow of scientific knowledge. They find that 90 percent of knowledge transmission happens within a few hundred kilometres of labs, and spillovers are small or virtually non-existent beyond 500km. Anderson, Quigley and Wilhelmsson (2009) consider knowledge spillovers in Sweden after a policy intervention aimed at decentralising post-secondary education throughout the country. They use annual estimates of output per worker for each of 284 local civil divisions to measure local productivity. Innovative activity is found to be related to the comprehensive records of patent awards, which also include the inventor's home address. Estimates clearly suggest that productivity gains are highly localised. The spillovers from researchers employed at old and new institutions are concentrated: roughly 40 percent of the cumulative gain in productivity materialises within 10km of the old institution. For new universities, this attenuation effect is even greater.

All in all, estimates suggest that positive externalities are typically effective in a narrow radius of 5-25km for interactions between people and 50-150km for interactions between firms. Hence, proximity matters and this makes it useful to unpack the economic performance of a country into the economic performance of its regions.

### 3.2.3 Granularity

In most countries, a handful of firms are responsible for a large proportion of economic activity, including export sales and foreign direct investment<sup>19</sup>.

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19. For details, see Gabaix (2011), di Giovanni and Levchenko (2011) or Mayer and Ottaviano (2007).

## Dominant firms

Gabaix (2011) estimates that the business cycle movements of the largest 100 firms in the US explain a third of the aggregate movements in output growth. In European countries, even after disregarding firms with fewer than 10 employees, as most datasets do, 1 percent of the firms produce over 75 percent of output or of foreign sales. These are the dominant firms that are also important for their impact on business cycles. This dominance is exacerbated at a regional level, and the more so the finer the level of spatial disaggregation. Kleinert *et al* (2012) show how the features of a small number of large foreign-owned firms can explain several aspects of regional business cycles in France. ‘Granularity’ captures this idea that a few selected companies play a dominant role in regional and national economic performance. In principle, it has little to do with externalities. Firm size might follow a ‘power law’ (ie exhibit log-linear distribution), a property initially uncovered by Gibrat (1931) in the case of French firms. More recent research by Axtell (2001) on US firms estimates a power law with exponent  $1.059 \pm 0.054$ . This is very close to 1, a special case of the power law known as Zipf’s law. In this special case, the second largest firm is half the size of the largest, the third largest firm is one-third of the largest, and so on. This can be shown to be the result of random firm growth. If different firms grow randomly with the same expected percentage growth rate (which equals the average firm growth rate) and face the same variance in percentage grow rates, the limit distribution of firm sizes converges to Zipf’s law, characterised by the presence of a few dominant firms.

While other factors might also contribute to the emergence of few dominant firms (such as public intervention or imperfect competition), the key point is that the importance of ‘proximity’ makes the local context the scale at which most of the action takes place and, once the local context is targeted, the economy becomes extremely ‘granular’ because local economic performance even more than national performance ends up being driven by the fortunes of a handful of firms that are large (at least relative to the local context).

### ‘Million dollar plants’

Granularity makes it natural for local leaders to commit public funds to attracting investment from large companies. This might imply particularly large sums in the case of large multinationals. Greenstone, Hornbeck and Moretti (2010) report that in 1991 BMW was given \$115 million in grants to subsidise a new plant in Greenville-Spartanburg county in South Carolina in return for an investment creating new jobs. The cost and benefit analysis hinged on the hope that BMW would create an additional 2000

jobs and generate massive gains within the county. Comparing the economic performance of counties that managed to attract similarly large investments – called ‘million dollar plants’ – with those of counties that almost managed but did not quite succeed, Greenstone, Hornbeck and Moretti (2010) were able to identify the associated gains by measuring spillovers to other businesses, wages and house prices. They found that industry in the winning county benefited substantially over the five years following the investment: output rose, the TFP of existing companies grew and wages increased<sup>20</sup>. These gains have to be weighed against the possible monopsonistic power (in which only one buyer exists for the products or services of several vendors) of dominant firms with respect to local workers, local suppliers and local authorities (Kleinert *et al*, 2012).

### 3.3 ‘Regional competitiveness’

We now explore the implications of ‘proximity’ and ‘granularity’ for of the assessment and measurement of ‘regional competitiveness’.

‘Competitiveness’ is a notoriously elusive concept. In its most general definition it refers to the performance of the unit of analysis relative to some chosen benchmark. Specific definitions then differ in terms of the unit of analysis, the exact measure of performance or the chosen benchmark.

Among the several definitions of competitiveness, two stand out as particularly relevant for the discussion of ‘regional competitiveness’: a macroeconomic definition that takes the country as the unit of analysis; and a microeconomic definition that focuses, instead, on the firm. The concept of ‘national competitiveness’ is often used in the analysis of a country’s macroeconomic performance relative to its trading partners, with an emphasis on the factors that help explain relative export performance. These include both more qualitative factors, such as technological innovativeness, product specialisation and product quality, and more quantitative factors, such as cost-effectiveness and productivity. The problem with this approach is that, even when all factors are favourable, they do not necessarily lead to more exports because they might mostly show up as exchange-rate appreciation and better terms of trade. That is why standard measures of national competitiveness rely on a more restricted notion of relative performance related to international cost or price differentials (Riley, 2012). This is the logic underpinning the dominant use of the Real Effective Exchange Rate (REER)

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20. This does not imply that subsidies were in fact a good public investment.

– with the underlying relative price and cost indicators – to measure a country's national competitiveness<sup>21</sup>.

The use of the term 'competitiveness' to refer to relative national trade performance has been heavily criticised by economists<sup>22</sup>, for two reasons. First, it gives the impression that trade performance is an objective worth pursuing *per se* at the national level, whereas the trade balance should be viewed as only a channel through which a country can borrow from or lend to other countries. And whether borrowing or lending are good or bad cannot be assessed in absolute terms but rather depends on the return on investment. Second, it suggests that factors, such as technological innovativeness, product specialisation, product quality, cost-effectiveness and productivity, have some value only because they help the country gain international market shares, whereas they should be considered as important *per se* because, even in autarky, they would affect national living standards.

A reason for this confusion between ends and means arguably lies in the application to the analysis of country performance of notions first developed to describe firm performance. From this microeconomic point of view, competitiveness refers to the fact that a firm outperforms its 'competitors' in terms of size (employment, output, revenue) and profitability thanks to everything that affects the perceived quality of the firm's products and its cost-effectiveness in supplying them. When benchmark competitors consist of all firms in the same sector *producing* in the same place, a firm's competitiveness boils down to its own ability to generate more added value from any given amount of inputs, ie from its measured total factor productivity (TFP). When benchmark competitors consist, instead, of all firms in the same sector *selling* in the same place, a firm's competitiveness is a nexus of its measured TFP and all the external factors that determine the quality-cost effectiveness of the place where the firm supplies from. These external factors link the microeconomic and the macroeconomic aspects of competitiveness (with the caveat that what is good for the firm is not necessarily good for the place where the firm operates, and vice versa).

The distinction between the macroeconomic and microeconomic definitions of competitiveness percolates to the regional level. However, when it comes to 'regional competitiveness', the notion of competitiveness as a relative performance outcome driven by a given set of factors is often lost. For example, underlying the European Commission's 'Regional Competitiveness Index' (RCI) there seems to be a notion of

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21. <http://www.bis.org/publ/econ39.htm>; <https://www.ecb.europa.eu/stats/exchange/hci/html/index.en.html>.

22. See, for example, Krugman (1994).

competitiveness as a *process* with its own inputs and outputs. Specifically:

*“...the index is based on eleven pillars describing both inputs and outputs of territorial competitiveness, grouped into three sets describing basic, efficiency and innovative factors of competitiveness. The basic pillars represent the basic drivers of all economies. They include (1) Quality of Institutions, (2) Macro-economic Stability, (3) Infrastructure, (4) Health and the (5) Quality of Primary and Secondary Education. These pillars are most important for less developed regions.*

*“The efficiency pillars are (6) Higher Education and Lifelong Learning (7) Labour Market Efficiency and (8) Market Size. The innovation pillars, which are particularly important for the most advanced regional economies, include (9) Technological Readiness, (10) Business Sophistication and (11) Innovation. This group plays a more important role for intermediate and especially for highly developed regions. Overall, the RCI framework is designed to capture short- as well as long-term capabilities of the regions”<sup>23</sup>.*

This notion of ‘regional competitiveness’ as a process drifts away from both the macro-economic and the microeconomic definitions of competitiveness. Bundling outputs and inputs of the process together as ‘pillars’ creates a taxonomy that may be somewhat useful to rank regions on a set of more or less reasonable criteria, but transforms the concept of competitiveness into a magic black box of limited practical use.

Based on the macroeconomic and microeconomic traditions, we want to put forward, instead, the idea that the most useful way to think about ‘regional competitiveness’ is in terms of a measurable relative *outcome* driven by measurable *factors*. The only meaningful outcome that can be called ‘competitiveness’ of a region is the performance of its firms relative to their competitors in benchmark regions.

The focus on firm performance has several advantages. First, while it is true that what is good performance for a region’s firms is not necessarily good performance for its people, in practice the two are highly correlated. Second, ‘competitiveness’ might be a disputed concept in the case of places, but it is a generally accepted concept in the case of firms. Third, when it comes to regional policy, much ‘competition’ between regions is about attracting ‘competitive firms’ because these hire more workers, offer better job security, pay higher wages, invest more (also in human resources), generate more revenues and profits, and therefore allow regions to raise more tax revenues for

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23. [http://ec.europa.eu/regional\\_policy/sources/docgener/studies/pdf/6th\\_report/rci\\_2013\\_report\\_final.pdf](http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/6th_report/rci_2013_report_final.pdf).

any given tax rate.

The fact that ‘competitive firms’ are better in a number of ways raises the thorny question of which measure of performance should be used to identify them. Recent developments in the academic literature on international trade come to the rescue. These developments show that all measures of firm performance are driven by firm TFP<sup>24</sup>. They also show that the best proxy of exceptional TFP for a firm is its export participation and intensity: whether or not the firm is an exporter, and how much it exports. Hence, exports become a crucial indicator of ‘competitiveness’<sup>25</sup>. This bridges the macroeconomic and microeconomic views on ‘competitiveness’, and has the additional advantage of avoiding the direct estimation of firm TFP, which often requires unachievable standards in terms of data availability and still faces some open methodological issues<sup>26</sup>. Data on European firms reveals a positive correlation at the firm level between TFP and export share of revenues. Focusing on exports has also an additional advantage related to the concept of ‘granularity’. As already discussed, ‘granularity’ captures the idea that a few selected companies play a dominant role in regional and national economic performance. Because of export costs, export participation and intensity are the best indicators that a firm belongs to that selected group because they do not require any typically noisy measure of ‘TFP thresholds’.

Specifically, consider the export activities of firms located in different EU regions and active in a sector  $s$ . Consider a EU origin region  $o$  and a non-EU export destination  $d$  that is far enough from Europe and without former colonial, cultural or language links with any EU country to be equally ‘accessible’ from all EU regions (eg China). Let  $L_{o,s}$  denote employment by sector  $s$  in region  $o$  and  $X_{o,s}$  denote exports of sector  $s$  from region  $o$  to destination  $d$ . Analogously, let  $L_s$  denote total EU employment in sector  $s$  and  $X_s$  denote total EU exports to  $d$  in sector  $s$ . Then compute the share of region  $o$  in total EU exports normalised by the share of region  $o$  in total EU employment in the sector. We take the resulting ‘normalised export share’

$$NXS_{o,s} = (X_{o,s}/X_s)/(L_{o,s}/L_s)$$

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24. See, for example, Mayer and Ottaviano (2007).

25. Firms that not only export but are also directly investing abroad (FDI) are even more exceptional. Indeed, ‘internationalisation’ in general (ie selling to customers on a global market) is what we have in mind. However, we prefer to focus on exports because data is more easily available. Considering FDI as well would increase the importance of the top 5 percent of firms.

26. See, for example, Bartelsman *et al* (2013).

as our measure of the ‘regional competitiveness’ of region  $o$  in sector  $s$ . This can be rewritten as

$$NXS_{o,s} = (X_{o,s}/L_{o,s})/(X_s/L_s)$$

which is export per worker from region  $o$  to destination  $d$  relative to the EU average. Hence, our ‘regional competitiveness’ captures the capacity of a region’s firms to outperform the firms of the average EU region in terms of exports. It is worth stressing that this does not imply that we see exporting as good in itself. Rather, we focus on exports because it is a strong indicator of the TFP of firms in the region.

According to the academic literature on which this argument is based, export proxies ‘exceptional firm productivity’ because firms have to be very productive in order to generate the revenues needed to cover the additional costs they face in serving foreign markets. Some of these costs arise from the fixed initial investment required to break into a market (such as the costs of creating a distribution network), others are recurrent and vary with the amounts shipped (such as transport costs and tariff barriers). Fixed export costs affect the number of producers that are able to export (‘extensive margin’); variable export costs affect the amount of shipments per exporter (‘intensive margin’).

To capture these two aspects, we denote the numbers of exporters and producers in region  $o$  (in the EU) by  $n_{o,s}$  ( $n_s$ ) and  $N_{o,s}$  ( $N_s$ ) respectively. This allows us to decompose the normalised export share into two multiplicative components as

$$NXS_{o,s} = (n_{o,s}x_{o,s}/N_{o,s}l_{o,s}) / (n_s x_s / n_s l_s) = [(n_{o,s}/N_{o,s}) / (n_s/N_s)] \times [(x_{o,s}/l_{o,s}) / (x_s/l_s)]$$

where  $x_{o,s}$  ( $x_s$ ) denotes average export per exporter and  $l_{o,s}$  ( $l_s$ ) denotes average employment per producer in region  $o$  (in the EU) respectively. We then use the ‘extensive’ and the ‘intensive’ normalised export shares

$$NXS_{o,s}^{\sigma} = (n_{o,s}/N_{o,s}) / (n_s/N_s)$$

$$NXS_{o,s}^i = (x_{o,s}/l_{o,s}) / (x_s/l_s)$$

to measure region  $o$ ’s ‘extensive regional competitiveness’ and ‘intensive regional competitiveness’ in sector  $s$ . These capture the extent to which regional competitiveness is affected by fixed versus variable export costs. In particular, the importance of the extensive margin suggests that firms have to be productive enough in order to break into the export market. This implies that regional competitiveness is driven not only



by the TFP of the average firm (which affects the extensive margin) but also by the proportion of local firms with a TFP that is high enough to overcome the fixed costs of exporting. Hence, our measure of regional competitiveness puts a premium on the concentration of firms in the upper tail of the TFP distribution ('granularity')<sup>27</sup>. As these are the firms that hire more workers, offer better job security, pay higher wages, invest more (also in human resources) and generate more revenues and profits, this premium is not unwarranted<sup>28</sup>.

A final caveat is in order. Our notion of regional competitiveness is sectoral in nature, the idea being that it does not make much sense to try to gauge the relative performance of two regions by comparing the productivity of firms that operate in different sectors. However, the inter-sectoral perspective can also be important from a risk-sharing point of view: is it better for a region to be very competitive in fewer sectors or somewhat less competitive in a greater number of sectors? The answer depends on how risk is shared with other regions through labour and capital mobility or redistributive policies<sup>29</sup>. Inter-sectoral specialisation might also matter in terms of growth potential because specialising in some products at the country level has been shown to bring higher growth than specialising in others<sup>30</sup>. Both aspects, however, shift the focus from regional to national competitiveness and this goes beyond the scope of our analysis.

### 3.4 Measurement issues

#### 3.4.1 Ideal data

In this section, we contrast our first best approach to the realities of data. We start by describing what an ideal dataset – building on existing but not easily accessible data – would look like, followed by a discussion of major issues and challenges. We acknowledge that while the data we need does exist, access to that data is very difficult in most countries, and coming up with a harmonised, distributed data approach is hard.

27. See Barba Navaretti *et al* (2014) for a discussion of the importance of the higher moments of the productivity distribution in explaining aggregate export performance. Duranton *et al* (2012) discuss how these moments are shaped by agglomeration economies.

28. See, for example, Gabaix (2013) for a discussion of the role of large firms in economic activity at the national level. Large firms are even more important at the regional level as implied by the notion of 'balls and bins' put forth by Armenter and Koren (2014).

29. Koren and Tenreyro (2007) show that GDP growth is much more volatile in poor countries than in rich countries for four reasons: they specialise in more volatile sectors; they specialise in fewer sectors; they experience more frequent and more severe aggregate shocks; and their macroeconomic fluctuations are more highly correlated with the shocks of the sectors they specialise in.

30. Hausmann, Hwang, and Rodrik (2007) show that, all else being equal, countries specialising in the types of goods that rich countries export tend to grow faster than countries specialising in other goods.

For any given year, the competitiveness index for a region  $o$  and industry sector  $s$  is created in several steps. The data need is quite extensive. First, we need firm-level balance-sheet data with information on the number of employees and industry classification. This data is available for almost all EU countries but often with limitations. It is missing for Croatia, for Czech Republic and Slovakia. In Poland, firms are only surveyed beyond a size limit (typically 10-50 employees).

Second, we need information about the location of the firm, at least to regional level. For several countries, a NUTS2 or NUTS3 code is directly available. In other countries, the city or the postcode of the headquarters is available in addition to financial data, although it sometimes requires merging data from corporate registries. Third, we need firm-level datasets matched with customs data with detailed information about exports, including destination countries, and ideally, products as well. Customs data is more and more available in Europe.

Provided that all data is available, the key task is to decide on aggregation details. Based on availability information<sup>31</sup>, considering NUTS2 regions, 2 digit NACE revision 2 industry classification should work for almost all countries. We present an example of the procedure using Hungarian data in the Annex to this chapter.

Another option would be to use private/survey data, as used by Konings and Marcolin (2011). The advantage of such dataset is availability for many countries. At the same time, in the absence of trade data, it can only use balance-sheet information that is often hard to compare across countries that differ substantially in accounting and reporting standards.

### 3.4.2 Data problems and challenges

#### A: Regional definitions

Before turning to data issues to generate our preferred variable, we should acknowledge that the administrative definition of region does not necessarily coincide with the relevant definition based on interactions. A key area of study in economic geography is the modifiable area unit problem, the notion that aggregation based on different scopes and boundaries might yield different outcomes. In particular, the size of regions seems to be an important driver of some measured elasticities<sup>32</sup>.

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31. See chapter 2 of Castellani and Koch (2015) as well as <http://mapcompete.eu/meta-webtool>.

32. See Briant *et al* (2012) and Békés and Harasztosi (2015).

Another aspect, recognised by the EU in its competitiveness report by Annoni and Dijkstra (2013, p5) is related to accounting for employment in large cities. This is not a problem for Paris (as Ile-de-France includes commuters), but it is for London, which is actually cut into two NUTS2 regions. The problem is also particularly significant for Brussels, Prague, Berlin, Amsterdam and Vienna. Annoni and Dijkstra (2013) detail several other regional boundary-related issues.

Given data requirements, this is not a real issue for us. NUTS2 seems the realistic area of study. Looking at evidence from MAPCOMPETE, we know that data is typically collected according to the administrative definition, at NUTS2 or NUTS3 level. It is only in a few countries, such as France or Hungary, where data might be actually linked to corporate registries with information on the municipality in which the firm is located.

One potential solution might be to start with NUTS2 level, but consider some additional regional aggregation.

#### **B: Narrow industries, small regions**

Calculating this index faces a challenge specific to the use of anonymised data: data providers retain the right to suppress observations to prevent external identification of corporate data. In particular, calculating values at regional and sectoral level often runs into secrecy problems. One typical barrier to computation of each region-sector cell is a minimum requirement of firm count: each cell has to be made up of at least a few firms (3-6 depending on countries). This might be an issue when sectors are narrowly defined or regions are small. At this stage we believe this not a major issue, but it might matter for small regions and small sectors – requiring sectoral aggregation.

#### **C: Extreme granularity – top-firm accounting**

The next problem is more important because it goes to the core of our exercise. Data providers also suppress cells when one firm is too important (for example, its sales represent more than 70 percent of total sales of firms in that cell). As a result, when the sector-region cell includes the top firm in that sector, the cell result may be suppressed even if there are other firms present. Given the narrow approach, this can generate a huge bias.

These problems could be reduced by aggregating industries (such as food and beverage) or aggregating regions. This is a key reason for choosing NUTS2 as more realistic

level as opposed to NUTS3<sup>33</sup>. However, the large-firm problem might still arise and there is no easy fix. It can only be solved by cooperation between national statistical institutes and Eurostat.

Beyond issues relevant to this index, the main obstacle in calculating our preferred index is access to data. As argued by Koch and Castellani (2015), data availability is typically good to excellent in EU countries, but accessibility is often rather difficult. To calculate our index, one needs access to the raw data. However, because of differences between countries and lack of access points for researchers, this latter approach is rather cumbersome. Furthermore, in several countries, such as France and Germany, there are legal barriers to access.

As a result, the only possible way to calculate these indices would be to get Eurostat to coordinate a project with scientific involvement, through which national statistical offices would calculate values based on a common and harmonised approach.

#### **D: Firms: observation and reality – from establishments to value chains**

The typical unit of observation is the legal entity. This might cause problems in the presence of multi-plant firms or business groups. When part of the economic activity takes place in other location away from the headquarters, performance might be wrongly assigned. In several EU countries, there are plans to improve data quality and collect information about establishments and groups, but in the short run, this is an important caveat to any index.

Another measurement problem relates to multinational groups. Data on exports to non-EU countries is collected and assembled by national and EU institutions. Ideally, the final destination is recorded. However, multinational companies exercise great freedom in terms of organising in which country authorities actually carry out customs procedures. Hence, a multinational company's Czech affiliate might export to China, but this will not be picked up because the company might concentrate its customs activity in, say, the Netherlands. Once again, there is very little we can do other than acknowledge that our measure is likely to be biased towards regions that are more specialised in global commerce.

In particular, some sectors might be organised rather differently in terms of value chains and distribution networks. This might lead to countries that are specialised in

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33. To see NUTS3 level data, one should aggregate sectors into a handful of macro sectors.

some sectors exporting more or less directly to non-EU countries. Industries with flatter value chains should create less bias because of the presence of distributors or specialised trading subsidiaries in some countries. For our purpose, we compare sectors instead of aggregated economies, and we may disregard the wholesale sector.

### E: Business services

Trade in services is typically not as well accounted for as trade in goods, potentially mis-measuring performance of regions with strong service sectors. Fortunately, trade in services is included in firm-level data<sup>34</sup>. The bad news is that measurement and pricing issues might typically be of greater importance for services than for trade in goods.

## 3.5 Conclusion and suggestions

This chapter addressed some core issues discussed in this Blueprint. Granularity and the roles of large firms are crucial to understand why regional competitiveness and efforts to attract these firms are at the centre of many regions' and cities' policies. The focus on exporting and the separation of extensive and intensive margins also underlines that performance of regions hinges on their capacity to foster firm development. Only the most productive firms will be able to perform on global markets, and it is the growth of these firms in a given region – by reallocation of resources from less productive firms – that will generate high-paying jobs for the region's employees. Here, we have argued for a new approach in thinking about regional competitiveness and offer a new measure of this.

First, we argued that there are some solid economic arguments in favour of thinking in terms of regions as units. Proximity matters because agglomeration externalities influence firm performance, these externalities decay fast with regions being close to a relevant area for most spillovers, and granularity is key, as a few large firms matter regionally more than in countries.

Second, we made a case in favour of an index that captures performance directly rather than by averaging values from a mix of indicators. Such an 'outcome' measure has the advantage of transparency and allows for future enquiries about the relationship between outcome (firm performance) and potential drivers such as infrastructure or local R&D. Third, we proposed a measure based on firms' sales in non-EU markets. This approach has the advantages of comparability across EU countries and easy calculation.

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34. Included in trade data, HS6 starting with 98 and 99.

Finally, we looked at data availability and access across Europe and concluded that our index might be calculated given available data for almost all EU countries. However, such an exercise would require either Eurostat coordination, or collaboration between a large number of institutions. We believe that what is needed at this stage is a Eurostat-coordinated effort – with potential researcher participation. Once the index is calculated, future research can concentrate on the analysis of key drivers of differences in firm performance in various regions. Coordination with national statistical institutions is also key in order to manage confidentiality issues.

Furthermore, with improved data quality, research into the importance and structure of business groups, the diversity establishment networks and accounting practices for the trade in services might shed light on potential biases in measurement.

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## Annex

### A: Example: Hungarian regions

Before creating variables, one needs to make some choices: (i) how to best define outside markets, (ii) what regional aggregation, and (iii) what sectoral aggregation. Here, we use all countries outside Europe<sup>35</sup>. As for regional aggregation, NUTS2 level is necessary to get sensible sector-level values. NUTS3 is only possible when using total economy aggregates – ie when we assume simple additivity of industry competitiveness values. For most sectors, 2-digit level is the maximum to get enough firms. For a few broad sectors, such as machinery, 3-digit level would be possible.

The first step uses firm-destination-product specific data, mostly available from customs. Product data is typically available at HS6 level. There are two alternatives to get sector-level values when exports are given at product level. The more direct approach is to sum export sales by products and apply a product-sector conversion filter to get firm-destination-sector-level export data. We suggest using 2 digit NACE rev2 industry setting. The second, easier but less precise approach is to classify all a firm's exports by the firm's primary NACE code.

For each firm-NACE, calculate  $XO_{id,nace}$ : Firm-NACE-Export to outside Europe,  $X_{id,nace}$ : Firm-NACE total export. Then generate  $XOS_{id} := \text{sum of } XO_{id,nace}$ ;  $XS_{id} := \text{sum of } X_{id,nace}$ . As noted earlier, NXS per region and sector is calculated as  $\{XO_{s/Lo,s}\}/\{Xs/Ls\}$ .

The second step, is to work on firm level data to calculate, for each firm,  $L_{id}$  as the number of employees and  $Y_{id}$  as the total sales of firms. We can generate  $L_{id,nace} := L_{id} * X_{id,nace} / XS_{id}$

35. EU28+ Andorra, Belarus, Bosnia and Herzegovina, Iceland, Liechtenstein, Macedonia, Moldova, Monaco, Montenegro, Norway, San Marino, Serbia, Switzerland, Ukraine, Vatican City.



In the third step, we need to merge data to have firm-NACE level observations. We sum by region-sector, to get total exports to outside EU by sector and region and to calculate number of firms per region-sector, number of firms exporting to outside EU per region-sector so that we can discuss extensive and intensive margins. Finally, we create number of employment per sector-region using `L_id_nace`.

Table 1 presents NXS index values for NACE2 manufacturing sectors in Hungary. Calculations are based on total non-Europe (EU28+) exports<sup>36</sup>. For instance, let us consider the food manufacturing sector (#10). By dividing exports value by employment, and comparing them across regions, we disregard specialisation (ie the number of firms). According to our measure, in this industry, the most competitive region is South-East Hungary, where an average-sized firm exports to outside EU twice (215 percent) the Hungarian average.

NUTS2 region	Food	Light industry	Wood	Chemicals	Raw materials	Fabr. Metal
Budapest/Centre	131%	112%	48%	116%	120%	88%
Centre-West	32%	40%	335%	35%	102%	170%
West	65%	93%	100%	45%	118%	167%
South-West	25%	165%	135%	10%	7%	6%
North	29%	46%	24%	170%	4%	64%
North-East	63%	87%	10%	159%	194%	83%
South-East	215%	107%	11%	27%	49%	31%

NUTS2 region	Electrical	Machinery	Motor	Other manuf.	Man. average	Business services
Közép-Magyarország	83%	102%	20%	80%	<b>90%</b>	133%
Közép-Dunántúl	293%	158%	170%	206%	<b>159%</b>	76%
Nyugat-Dunántúl	56%	207%	298%	22%	<b>121%</b>	5%
Dél-Dunántúl	<b>91%</b>	14%	5%	14%	<b>45%</b>	24%
Észak-Magyarország	29%	88%	84%	197%	<b>67%</b>	35%
Észak-Alföld	82%	47%	4%	136%	<b>78%</b>	N/A
Dél-Alföld	13%	28%	47%	31%	<b>58%</b>	58%

Source: Central Statistics Office Hungary. Notes: The table shows NSX values for Hungary, at 2-digit NACE2 industries and NUTS2 regions. Values are calculated with only Hungarian data, ie 100 percent would be the average region-sector value in Hungary. Red numbers are based on imputations because of suppressed data (too few firms or presence of very large firms). Business services: some selected sectors available in data.

36. We repeated this exercise for EU28 exports and found a 60 percent correlation. China alone cannot be determined at 2-digit industry level.

Considering manufacturing, the West and Centre-West regions are the most competitive on average (weighted by employment in industries), followed by the Central region (including Budapest). As is visible from the table, there is substantial variation between regions. South-West does well in food, while North is competitive in chemicals.

### *B: Example: EFIGE results for selected EU regions*

In the absence of official data, one could use private data or survey information. One possibility could be to use Amadeus, the European firm-level database compiled by Bureau van Dijk. Data includes balance-sheet information including export sales. However, this information is not available for most countries. The EFIGE survey offers a way to compare regions in selected countries. The dataset covers 14,800 EU manufacturing firms with at least 10 employees, located in seven countries: Austria, France, Germany, Hungary, Italy, Spain and the United Kingdom. The dataset includes a great deal of information about the internationalisation activities of these firms<sup>37</sup>.

The advantage of the EFIGE dataset is that for each firm, we know the share of sales exported to outside Europe, calculated by multiplying (i) the ratio of exports to sales and (ii) the ratio of non-Europe exports to total exports. Unfortunately, the sample is not large enough to consider sectors.

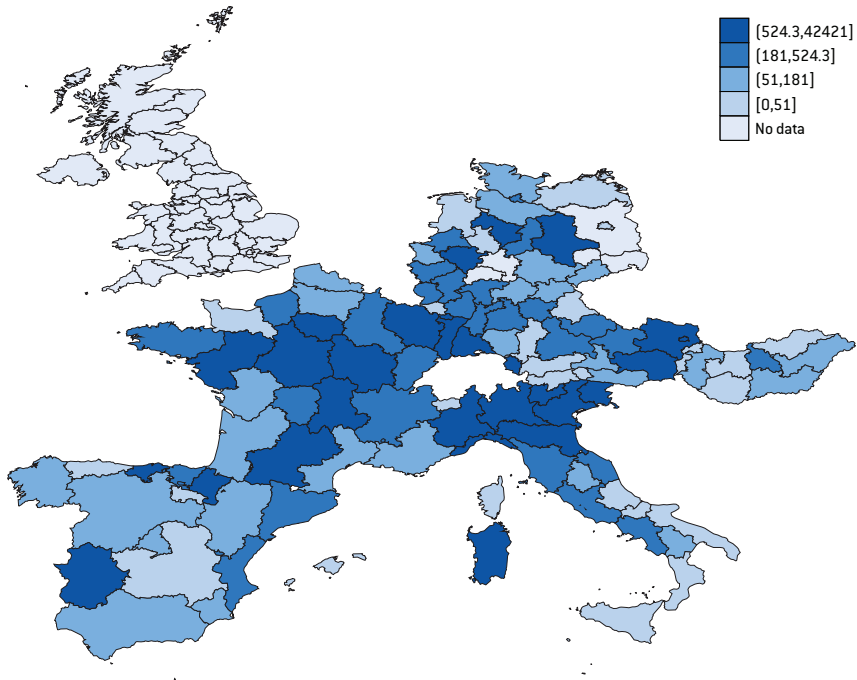
Before turning to results, please note that the EFIGE dataset does not include exports values, only size of the company by workforce. To partially remedy this, we merged the data with information from Amadeus on total sales revenue. As a result, we generated our preferred index for most regions in six countries – Amadeus sales data is very poor in the UK. We also generated a simplified index, available for all regions in the sample: instead of adding up export sales in euros, we weight ‘normalised export share’ by labour only. Hence our second measure, is a regional labour weighted average non-Europe exports to sales ratio.

Highest index values are attained by regions in the centre of France, north west of Germany, north of Italy and some regions in Austria. Low values are attached to Hungarian regions apart from the Centre, southern Italy, the eastern part of Germany and eastern Spain. The simplified measure would put a great many UK regions on top as well. Of course, this is just an illustration of our approach. Given data weakness, actual results should be treated with great caution.

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37. For details, see Altomonte *et al* (2013).

Figure 1: Map of NSX regional competitiveness index



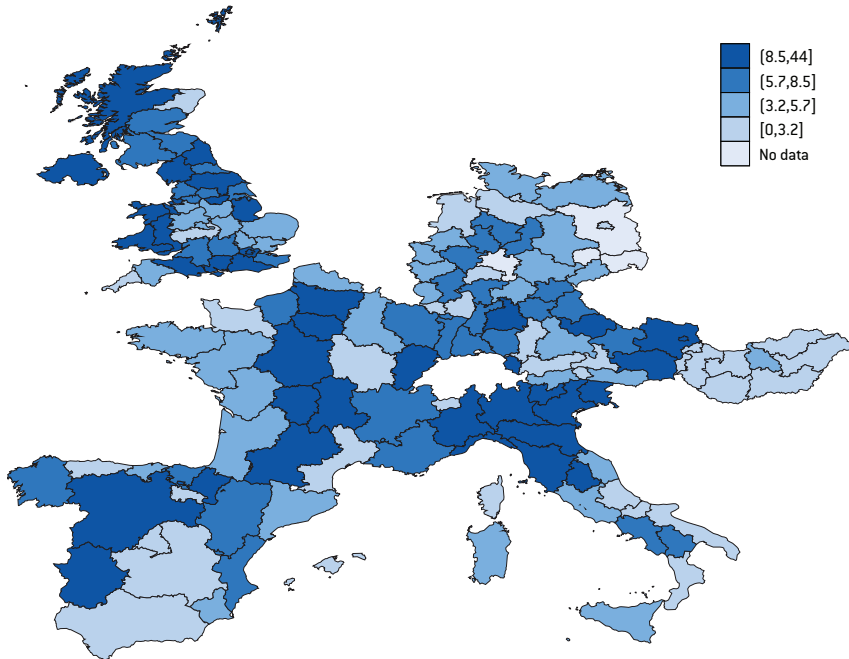
Source: MAPCOMPETE. Notes: Calculated using the EFIGE survey for 2009. The index is calculated for most but not regions in the sample in 6 EU countries (no UK data). Generated by weighing non-Europe export values by labour (as defined above).

Finally, as noted in Section 3, we can calculate extensive and intensive margins, and hence, investigate to what extent the share of firms exporting outside of the EU in a region might determine that region's performance. To do that we consider the EFIGE universe as representative, and calculate the share of firms exporting overseas compared to all firms. A simple OLS regression of the NSX index value on the share of overseas exporters suggests that the number of firms explains about 20 percent of a region's performance, while 80 percent is explained by the average non-EU export share of firms. Of course, this is just a simple exercise disregarding sectors.

For each region, we can calculate the difference between index value and its predicted value – based on the number of firms exporting overseas. Table 2 shows the relative importance of average export share – calculated as mean of regional values per country. This shows that Austria is special in the sense that the non-EU export performance of Austrian regions is well above the levels suggested by the number of firms. Of

course, this might just be a small-sample issue (fewer Austrian firms in the sample, more prone to bias), but it shows that with better data, this could be an interesting issue.

Figure 2: Map of NSX regional competitiveness index – simplified version



Source: MAPCOMPETE, EFIGE dataset. Notes: Calculated using the EFIGE survey for 2009. The index is calculated for all regions in the sample in seven EU countries. Simplified version: generated only by using number of employees as weights disregarding labour productivity.

Table 2: Relative importance of firm average	
Country	Relative of firm average
Austria	2.91
France	0.50
Italy	0.20
Hungary	-0.46
Germany	-0.83
Spain	-0.86

Source: MAPCOMPETE.

# 4 Resource misallocation and aggregate outcomes: towards better assessment of competitiveness

Lionel Fontagné, Gianluca Santoni and Chiara Tomasi

## 4.1 Introduction

From a firm-level point of view, measures of competitiveness are based on solid economic theory foundations<sup>38</sup>. Being successful in business is not just about gaining market share relative to competitors: it relates to the overall efficiency of the firm in transforming inputs into outputs at the lowest possible cost (ie productivity). Since this capacity is very unevenly distributed between firms within sectors, one of the key drivers is ease of resource allocation. A relevant feature from the empirical literature is however that resources do not flow freely from the least to the most productive firms, even if more efficient firms are the most likely to survive in the market. Several market distortions might thwart this process, including search, hiring and firing costs; capital adjustment costs; distorted taxes and subsidies; hold-up and contracting problems. A better knowledge of the economic forces shaping this process is essential in order to design sound and effective policies.

The large variability at firm level is not confined to productivity (ie total factor productivity, TFP). Sales growth rates in the US, for example, show a standard deviation of about 50 percent (Davis *et al*, 2007), which translates for one third of the firms into an expected growth of more than 60 percent and for another third an expected decline of more than 40 percent.

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38. See <http://mapcompete.eu/theoretical-and-policy-aspects-of-competitiveness-at-different-aggregation-levels/>.

The high variability of firms' productivity, sales, entry and exit rates suggest that aggregate indicators might not be able to capture the degree of resource 'churning' at the micro level, within a sector or a region. Typically, a one percent aggregate increase in an economic figure (eg number of jobs) is the outcome of individual performance ranging at least from plus to minus 10 percent at the micro-economic level. This is where allocation of resources plays an important role: notwithstanding the more structural employment shifts, the capacity of churning to drive resources within sectors towards the most efficient firms is conducive to aggregate performance.

Beyond within-sector firm heterogeneity, productivity differences are meaningful to understand cross-country income differentials (Syverson, 2011; Hsieh and Klenow, 2010). A large portion of productivity differentials between countries can be attributed to input misallocation: with the distribution of resources between heterogeneous firms have relevant consequences for aggregate outcomes in relation to both output and allocation efficiency<sup>39</sup>. At the sector level, competitiveness and productivity are determined by heterogeneous individual firm performance and by the shape of the firm-size distribution.

But how can this inefficiency in allocation of resources between firms within a given sector be gauged? To get an idea of the order of magnitude of such inefficiencies, Syverson (2004) reports for the US a TFP ratio of 1.9 among firms at the 90 percentile and 10 percentile of industry distribution: within a narrow defined sector, the most productive firms are able to produce almost twice the output of the less productive, with the same amount of inputs. The degree of misallocation is even higher in China and India, the gain in TFP by achieving the same allocative efficiency as the US would be between 30-50 percent for China, and as much as 40-60 percent for India, while the increase in output would be almost two times higher<sup>40</sup>.

A complementary approach to measuring the degree of allocative efficiency in different countries, or within countries over time, is worth considering. This can be envisaged from different points of view.

The first approach to evaluate the degree of resource misallocation looks at the dispersion of revenue-based productivity (Syverson, 2004; Hsieh and Klenow, 2009). The rationale is that, without distortions, revenue-based productivity should be equal for all firms in the same sector as differences in physical productivity are fully com-

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39. See Syverson (2014), Dhingra and Morrow (2014).

40. See Hsieh and Klenow (2009); US productivity naturally displays gaps and a degree of misallocation; the distribution is used just as a control group.

compensated by firm price differentials. In other words, the marginal revenue products of labour and capital should equate across firms. The higher the dispersion of productivity (marginal products), the higher the degree of distortion faced by firms.

The second approach is grounded in a statistical argument: if resources were allocated in a purely random way between firms, the covariance between firms' size and productivity would be zero (Bartelsman *et al*, 2009). Conversely, the higher the covariance the more efficiently resources are allocated between firms<sup>41</sup>. The authors find that for the US, the overall productivity is 50 percent larger than what a random allocation of resources would give. Although there is misallocation of resources in the US, the outcome is much better than a random allocation: more productive firms are larger while the least productive are smaller than in the random case. This deviation from the random benchmark is lower in Europe in general, pointing to less efficient allocation of resources between firms.

Market rigidity, distorted regulations and other frictions might weaken the correlation among firm size and productivity; at the limit (pure randomness), no difference is expected between entering, exiting and incumbent producers in their fundamentals (such as size and productivity). Bartelsman *et al* (2013) provide a theoretical model using heterogeneous firms and adjustment friction where the aggregate outcome is significantly affected by selection and resource allocation<sup>42</sup>. The empirical evidence reported in CompNet (2014)<sup>43</sup> confirms the findings of Bartelsman *et al* (2009): from 2003-07 the distribution of inputs between firms in Europe could have been improved significantly<sup>44</sup>.

A third and last approach starts from the microeconomic optimisation problem at firm

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41. The procedure, following Olley and Pakes (1996), uses the covariance between firm size and productivity within sectors to assess the efficiency of input allocation. Note that this is the static version of allocative efficiency, on a cross-section framework; see Haltiwanger, (2011) for a discussion on static and dynamic allocative measures.

42. According to the model, an increase in the dispersion of distortions decreases aggregate consumption. Given the extremely high correlation between consumption and output, it is likely that the same negative shock in distortions should imply a decrease in output per capita; see Bartelsman *et al* (2013), online appendix.

43. The Competitiveness Research Network is composed of economists from the 28 national central banks of the European Union member states and the European Central Bank, international organisations (World Bank, OECD, European Commission), universities and think-tanks, and non-European Central Banks (Argentina and Peru) and organisations (US International Trade Commission). CompNet's objective is to develop a more consistent analytical framework for assessing competitiveness, with a better correspondence between determinants and outcomes.

44. Results from Bartelsman *et al* (2013) report relatively higher covariance for European countries than CompNet, ranging from 15-38 percent and confirming a sizeable efficiency gap relative to the US benchmark. The difference between the two estimates relies on the combination of different weighting schemes in the two studies (in terms of value added or employment of sectors) and different definitions of productivity (in terms of turnover or value added per employee). Using the Bartelsman *et al* (2013) approach, we basically replicate their results for France.

(or even plant) level, and aims to assess the extent to which firms depart from optimal use of any factor. Resource misallocation defines the output loss due to inefficiencies in input allocation at the firm level, and the impact of policy change at both firm and aggregate level (Petrin and Sivasadan, 2013). This is the approach we follow in this chapter.

We show that labour gaps have been increasing during the 2000s, and that general determinants (distortions) have been driving this evolution, notwithstanding some evidence of sectoral shocks. Controlling for firm characteristics, we observe – after a transitional increase in negative gaps in 2001 and 2002 – that most of the adverse evolution falls on the positive gaps. This means that the most productive firms after 2003 were unable to grow at the expected pace. The small firms are more affected by distortions but this disadvantage has increased at a slower pace over time. Similarly, the 50-employees discontinuity associated with regulations in the labour market is present, but does not explain the worsening of the situation. We conclude from this that more subtle micro-economic developments (the difficult reallocation of resources between firms within sectors) have contributed to the deterioration of the aggregate performance of French industry.

#### 4.2 From micro shocks to aggregate performance

There are two channels that link microeconomic and aggregate performance. First, the huge dispersion in firm-level outcomes implies that micro-economic behaviour does matter for aggregate performance of a sector in a given country, or even for a country's aggregate competitiveness. The evolution of several macro-economic forces, such as productivity, value added, employment and investment are then closely related to what happens at the micro-level. The 'granular' hypothesis shows how the idiosyncrasies of large firms affect aggregate GDP fluctuations and, through general equilibrium channels, all other firms as well (Gabaix, 2011)<sup>45</sup>. For the US economy, shocks affecting the top 100 firms are responsible for one-third of the country's GDP fluctuation.

A significant consequence of such micro and macro interdependence is that productivity shocks (such as R&D, investment behaviour or management changes) that affect firms have a non-negligible impact on the state of the economy. The effect of firms' 'granularity' is also visible in export growth rates volatility (di Giovanni *et al*, 2014). Up to half of the aggregate export volatility is due to firm-specific demand shocks, and

45. The law of large numbers no longer applies if the distribution of firms' sales departs from normality and displays a 'fat tail'.



the magnitude of the firm-level contribution is equal to the sum of sectoral and macro-economics ones (common to all firms).

Sectoral links might act as another network through which microeconomic shocks transmit and eventually generate “*cascade effects*” (Acemoglu *et al*, 2012). When production structures imply inter-sectoral dependence (via the Input-Output mechanism), microeconomic fluctuations do not average out at the aggregate level. The previous evidence confirms that microeconomic characteristics at firm, sectoral and regional level, significantly affect macroeconomic outcomes in terms of both output and economic performance, suggesting that micro-macro linkages play a crucial role in shaping aggregate competitiveness.

The second channel relates to how resource allocation matches firm heterogeneity. Basically, resource misallocation within a sector implies that more efficient firms tend to be smaller than their optimal size, while less efficient firms tend to be bigger than optimum. This differs from the traditional view of countries specialising in sectors according to their advantage and hence improving their overall efficiency. Within-sector efficient allocation of resources comes on top of inter-sectoral efficiency in resource allocation.

What one expects is indeed a reallocation of economic activity at firm level that tends to benefit highly productive (low-cost) producers, resulting in an aggregate improvement; but several factors might hamper this continuous flow of resources from less to more efficient firms: business cycles<sup>46</sup>, labour and capital rigidity, the regulatory environment and competition. Accordingly, firm-level outcome variability is a crucial element in the design of policies in several fields: wage dispersion, employment flows, business dynamics, productivity growth and technological change industry evolution (Syverson 2014).

The awareness of the constraints preventing more efficient re-allocation of inputs within sectors is relevant from a country perspective: it would be possible to boost productivity (and by that raise income) by reallocating within sectors inputs and resources already employed. But given the scale of the phenomenon, designing appropriate policies to correct resource inefficiencies is a perilous exercise that requires lots of information.

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46. Lazear and Spletzer (2012) show that such reallocation of labour seems to be more relevant during expansionary periods than recessions.

### 4.3 Measuring resource allocation gaps

Given the highlighted interconnections between micro- and macroeconomic forces, the quality of resource distribution across businesses could have significant effects on productivity and per capita income at country level. As noted before, input or output market imperfections (or any distortion) can create an incentive for less-productive firms to produce too much while hindering the most efficient firms. Under such circumstances, the economy is producing less than its resources would allow solely because of inefficient distribution of resources. In order to evaluate the loss in output because of a change labour market regulation in Chile, Petrin and Sivasadan (2013) propose a new methodology to evaluate the degree of resource misallocation at the firm level.

The following empirical work relies on Petrin and Sivasadan's (henceforth PS) methodology. Their approach, based on plant-level productivity estimates, aims to define the output loss because of inefficiencies in the allocation of inputs and the impact of policy change at both firm and aggregate level. The key concept of firm specific 'mis-allocation' is reflected in the *"gap among the value of the marginal product and marginal input price"* (PS, 2013). Such gaps are computed at firm level using the estimated coefficients from usual TFP analysis and they can be further aggregated at sector or spatial level. Moreover since those gaps are expressed in monetary terms, the direct aggregation gives the value of lost output due to the induced distortion in resource distribution across firms.

The economic intuition behind the methodology is that in a standard microeconomic optimisation problem, an input's value of marginal product is equated with its marginal cost, but many phenomena might move an economy away from such equilibrium. The analysis of firms' gap distribution is useful also to identify sectors (or regions) with the higher degree of 'misallocation' and to evaluate such misallocation in monetary terms. More importantly, the PS identification strategy works for evaluating policy changes or macro-shocks to the input environment (mark-ups, hiring, firing and search costs, capital adjustment costs, taxes and subsidies, hold-up and other contracting problems, and non-optimal managerial behaviour).

### 4.4 Data

The evaluation of input allocation is performed using balance-sheet firm-level data to retrieve TFP estimations, from which we derive the marginal contribution of production inputs. Using firm (or industry) specific input prices it is possible to derive a monetary

value of the allocation inefficiencies at firm level. The main source of firm-level data is the French BRN<sup>47</sup> dataset obtained from the fiscal administration. It contains balance-sheet information collected from firms' tax forms, along with detailed information on firms' balance sheets, including total, domestic and export sales, value added, and many cost items including wages, materials expenditures and so on, along with the sector and the region in which the firm operates.

The dataset covers the period 1993-2007 and gives a very detailed representation of the aggregate economy. We stop our exercise in 2007 in order to leave aside the different responses of firms to the subsequent economic crisis. The fact that the information comes from tax authorities ensures an overall very high quality of data. After excluding implausible observations, namely those reporting negative or zero values for our variables of interest, and cleaning the data of potential outliers<sup>48</sup>, we end up with an unbalanced panel of more than 137,000 firms for the French manufacturing

	No. firms	% single plant	% within same <i>département</i>
1993	69,740	0.795	0.891
1994	68,268	0.805	0.897
1995	69,232	0.811	0.901
1996	67,728	0.811	0.9
1997	69,407	0.809	0.899
1998	68,849	0.807	0.897
1999	68,624	0.807	0.897
2000	67,798	0.801	0.895
2001	66,409	0.795	0.891
2002	67,241	0.791	0.89
2003	66,557	0.79	0.889
2004	65,717	0.79	0.889
2005	64,232	0.779	0.883
2006	63,062	0.777	0.882
2007	63,122	0.779	0.884

Source: Fontagné and Santoni (2015).

47. *Bénéfice Réel Normal*, the normal tax regime for French firms. Database was accessed at the Banque de France.

48. We exclude observations with a growth rate of TFP variables – value added, fixed capital, material inputs and services – above/below the 99th/1st percentile of the relative distribution. We also make sure that firm balance sheets covers 12 months. Results are robust to changes in the thresholds.

sector<sup>49</sup>. Yearly, we have around 67,000 firms of all sizes and single-plant firms represent 80 percent of the observations: meaning that in the vast majority of the cases we observe production functions at the plant level. In addition, most firms, even if multi-plant, are located within the same *département*.

#### 4.5 The dynamics of TFP

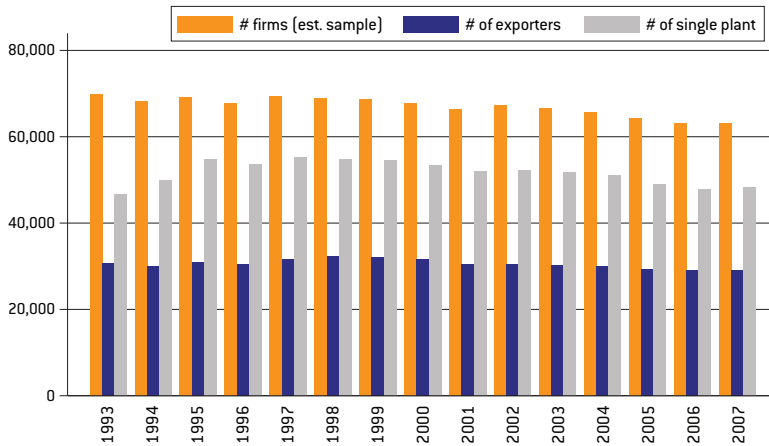
Before outlining our results in terms of productivity, we must check whether composition effects drive the observed results: the population of firms is not constant and we know from the repeated evidence in the literature that exporters are more productive. Accordingly, a changing proportion of exporters in the population might change the aggregate outcome. We observe in Figure 1 that changes in the proportion of exporters in our sample are marginal and will hardly affect the results. Out of a yearly population of roughly 67,000 statistical units belonging to the manufacturing sector, we have some 30,000 exporters.

We can now examine the distribution of TFP across firms across time. In Figure 2, we plot this distribution for three years: 1995, 2000 and 2005. We observe two phenomena: a shift to the right and a flattening of the distribution. This means that firms are overall increasingly productive over time, notwithstanding a slightly higher dispersion. Such an increase in productivity over time does not come as a surprise: technical changes and the ongoing rationalisation efforts of firms confronted with competition necessarily translate into increases in efficiency in the absence of a major economic crisis. This does not mean however that the use of resources is increasingly close to optimal efficiency. Notwithstanding the trend in aggregate productivity, inefficiencies in factor allocation might be an obstacle to fully reap gains associated with technical progress. Evidence for such misallocation is provided by the labour gaps that we computed.

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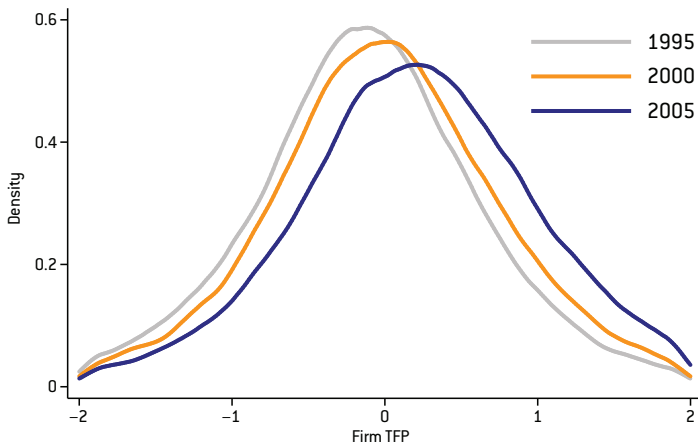
49. We limit the analysis to the manufacturing sector only to ease the interpretation of TFP estimation coefficients as marginal products; the underlying methodology however can be applied to other sectors as well.

Figure 1: Distribution of firms in the manufacturing sample, number of exporters and single-plant firms



Source: Fontagné and Santoni (2015).

Figure 2: TFP distribution of firm values, selected years



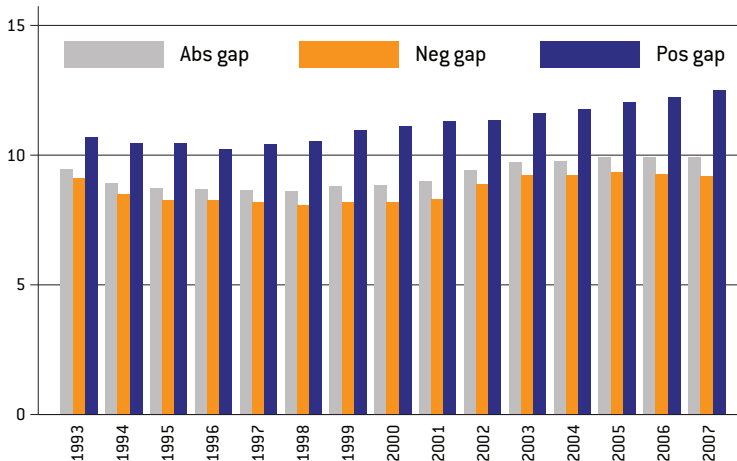
Source: Fontagné and Santoni (2015). Note: Figure 2 reports the distribution of manufacturing firm TFP for selected years. Values have been standardised to have zero mean and a standard deviation equal to 1. The three distributions are statistically different at 1 percent confidence level.

#### 4.6 The labour gap: the value of resource (mis)allocation

As explained in the preceding section, we estimate, within each sector, the marginal value attached to the misallocation of labour between firms, based on a simple production function with constant returns to scale (an assumption supported by the data). The gap is defined as the real value of the marginal product of an additional worker in a plant (or firm) minus the associated cost for that firm. A positive gap means that it would be worth hiring one more worker, while vice versa for the negative gap. Within a given industry, some firms are ‘too large’ in terms of employment and other firms are ‘too small’. The annual difference between marginal product and factor cost could for instance be €15,000 in a firm and -€5,000 in another firm. The average gap is then simply defined as the mean of the absolute values of the two, €10,000 in this example.

Figure 3 shows the mean negative and positive gaps for the manufacturing sector, after aggregating individual gaps by firm value added, and similarly sector-level gaps with sector-level value added. This choice is consistent with our definition of the marginal product in value added (and not in turnover) terms. The order of magnitude of the average gap in French manufacturing firms is approximately €10,000. This decomposes to a large positive mean gap and a more limited negative mean gap. However, the frequency of the negative gap is much higher than that for the positive gap, which drives the absolute value of the absolute gap close to the absolute value of the negative gap.

Figure 3: Average labour gap, €000s – real terms – manufacturing sector

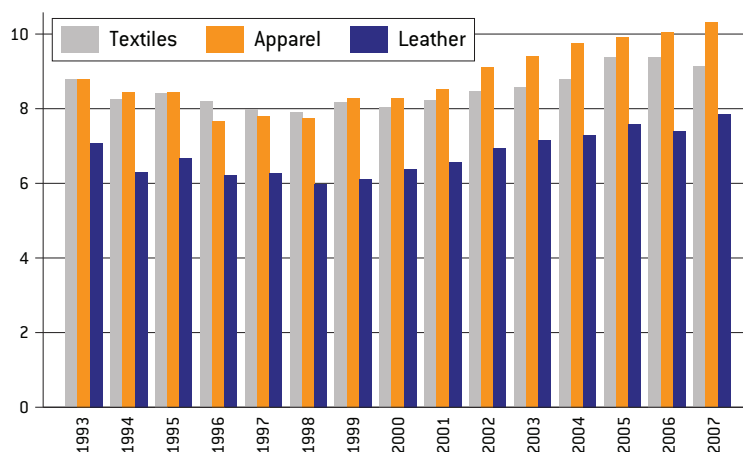


Source: Fontagné and Santoni (2015).

The second result is that the absolute gap has been increasing in the 2000s (Figure 3), pointing to an increasingly inefficient allocation of resources and possibly revealing distortions hampering economic optimisation at firm level. This evolution contrasts with the slight decrease and subsequent relative stability of the gap up to 2002.

In certain clearly identified sectors, external shocks may have imposed rounds of restructuring, leading to transitory gaps. The case of clothing illustrated in Figure 4 is a good example. The Chinese accession to the World Trade Organisation (WTO) in December 2001 and the progressive phasing out of quotas associated with the Agreement on Textiles and Clothing are a good example of an external shock imposing a profound shift of resources within the affected sector in high-wage countries in the early 2000s. Companies able to cope with such tough competition are present in different market segments and have different positions in global value chains. Figure 4 shows that recently clothing (which was first affected by this shock) has exhibited a worse evolution than to the two related sectors of textiles and leather.

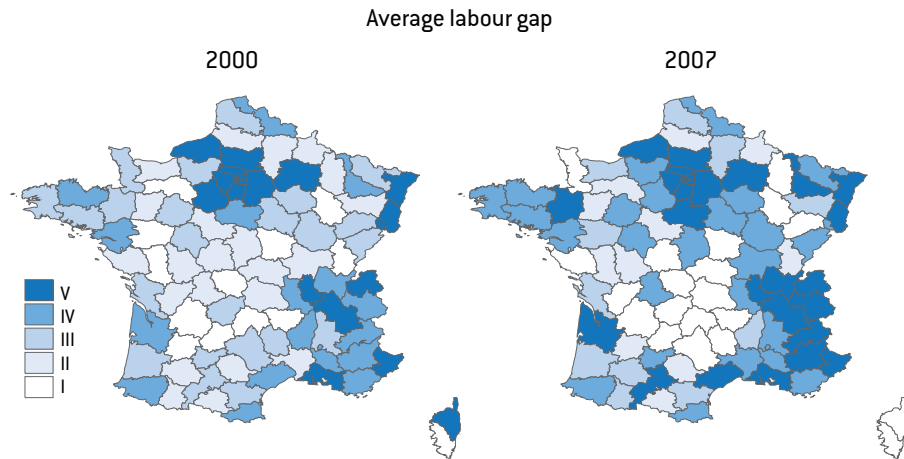
Figure 4: Average absolute labour gap, €000s – real terms – selected sectors



Source: Fontagné and Santoni (2015).

However, not all manufacturing sectors have been confronted with external shocks, and internal factors might well have prevented factor reallocation between firms in France in the 2000s. A detailed analysis of the evolution of labour and product markets regulations would be needed to identify these determinants. This would go beyond our objectives in this chapter, which simply aims to provide evidence for such gaps.

Figure 5: Geographic distribution of labour gaps



Source: MAPCOMPETE. Note: Labour gaps computed for single-plant enterprises. Darker blue indicates a larger mean gap.

One way to address the previous question – do we observe a general widening of the gaps or is it a sectoral phenomenon? – is to observe the gaps at geographical level. Figure 5 shows the mean gap for each French *département* in 2000 and 2007 and asks whether the adverse evolution of the gaps is geographically concentrated, which would suggest a strong sectoral dimension, or dispersed suggesting more horizontal phenomenon. We also expect a more detrimental evolution in peripheral regions because of the increasing toughness of international competition. To proceed, we focus on single-plant firms, because multi-plant companies might have plants located in different *départements*.

The evidence on the geographical distribution of labour gaps in 2000 is clear-cut, and not necessarily intuitive: gaps are concentrated in the Ile de France, or close to France's eastern borders. In order to correctly interpret this snapshot, it must be kept in mind that we are considering gaps in value terms, and that we have not controlled for the characteristics of the *départements*. Locations with high value added per employee on average could well have larger gaps other things being equal. As a confirmation of this hypothesis, one can double check that peripheral regions (the centre of France lacks connections to good infrastructure and has limited urbanisation) exhibit limited gaps in cross section. More interestingly, the evolution of gaps over time confirms the impression. The magnitude of the mean gaps is increasing in most places, suggesting that the overall worsening of gaps observed from 2000-07 is neither driven by sectoral



nor geographical shocks but mirrors a systematic increasing difficulty of reallocating resources between firms in that period. We now turn to the evolution of labour gaps with the aim of better understanding the mechanisms at work.

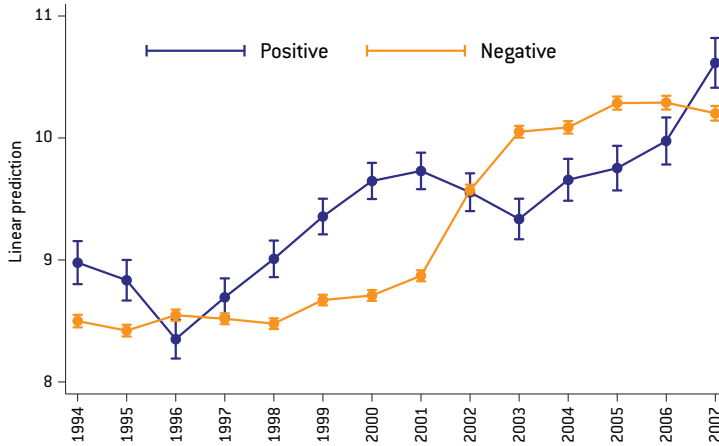
#### 4.7 Labour gap: mechanisms

We have so far observed the value of labour gaps without controlling for the characteristics of the firms or for their locations. We now assess the labour gap relative to individual characteristics of firms, in order to control for differences in size, productivity and, in a second step, location.

In Figure 6, we plot the mean positive and negative gaps controlling for firms' characteristics. What we observe is striking: the negative gap, overall, was constant up to 2001, before increasing substantially until the mid-2000s. During the three first years, in addition, the positive gap was decreasing. But while the negative gap stabilised by the end of the period covered by our analysis, the positive gap increased substantially. This evolution points to increasing difficulty, or lack of willingness, to recruit by the most efficient firms within sectors. In a nutshell, the recent problem with the aggregate performance of French industry is that firms that should grow haven't.

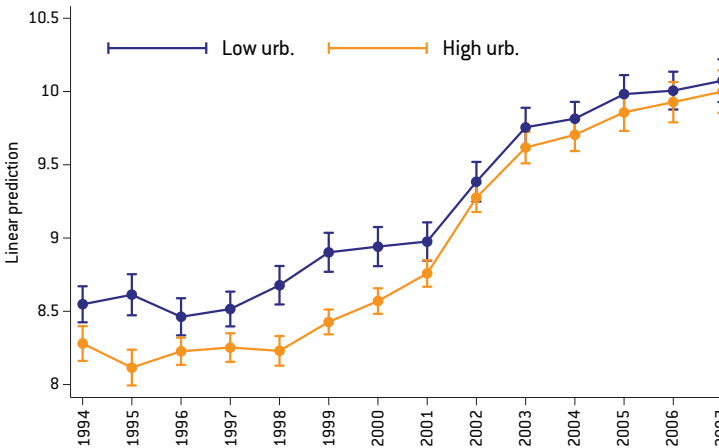
In the same spirit, we can ask whether agglomerations provide a better environment for firms when it comes to assortative matching between employers and employees. In Figure 7, we plot labour gaps for single-plant firms conditional on their location. This is one way of clarifying what Figure 5 suggested. We plot firms located in highly-urbanised *départements* versus those in less-urbanised *départements* and observe little difference over the whole time horizon. More precisely, there was a significant difference at the beginning of the period, confirming the above-mentioned hypothesis of better matching in agglomerated economies, but this advantage vanishes over the period, in line with the spread of larger labour gaps.

Figure 6: Average labour gap conditional on firm characteristics



Source: Fontagné and Santoni (2015).

Figure 7: Average labour gap conditional on firm characteristics highly vs. less-urbanised départements



Source: Fontagné and Santoni (2015).

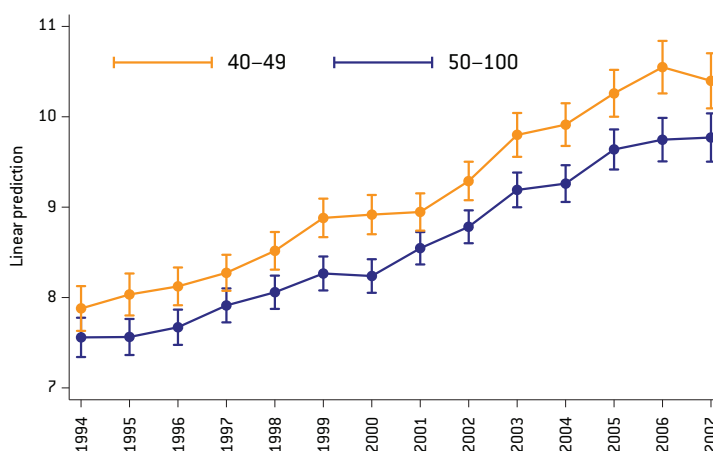
A last issue to tackle is the relationship between the labour gaps and the dynamics of the firms. Plotting ‘young’ firms<sup>50</sup> against the rest, we did not observe any significant pattern (results available upon request). More interestingly, there is ample evidence that a discontinuity is present in the French demography of firms around the 50 em-

50. We define young firms as those with less than 5 year of activity.

ployee threshold, above which firms must comply with a range of specific regulations in the social arena. We confirm that such a discontinuity is present in our data, but it results in only a marginal difference in labour-gap levels, not in their evolution over time (see Figure 8).

Interestingly it appears that firms that choose to stay below the 50-worker threshold report, all other things being equal, a slightly higher gap, most likely because they are operating at a sub-optimal scale. Despite this small difference the sharp increase in the wedge between labour marginal return and marginal cost seems to have affected manufacturing firms irrespective of the threshold.

Figure 8: Average labour gap conditional on firm characteristics by employment levels



Source: MAPCOMPETE.

#### 4.8 Resource misallocation and external competitiveness

The inefficiencies in input allocation at the firm level discussed so far can have significant consequences for aggregate performance. In particular, the distribution of resources across firms helps explain critical outcomes, such as foreign competitiveness across sectors and countries.

As stressed by the most recent stream of the international-trade literature, a country's trade performance depends strongly on firm-level characteristics and on the reallocation mechanisms across firms within sectors (Melitz, 2003; Melitz and Ottaviano, 2008; Bernard *et al*, 2007). This literature, largely based on micro-level datasets, reveals that

the international performance of countries is essentially driven by a few highly productive firms, which make up the bulk of a country's exporting activity measured on a value basis. Mayer and Ottaviano (2007) find, for several European countries, that the share of total exports accounted for by the top 10 percent of exporters is greater than 80 percent. Moreover, these few top exporters are relatively big and supply several foreign markets with several differentiated products.

Empirical evidence shows that there are significant differences between firms involved in international trade activities. One of the most robust and important results found for all countries is that exporters are more productive than non-exporters, they pay higher wages and they adopt more capital-intensive production techniques. Bernard *et al* (2007), for instance, estimate that US exporting plants are more productive than their domestic counterparts by 14 percent for value-added and 3 percent for TFP. Similarly, Altomonte *et al* (2012) in the EFIGE project<sup>51</sup> estimated that exporters exhibit a 10 percent higher TFP than non-exporters. Previous research has convincingly shown that in most cases this 'export premia' can be attributed to a self-selection effect, which induces only the best performing firms to compete internationally<sup>52</sup>. In other words, there exists a performance threshold or productivity cut-off above which firms are able to maintain an international presence. Considering a ranking of all firms according to their productivity levels, there will be three outcomes: firms with the lowest levels of productivity will exit the market, firms that enter but only sell on the domestic market and firms with the highest level of productivity that both export and sell domestically.

An important implication of the analysis of firm behaviour is that new sources of gains from trade can be identified as a consequence of trade liberalisation. Empirical studies show that a reduction in trade costs forces the least-productive firms to exit and to reallocate market shares from less-productive to more-productive firms. By forcing the low-productivity firms to contract and by allowing the entry and the expansion of high-productivity firms, intra-industry reallocation has, in turn, the effect of raising average sectoral productivity. Bernard *et al* (2006), using US manufacturing firms, find that a reductions in tariffs leads to higher aggregate productivity growth because of the exit of lower productivity firms.

To sum up, the recent literature on international trade suggests that a country's foreign

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51. The EFIGE (European Firms in a Global Economy: internal policies for external competitiveness) projects provided the first comparable firm-level dataset covering seven European countries. The project was supported by the European Commission through its 7th Framework Programme, and was coordinated by Bruegel.

52. See Wagner (2007) for surveys on empirical studies and The International Study Group on Export and Productivity (2007); and Mayer and Ottaviano (2007) for international comparative evidence.

competitiveness depends heavily on firm-level factors, especially productivity. According to this literature what matters for enhancing competitiveness abroad is the firms' ability to compete successfully in foreign markets, which in turn requires firms to make a quantum leap in terms of productivity, overcoming a minimum performance threshold induced by the additional costs of internationalisation. Inefficiencies in input allocation might prevent a firm from moving from below to above the minimum performance cut-off required to access foreign markets, with important implications both at micro and macro level.

In this sense, policies that foster firms' productivity growth and reallocate resources towards better-performing firms can boost the aggregate level of foreign competitiveness. By contrast, input and output market imperfections or any regulation that distorts resource distribution across firms can create an incentive for less-productive firms to produce too much and stay in the market and at the same time hinder the most efficient firms. These distortions, therefore, hamper the reallocation of resources and market shares from less to more productive firms, with significant consequences for overall productivity and competitiveness improvements.

In line with this hypothesis we expect our measure of resource misallocation due to market inefficiencies to be negatively correlated with export performance, both at the firm and sectoral level. At the micro level we should observe that firms with higher labour gaps are less likely to export and export less than firms with gaps close to zero<sup>53</sup>. This correlation should be driven by negative rather than by positive gaps<sup>54</sup>.

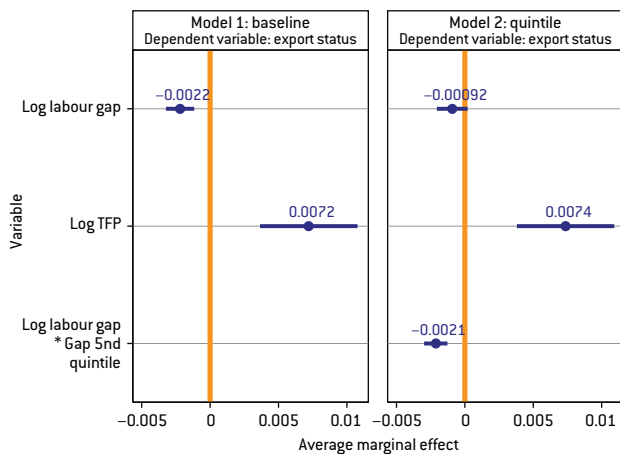
In what follows, to ease interpretation, we use the (absolute) labour gap as a measure of resource misallocation to explore the effects of allocative inefficiencies both on the probability of a firm entering foreign markets (the 'extensive margin'), and on a firm's total exports (the 'intensive margin'). We then show how these inefficiencies have an impact on sector export growth performance, focusing on the apparel industry compared to textiles and leather.

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53. Khandelwal, Schott and Wei (2013) study the effects of inefficiencies induced by export quotas and embedded institutional frictions on firms' export outcomes in the Chinese textile and clothing sectors. They observe that market distortions can have an impact for existing firms in term of export value and also for potential exporters by preventing productive firms from entering the export market.

54. We expect a stronger relationship between the export activity and the value of the firm misallocation in the negative side, with exporters being less likely to have a negative rather than a positive gap. In other words, exporters that suffer from misallocation are mainly firms that are smaller than their optimal size (showing positive rather than negative gaps). Limitations on resources might prevent them from reaching foreign markets and reduce their total volume of trade. However, domestic firms, those that are not able to compete on international market, are more likely to be oversized (negative gaps).

Figure 9: Average labour gap and export status conditional on firm characteristics



Source: MAPCOMPETE.

In Figure 9 we plot the average marginal effect of the labour gap (with 95 percent confidence intervals) on the probability of being an exporter controlling for firm characteristics<sup>55</sup>. The average marginal effects indicate whether the relationship between the measure of allocative inefficiencies (labour gap) and a firm's status with respect to its export activity (export status) is positive or negative. Among the controls, we include a firm's TFP which has been clearly identified as a crucial determinant of export patterns. The coefficient for TFP (log TFP) is shown in the graph<sup>56</sup>.

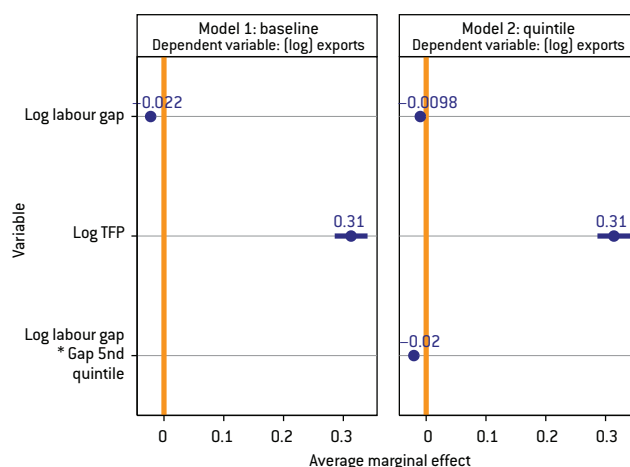
The left-hand panel of Figure 9 shows our baseline results. We observe a negative relationship between the (log) labour gap and a firm's export status suggesting that, on average, those firms with higher labour gaps have a lower probability of being exporters. The coefficient for the gap variable is -0.0022 suggesting that doubling the wedge between labour marginal return and cost for the marginal worker reduces, on average, a firm's propensity to enter foreign markets by 0.16 percentage points. This implies that inefficiencies in inputs allocation are an obstacle to firms competing on global markets. Results also confirm that productivity level has an important impact in determining a firm's ability to reach foreign countries. A 100 percent increase in a firm's productivity is associated with a rise in the probability of exporting of 1 percentage point.

55. We report the results of a linear probability model in which we control for firm unobserved heterogeneity constant over time and for year fixed effects.

56. Note that to minimise simultaneity bias regressors are one-period lagged.

The right-hand panel of Figure 9 shows a similar exercise but examines whether the negative effect on the probability of being an exporter is stronger for those firms with a relatively higher labour gap. Interestingly it appears that firms with a gap in the fifth quintile of the distribution have a stronger negative impact on a firm's ability to successfully operate in international markets.

Figure 10: Average labour gap and exports conditional on firm characteristics



Source: MAPCOMPETE.

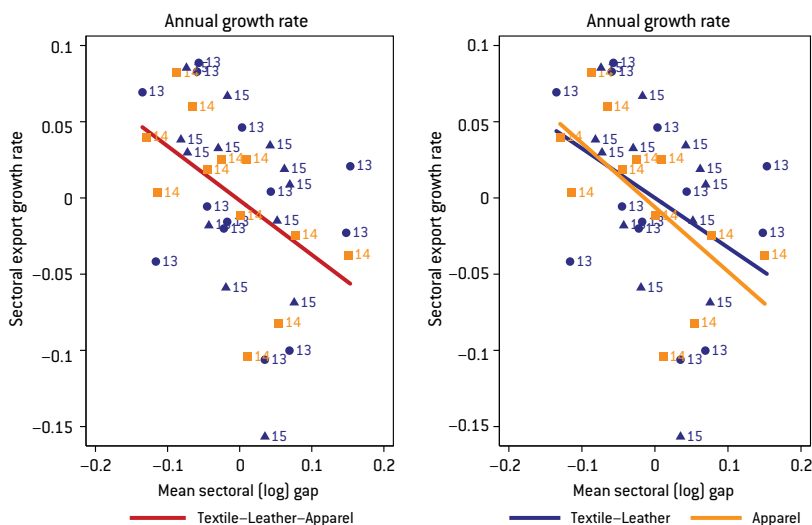
Figure 10 shows the results of a similar exercise using as a dependent variable a firm's total exports. We confirm that allocation inefficiencies not only affect the probability of exporting but also a firm's export value, conditional on being an exporter. The partial elasticity suggests that a 100 percent increase in the labour gap for the marginal worker determines a 2.2 percent reduction in a firm's exports, holding productivity and other firm characteristics constant. The plot on the right-hand side confirms that the negative effect is stronger for those firms with higher absolute labour gaps. As expected, productivity has a positive impact on firms' sales in foreign markets.

From a firm-level exercise we move to a sectoral-level analysis of the impact of resource misallocation on export performance. We provide here a regression model in which we relate internationalisation performance to a sectoral indicator of inefficiency. More precisely, for three different sectors – textiles, apparel and leather - we regress the sectoral mean<sup>57</sup> value of labour gaps on the annual growth rate of exports, control-

57. Results do not change if we take the median labour gap among firms belonging to the same sector rather than the mean.

ling for sectoral and year fixed effects. Figure 11 shows the estimation results when considering all three sectors (left plot) and separately for apparel and textiles/leather (right plot). In both cases we show that the export growth rate is, as expected, negatively related to the average labour gap. Therefore, we confirm that trade outcomes are better in those sectors in which firms have, on average, lower labour gaps. Interestingly, when running separate regressions (right plot) we observe that the effect is stronger for apparel rather than textiles or leather, a result in line with the hypothesis that the economic performance in this sector has been to a great extent influenced by distortions induced by external shocks.

Figure 11: Sectoral labour gap and exports conditional on firm characteristics



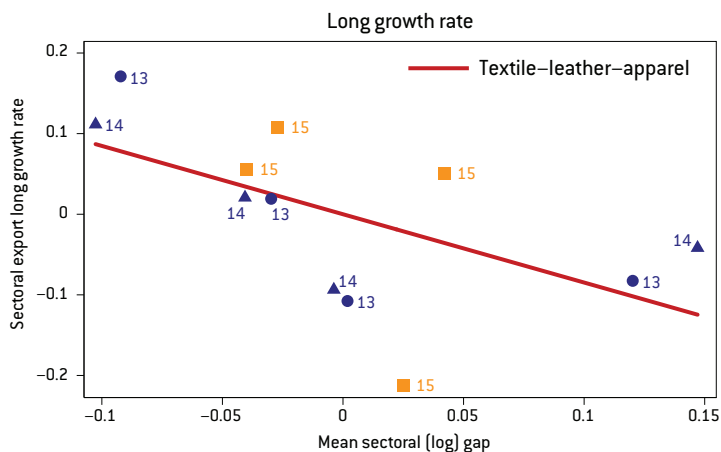
Source: MAPCOMPETE. Note: numbers in the scatter-plot refers to the NACE rev 2 industries, 13 Textiles, 14 Apparel and 15 Leather.

Finally, in Figure 12 we propose a similar exercise for the three sectors by considering long-term export growth rate. We divide the time span into four different periods (1994-97; 1998-2000; 2001-04; 2005-07) and compute the growth rate for each interval. The plot confirms that the negative effect of resource misallocation on trade performance holds also when considering longer time spans.

Though preliminary, our analysis shows how relevant the role of resource misallocation on trade outcomes can be, both at micro and macro level. The results suggest that differences between sectors or countries in terms of policies that distort the efficient allocations of resources between firms can have sizeable effects on trade performance.



Figure 12: Average labour gap and exports conditional on firm characteristics



Source: MAPCOMPETE. Source: Authors' estimates. Note: numbers in the scatter-plot refers to the NACE rev 2 industries, 13 Textiles, 14 Apparel and 15 Leather.

## 4.9 Conclusions

Competitiveness at country level is the result of the aggregation of individual firms' competitive positions. Thus, the ability of firms to employ productive resources in an efficient way is crucial for aggregate performance. In this light, the allocation of resources between firms plays a crucial role in the evolution of critical outcomes, such as foreign competitiveness across sectors and countries. The recent international economics literature argues that a country's trade performance depends heavily on firm-level characteristics, especially productivity. In this framework, what matters for the enhancement of aggregate competitiveness is firms' ability to succeed in foreign markets by raising their productivity above a minimum performance threshold induced by the additional costs of internationalisation. Input inefficiencies might thwart this process, impacting adversely on the aggregate outcome.

Using a novel methodology proposed by Petrin and Sivadasan (2013), we are able to assess the degree of resource misallocation at the firm level, measured as the gap between the value of the marginal product and marginal input, and to give a monetary value to it. Our results show that the average gap in French manufacturing firms is approximately €10,000 and that the related average output loss represents about 0.38 percent of manufacturing value added. Labour gaps have been increasing since 2000, and general determinants (distortions) have been driving this evolution across France's different *départements* and sectors. Controlling for firm characteristics, we

observe that, after 2003, most of the adverse evolution falls on the positive gaps. In a nutshell, the recent problem with French industry aggregate performance is that, in the recent years, firms that should grow – the most productive ones – were unable to grow at the expected pace. Regarding export capability, we observe a negative and statistically significant relationship between the (log) labour gap and a firm's export status suggesting that, on average, those firms with larger labour gaps have a lower probability of being exporters. Looking at a firm's total exports, we observed that allocation inefficiencies not only affect the probability of exporting but also a firm's export value, conditional on being an exporter.

Awareness of the constraints preventing more efficient reallocation of inputs within sectors is relevant from a country perspective: it would be possible to boost productivity (and through that to raise income) by reallocating within sectors inputs and resources already employed. Input and output market imperfections or any regulation that distorts resource distribution between firms can create an incentive for less-productive firms to produce too much and stay in the market, while hindering the most efficient firms. But given the scale of the phenomenon, designing appropriate policies to correct resource inefficiencies is a perilous exercise that requires more and more detailed data on firms' economic behaviour and outcomes.

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# 5 Centralisation of wage bargaining and firms' adjustment to the Great Recession: a micro-based analysis

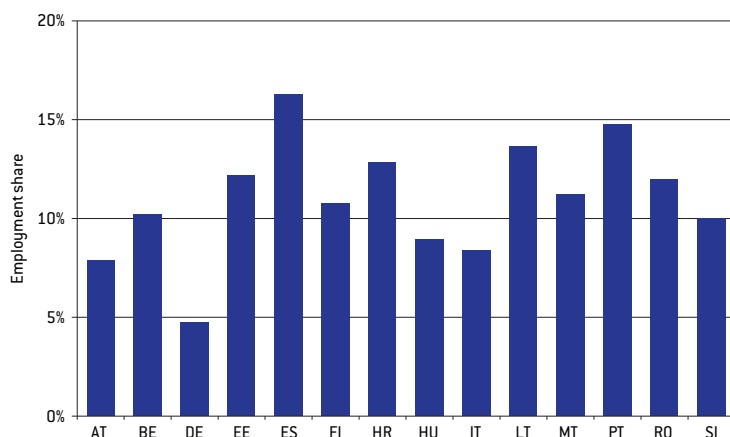
Filippo di Mauro and Maddalena Ronchi

## 5.1 Introduction

Whether labour market institutions, and wage-setting regimes in particular, shape the response of firms to negative economic shocks is a contentious issue in labour economics. Standard economic theory (Nickell and Andrews, 1983) predicts that centralised bargaining institutions are likely to hamper the smooth functioning of labour markets and amplify the negative impact of aggregate shocks on employment by preventing wages from adjusting downwards during economic downturns. Recently, this theme has retaken centre stage in the policy debate as a result of high and persistent unemployment caused by the Great Recession. More specifically, since the start of the economic and financial crisis more than five million jobs have been lost, wiping out the gains from almost ten years of strong job creation. However, behind this aggregate data lies a very heterogeneous picture, with the structural development of unemployment dynamics differing widely in different euro-area countries (the current euro-area unemployment rate of 11.3 percent is the weighted average of national unemployment rates that include a rate of close to 5 percent in Germany and 23 percent in Spain). Despite a generally strong shock to GDP, in some countries the economic and financial crisis only had a short-term effect, with little overall impact on employment losses, while in other countries it caused a dramatic and persistent increase in unemployment. Against this background, understanding which factors are shaping

how the euro-area labour markets adjust to aggregate shocks is currently at the core of the policy debate (see Task Force of the Monetary Policy Committee of the European System of Central Banks, 2012; and Ad hoc team of the European System of Central Banks, 2015).

Figure 1: Employment share in construction (%)



Source: CompNet. Note: average over the period 2004-06.

Clearly, this cross-country heterogeneity results from a number of factors, including different initial economic conditions. A first factor to consider is the varying sectoral composition of employment (particularly the share of workers employed in construction) in euro-area countries (Figure 1). Given that the construction sector was severely affected by the crisis and, unlike other sectors, started to suffer from pronounced downsizing as early as 2007 (see Pissarides, 2013; Hoffmann and Lemieux, 2014), differences in the proportion of workers employed in construction partly explain the observed variability in the response of the labour market to the crisis. Another factor driving cross-country heterogeneity in labour market dynamics is the historical trend in unemployment rates, which have been systematically higher in some countries than in others. Figure 2 shows that unemployment rates in the pre-crisis period ranged from about 5 percent in Austria to above 10 percent in Spain, Estonia and Lithuania. Finally, and more importantly from a policy perspective, cross-country heterogeneity in unemployment rates reflects the relationship between labour market institutions and the impact of shocks on employment. More specifically, among the different labour market institutions, a natural explanation for the differences in labour market adjustments is those institutional structures impinging on the adjustment margins and cost-cutting strategies of firms, because differences in their functioning create

cross-country differences in the way labour markets respond to aggregate shocks in term of employment.

Empirical evidence indicates that the economies that have managed to limit job destruction rates during the crisis tend to be characterised by more flexibility in the labour market and, thus, by the ability to promptly adjust to new economic conditions (see, for example, Burda and Hunt, 2011). The relevance of labour market institutions in explaining the impact of the crisis on employment is particularly evident if we compare labour market adjustments within the group of countries experiencing a particularly acute sovereign debt crisis. Although the severity of the crisis has been similar in these countries, employment dynamics have differed depending on the degree of flexibility of their labour market institutions.

This is particularly evident in Spain and Ireland. While both countries witnessed a dramatic increase in employment losses in the construction sector right after the financial crisis hit, they fared quite differently during the sovereign debt crisis. The reason for this diverging performance is that the Irish labour market was relatively flexible at the time of the crisis and was further deregulated at the end of 2010 as part of the EU-IMF programme. As a result, Irish unemployment stabilised after an initial large increase and then fell. Conversely, Spain entered the crisis with an inflexible labour market and labour market institutions, and only started undertaking relevant reforms in 2012, meaning unemployment kept rising until 2013. More specifically, the limited capacity of the Spanish labour market to adjust to the crisis was the result of a broadly regulated system of wage bargaining characterised by a high degree of centralisation and the

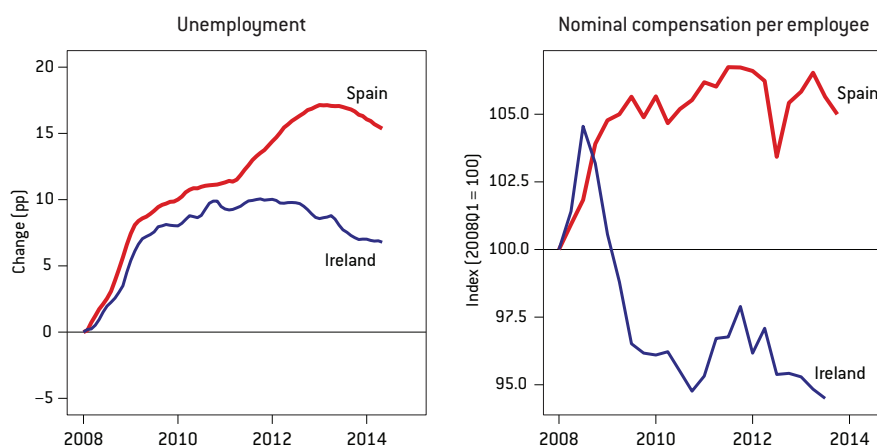
**Table 1: Unemployment rates (%)**

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Belgium	6.9	6.6	7.5	8.2	8.4	8.5	8.3	7.5	7	7.9	8.3	7.2	7.6	8.4	8.5
Germany	7.9	7.8	8.6	9.7	10.4	11.2	10.1	8.5	7.4	7.6	7	5.8	5.4	5.2	5
Estonia	14.6	13	11.2	10.3	10.1	8	5.9	4.6	5.5	13.5	16.7	12.3	10	8.6	7.4
Spain	11.9	10.6	11.5	11.5	11	9.2	8.5	8.2	11.3	17.9	19.9	21.4	24.8	26.1	24.5
Italy	10	9	8.5	8.4	8	7.7	6.8	6.1	6.7	7.7	8.4	8.4	10.7	12.1	12.7
Ireland	4.2	3.9	4.5	4.6	4.5	4.4	4.5	4.7	6.4	12	13.9	14.7	14.7	13.1	11.3
Lithuania	16.4	17.4	13.8	12.4	10.9	8.3	5.8	4.3	5.8	13.8	17.8	15.4	13.4	11.8	10.7
Austria	3.6	3.6	4.2	4.3	5.5	5.6	5.3	4.9	4.1	5.3	4.8	4.6	4.9	5.4	5.6
Portugal	5.1	5.1	6.1	7.4	7.8	8.8	8.8	9.2	8.7	10.7	12	12.9	15.8	16.4	14.1
Romania	7.6	7.4	8.3	7.7	8	7.1	7.2	6.4	5.6	6.5	7	7.2	6.8	7.1	6.8
Slovenia	6.7	6.2	6.3	6.7	6.3	6.5	6	4.9	4.4	5.9	7.3	8.2	8.9	10.1	9.7

Source: Eurostat, annual average.

indexation of wages to past inflation (European Central Bank, 2009). Consequently, as can be seen in Figure 3, while wages in Ireland started to adjust downward as early as late 2008, Spanish nominal compensation per employee kept rising until the end of 2011, even though the country at that time was already suffering from a 12 percentage point increase in unemployment.

Figure 2: Unemployment and nominal compensation developments in Ireland and Spain



Source: Speech by Mario Draghi, Annual Central Bank Symposium in Jackson Hole (2013)

As a result, whereas the Irish labour market facilitated some adjustment through prices, the Spanish labour market adjusted primarily through quantities. Wage bargaining institutions are identified as one of the main reasons for the different strategies for cutting labour costs at the firm level in Spain and Ireland, because of the power they have to amplify the impact of a negative shock on employment by limiting downward wage adjustment.

Given the criticism made by economists and policymakers regarding centralised bargaining regimes that are responsible for restricting the options firms have to adjust wages in response to new economic conditions, in Spain, as in other stressed countries, a number of these labour market rigidities have been addressed through labour market reforms. As reported by the European Commission (Visser, 2013), the Pact for the Euro of March 2011 and the 'Six-Pack' of regulations on economic governance adopted by the European Council in October 2011 heralded a movement towards reforms that limit extended coverage and multi-employer bargaining and favour company bargaining over central and industry bargaining.

## 5.2 Employment dynamics during the Great Recession: exploring the new CompNet database

As documented in the preceding section, unemployment developments during the economic and financial crisis varied widely in the countries of the euro area. In this section, using information from the new CompNet database, we show whether and to what extent firms' growth dynamics vary between countries<sup>58</sup>.

Figure 3 illustrates differences in firms' growth trajectories in Germany and three groups of countries. More precisely, it reports the change in the proportion of firms growing, shrinking or remaining in the same size class<sup>59</sup>. This proportion is calculated using a 'transition matrix', a powerful tool reflecting firms' movement along the distribution of size classes during a three-year period. Figure 3 covers three-year windows between 2000 and 2012. Figure 3 shows some interesting facts about firms' growth trajectories. First, the structure of firms' growth dynamics was quite stable during the pre-crisis period. At the same time, the economic crisis significantly altered the growth dynamics in place before its outbreak. However, the response of labour markets in terms of the proportion of firms downsizing varies widely between countries, with the crisis having a particularly strong impact on the functioning of the labour market in a group of 'stressed' countries (Italy, Portugal, Slovenia and Spain) and a group of eastern European EU countries (Estonia, Lithuania and Romania), which experienced a dramatic increase in the share of firms shrinking, mainly at the cost of the proportion of firms growing, while the crisis barely changed firms' growth dynamics in a group of non-stressed countries (Austria, Belgium and Finland). An exceptional case is that of Germany, which experienced only a short interruption to the increasing trend in the proportion of firms expanding during the crisis and a complementary increase in the share of firms shrinking. Moreover, while in the group of eastern EU countries the trajectories altered by the Great Recession have already started to revert to trend, there is no such evidence in the group of stressed countries.

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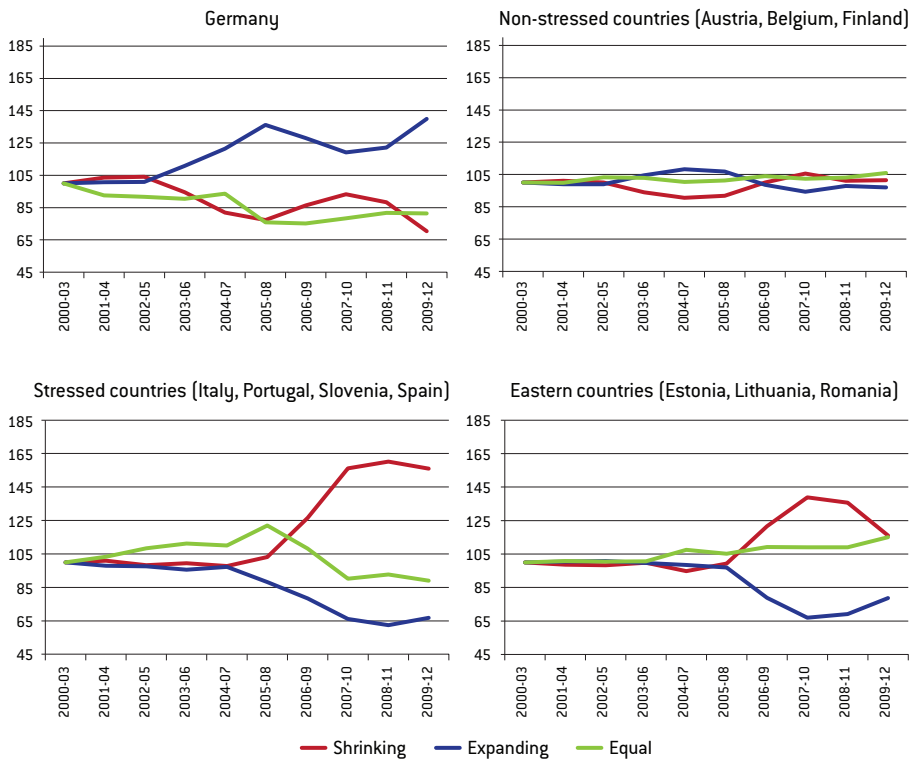
58. CompNet, the Competitiveness Research Network of the European System of Central Banks, began operations at the end of 2011 with the goal of improving the existing set of indicators of competitiveness through a firm-level data collection exercise relying on firms' balance-sheet information. Please refer to Di Mauro, Lopez-Garcia and the CompNet Task Force [2015] for detailed information on the newly expanded database of cross-country comparable competitiveness-related indicators and to the CompNet website for general information on the network ([https://www.ecb.europa.eu/home/html/researcher\\_compnet.en.html](https://www.ecb.europa.eu/home/html/researcher_compnet.en.html)).

59. Firms are categorised into five size classes, depending on number of employees: firms with between one and nine employees fall into size class [1], firms with ten to 19 employees fall into size class [2], firms with 20 to 49 employees fall into size class [3], firms with 50 to 250 employees fall into size class [4] and firms with 250 employees or more fall into size class [5].



Our research links the cross-country heterogeneity in employment dynamics at the firm level to the different functioning of existing labour market institutions. In particular, given the constraints that collective agreements might put on wage adjustments, we explore whether and to what extent the degree of centralisation of wage bargaining institutions shaped the response of firms to the Great Recession by explaining the relative importance of wages and employment adjustments.

Figure 3: Change to number of growing and shrinking firms



Source: CompNet dataset.

Before moving to our empirical results, we report the main features of wage bargaining institutions across Europe, highlighting their impact on the heterogeneous restrictions on wage adjustment and reviewing the main studies that examine the effects of aggregate shocks on collective agreements and labour market adjustments. We stress the importance of micro data for obtaining robust and significant results and, as a consequence, the added value of a largely unexplored database matching the CompNet micro-distributed dataset with the Wage Dynamic Network (WDN) survey-based dataset at the firm level<sup>60</sup>.

### 5.3 Wage bargaining regimes and the WDN dataset

The main goal of collective bargaining institutions is to establish a process of negotiation between unions and employers' organisations to agree upon rules regulating wages and other working conditions. The scope of the agreements depends on country-specific regulations and on the relative bargaining power of unions and employers' organisations. Historically, wage bargaining institutions arose as a stabilising tool and as an instrument to help prevent wage deflation through the setting of a wage floor. However, in many European countries, collective bargaining became the main mechanism through which unions can push for higher wages.

To study the effects of wage-setting institutions on economic outcomes, notably wages and employment, the existing literature has focused on some specific features that define wage-bargaining structures, such as the degree of centralisation, coordination, union density and coverage (OECD, 1997, 2004 and 2012). Economic theory (Nickell and Andrews, 1983; McDonald and Solow, 1981) and many empirical studies focus on the levels at which bargaining takes place and predict that the degree of centralisation in wage bargaining has an impact on economic performance. The underlying reasoning is that agreements bargained at the firm level are more flexible than those bargained at sector or national level and are therefore likely to give firms a greater margin of adjustment to adapt to new economic conditions.

According to the evidence collected by the WDN, there are some differences between countries in the levels at which bargaining takes place. Sector-level agreements are predominant in western European countries and cover the greatest proportion of workers, while wage-bargaining systems are highly deregulated and organised at the plant level in central and eastern European countries (ECB, 2009). However, the levels at

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60. The WDN was established in 2006 and its main goal is the identification of the mechanisms underlying wage and labour cost dynamics. For further information on the network, refer to: [https://www.ecb.europa.eu/home/html/researcher\\_wdn.en.html](https://www.ecb.europa.eu/home/html/researcher_wdn.en.html).

which bargaining can take place do not have to be mutually exclusive, and therefore this distinction is only a first approximation of the degree of centralisation of wage-setting institutions. To deepen this analysis, a further distinction between single- and multi-level bargaining systems is needed.

In the last two decades, several euro-area countries have experienced strong development of multi-level bargaining structures, meaning that the same bargaining process can take place at many levels. To account for this further distinction, throughout our analysis we classify countries into two groups: two-tier and non-two-tier countries. Among the sampled countries, the two-tier group is composed of Austria, Belgium, Italy, Portugal and Spain, and is characterised by the possibility of supplementing multi-employer pay agreements (ie those taking place either at the national or sectoral level) with single employer agreements (ie agreements at plant level). It is fundamental to note that the negotiations on wage setting undertaken at the company level only allow for wages to be set higher than those established at the central level, according to the favourability principle. In other words, the multi-employer agreement is taken as a wage floor and the negotiation at the plant level can operate only to improve workers' conditions<sup>61</sup>. Conversely, non-two-tier countries have, by definition, a single-level bargaining structure that can be either fully decentralised (ie negotiations take place at the firm level only) or fully centralised (ie negotiations take place at the national or sectoral level only). In our analysis Hungary, Lithuania and Slovenia are all defined as non-two-tier countries at the time of the outbreak of the economic crisis (note that, contrary to the rest of the countries included in this group, Slovenia has a largely regulated system in which multi-employer bargaining is more common than plant-level bargaining)<sup>62</sup>. Clearly, according to this country classification, multi-level bargaining can only occur in two-tier countries, while fully decentralised bargaining structures only operate in countries that are not defined as two-tier. Conversely, in both groups of countries, firms can operate under multi-employer bargaining or not subscribe to any agreement.

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61. Two-level bargaining does not necessarily mean multi-level bargaining, as it is defined in this analysis. There is a distinction between situations in which 'opening clauses' are allowed in centralised agreements and the 'institutionalised' version of multi-level bargaining. In the first case, the labour legislation allows for derogation from sectoral standards and enables, within certain limits, agreements on working conditions that deviate from the binding sector-level wage agreement. In the second case, plant-level bargaining can coexist with multi-employer bargaining only when the higher pay level agreements are taken as a floor and not as a ceiling. Therefore, in this situation, which is the one present in the group of sampled countries, it is not possible to deviate from the binding industry-level agreements and changes at the plant level are only allowed if they guarantee an improvement of the working conditions already agreed at the central level.

62. Hungary, however, is included only in the wage equation as we do not have information on the transition matrices for this country.

Historically, the decision in a number of countries to move towards multi-level regimes during the 1990s was mainly driven by criticism of centralised wage-bargaining institutions by the OECD (1994a), these being the most common institutions at that time in European countries. According to these criticisms, multi-employer structures were a major cause of the low degree of responsiveness of the labour market to the 1980s job crisis (Visser, 2013). The general recommendation of the OECD was to “*refocus collective bargaining at the sectoral level to framework agreements, in order to give firms more leeway to adjust wages to local conditions*” (OECD, 1994b). Therefore, although individual countries’ experiences vary considerably with respect to the historical development of multi-level structures, the common factor behind the spread of firms adopting this type of bargaining regime is the attempt to achieve a more decentralised collective bargaining structure while avoiding a drastic move from fully centralised to fully decentralised structures. The current level of decentralisation of countries defined as two-tier can be considered as occupying the middle ground between multi-employer and plant-level bargaining. Although the decision to introduce or expand the presence of multi-level bargaining in the euro area was based on the hypothesis that these new structures could integrate macroeconomic stability with greater decentralisation in wage setting, we will show that the design of these structures seems ill-suited for achieving this goal and that they do not permit adequate adjustments in the face of economic shocks.

In the literature, the notion that wage bargaining institutions play a fundamental role in shaping economic outcomes at both the micro and macro levels has received a lot of attention, at least since the 1980s. Many empirical studies attempt to link cross-country differences in unemployment to the degree of centralisation at which bargaining takes place (for a survey, see Flanagan, 1999). A typical argument in labour economics is that wage-setting institutions have the power to amplify the impact of a negative shock on employment by limiting downward wage adjustments. For these specific characteristics, they have recently been identified as an important factor behind the dramatic rise of structural unemployment, especially in the stressed countries (see Bertola *et al*, 2010; and Ad hoc team of the European System of Central Banks, 2015). The most influential argument relating to collective bargaining and unemployment is the hump-shaped relationship between centralisation of wage setting institutions and real wages, proposed by Calmfors and Driffill (1988). The basis of this relationship is that countries with fully centralised or fully decentralised bargaining institutions (ie where agreements take place at the national and firm level respectively) will perform better in terms of employment than countries characterised by an intermediate degree of centralisation (ie sector level). This statement is based on the consideration that large and all-encompassing unions are able to recognise their mar-

ket power and will therefore take an international approach to wage externalities by taking into account both the inflationary and unemployment effects of wage increases. Conversely, trade unions operating at the individual plant level have very limited market power and consequently have their bargaining strength constrained by market forces. Finally, in cases in which bargaining takes place at an intermediate level, which in Europe is the most common situation covering the greatest proportion of workers, unions can still exert some market power but are likely to ignore the macroeconomic consequences of their actions.

However, irrespective of the estimation approach, drawing inferences about the relationship between collective bargaining institutions and macroeconomic performance is a challenge (for a survey, see Freeman, 2007). Although the theoretical literature assigns an important role to wage-bargaining institutions and an extensive empirical literature tries to quantify this role, assessing institutions remains difficult and comparable information at an international level is still limited. 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 because the variation in the level of bargaining used in these papers is exclusively across countries and often comes from ad-hoc studies (and is therefore not comparable across countries). This implies not only that they draw conclusions from very limited data and, thus, a few outliers can significantly bias the results, but also that they only marginally vary over time (see Aidt and Tzannatos, 2005). For example, results obtained in studies using OECD indicators are rarely significant or robust to variations in the specification of the dependent variable, the composition of the sample or the time period considered (see Baker *et al*, 2005). Because of the above-mentioned limitations, macro analyses can tell us little about the underlying causal relationship between wage bargaining institutions and economic outcomes.

On the contrary, micro-data analyses reveal that bargaining systems matter. For example, using firm-level data from the WDN, Bertola *et al* (2010) find that bargaining at a level higher than that of the firm significantly increases the probability of reducing employment. They conclude that firms covered by centralised wage bargaining structures are more likely to reduce labour costs by cutting the level of employment than by cutting the level of wages because of the higher level of wage rigidities. Similar results are also presented in Cardoso and Portela (2009) and Jimeno and Thomas (2011), which demonstrate that collective bargaining and minimum wage institutions are both related to less wage flexibility at the micro level.

## 5.4 Data and results

As the structure of labour markets is increasingly perceived as a determinant of the macroeconomic performance of a country, we use a novel micro-distributed database to assess the role of wage bargaining institutions in shaping economic outcomes, notably wages and employment. More specifically, we exploit the variation of the level at which bargaining takes place across firms in seven euro-area countries and relate it to different firm-level cost-cutting strategies following the crisis. We are interested in seeing whether, when faced with a negative shock, firms operating in centralised bargaining structures are more likely to reduce labour costs by reducing employment compared with firms operating in decentralised and/or more deregulated systems.

The novel and largely unexplored micro-level dataset used to perform this analysis is the outcome of a merging procedure between the CompNet and WDN databases. The rich structure of both databases allows us to relate the reaction of firms to the Great Recession in terms of variation in employment and wages (inferred from CompNet and absent in the WDN dataset) to self-reported features of labour market environments at the firm level (inferred from the WDN and not present in CompNet). The goal of the matching procedure is to produce a database that can be used to analyse (by exploiting comparable information for different countries) firms' growth dynamics by linking them to information on both firms' characteristics and on the relevant features of the labour market environments in which they operate. The new dataset contains information on:

- Five different firm size classes, depending on the level of employment – firms with one to nine employees, firms with ten to 19 employees, firms with 20 to 49 employees, firms with 50 to 249 employees and firms with 250 employees or more;
- Four macro sectors – manufacturing, construction, trade and market services<sup>63</sup>;
- Seven countries: Austria, Belgium, Hungary, Italy, Lithuania, Portugal, Slovenia and Spain<sup>64</sup>.

Two particular features of the dataset need to be stressed. First, while CompNet indi-

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63. Where 'market services' comprises all the following disaggregated sectors in CompNet: transportation and storage, accommodation and food services, information and communication, real estate, professional, scientific and technological services and support activities. These sectors have been aggregated in order to be matched with the market service sector as defined in the WDN. The aggregation process followed the procedure already used by CompNet (defined in CompNet Task Force, 2014).

64. The group of selected countries results from the merging procedure and represents the number of countries that are present in both datasets. One exception is Estonia which, although present in both samples, is not included in our analysis because it implemented a labour regulation reform in 2009.

cators vary over time between 1995 and 2012, the WDN dataset is a cross-section and relates to the period from 2007 to 2009. However, as between 2006 and the end of 2011 no fundamental changes were observed in wage-bargaining institutions in the group of sampled countries (Task Force of the Monetary Policy Committee of the European System of Central Banks, 2012), we can treat the measures of bargaining institutions as time invariant during the time period we consider (ie 2006-12). Second, and in contrast to the majority of previous studies (with the exception of Boeri, 2014), we distinguish between multi-level and single-level bargaining (either at the firm or multi-employer level). While many empirical studies have already assessed the effects on wages and employment of both fully centralised and fully decentralised bargaining, much less is known about multi-level structures, despite their extensive development in a number of European countries during the last two decades. In this way, we are able to check whether two-tier structures, designed to allow for more decentralisation and more wage renegotiation than multi-employer regimes, perform better than fully centralised structures.

From a more general point of view, while previous empirical studies using macro variables limit their analysis to aggregate figures of coverage and the degree of centralisation at different bargaining levels, this micro-distributed dataset allows us to account for the nature of firms taking part in the bargaining regime at issue. Consequently, thanks to the use of cross-country, harmonised micro data, we can control for sectoral and firm characteristics in addition to country-specific ones.

#### 5.4.1 Centralisation of wage bargaining and employment reduction

Given that wage bargaining takes place predominantly in the form of collective bargaining in Europe, understanding to what extent the structure of wage bargaining regimes determines the scope of employment reaction to the economic crisis is important from a policy perspective. In particular, we are interested in studying the extent to which a higher degree of centralisation of wage bargaining institutions implied greater firm-level employment reduction during the Great Recession. To answer this question, we ran the following estimation model:

$$SSF_{cszt} = \beta_1 SFB_{csz} + \beta_2 SFC_{csz} + \beta_3 SFD_{csz} + TFP_{cst} + a_c + b_s + c_z + d_t + u_{cszt}$$

where  $SSF_{cszt}$  stands for the share of shrinking firms in country  $c$ , sector  $s$ , size class  $z$  at time  $t$ , calculated using the transition matrices previously described in section 2. In order to focus on the period of the crisis we selected the following periods as three-years rolling windows for our empirical analysis: 2006-09, 2007-10, 2008-11 and

2009-12. The variables *SFD*, *SFC* and *SFB*, varying by size class, sector, and country, represent respectively the share of firms engaging in fully decentralised bargaining, in fully centralised bargaining, and operating in both levels of bargaining according to the principles previously explained. As already pointed out, these variables are treated as time invariant. Finally,  $a_c$ ,  $b_s$ ,  $c_z$ , and  $d_t$  control respectively for country, sector, size and time-specific effects. In particular, country dummies account for unobserved national effects such as those that could derive from country-specific employment legislation. Sector and firm-size dummies are included to control for unobserved technological and market-structure differences between industries and different size firms.

Our results are reported in column 1 of Table 1 and show that the share of firms engaging either in multi-level or multi-employer bargaining are significantly and positively associated with the share of firms that reduced in size during the Great Recession. In other words, an increase in the share of firms engaging in these two regimes of bargaining within a cell (as defined by a firm's size class, sector and country) leads to a statistically significant increase in the share of firms reducing employment with respect to our reference group (firms not engaging in any collective agreement). On the contrary, and as expected, the coefficient of the share of firms in decentralised bargaining regimes is not statistically different from that of our base group.

In column 2 we report the results for a second specification for which, in addition to the variables already included, we also control for sectoral total factor productivity (in logarithm). We add this variable to our previous specification because multi-level bargaining is not randomly allocated across firms because of its add-up properties and this prevents us from making causal inferences about the relationship between economic outcomes and bargaining regimes. In particular, we know that multi-level structures are more common among more productive and bigger firms – which are in fact more unionised – because they forces employers to pay a wage drift with respect to the level set at the higher bargaining level. We partially control for the possibility of having endogenous sorting of firms across the bargaining regimes by adding to our specification the level of sectoral TFP of the starting year of each rolling window (ie from 2006 to 2009) because it is exogenous to the single firm and more structurally determined. The results show that when, on top of controlling for factors such as country, sector and firm size, which are already likely to largely explain the allocation of firms across the different bargaining regimes, we also control for sectoral TFP, our previous findings hold up and remain statistically significant.

These results already point in the direction that multi-level bargaining regimes have a positive and significant impact on the share of downsizing firms. To deepen the



analysis and to explore whether multi-level bargaining allows for greater margins of adjustment to shocks with respect to fully centralised structures, we run the same equation as in columns 1 and 2 but only for two-tier countries (these results are shown in columns 3 and 4). As predicted by the theory, we see that firms not subscribing to any bargaining regime tend to lay off employees less frequently than firms operating in fully centralised systems. On the contrary, engaging in multi-level bargaining seems to have an even stronger impact on employment reduction with respect to fully centralised regimes. We can explain this evidence by referring to the intrinsic nature of multi-level structures, where plant-level bargaining can only generate a 'wage drift' with respect to the pay level agreed at the higher level. For this reason, firms in multi-level structures are likely to be characterised by smaller margins of adjustment than firms engaging in either fully centralised or fully decentralised wage bargaining systems.

Table 2: OLS model

Employment adjustment and centralisation of collective agreements				
Share of shrinking firms	(1) All countries	(2) All countries – with sectoral TFP	(3) Two-tier countries only	(4) Two-tier countries only – with sectoral TFP
Multi-level	0.2025*** -0.0459	0.2160*** -0.0871	0.0787*** -0.0222	0.0784*** -0.0232
Multi-employer	0.1120*** -0.04	0.1221*** -0.0442	(base group)	(base group)
Plant-level	0.0697 -0.0537	0.0871 -0.0538	–	–
No collective bargaining	(base group)	(base group)	- 0.1298*** -0.0429	- 0.1330*** -0.0488
Sectoral TFP		0.0062 -0.0102	–	-0.0095 -0.0104
Country dummies	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes
Size dummies	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Constant	0.3143*** -0.0191	0.3412*** -0.0267	0.1501*** -0.0114	0.2288*** -0.0494
Observations	362	343	254	235
R-squared	0.7765	0.7839	0.7641	0.7641

Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: MAPCOMPETE.

In conclusion, this analysis shows that multi-level structures, although designed to allow for more decentralisation in two-tier countries and for higher frequency in wage renegotiation in response to shocks, perform worse than either fully decentralised or fully centralised wage bargaining regimes. More generally, it turns out that the structure of the wage-bargaining regime is an important factor in determining the extent of employment reaction to the economic crisis and demonstrating that the evidence we collected is in line with theoretical predictions. In the next section, we complement this evidence by analysing whether the way in which a shock tends to be allocated across wages and employment partly depends on the degree of firm-level wage rigidity under the different bargaining regimes.

#### 5.4.2 Centralisation of wage bargaining and wage rigidity

In light of the intensity of the crisis, wage adjustments in response to the Great Recession in the euro area have been rather limited. As reported by the Task Force of the Monetary Policy Committee of the European System of Central Banks (2012), *“this apparently limited adjustment seems to corroborate evidence [...] about the existence of various obstacles to wage adjustments in European countries. At the same time, there is a large degree of cross-country heterogeneity regarding the speed and size of wage adjustment since the crisis. These heterogeneous adjustment patterns may partially reflect cross-country differences in exposure to the recession as well as differences in wage bargaining institutions.”*

Against this background, we have shown that labour markets characterised by a greater proportion of firms engaging in centralised bargaining (both single- and multi-level) are characterised by a higher share of firms reducing employment if confronted with a negative shock. To see whether this evidence could be partly driven by greater wage rigidity, we ran a probit regression relating the probability of firm-level nominal wage reductions to the share of firms operating in the different bargaining regimes. The estimated equation is the following:

$$WV_{cszt} = \beta_1 SFB_{csz} + \beta_2 SFC_{csz} + \beta_3 SFD_{csz} + a_c + b_s + c_z + d_t + u_{cszt}$$

where  $WV_{cszt}$  is a dummy equal to one if the variation in the average labour cost per employee from one year to another – starting with the difference between wages in 2009 and wages in 2008 – was negative and equal to zero otherwise. The remaining variables are defined as in the previous equation. The results are presented in table 2 where we also present the results when controlling for sectoral TFP (column 2) and when focusing on the subset of two-tier countries only (columns 3 and 4).

Table 3: Probit model

Wage adjustment and centralisation of collective agreements				
Wage reduction probability	(1) All countries	(2) All countries – with sectoral TFP	(3) Two-tier countries only	(4) Two-tier countries only – with sectoral TFP
Multi-level	-1.6879* (0.9681)	-1.8292* (0.9860)	-2.4977** (1.1889)	-3.1214** (1.2783)
Multi-employer	-1.4817* (0.7932)	-1.6630** (0.8099)	-2.0082** (1.0046)	-2.4646** (1.0937)
Plant-level	-1.5505 (1.0005)	-1.6501 (1.0190)	–	–
No collective bargaining	(base group)	(base group)	(base group)	(base group)
Sectoral TFP		-0.3164 (0.2521)	–	-0.5998 (0.3134)
Country dummies	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes
Size dummies	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Constant	1.9298** (1.1108)	2.9647*** (1.1108)	2.3408*** (0.6854)	4.2605*** (1.1440)
Observations	537	517	320	300
R-squared	0.2762	0.2766	0.1621	0.1720

Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Hungary is included in the wage regression but data is lacking for the employment regression. The probit results are robust to removal of Hungary.

Source: MAPCOMPETE.

In line with theoretical models, our analysis shows that engaging in centralised bargaining structures (both single- and multi-level) decreases the probability of cutting wages during the Great Recession period. These results suggest that centralised bargaining regimes put constraints on wage adjustments and, in turn, induce firms operating under these regimes to react to negative shocks mainly through reductions in employment. On the other hand, firms operating in decentralised bargaining institutions are more resilient to shocks in terms of employment levels, because they are shown to also be able to adjust to changes in economic conditions through wage changes. The same results hold when we control for sectoral TFP and when we limit our analysis to the sub-sample of two-tier countries only.

## 5.5 Conclusions

For our empirical analysis we used a novel dataset that links information on firms' characteristics and growth trajectories from CompNet to information from the WDN dataset on the labour market environment in which firms operate. We found that the way in which the negative economic shock of the Great Recession was distributed across wages and employment was associated with the degree of centralisation of wage-bargaining regimes in theoretically sensible ways.

More specifically, our analysis found that differences between euro-area countries in terms of employment adjustment seemed to reflect the degree of wage flexibility entailed in the different bargaining regimes. Once we control for firms' structural characteristics, labour markets with a higher proportion of firms subscribing to centralised collective bargaining are characterised by a higher proportion of firms reducing the number of employees and that this might be partly a consequence of greater wage rigidity.

As already emphasised, these regressions should not be interpreted as offering a causal interpretation. In order to identify a truly causal relationship between the different structures of bargaining institutions and the relative importance of employment and wage adjustment in reaction to shocks, we would need to control for potential firm selectivity effects through a longitudinal database allowing us to identify some sources of exogenous variation in the bargaining regimes. As highlighted by Hartog *et al* (1997), controlling for the fact that firms subscribing to a specific bargaining regime might not be representative of the overall population will remain a challenge *“as long as no (satisfactory) independent variables to control for the endogeneity of the bargaining regime are available”*. However, while the results previously found concerning the link between the degree of centralisation of wage bargaining structures and economic outcome can be interpreted only in the spirit of correlation analysis, they are robust to controls for factors such as country, sector and size, which are likely to largely explain the allocation of firms across different bargaining institutions.

The structure of the labour market, and particularly the degree of centralisation of wage bargaining institutions, seems to matter for the way firms adjust to economic shocks. Thanks to this new dataset we are able to disentangle different bargaining regimes, including multi-level regimes, and relate them to firms' growth trajectories in terms of employment and to nominal wage changes throughout the Great Recession. Therefore, in addition to providing insights on the impact of labour market institutions on cost-cutting strategies at the firm level, this chapter intends to promote a more extensive use of micro data, especially given the limitation of macro indicators of labour market institutions.

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# 6 In search of lost market share: the French case

Maria Bas, Lionel Fontagné, Philippe Martin and Thierry Mayer

The arrival of powerful new players on world markets – the foremost being China – automatically reduces the market share of advanced economies. But France's export market share has decreased more than those of other European countries. This is not 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 by an inadequate 'quality/price ratio' for French products on average. When products are 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.

A country's competitiveness comprises a price dimension and a non-price dimension. Regarding 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. Price competitiveness is therefore not solely a matter of labour costs for exporting companies. We also need to look at the input side, whether it be intermediate goods (possibly imported), energy or even services produced in France for exporting companies. The central message is that competitiveness is everybody's concern, and not just a concern of industrial companies. Greater efficiency in non-tradable sectors (business services, construction, public services) also contributes to price competitiveness.

Non-price competitiveness is more difficult to measure. We rely on disaggregated data to provide a per-product diagnosis, a micro-economic approach that is particularly well-suited to demonstrate the quality effect. Among the OECD countries, France retains a relatively good position in terms of the number of sectors in the top ten for non-price competitiveness (7th). However, there has been a drop-off since 2008 with a downturn in a number of sectors.

Non-price competitiveness policies and productivity policies to a great extent overlap, which is why we emphasise the importance of reallocating production factors (labour and capital) to help the most productive companies develop faster. Reforms to reduce the regulation of the goods, services and labour markets need to explicitly take this objective into account. Moreover, the example of luxury goods demonstrates the importance of brands in the creation of non-price competitiveness. The protection of intellectual property rights should be a priority for France and the European Union in international negotiations.

## 6.1 How France is losing market share

The rise of emerging economies on world markets has automatically led to a drop in the market shares of all advanced economies. This downward trend of French market share, which is well documented in a number of reports, is therefore in part a reflection of the reconfiguration of world trade. Nevertheless, we should be concerned by the fact that French market share has dropped further than that of other countries in the European Union, with the exception of Italy (Figure 1)<sup>65</sup>. Between 1995 and 2013, France's market share dropped by 42 percent for goods and services, as did that of Italy, whilst this figure stood at just 21 percent for Germany and 27 percent for the United Kingdom, with Spain retaining an almost stable market share<sup>66</sup>.

In this chapter, we focus solely on the export of goods that are central to international trade and for which detailed statistics are available by product and trading partner<sup>67</sup>.

### 6.1.1 State of play

France's poor exporting performance is sometimes attributed to its poor geographic or sectoral positioning. If this were true, a solution to reduce loss of market share would be to target high-growth countries and sectors (such as large emerging economies, agri-food, health, new information and communications technology<sup>68</sup>), maybe by providing incentives for firms to redirect exports towards them.

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65. We work on the basis of world market share, including intra-European trade flows. France's market share is the ratio between French exports to all foreign markets (including European) and all global exports (including intra-European).

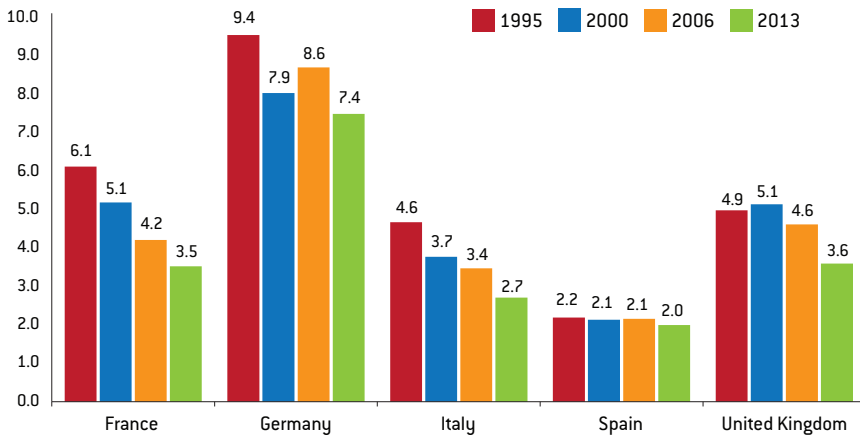
66. The drop in French market share stood at 47 percent for goods (between 1995 and 2014) compared with 21 percent for Germany, 30 percent for Italy and 41 percent for the United Kingdom. We note however that the French performance is average within the OECD.

67. For an analysis of services exports, please see, for example Gaulier *et al* (2010).

68. See the Direction générale du Trésor (2012).



Figure 1: Changes in world market share for goods and services for the five largest EU countries, 1995 to 2013



Source: The World Trade Organisation. Note: exports in goods and services in percentage of world exports including intra-European trade.

European countries, which trade a great deal between themselves, suffer from a negative geographic composition effect because Europe is growing at a slower pace than the rest of the world (Asia in particular). No European country has escaped this effect and France is, from this point of view, average over the period 2006 to 2014 (Table 1 and method in Box 1). The countries that have been most successful in positioning themselves on emerging markets have suffered slightly less from this 'European' effect: this is the case for Germany and Italy. However the geographical effect has a greater impact on Spain and the United Kingdom than it does on France.

As for product specialisation, this generally accounts for very little in the market share variations observed between 2006 and 2014, as shown in Table 1. In the case of France however, this specialisation has proved to be an advantage compared to Germany: the geographic disadvantage of French exporters compared to German exporters has been more than compensated for by more favourable product positioning. The combined contribution of country specialisation and product specialisation in explaining loss of market share is practically zero in the case of France ( $-0.1$  percent average per annum) whilst it is clearly negative for Germany ( $-0.7$  percent per annum). Germany's better performance is therefore solely explained by 'pure' competitiveness effects: French exporters are less effective than German exporters in selling the same product on the same market.

**Table 1: Changes in world market share for goods, 2006-Q1 to 2014-Q3 annual average variation in %**

	Rate of growth in exports	Annual variation in world market share	Geographic effect	Of which: Sectoral effect	Pure performance
EU-28	4.4	-1.9	-0.8	-0.1	-1.0
Euro area 17	4.3		-0.8	-0.1	-1.1
France	3.0	-3.2	-0.8	0.7	-3.1
Germany	4.5	-1.7	-0.5	-0.2	-1.0
Italy	4.0	-2.2	-0.5	-0.6	-1.1
Spain	4.5	-1.7	-1.1	-0.1	-0.5
United Kingdom	2.3	-3.9	-0.9	0.4	-3.3
World	6.2	0.0	0.0	0.0	0.0

Source: World Bank, *Export Competitiveness Database*. Note: variations are in delta-log. For example, where market share falls from 10 to 9%, the variation recorded is  $\ln(9/10) = -10.5\%$ .

#### BOX 1: BREAKDOWN OF MARKET SHARE VARIATIONS BETWEEN 2006 AND 2014

In order to pinpoint the contribution made by geographic and sectoral specialisations in market share evolution, we made use of the Export Competitiveness Data Base developed by the World Bank in collaboration with the Banque de France and the International Trade Centre (CNCUCED-OMC). The 'shift share' method proposed by Gaulier *et al* (2013) was applied to quarterly data starting in 2006 for 228 countries or territories at the HS-6 level of the Harmonised Commodity Description and Coding System which comprises some 5,000 products. The latest data available was for the third quarter of 2014. Compared with the 'traditional shift-share' method (Cheptea *et al*, 2005; Cheptea *et al*, 2014a; Cheptea *et al*, 2014b), the one used to create this database has a greater frequency of data and takes into account extensive trade margins (increase in the number of products exported or the number of destinations served).

Variations in exports for each category of product/exporting country/importing country/quarter are regressed under the fixed effects of product, exporter and importer enabling the effect of 'pure' competitiveness to be isolated by deduction for each exporting country. This 'pure' competitiveness effect answers the following question: "What would the variation in exports for a country be if the geographic and sectoral structure of its exports were the same as that of its competitors?"

We would like to thank Gianluca Santoni (CEPII) for extracting the data.

This ‘pure’ competitiveness effect is quantitatively significant. To see this at work, it is possible to compute what France’s market share would have been if it had not lost more ‘pure’ competitiveness than Germany between 2006 and 2014. Its loss in market share would thus have been 0.75 percent on average per annum instead of the 3 percent loss shown in Table 1. This represents a loss of €112 billion for 2014 in terms of the export of goods<sup>69</sup>.

World trade declined sharply in 2009, followed by a more long-term slowdown after the automatic rebound in 2010. The specifically European economic crisis also started in 2009, which placed European Union exporters in an even less favourable position, given their strong exposure to EU markets. Table 2 shows that between 2009 and 2014, the contribution made by geographic specialisation to losses of market share practically doubled for all European countries. In France however, this negative effect was offset by a strongly positive product-specialisation effect. As such, loss of French market share since 2009 (–1 percent per annum on average) is essentially explained, as since 2006, by a competitiveness factor. However, these global developments hide very different realities. One sector in particular – luxury goods – has recorded a good trade performance and deserves closer analysis.

**Observation 1: Poor French export performance is linked to an inadequate ‘quality/price ratio’, not to poor country or product positioning.**

**Table 2: Changes in world market share for goods, 2009-Q1 to 2014-Q3 annual average variation in %**

	Rate of growth in exports	Annual variation in world market share	Of which:		
			Geographic effect	Sectoral effect	Pure performance
EU28	0.3	–2.3	–1.8	0.5	–1.0
Euro area 17	0.1	–2.5	–1.8	0.5	–1.3
France	–1.0	–3.5	–1.5	1.5	–3.5
Germany	0.5	–2.0	–1.3	0.5	–1.2
Italy	–0.3	–2.8	–1.4	0.2	–1.6
Spain	1.1	–1.4	–1.9	0.7	–1.8
United Kingdom	–0.2	–2.7	–1.6	0.7	–1.8
World	2.5	0.0	0.0	0.0	0.0

Source: World Bank, *Export Competitiveness Database*.

69. This calculation is based on the variation when comparing Germany’s market share and that of France up to the fourth quarter of 2013. The export ‘deficit’ measured in this way at the end of 2013 is applied to world trade in 2014; 0.76 points of  $18,784 \times 1,021/1.3$  with world exports of goods of \$18,784 billion in 2013 and world trade growth estimated at 2.1 percent in value terms in 2014 [CPB, World Trade Monitor estimate]. We use an average euro-dollar exchange rate of 1.3.

### 6.1.2 The counter-example of luxury goods

A labour-intensive industry located – at least in part – in a country deemed to have high labour costs, the French luxury goods industry has proved able to compete with emerging countries and to benefit from the rapid growth of an affluent class within those countries. Two recent studies shed light on this success based on data from the grouping of part of the luxury goods industry within the Comité Colbert<sup>70</sup>. A number of sectors are covered: tableware, decoration, clothing, drinks, perfumes, jewellery, hand-bags and shoes and confectionery.

Three results emerge: advanced countries are less disadvantaged, all other things being equal, in the export of luxury goods than in that of other industrial products: the high-end positioning protects them from competition from emerging countries; the export of luxury goods is less sensitive to distance than other products on average; luxury goods react to a greater extent than other exports to an increase in purchasing power in destination markets, but this is only the case for a handful of exporting countries, including France.

At the centre of this success is one crucial variable: brands. The factor explaining France's difference (as well as Italy's and Switzerland's) is the number of luxury brands from the exporter country among the top 100 global brands. In France there are 24 compared to 10 in Switzerland, 7 in Italy and just 1 in Japan (World Luxury Association).

**Observation 2: The sectors which have been most successful in resisting competition rely on strong brands.**

### 6.1.3 Too few exporters?

We have seen above how export growth can be broken down into a geographic specialisation component, a sectoral specialisation component and a 'pure' competitiveness factor. Another interesting analysis separates the increase, over time, of already existing flows (for example exports from France of small Peugeot cars to Denmark), from the creation of new flows (new products, new markets or new exporting companies).

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<sup>70</sup>. See [www.comitecolbert.com](http://www.comitecolbert.com). See Martin and Mayneris (2015), and Fontagné and Hatte (2014). The results of these two studies are confirmed, in the special case of champagne, by Crozet, Head and Mayer (2012).

In the short term (from one year to the next), the growth of French exports is overwhelmingly explained by an increase of the flows already in place, known as the intensive mark-up (87.7 percent) (Berman *et al*, 2015). The remainder (12.3 percent), known as the extensive mark-up, is new flow creation: 2.4 percent is the result of the arrival of new companies (net of the departure of companies which were previously present in the export market), and 9.9 percent is the result of companies which were already present in the market but which have added or withdrawn products and/or destination markets to/from their export portfolios. Therefore, over the short term it is not the arrival of new exporting companies that is the principal explanation for the growth in French exports.

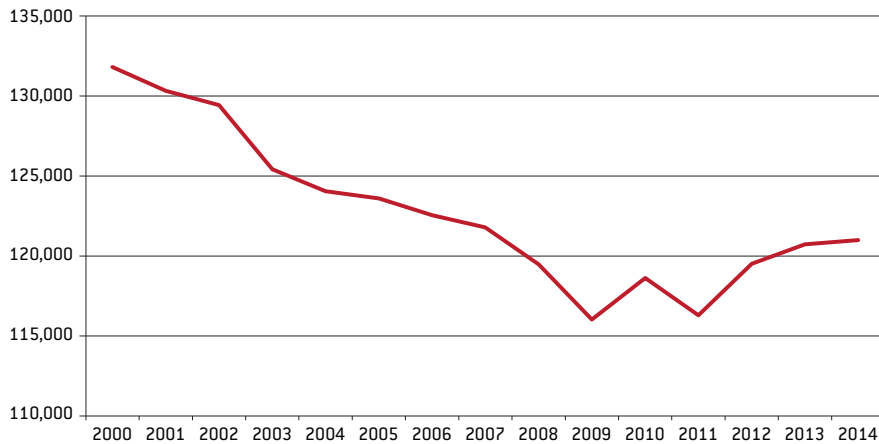
On the other hand, over a ten-year period, the extensive mark-up accounts for 53.5 percent of export dynamics: 26.2 percent as a result of new companies entering the export market and 27.3 percent through the multiplication of products or markets by existing companies. Over this period, the intensive mark-up accounts for just 46.5 percent of the growth of all exports. The difference between a short-term analysis and an analysis over a period of 10 years lies in the fact that the new export flows are small in size but liable to grow rapidly over time (because of drastic selection of best entrants, with the remainder exiting the market fairly quickly) to such an extent that after 10 years, these initially weak flows become significant.

France's weak export performance does not result from a different distribution between the development of existing markets (which would have been maintained) and entering new markets (which would have been insufficient – see the drop in the number of exporting companies between 2000 and 2009, Figure 2). The very strong reliance of French exports on a small number of exporting companies is a phenomenon that is characteristic of advanced economies<sup>71</sup>, and the share of the export dynamics between intensive and extensive mark-ups is similar in other countries. Moreover, the French performance is not the result of a peculiar under-representation of SMEs in exports: one third of the value of French exports to outside of the EU was accounted for by SMEs in 2011. This is lower than for Italy (49 percent) but higher than for Germany (28 percent) and falls within the European average (Cernat *et al*, 2014).

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71. In 2003, the top 5 percent largest French exporters accounted for 73 percent of the country's exports. The corresponding figure was 81 percent for Germany and 69 percent for the United Kingdom. Italy was slightly lower at 59 percent. See Mayer and Ottaviano (2007). This extreme concentration remains true at a more detailed level: in 2008, the largest 10 French exporters represented just over 20 percent of total exports; in Spain this figure exceeded 40 percent and in Italy it stood at approximately 10 percent, see: Berthou *et al* (2015).

Figure 2: Number of exporting companies in France, 2002 to 2014



Source: French customs.

### 6.1.4 Export support policies

As we have seen, the creation of new export flows is a key element in export dynamics at least within a 10 year timeframe, if not in the short term. These new flows might come from large companies developing new products or investing in new markets. They might also come from SMEs that are first-time exporters. There are three grounds for public intervention in this area.

#### 6.1.4.1 Information costs

According to recent theories of international trade (Melitz, 2003), first-time exporters face fixed information-gathering costs that weigh proportionately more on small companies than on large ones. Numerous SMEs do not export because their productivity is inadequate to cover this fixed cost. Governments might therefore wish to support those SMEs closest to the productivity threshold to enable them to export, given that the start-up cost has only to be borne once. Government action is however faced with a number of problems (Box 2): it is difficult to identify companies close to the productivity threshold enabling them to export; a large number of first-time exporters are not able to retain their place in target markets, which reduces the return on government intervention<sup>72</sup>; if a multiplicity of support packages for growing overseas leads to the

<sup>72</sup> .According to Bentejac and Despons (2013) about one third of first-time exporters (not having exported in the previous five years) survive beyond one year. This proportion is 70 percent for businesses that are members of a group.

### Box 2: Government export support policies

In France, a large number of agencies are involved in helping companies grow their business overseas and more than 90 percent of medium-sized businesses and SMEs that are already trading internationally or are about to do so (2 percent of all companies) state that they use at least one support body (Bentejac and Despons, 2013). The processes cover two major types of support packages:

- **Advisory:** information, access to international contacts or partners in the target market, attendance at trade shows, employment assistance through the post-graduate students for international business programme, etc. Business France (previously Ubifrance) provides trade advice and support to some 9,000 businesses each year to which is to be added the networks of French chambers of commerce located overseas and that of the Department of Finance, the diplomatic network, foreign trade advisers, as well as sectoral agencies (such as agriculture and cultural products), help provided at the regional and local levels and EU schemes for promoting exports;
- **Financing and insurance:** public intervention is essentially carried out by BPI France and by Coface. Three schemes, targeting approximately 1,000 companies per year, are provided by BPI France: export development loans (unsecured loans guaranteed by public funds); cash flow loans (export loans, buyer-credit); bank loan guarantees. Coface offers credit insurance (as a private insurer) and assistance in surveying potential markets (on behalf of the State). It boasted 37,000 customers in 2013.

Crozet *et al* (2013) have assessed the direct impact of a small number of services provided by Ubifrance and Coface on the export performance of French companies between 2005 and 2010, by comparing those companies receiving support with their peers (same characteristics in terms of sector, size and productivity) not receiving support. According to this study, the main impact of the assistance in surveying potential markets provided by Coface appears to be an increase in export volumes for exporters already in place (about +20 percent) and in the number of destinations (approximately one additional country). Support packages set up by Ubifrance and which focus on coaching a group of companies appear to be the only ones that encourage companies to get started in international trade; both schemes have an impact on exported volumes that is similar in size, but the latter appears to be short-term while assistance in surveying markets has a more sustainable impact. These results are in line with those from other countries (Cadot *et al*, 2011; Volpe Martincus and Carballo, 2008; Van Biesebroeck *et al*, 2015) although it should be noted that all studies (including this one on France) are quite sensitive to the choice of control group. These results are also in line with surveys carried out by Business France and BPI France.

replacement of the entry cost to a foreign market (subsidised by the government) by a research cost for an adequate support mechanism (supported by the SME) the net effect on export capability could be uncertain. In fact, the complexity of mechanisms in France is regularly highlighted by assessment committees in spite of rationalisation efforts<sup>73</sup>.

In any event, export-support policies as they are currently structured fail to explain the worsening of the French balance of trade. The businesses involved are generally small in size and contribute only modestly to external trade; in addition, external trade has declined while support mechanisms have improved. The significant government support (estimated at some €600 million in 2012)<sup>74</sup> has recently shifted away from first-time exporters towards companies that already have overseas activities, with the aim of increasing their exports and the number of their subsidiaries abroad.

#### 6.1.4.2 Imperfections in the credit market

A second justification for government intervention is the financial constraints on SMEs, especially when they invest in order to reach export markets. Assessing these interventions in terms of financing poses the same problems as those related to support (identifying the reference group).

Whereas government intervention in terms of financing affects a sizeable proportion of exporting companies (see Box 2), it is unlikely that financing is a decisive factor in France regaining its market share. According to Bricongne *et al* (2012), during the 2008 world financial crisis, French exporters were less affected by the discontinuation of funds than by the fall in international trade: over 60 percent of the fall in French exports was due to the 'net intensive mark-up' of the largest exporting companies (the top 1 percent), which were barely affected by credit restrictions. The credit squeeze was directly felt by companies that were already in financial difficulty and for which restrictions on loans related to the crisis were an aggravating factor; however as their number was low, the impact was limited.

#### 6.1.4.3 Externalities

A last justification for export aid relates to positive external effects on companies upstream and downstream of the exporting company. Enabling a company to export has

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73. See Bentejac and Desponts (2013) and Cour des Comptes (2011).

74. See Bentejac and Desponts (2013).



a multiplying effect insofar as it is able to share information with other potential exporters, or simply serve as a demonstration model for close competitors. Recent studies confirm the existence of these positive effects<sup>75</sup>. However, competitiveness clusters do not seem to have a knock-on effect on R&D, the number of patents or turnover. Some studies do demonstrate the positive impact of competitiveness clusters on the probability that exporters in these clusters will continue exporting. However, these companies are more dependent on the cluster's 'lead' company and their presence within clusters did not seem to protect them during the 2008-09 financial crisis<sup>76</sup>.

Compared to other European countries, France is in the upper range for government export support (Box 3). The types of support mechanism are similar from one country to another. However, French support schemes are characterised by a larger share of services invoiced to companies.

**Observation 3. A wide range of government export support mechanisms are available to French SMEs. Even though they would gain from being further rationalised, these mechanisms are not the primary answer to the erosion of French market share.**

## 6.2 Inadequate non-price competitiveness

'Pure' competitiveness, as defined in the previous section, comprises a price dimension and a non-price dimension. Price competitiveness is the result of unit production costs (including labour costs, energy costs, cost of capital and intermediate consumption, net of productivity gains), mark-ups and nominal exchange rates. Non-price competitiveness can be considered as a residual in that it is the part of demand that is not explained by price. It has a variety dimension (horizontal product differentiation, different yoghurt flavours for example) and a quality dimension (vertical product differentiation, more- or less-creamy yoghurt for example).

The fact that non-price competitiveness is not directly measurable makes any diagnosis rather precarious, particularly when it is based on aggregated data<sup>77</sup>. Here we have adopted a micro-economic perspective: we compare changes in non-price competitiveness for products exported by France, to those of other major OECD countries on the basis of disaggregated data by product for the period 2000-13. The non-price

75. Koenig *et al* (2010).

76. See Askenazy and Martin (2015), who recommend an independent assessment of competitiveness clusters and a reduction in their number, and Bellégo and Dortet-Bernadet (2013).

77. See for example Borey and Quille (2013).

competitiveness indicator used reflects product characteristics which see increased demand at a given price. The idea is that consumers are ready to pay a higher price for products with attributes – other than price – that they value strongly, such as brand, company image, exporting country, quality of associated services, reputation, product reliability or design. The methodology is set out in Box 4.

### BOX 3: SUPPORT POLICIES FOR GROWING OVERSEAS IN SOME EUROPEAN COUNTRIES

In Germany the promotion of exports is by and large in the hands of the Ministry of the Economy with a 2012 budget of €138.4 million. A large share of this is invested in organising trade fairs and exhibitions (40 percent) and in the consular networks of 120 bilateral chambers of commerce (27 percent). The latter have 2,200 staff and 50,000 member companies spread over 80 countries. Support schemes at federal level are also based on financial advisors at embassies and on the German Trade and Invest agency, an agency of the Ministry of the Economy with some 300 agents and a budget of €17 million. Companies are supported at state or *Länder* level by local chambers of commerce; in the most industrialised *Länder*, specific advisory bodies support locally-based companies in exporting. In addition, companies receive guarantees and credit insurance (€30 billion in 2011) of which 75 percent is allocated to trade with emerging and developing countries; this budget supports export growth but also covers industrial policy, foreign policy and employment protection objectives.

The Italian system is supported by the Ministry of Foreign Affairs and the Ministry of Economic Development, the former having a coordinating role based on its diplomatic networks whilst the latter is responsible for granting export aid (supporting promotional work, preferential loans or credit insurance products, in particular for SMEs). This system was reformed in 2013 to recentralise certain skills which had been devolved to the regions, with the aim of making processes more transparent and efficient. Financial support granted by the Italian state has been halved over the past years, reaching €33 million in 2012.

In the United Kingdom, export support is organised jointly by the Ministries of Trade and Foreign Affairs, via UKTI (UK Trade and Investment – the equivalent of Business France). This is based on a regional organisation of 12 agencies dispersed throughout the country. The UKTI has a budget equivalent to €368 million for 2014-15, more than double the 2013-14 budget. It has nearly 2,300 employees, half of which are based abroad. Moreover, the British model is based on cooperation with private service

providers and chambers of commerce located abroad (for example the China Britain Business Council). Sectoral priorities (health, defence, creative industries, oil and gas and agribusiness) and geographic priorities (high growth emerging markets) were set out. 54,190 companies used one or more of the UKTI services between October 2013 and September 2014 (compared with 25,400 in 2011) including 11,430 first-time exporters. The latter have access to a number of free services or grants, for example export advice from a UKTI expert, financial help in attending exhibitions and trade shows overseas and access to market research for overseas. Other services are to be paid for, as with the Overseas Market Introduction Service (which offers a number of schemes using on-site UKTI experts) or Postgraduate Students for International Business introduced in 2014. Via UK Export Finance, businesses that have not been able to secure insurance on the private market were able in 2013 to benefit from insurance products amounting to approximately £2 billion.

### *6.2.1 France ranks 7th in the OECD...*

We limit ourselves here to sectors that represent more than 1 percent of exports for each country under consideration. Table 3 sets out the 10 leading sectors for non-price competitiveness in France and Germany in 2013. The sectors are classified by decreasing ranking within the OECD. As such, France's number one sector in terms of non-price competitiveness is aeronautics, in which France ranks top among OECD countries. This non-price competitiveness is assessed in section 2.4: in this sector, French exporters could set prices more than twice as high what they would be if their quality was identical to the average for OECD countries. This advantage stands at 7.3 in the leather goods sector, in which France ranks second among OECD countries in terms of non-price competitiveness.

The three sectors in which France is most competitive in non-price terms are aeronautics, leather goods and wine. In Germany, it is automotive spare parts, non-ferrous metals and plastic products. These top three sectors represent 15 percent of German exports, compared with just 7 percent of French exports. In addition, Germany ranks top in the OECD in three sectors, while France ranks second in leather goods and third for wine. Moving down the list, Germany remains the top performer in its first ten sectors, whilst France falls to eighth in the OECD in its tenth sector (plastic products). Germany thus clearly ranks ahead of France in terms of non-price competitiveness. This is even more disadvantageous for French exports given that, among the ten most competitive sectors in non-price criteria, four are common to both countries: Germany is France's closest competitor and outperforms France in terms of non-price competition.

**BOX 4: MEASURING NON-PRICE COMPETITIVENESS**

Bas, Martin and Mayer (2014) have adapted the method developed by Khandelwal, Schott and Wei (2013) in order to estimate the quality of exported products at the HS-6 level (over 5,000 products) using bilateral international trade data (Bas *et al*, 2014; Khandelwal *et al*, 2013). The data used here is that of BACI, a database developed by the CEPII based on the United Nations' COMTRADE data (see Gaulier and Zignago, 2010). Estimates concentrate on the 50 exporting and importing countries with the highest flows of trade (the list of countries is set out in Bas *et al*, 2014). To compare countries similar to France, we have concentrated on exporting countries which are members of the OECD.

Non-price competitiveness is estimated on the basis of a demand function which depends negatively on prices, with a constant elasticity of substitution, and positively on non-price products' attributes (including perceived quality):

$$x_{kint} + \sigma_k p_{kint} = \beta PIB_{it} + \lambda D_{in} + \alpha_{knt} + \varepsilon_{kint}$$

where  $x_{kint}$  and  $p_{kint}$  are logarithms of the quantity and price (unit values) of a product  $k$  exported by country  $i$  to destination  $n$  in year  $t$ .

The method has been changed to take into account bilateral determinants of international trade such as distance, shared language, border effects and colonial links, grouped together in the term  $D_{in}$ . In addition, the fixed effect  $\alpha_{knt}$  includes demand as well as the degree of competition in the destination country. Finally, the equation controls for the effect of the country of origin's size. The elasticity of substitution between products  $\sigma_k$  is from Broda and Weinstein (2006).

Estimated non-price competitiveness  $q_{kint}$  is the residual of the equation  $\varepsilon_{kint}$  standardised by the elasticity of the corresponding product:  $q_{knt} = \varepsilon_{kint}/(\sigma_k - 1)$ . An equivalent residual reveals higher non-price competitiveness when related to products with low elasticities for which price variations have little impact on sales. This measure of non-price competitiveness is then aggregated by sector (102 sectors).

We now turn to the top 10 countries in terms of non-price competitiveness for each sector. In 2013, France had 55 sectors (out of 102 analysed) in the OECD 'top 10' (Figure 3), placing it in seventh position overall in the OECD, a relatively good (and stable) position<sup>78</sup>. The graph shows that Germany is out in front with 85 sectors in the 'top 10'. Italy, Switzerland, the Netherlands, the United Kingdom and Japan are all slightly

78. The conclusion about relatively high export unit values in the case of France is confirmed by Fontagné *et al* (2008). The authors deal with non-European trade.

**Table 3: 10 leading sectors for non-price competitiveness, France and Germany, 2013**

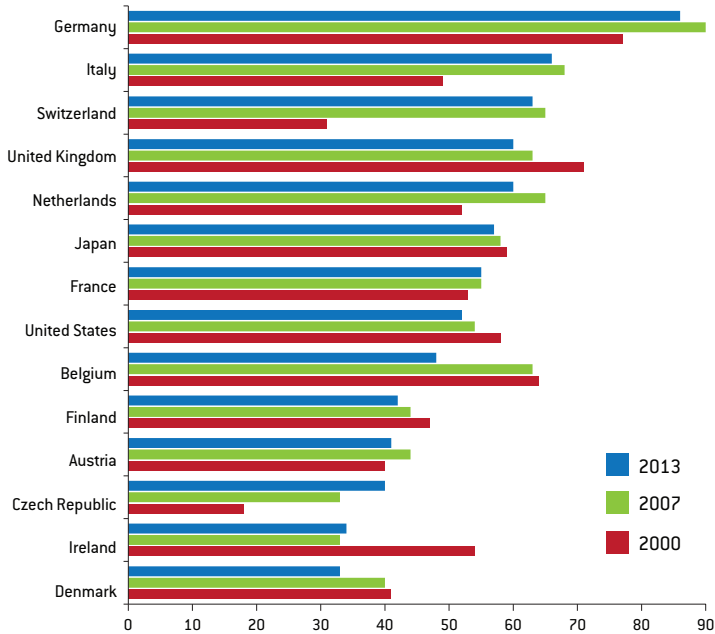
	Market share within OECD (%)	Sector share of total country exports (%)	Non-price competitiveness*	OECD ranking
<b>FRANCE</b>				
Aeronautics	10.2	3.4	2.4	1
Leather goods	25.6	1.3	7.3	2
Wine	28.0	2.4	2.2	3
Electrical distribution equipment	6.0	1.7	4.5	3
Automotive spare parts	6.2	6.0	1.4	5
Dairy products	14.6	2.2	1.2	5
Clothing	9.3	1.1	1.2	5
Plastics	7.5	3.9	1.1	7
Other metal products	5.8	2.2	1.2	7
Plastic products	6.4	2.8	1.3	8
<b>GERMANY</b>				
Automotive spare parts	22.6	8.0	3.4	1
Non-ferrous metals	16.4	3.6	1.4	1
Plastic products	20.4	3.3	2.8	1
Automotive vehicles	16.8	3.0	1.6	1
Other metal products	21.5	3.0	2.2	1
Electrical distribution equipment	24.2	2.5	34.2	1
Machinery, other	20.7	2.3	3.7	1
Machine-tools	27.4	2.3	2.1	1
Precision instruments	21.1	2.2	21.4	1
Electronic components	17.1	1.8	25.6	1

Source: MAPCOMPETE. Note: \* = price equivalent. For example, the figure '2' means that in that sector, exporters may set prices that are twice as high as they would be if their quality was identical to the average for OECD countries.

ahead of France but to a lesser degree (between 57 and 65 products). The USA performed slightly less well than France (51 products). Figure 4a breaks down the market share variations of several OECD countries into variations resulting from price competitiveness and non-price competitiveness, for the period 2000-13. Here we examine market share compared to the OECD average, and therefore between comparable countries. This figure compares Japan, the United Kingdom and the USA on the one hand, which lost greater market share than the OECD average, and Germany and above all Poland on the other hand, which lost less than average market share and even gained market share (in the case of Poland and more generally central and eastern European countries, Mexico and Turkey which are not represented on the graph). In both cases, changes in market share seem to be primarily explained by non-price competitiveness, which decreased in the first group and increased in the second. France finds itself in

an intermediate position which, nonetheless, masks contrasting changes between sectors<sup>79</sup> and over time.

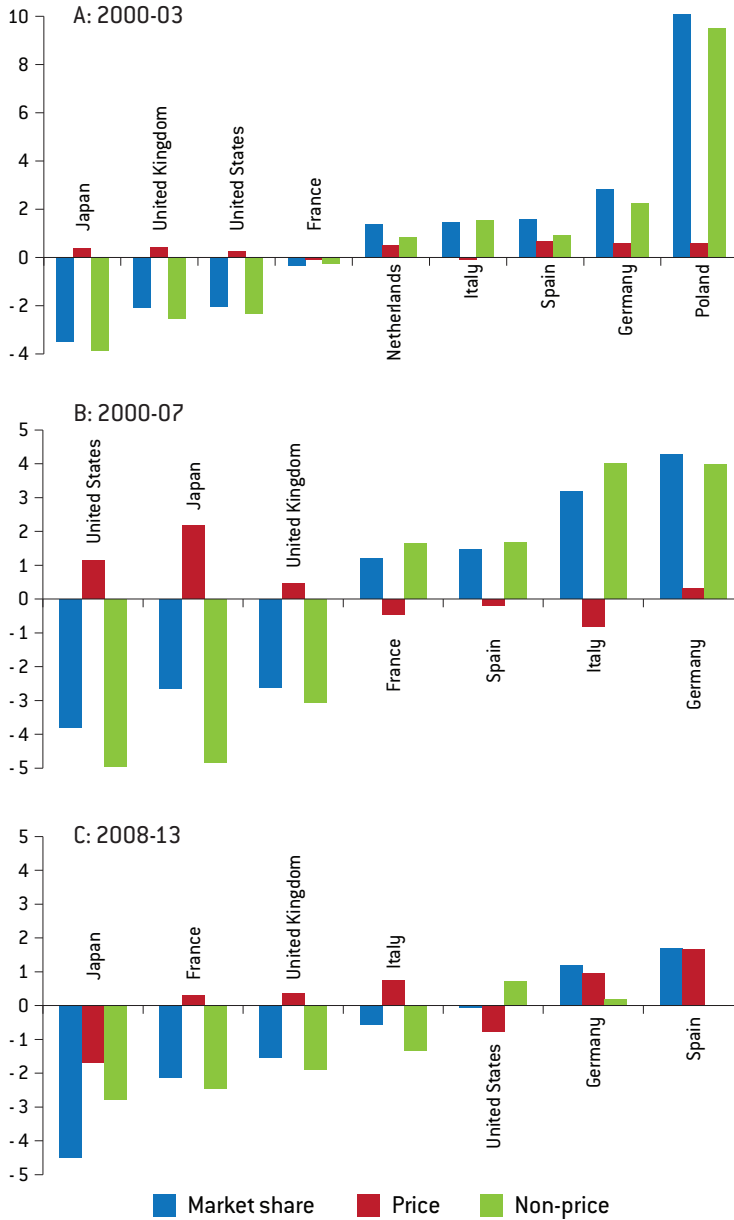
Figure 3: Number of sectors by country in the top 10 for non-price competitiveness, 2000, 2007 and 2013



Source: MAPCOMPETE.

79. The top two French sectors in terms of non-price competitiveness – aeronautics and leather goods – have shown strong increases in competitiveness since 2000. See <http://www.cae-eco.fr>.

Figure 4: Relative annual variations in market share and price and non-price competitiveness component, %



Source: MAPCOMPETE. Note: Relative change compared with the OECD average.

### 6.2.2 ...but has dropped in several sectors since 2008

From 2000-07, French market share dropped a little less rapidly than the OECD average (Figure 4b). Over this period, French price competitiveness worsened (partly because of the appreciation of the euro), but this was offset by a net increase in non-price competitiveness. Over this same period, Germany improved its price competitiveness thanks to wage moderation and the delocalisation of the less-competitive segments of its production chain. But the marked increase in its non-price competitiveness demonstrates that Germany used this period to increase the quality of its products. This observation downplays the view that Germany has carried out a strategy based solely on reducing related costs over this period. From 2008-13, French performance was far below the OECD average, even though its price competitiveness improved slightly (Figure 4c). Its non-price competitive greatly deteriorated. It is possible that the pre-2008 non-price competitiveness improvement was primarily driven by a selection effect: given the decline of price competitiveness during this period, only the most productive exporters and those with high non-price competitiveness were able to survive, which is consistent with the drop in the number of exporters recorded up to 2009 (Figure 2) and the drop in industry mark-up rates<sup>80</sup>. As of 2008, while France's cost-competitiveness improved slightly, the lack of innovation, investment and an up-market shift (difficult when mark-ups are weak) seem to have led to a non-price competitiveness fall-out. Although still in the top 10, a number of sectors have declined for France: electrical distribution equipment, wine, automotive spare parts and furnishings.

**Observation 4. Among OECD countries, France enjoys relatively good (7th in the OECD) non-price competitiveness, but this competitiveness has declined since 2008. Germany is in pole position among OECD countries.**

### 6.3 How can market share be regained?

Debates on competitiveness tend to focus on less-important explanations of France's export underachievement (poor geographic or sectoral specialisation, credit constraints or insufficient exporter support) and give insufficient prominence to the most important quantitative factor: the quality/price ratio of products.

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80. See Martin and Méjean (2014) and Aghion *et al* (2014).



### 6.3.1 Price competitiveness

Price competitiveness is understood differently according to whether we are looking at the euro-area markets or the non-euro area, even if we need to put this distinction into perspective insofar as France is in competition with countries in the euro area in non-euro area markets.

#### 6.3.1.1 Exchange rate

Competitiveness in non-euro area markets strongly depends on the euro exchange rate. Estimates of data from French companies suggest that, all other things being equal, a 10 percent depreciation of the euro compared to a partner country outside of the euro area increases the sales value of the average exporting company to that country by some 5 to 6 percent. This increase – which generally takes place in the same year as the depreciation – arises mainly from an increase in export volumes (4 to 5 percent) and the remainder (0.5 to 1 percent) from an increase in mark-ups on each unit sold (via a slight increase in the price in euro)<sup>81</sup>. Overall, the impact of a 10 percent depreciation of the euro on the value of exports is greater – some 7 to 8 percent – because this depreciation not only improves the position of exporters already in the market but also encourages new companies to enter export markets. From March 2014 to March 2015, France's effective exchange rate depreciated by approximately 6 percent. Applying a simple rule of three suggests that our exports should increase by 4 to 5 percent.

#### 6.3.1.2 Labour and intermediate consumption

What then are the cost components thanks to which French economic policy can stand out from its competitors in the euro area? The debate tends to focus on direct labour costs in exporting sectors, while a breakdown of the value-added of exports shows that only 23 percent of export value is attributable to labour costs in the export sector directly concerned. Labour costs in other areas used in domestic intermediate consumption represents 21 percent of export value. The remaining 56 percent comes from intermediate consumption (excluding labour costs from domestic intermediate consumption) including imported products (25 percent of export values). These figures encourage an examination of imports as a way of optimising the value chain, of smoothly increasing the price of electricity which weighs heavily on some exports<sup>82</sup>

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81. See Bénassy-Quéré *et al* (2014).

82. See Bureau *et al* (2013).

and, finally, of controlling the costs associated with services, which have increased greatly over the past 10 years compared to Germany, not only because of labour costs but also because of the still high level of obstacles to competition in the service sector<sup>83</sup>.

More generally, it should be emphasised that the entire French economy contributes to the creation of price competitiveness. Improving the way that the housing market works, for example, contributes to competitiveness insofar as an increase in rents and property prices weighs heavily on household budgets and over time leads to increases in salaries. This line of reasoning can be extended to all services in the sheltered sector including government offices: the entire French economy is affected by the question of price competitiveness, not just front-line exporting companies.

### 6.3.1.3 'CICE targeting'

The Employment Competitiveness Tax Credit (CICE) implemented at the start of 2013 following the Gallois report on French industrial competitiveness<sup>84</sup>, has as its explicit aim the stimulation of employment and improvement of business competitiveness. We concentrate here on this second objective.

The yearly €20 billion of CICE tax credits represents, in principle, an overall reduction in labour costs of 3 percent for those companies concerned. Exporting companies therefore have a choice between lowering their export price and therefore increasing their price competitiveness and market share, or raising their mark-ups and offering wage increases. We still lack hindsight in knowing how French companies have reacted, although the results of surveys shed some light<sup>85</sup>. But we know that the CICE covers wages up to 2.5 times the legal minimum salary (SMIC), a threshold chosen in order to affect the industrial companies accounting for a large share of exports and whose employees are, on average, paid more than in the service industries. At these levels of remuneration, (skilled) employees face a relatively low risk of unemployment: recent secondary school graduates are faced with an unemployment rate close to 5 percent. In these circumstances exemptions reducing, *a priori*, labour costs by 1 percent could result in an increase in salaries of 0.9 percent<sup>86</sup>. *A posteriori*, the fall in labour

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83. See the Conseil d'analyse économique (2014).

84. Gallois (2012).

85. See INSEE outlook paper on the use of CICE tax credits (2014). Generally, companies state that they will use this tax credit to increase their operating profits; for 58 percent of industrial companies and 52 percent of service companies this extra resource will be used mostly for investment.

86. Cahuc and Carcillo (2014). See also Plane (2012) or Bock *et al* (2015), which uses a decreasingly elastic profile of employment in relation to cost according to wage level.

costs would therefore only be 0.1 percent for employees subject to a low unemployment rate. The possible gain in price competitiveness or increase in mark-ups would therefore be limited. These results suggest that the effect of CICE on wage dynamics should be assessed and, if this analysis were to show a stronger growth in wages above 1.5 times the legal minimum wage after these tax credits have been set up, then the benefit of these tax credits and the responsibility agreement should be re-focused on wages lower than 1.5 times the legal minimum.

The counter-argument generally put forward is that decreasing costs on low wages primarily benefits the non-tradable sector – retail or personal services, for example. Exporting companies, which are generally industrial companies, employ more workers at relatively high salaries. By not affecting higher salaries, the CICE tax credit would be missing its competitiveness objective. However, as we have seen, a large proportion of export value is made up of incorporated services, including a share of low-skilled services (cleaning, security, catering and transport). A decrease in the cost of low-skilled labour is therefore an important component of price competitiveness.

**Recommendation 1: Assess the impact of CICE on wage dynamics. If there is stronger growth in relatively high wages after CICE tax credits have been implemented then reductions in social security contributions should be concentrated on lower wages.**

### *6.3.2 Non-price competitiveness*

Non-price competitiveness policies largely overlap with productivity policies which also involve stimulating innovation and increasing quality. This is why we can here refer to the recommendations made by the French Conseil d'analyse économique on training and research<sup>87</sup>. This is, in particular, the case with professional training, which should also be considered as an investment for increased competitiveness and an up-market shift.

However, as the example of luxury goods demonstrates, brands play a specific role in exports by offsetting cost disadvantages and eliminating the handicap of geographic distance. Intellectual property rights issues should be a priority in international trade negotiations in which Europe is engaged, and this should be clearly affirmed by the French authorities. The rejection of the Anti-Counterfeiting Trade Agreement (ACTA) by the European Parliament in July 2012 is, from this point of view, particularly concern-

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87. Artus *et al* (2014); Fontagné *et al* (2014).

ing, in contrast to its signature in 2011 by Canada, the USA, Japan, Korea, Singapore, New Zealand and Morocco.

**Recommendation 2: Make defending intellectual property rights a priority in international negotiations.**

However, productivity is not just a question of design and innovation. Recent studies suggest that an important part (between one quarter and one third) of differences in productivity between companies and between countries is simply due to the quality of company management<sup>88</sup>. France ranks seventh among OECD countries in terms of the average quality of its company management. Compared with countries like Germany or the USA, it is nevertheless characterised by a large proportion of small companies with weaker management quality on average and therefore lower productivity.

Lastly, growth in the productivity, and therefore competitiveness, of a country comes largely (50 percent according to recent studies) from reallocating production factors from under-productive to more-productive companies. Rigidity in the employment and goods markets limits this reallocation<sup>89</sup>. Measured at company level for each French industrial sector, the average difference between wages and productivity increased by almost 15 percent in real terms between 2002 and 2007<sup>90</sup>. This phenomenon of companies not working at optimum size is most marked at around 50 employees, reflecting a threshold effect. But this worsening is no more marked in the area of this threshold. Other possibilities need therefore be considered such as the cost of redundancies, bankruptcy law and goods and services market regulations<sup>91</sup>.

**Recommendation 3: In deliberations on structural reforms, the impact of these reforms on the reallocation of production factors (labour and capital) to the more productive companies should be explicitly taken into consideration.**

Finally we can see that export performance is, to a great extent, a simple reflection of the efficiency of the national production system, such that competitiveness policies overlap with policies to improve productivity.

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88. See Bloom *et al* (2014).

89. Aghion *et al* (2008) show the link between rigidity in the labour and goods markets and productivity. Dostie *et al* (2009) suggest that the reallocation of production factors could explain between 50 and 70 percent of overall growth in productivity of these factors.

90. Fontagné and Santoni (2015).

91. A recent International Monetary Fund study demonstrates that regulations reducing competitiveness on the goods and services market have a negative impact on productivity growth. See International Monetary Fund (2015) *World Economic Outlook*, pp104-107.

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# 7 Global value chains and GDP growth in the post-crisis context

Carlo Altomonte, Italo Colantone and Elena Zaurino

## 7.1 Introduction

*“...one of the most perplexing questions facing economists in recent years: does a continuing slowdown in the growth of international commerce mean globalisation has peaked?”* (‘IMF and World Bank warn of “peak trade”’, *Financial Times*, 2014).

The recent financial crisis generated a ‘Great Trade Collapse’ (Baldwin, 2009) in 2008-09, followed by a brisk recovery in 2010. Since then, however, international trade has grown at a markedly slower pace than in the previous fifteen years, a period in which yearly trade growth at times even doubled global GDP growth. Post-crisis, the growth of world exports has essentially been in line with GDP growth – slightly above or below depending on the data used (ie volume versus nominal flows). This pattern has been referred to as the ‘Global Trade Slowdown’, and has attracted the attention of economists and policymakers<sup>92</sup>. Trade is widely recognised as an important driver of growth, so there is a concern that the current slowdown might hurt growth prospects in the coming years.

The ongoing debate is essentially focusing on the causes of the trade slowdown. Uncovering the causes might help us understand whether the slowdown is a temporary phenomenon related to the economic cycle, or it represents a ‘new normal’ resulting from a structural change in global activities. According to many observers, a structural reason behind the trade slowdown could be related to the role of global value chains

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92. See, among others, ‘A troubling trajectory’, *The Economist*, 13 December 2014.



(GVCs), ie the breaking-up of production processes into ever-narrower discreet activities and tasks, combined with the dispersion of these activities and tasks across countries. The development of GVCs was one of the key factors behind fast trade growth starting from the 1990s. However, recent contributions suggest that the expansion of GVCs might have levelled off already before the crisis, thus contributing to a structural reduction in the elasticity of trade with respect to GDP (Al-Haschimi *et al*, 2015; Constantinescu *et al*, 2015). According to this view, the current trade slowdown is then likely to be largely ascribable to structural, GVC-related reasons, rather than cyclical ones. In this chapter, we argue that, even if trade dynamics can largely be explained by the development of GVCs, cyclical factors can also be at play in the adjustment of GVCs to the post-crisis context. In particular, exploiting a dataset on trade in value added by Wang *et al* (2013), we show that the crisis hit different components of trade in different ways, with two main findings: (1) the components of trade that are more directly linked to GVCs have been more heavily affected; (2) these components display the slowest speed of cyclical adjustment, ie it takes more time for them to recover from a negative shock (about six years). The combination of these factors sheds light on an additional cause of the trade slowdown, which might therefore have a greater cyclical component than so far thought, even as part of a GVC-related explanation. Overall, our results suggest that the trade slowdown is likely to be partly reabsorbed over the coming years, at least to the extent that GVC dynamics are responsible for it.

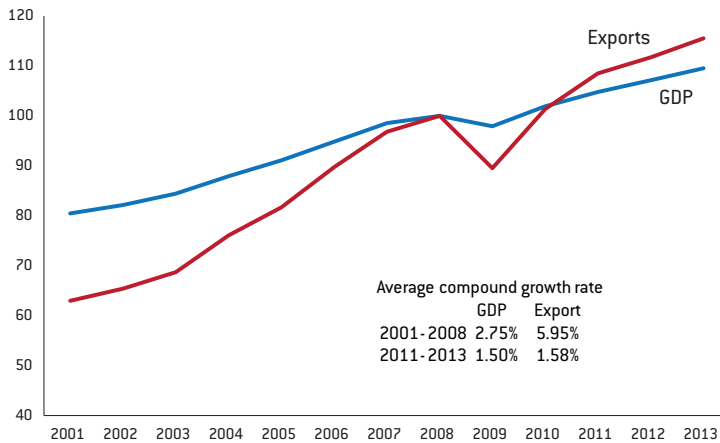
## 7.2 GDP vs. export growth and the role of GVCs

Figure 1 shows the evolution of world exports and GDP in volumes, from 2001 to 2013. Both indexes have 2008 as a base year, denoting the pre-crisis peak. Trade growth was clearly much higher than GDP growth until the crisis: 6 percent against 2.8 percent. The ‘Great Trade Collapse’ is then evident in 2009, when global exports dropped by almost 10 percent, much more than the drop in GDP. This was the biggest drop in trade since the Second World War. The trade slump starting in November 2008 was even much steeper than during the Great Depression, which ultimately led to a larger trade shock worldwide. In fact, over the Great Depression, world trade took almost two years to fall as much as it did in the first nine months of the last financial crisis (Eichengreen and O’Rourke, 2009). Global exports rebounded strongly in 2010, but since then their growth has been essentially in line with GDP growth, leading to the ‘Global Trade Slowdown’ puzzle<sup>93</sup>.

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93. See Hoekman (2015) for an extensive treatment of this issue.

Figure 1: GDP and exports in volumes - index 2008=100



Source: World Bank, *World Development Indicators*.

Some studies have attributed much of the current trade slowdown to cyclical factors, in particular weak (import) demand in European Union countries, which are recovering from the crisis in a very slow and anaemic way (Boz *et al*, 2014; Gavyn, 2013). As the EU accounts for about 35 percent of global trade, any slowdown in the EU has a substantial impact on world figures. Another cyclical explanation is related to the changing composition of GDP during the crisis, which has often witnessed a reduction in the investment component in favour of public expenditure. Since investment is more trade-intensive than public expenditure, such a compositional shift might explain part of the trade slowdown (Constantinescu *et al*, 2015). A third cyclical explanation relates to the role of trade finance. Access to finance is crucial for firms' exporting activities (eg Chor and Manova, 2012). The credit crunch arising from the financial crisis was one of the reasons for the trade collapse in 2009, and is likely to have hampered export growth subsequently, as banks have de-leveraged and rebuilt their balance sheets. Overall, to the extent that such cyclical drivers are responsible for the trade slowdown, we should observe a convergence back to faster trade growth as the global economy fully recovers from the crisis.

Another reason for the trade slowdown might be the reduced speed of trade liberalisation. High trade growth from the 1990s onwards was crucially driven by the successful conclusion of the Uruguay Round in 1994, and by the integration of China and the former Soviet countries into global markets (Bussière and Schnatz, 2009). The Doha round has failed to deliver and this momentum has diminished over time. Moreover, in the aftermath of the financial crisis, many governments have adopted protec-

tionist measures, which might also explain part of the slowdown (Evenett and Wermelinger, 2010; Evenett and Fritz, 2015).

A more structural explanation is related to the role of global value chains, the development of which was a key factor behind fast trade growth before the crisis. According to, for example, Al-Haschimi *et al* (2015) and Constantinescu *et al* (2015), this expansion process might have now levelled off, especially for China and the US, leading to a structural reduction in the elasticity of trade to GDP.

An extensive literature exists on the emergence of GVCs, which have changed the very nature of international trade<sup>94</sup>. Since the 1990s, trade has increasingly involved multiple flows of inputs and semi-finished products across borders, as different production steps were moved to different countries. This in turn has led to trade growing much faster than GDP, also as a result of so-called 'double counting' in gross trade figures. The underlying idea is very simple. Think about an input 'x', which is produced in country A. Imagine that this input is exported to country B, where it is assembled with other components into a semi-finished product 'y'. The latter is then exported to country C, where it is incorporated into the final product 'z', which is then exported to country D for final consumption. In this example, the value of the input 'x' has contributed three times to global (gross) export flows, while only once to global GDP, ie in the value-added of country A. 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).

In light of the above discussion, the gross export figures of any country have become less and less informative over time, especially if one is interested in the contribution that exports make to domestic GDP growth. Economists have thus recently developed 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). In what follows, we explain and make use of the decomposition by Wang *et al* (2013), trying to uncover whether different components of trade have been affected differently by the crisis. We will also study their adjustment behaviour after the shock, uncovering specific patterns that contribute to a cyclical, GVC-related explanation of the global trade slowdown.

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94. A survey on the role and impact of global value chains can be found in Veugelers (2013), and in Amador and Di Mauro (2015).

### 7.3 GVCs and trade in value added

In a world characterised by GVCs, gross exports from country A to country B include not only domestic value added generated in A, but also foreign value added generated in any other country. Exports from country A to country B might even include value added generated in B, which has first been embodied in inputs exported abroad and is finally returning home within final goods (or more advanced intermediates). Being able to decompose gross export flows into their different value added components is key for our analysis. To do so, we rely on the methodology recently developed by Wang *et al* (2013). Essentially, given a gross export flow equal to 100 from the home country A to the partner country B, this methodology allows us to uncover which share of the total gross flow corresponds to each value added component, such as domestic value added or foreign value added. In particular, we focus on four main value added components (Figure 2). The sum of these four components is always equal to the corresponding gross flow<sup>95</sup>:

- **Domestic value added (DVA)**: the value added generated in the exporting home country (HC) which is finally absorbed abroad.
- **Domestic value added first exported but eventually returned home (RDV)**: the domestic value added embodied in the export flows which returns home. It includes the export of intermediates that are processed abroad and return home, both as final and as intermediate goods.
- **Foreign value added (FVA)**: the foreign value added embodied in domestic exports, both in final goods and in intermediates.
- **Pure double counting (PDC)**: the portion of gross exports accounted for by intermediates crossing borders several times before being finally absorbed. PDC may include value added generated both in the home country (HC) and abroad, and can be considered as a sort of indicator for the extent of production-sharing across countries (Wang *et al*, 2013).

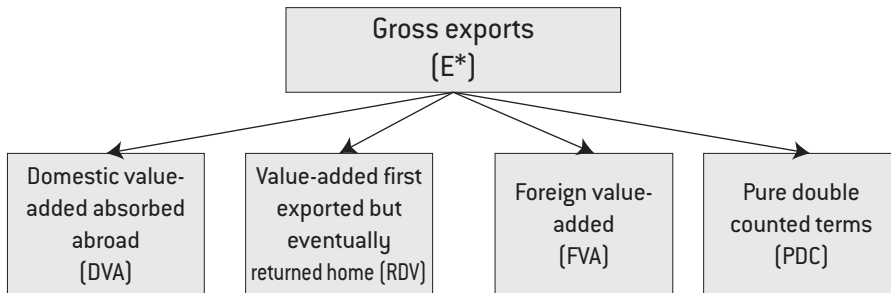
Wang *et al* (2013) have performed the decomposition of export flows for the period 1995-2011, considering the 40 countries covered by the WIOD database, as reported in the Annex<sup>96</sup>. Table 2 shows descriptive statistics on the four main components, ob-

95. As discussed by Wang *et al* (2013), their methodology is backward-linkage based. As such, it allows for a precise decomposition of the disaggregated export flows from each country to any partner country, at the industry-level. As long as one focuses on the aggregate export flows of each country, as we do later in our analysis, the Wang *et al* (2013) decomposition is equivalent to that of Koopman *et al* (2014).

96. The World Input-Output Database (WIOD) is a public database containing world input-output tables and export data ([http://www.wiod.org/new\\_site/home.htm](http://www.wiod.org/new_site/home.htm)). We are very grateful to Zhi Wang, Shang-Jin Wei and Kunfu Zhu for having shared with us their data on export decomposition.

tained by decomposing the gross exports of each country towards all its partners. Domestic value added (DVA) accounts on average for the greatest share of gross exports, 77 percent, followed by foreign value added (FVA), with 16 percent, and by pure double counting (PDC), with 6 percent. The standard deviations reveal however a substantial degree of heterogeneity across export flows, which will be useful in our empirical analysis. RDV is essentially negligible for our purposes, as it makes up only 0.4 percent of exports on average. Therefore, we will not consider its specific dynamics in the following analyses.

Figure 2: Gross exports accounting: major categories



Source: Wang *et al* (2013).

Table 1: Export components: descriptive statistics

Variable	Observations	Mean	Std. dev	Min	Max
Share of DVA	680	0.77	0.08	0.60	0.93
Share of RDV	680	0.004	0.01	0.00	0.04
Share of FVA	680	0.16	0.06	0.04	0.30
Share of PDC	680	0.06	0.06	0.01	0.12

Source: MAPCOMPETE based on Wang *et al* (2013) data.

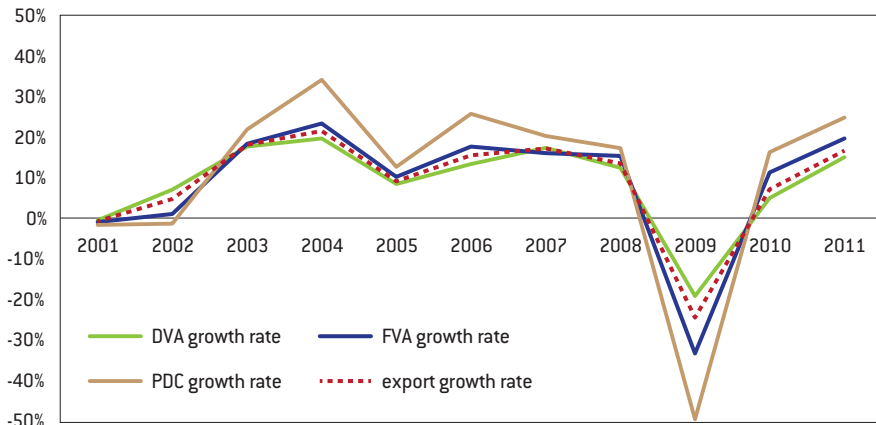
In previous studies, the share of FVA embedded in goods and services exported abroad has been used as a proxy for the fragmentation of production processes across borders (Amador *et al*, 2015). Exploiting the decomposition by Wang *et al* (2013), we are able to improve on this measure by considering also the dynamics of pure double counting (PDC). FVA and PDC are the two components of exports that are most directly related to the participation of a country in global value chains, while DVA represents somehow a more traditional component of exports.

Figure 3 shows the growth of gross exports and its components between 2001 and 2011. Export growth is comprised between the growth rates of its components.

Nevertheless, the growth rates of the different components show a considerable heterogeneous variation over time, pointing at non-obvious compositional effects on the overall pattern of export growth. Between 2003 and 2008, FVA and especially PDC grew faster than gross export flows. Since these components of exports are directly related to GVCs, such evidence is consistent with the global expansion of global value chains that took place over this period.

In 2009, as already discussed, there was a sudden drop in trade, and all components exhibited substantial negative growth rates (in nominal terms) in that year. However, FVA and PDC witnessed a much larger reduction than DVA. In particular, while DVA dropped by 19 percent, FVA dropped by 32 percent, and PDC by a striking 50 percent. In other words, the components of exports that are most directly related to GVCs were the ones most affected by the crisis.

Figure 3: Export components growth



Source: MAPCOMPETE based on Wang *et al* (2013) data.

Our finding of a larger collapse for GVC-related trade is consistent with earlier studies. In particular, Gangnes *et al* (2014) identified two possible channels through which GVCs might increase the responsiveness of trade to an income shock, namely a composition and a supply-chain effect. The composition effect is due to the fact that GVC-related trade is concentrated in durable goods industries, which typically display high income elasticities. Indeed, Eaton *et al* (2011) show that a reduction in spending on durable goods during 2008-09 aggravated the downturn, a finding that supports the composition-effect hypothesis. The supply-chain effect comes instead from higher inventory holdings that GVC-related trade entails. For instance, Alessandria *et al* (2010)

and Bems *et al* (2011) discuss how inventory adjustments induced by GVCs might have increased the impact of the crisis on trade, because of the disproportionately large inventories of imported inputs. Altomonte *et al* (2012) also stress the importance of the adjustment of inventories within supply chains. Specifically, they show that trade between related parties (ie within GVCs) is characterised by a faster drop compared to trade between unrelated parties. This is because, for related-parties, a reduction in final demand recorded by a firm operating down the value chain is quickly transmitted up to its suppliers. Trade in intermediates thus declines more rapidly than trade in final goods (and demand), through a so-called ‘bullwhip effect’.

Nagengast and Stehrer (2015) apply a structural decomposition to value-added trade data from WIOD, and explore the role of changes in the international organisation of production as an additional variable explaining the trade collapse. They find that the drop in the overall level of demand accounted for roughly a quarter of the decline in value added exports, while just under one third was due to compositional changes in final demand. As a result, changes in vertical specialisation accounted for almost half of the great trade collapse, with the decline in international production-sharing during the crisis partly accounting for the observed decrease in global trade elasticities in the 2000s compared to the 1990s, a result in line with the previously discussed findings of Constantinescu *et al* (2015).

From this analysis of the literature, we can conclude that GVCs seem to have had a twofold impact on the dynamics of trade flows. They have magnified the responsiveness of trade to income shocks, through the composition and supply-chain channels discussed above. In addition, to the extent that GVC expansion was levelling-off already before the crisis, they might have been exerting a dampening effect on trade growth, thus explaining in a structural way the global trade slowdown. And yet, given our novel evidence on the decomposed value-added flows that make up gross exports, it could also be the case that the GVC-related components of trade, which have been so intensively hit by the crisis, are still on a (slower) recovery path, without necessarily having undergone a structural slowdown. In what follows, we investigate this idea by using our value added trade data within an error correction model analysis.

#### 7.4 An error correction model for value added trade

We estimate an error correction model (ECM) in order to study the relationship between gross exports, their different components and GDP at the country-level. Our approach follows previous studies in the literature, for instance Constantinescu *et al* (2015). Essentially, an ECM analysis of exports and GDP produces three interesting results: (1)

an estimate of the long-run elasticity of exports to GDP, ie their long-term relationship; (2) an estimate of the short-run elasticity of exports to GDP, ie their immediate responsiveness after an income shock; (3) an estimate of the speed of adjustment of exports back to their long-term relationship after an income shock, ie how much time it takes for exports to converge again to the equilibrium, *ceteris paribus*.

Our ECM analysis relies on the value added trade data previously described. That is, we work with a panel of yearly aggregate exports from each country to all of its trading partners<sup>97</sup>. For each gross export flow, we exploit the breakdown into the three relevant value-added components: DVA, FVA and PDC. Our data spans the period 1995-2011. However, in our baseline estimations we drop the year 2009, which is a clear outlier, in order to avoid the risk of our results being biased by extreme values, as suggested by Maddala and In-Moo (1998)<sup>98</sup>. Our specification of the ECM closely follows Gruber *et al* (2011) and Constantinescu *et al* (2015). Box 1 describes the estimating equation.

Table 2 reports the results of the ECM estimated on gross exports. The short-run elasticity is equal to 0.58, meaning that a drop in GDP by 1 percent is associated with a drop in exports of about 0.6 percent. The coefficient on lagged exports is instead not significantly different from zero. Results point to a long-term positive relationship between exports and GDP, as we were expecting. In particular, the coefficient on lagged GDP (ie the long-run elasticity of exports) suggests that a 1 percent increase in GDP is associated with higher exports by around 1.3 percent. Finally, the speed of adjustment has a negative coefficient of about 0.22, pointing to adjustment dynamics spanning about five years after a shock, *ceteris paribus*.

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97. The cross-sectional dimension of our data is important for the identification, and compensates for the unavailability of quarterly data on value added trade. We have followed Blackburne and Frank (2007) and estimated a non-stationary heterogeneous panel data ECM based on the dynamic fixed-effect estimator. This methodology assumes that the coefficients of the cointegrating vector are equal across all panels, and that short-run and long-run coefficients are the same across groups. In a robustness check, we have replicated the same regressions also with mean-group estimators, which relax some of the stringent assumptions of the error-correction model with fixed effects, without significant differences in our results. Technically, there are two fundamental steps we had to undertake before proceeding with the estimation of an ECM: (1) verifying that the time-series of GDP, export and its components are integrated of the same order through a unit-root test, the Harris-Izavalis one, specifically developed for panel models; (2) checking that the series are cointegrated (Wasterlund cointegration test for panel data). The results, available upon request, suggest that these two preliminary conditions are fulfilled.

98. We discuss later in the chapter how including 2009 changes some of the estimated coefficients. Our main result is essentially unaffected.



**BOX 1: THE ERROR CORRECTION MODEL**

The ECM equation is specified as follows:

$$\Delta export_{it} = \alpha + \varphi(export_{it-1} - \beta GDP_{it-1}) + \gamma_1 \Delta GDP_{it} + \gamma_2 \Delta export_{it-1} + \varepsilon_{it}$$

The term in brackets on the right hand side represents the co-integrating vector, ie the long-term relationship between exports and GDP, here represented by the (stationary) lagged residual of the regression of exports on GDP. The coefficient  $\varphi$  denotes the speed of adjustment of exports to the long-run equilibrium relationship.  $\beta$  represents the long-run elasticity of exports to GDP.  $\gamma_1$  is the short-run elasticity of exports to GDP, ie the responsiveness to contemporaneous income shocks. To better take into account the dynamics of exports, we also control for export growth in the previous period (coefficient  $\gamma_2$ ), as in Gruber *et al* (2011).  $\alpha$  is a constant and  $\varepsilon$  is an error term. In all regressions, residuals are clustered at the country level. All variables are in logarithms.

**Table 2: Estimation results: ECM with gross exports**

Dependent variable:	Gross exports growth
Intercept ( $\alpha$ )	-1.048*** (0.23)
Long-run elasticity ( $\beta$ )	1.306*** (0.09)
Speed of adjustment ( $\varphi$ )	-0.215*** (0.05)
Short-run elasticity ( $\gamma_1$ )	0.581*** (0.06)
Lagged export growth ( $\gamma_2$ )	-0.022 (0.04)
R-squared	0.43
N. of observations	640

Source: MAPCOMPETE

Our results are in line with earlier studies, especially with Constantinescu *et al* (2015). In particular, the magnitude of the estimated long-run elasticity, 1.3, is the same as they found for the period 2001-13. Our estimated speed of adjustment is also very close to theirs (0.3), notwithstanding the differences in the data employed. In fact, they work with global exports, exploiting the long time-dimension of their data (1970-

2013]), while we employ country-level exports for the period 1995-2011, exploiting the cross-sectional nature of our database for identification.

Overall, our results seem to support the idea that, in the medium-term, global export growth could revert back to its long-run equilibrium relationship with GDP growth. However, the crisis might have led to a structural change in the trade-GDP relationship, and thus the same long-run equilibrium relationship might have changed. It is clearly too early to evaluate this, given the limited amount of data points available after 2009. Moreover, the analyses undertaken so far, including ours, treat GDP as exogenous with respect to trade outcomes, whereas the two variables are clearly endogenous. Results should thus be interpreted with some caution.

Nevertheless, our data allows us to investigate more in depth the adjustment dynamics of trade in the post-crisis context with respect to the rest of the literature, by analysing separately how the different components of exports respond to changes in GDP. This is key to better understand the role of GVCs in explaining the global trade slowdown. Indeed, we have found that FVA and PDC –the components of trade most directly related to GVCs – dropped much more than DVA in 2009. If on top of that we would find that the GVC-related components of trade adjust more slowly to income shocks, then we would shed light on an additional explanation for the global trade slowdown. This explanation would be cyclical in nature rather than structural, thus departing from what has been suggested so far on the role of GVCs.

Table 3 reports the results from three ECM estimations, one for each relevant component of gross exports: DVA, FVA and PDC. The specification is essentially the same as in Box 1, but here we employ the value-added trade components instead of gross exports<sup>99</sup>.

Two interesting results emerge. First, FVA and PDC have a higher long-run elasticity with respect to GDP. This is consistent with the view that the emergence of GVCs has been an important driver for the fast trade growth observed since the 1990s. In particular, a 1 percent increase in GDP is associated with an almost double increase in the pure double counting term (PDC), in line with the interpretation that much of trade growth has been related to inputs and semi-finished products crossing borders multiple times as GVCs spread across countries.

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99. As before, for each component of exports we have run the necessary preliminary tests before estimating the ECM, always detecting the required conditions. See the previous methodological footnote. Results are available on request.

Table 3: Estimation results: ECM with export components

	Export Components Growth		
	( 1 )	( 2 )	( 3 )
Dependent variable:	DVA	FVA	PDC
Intercept ( $\alpha$ )	-0.980*** (0.20)	-1.439*** (0.36)	-2.414*** (0.58)
Long-run elasticity ( $\beta$ )	1.213*** (0.07)	1.503*** (0.18)	1.994*** (0.22)
Speed of adjustment ( $\rho$ )	-0.235*** (0.06)	-0.166*** (0.05)	-0.155*** (0.04)
Short-run elasticity ( $\gamma_1$ )	0.650*** (0.07)	0.304*** (0.10)	0.387*** (0.10)
Lagged DVA growth	-0.043 (0.04)		
Lagged FVA growth		0.013 (0.04)	
Lagged PDC growth			-0.072* (0.04)
R-squared	0.53	0.20	0.19
N. of observations	640	640	640

Source: MAPCOMPETE.

The second important result is that FVA and PDC exhibit a significantly lower speed of adjustment than DVA. The estimated coefficients suggest that it takes about six years for FVA and PDC to converge after a shock, *ceteris paribus*, against slightly more than four years for DVA. As previously anticipated, considering that FVA and PDC dropped by more than DVA in 2009, such evidence of a slower adjustment sheds light on a new cyclical explanation for the trade slowdown, as the hardest-hit components of trade are also the slowest to recover<sup>100</sup>.

100. Perhaps surprisingly, the estimated short-run elasticities for FVA and PDC are lower than that for DVA (0.30 and 0.39, respectively, vs. 0.65). This result changes if we include 2009 in the analysis, consistent with the descriptive evidence presented before. In fact, we then find a short-run elasticity of 1.1 for PDC, 0.78 for FVA, and 0.86 for DVA. The evidence on a lower speed of adjustment for FVA and PDC is preserved also when including the year 2009. Results keep holding also when estimating the ECM for the 1995-2008 period only.

## 7.5 Conclusion

We have provided additional evidence on the 'Global Trade Slowdown'. Specifically, we have exploited a new dataset on value added trade in order to shed light on an additional cyclical driver of the slowdown, which is related to global value chains. In particular, we have shown that those components of trade that are most directly related to GVCs experienced the largest drop during the 'Great Trade Collapse' of 2009. Moreover, these components also exhibit the slowest speed of adjustment after an income shock. Taken together, these two pieces of evidence suggest that at least part of the GVC-induced trade slowdown is cyclical in nature, and might be re-absorbed in the coming years. In other words, GVCs might not just be having a structural dampening effect on trade growth, as suggested so far, because of their potential convergence towards a global-scale equilibrium.

Our results have two implications for policy. First, to the extent that trade is a driver of economic growth, it is important that policies be put in place to smooth the adjustment process of trade back to its long-term relationship with GDP. This entails exerting more effort in multilateral negotiations within the Doha round, and on bilateral agreements such as the EU/US Transatlantic Trade and Investment Partnership. These agreements are in fact instrumental to trade facilitation, and to the reduction of non-tariff barriers.

A second implication is related to the fact that GVCs are known to be relatively more important in some industries (eg automotive or chemicals) than in others (eg food). Therefore, country-specific patterns of the trade-GDP relationship are likely to depend on each country's industry specialisation. In particular, our analysis suggests that those countries that are relatively more specialized in GVCs-intensive industries (eg France or Germany) may expect their export slowdown to be less structural than thought so far. In fact, while part of the slowdown is certainly likely to depend on the deceleration of GVCs expansion, there seems to be also a GVC-induced cyclical component of the slowdown that is likely to be re-absorbed over time. By the same token, countries in which GVCs play a relatively lesser role (eg Portugal or Finland) might expect to experience a relatively more persistent trade slowdown.

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## ANNEX

List of countries in the WIOD sample.

Country: code and name			
AUS	Australia	IRL	Ireland
AUT	Austria	ITA	Italy
BEL	Belgium	JPN	Japan
BGR	Bulgaria	KOR	South Korea
BRA	Brazil	LTU	Lithuania
CAN	Canada	LUX	Luxembourg
CHN	China	LVA	Latvia
CYP	Cyprus	MEX	Mexico
CZE	Czech	MLT	Malta
DEU	Germany	NLD	Netherlands
DNK	Denmark	POL	Poland
ESP	Spain	PRT	Portugal
EST	Estonia	ROM	Romania
FIN	Finland	RUS	Russia
FRA	France	SVK	Slovak Republic
GBR	United Kingdom	SVN	Slovenia
GRC	Greece	SWE	Sweden
HUN	Hungary	TUR	Turkey
IDN	Indonesia	TWN	Taiwan
IND	India	USA	United States

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