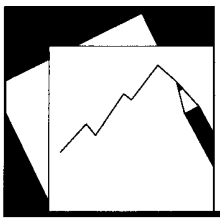
WP/14/79



IMF Working Paper

European Productivity, Innovation and Competitiveness: The Case of Italy

Andrew Tiffin

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Strategy, Policy, and Review Department

European Productivity, Innovation and Competitiveness: The Case of Italy

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Abstract

In Italy, price-based competitiveness measures are not always an accurate predictor of trade outcomes. This paper offers a more comprehensive assessment of Italian competitiveness, focusing on the role of innovation and the evolution of Italy's export market share. Overall, Italy maintains a high-quality export mix, and the adaptability of small-scale specialized firms is still a source of strength. But, small firm size is becoming less of an asset, and even the most innovative sectors are weighed down by the structural barriers that have depressed productivity more broadly. Italy's future competitiveness will depend on full implementation of a comprehensive structural-reform agenda.

JEL Classification Numbers: F14; F41; O30; O31

Keywords: Italy, competitiveness, exports, shift share analysis, CMSA

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I. INTRODUCTION

Italy's economic performance over the past two decades has been disappointing. In contrast to the 1970s and 1980s, when it stood out as the best growth performer among its major European partners, Italy has suffered a steady and prolonged decline in growth since the 1990s. And in the context of the recent financial crisis, the legacy of this slump has arguably made Italy's recession deeper and more persistent than in many of its peers. This is not simply an issue for Italy alone. The sustainability of Italy's public debt (already over 120 percent of GDP) is sensitive to the evolution of future output growth—making Italy's growth prospects a matter of concern for the entire Eurozone and beyond (Eichengreen, 2011).

Much of the discussion of Italy's performance has centered on declining productivity and an associated deterioration in competitiveness. For example, an examination of Unit Labor Costs (ULC) suggests that rising wages in Italy, although relatively modest by regional standards, have nonetheless outpaced productivity growth by a substantial margin; placing Italy at a growing disadvantage compared to its European peers.[1] But, measuring competitiveness is far from straight forward—there is no agreed definition, or well-defined set of indicators. Indeed, "competitiveness" is a somewhat multifaceted concept which continues to evolve in line with a rapidly changing global economy.

This paper will offer a comprehensive assessment of Italy's external competitiveness, focusing in particular on Italian export performance—an ex post measure that captures the extent to which countries gain or lose market share in external markets. Relative prices or costs may be an important driver of this performance. But non-price factors, such as innovation, specialization, and quality will also play a role. The opening sections of the paper will present some of the standard price- and cost-based indicators, outlining how they might perhaps be augmented in the context of an increasingly integrated global economy. The following sections will then focus on the evolution of Italy's export share; focusing in particular on the role of innovation in shaping the economy's continued trading success. The concluding section will outline some implications for the Italian authorities' structural reform agenda.

II. THE ITALIAN COMPETITIVENESS PUZZLE

A. A Collapse in Competitiveness without a Collapse in Exports?

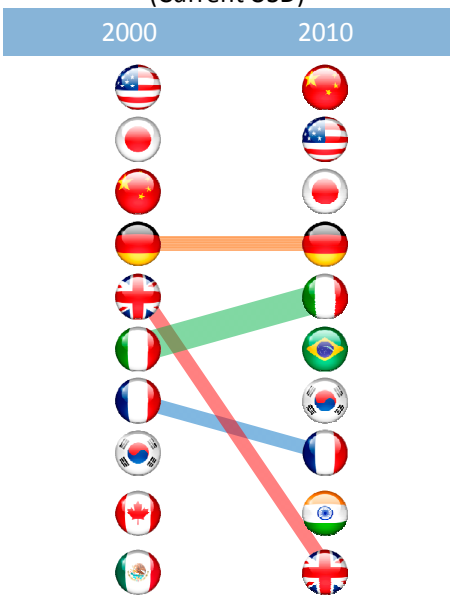
Over the past two decades, discussion of the Italian economy has increasingly centered on the key themes of weak growth and competitiveness. In this regard, a sustained drop in total factor productivity (TFP) growth, and the resulting increase in unit labor costs relative to

[1] See the Staff Report for the 2012 Article IV Consultations for Italy (IMF Country Report 12/167)

Italy's main EU competitors have raised repeated concerns about the competitiveness of Italy's exporters. A typical diagnosis points to notes an underlying reform gap in Italy; which has produced a stagnant economy and a labor market in which average earnings are largely decoupled from productivity and demand conditions. With Italian trading partners introducing productivity-enhancing reforms, and with the historical escape route of competitive devaluation unavailable, this has supposedly resulted in a sizable competitiveness gap, which has weighed down on investment, confidence and growth (Manasse, 2013).

Against this backdrop, however, Italian exports have held up relatively well (in value terms). In an era dominated by the dramatic expansion of emerging-market exporters, Italy's tradable sector continues to rank among the world's leaders—in contrast to many other European countries. And Italy's share of world exports has generally moved in parallel with its European peers. Most recently, the buoyancy of exports in the face of depressed global demand has underscored the continued adaptability and resilience of Italian trading firms. Indeed, according to the WTO/UNCTAD's Trade Performance Index, Italy remains the world's top-ranked exporter in textiles, clothing and leather goods; and is ranked second in the world (behind Germany) for non-electronic machinery and manufactures (basic and miscellaneous).

Top 10 Manufacturers by Value Added
(Current USD)



Source: UN Stats.

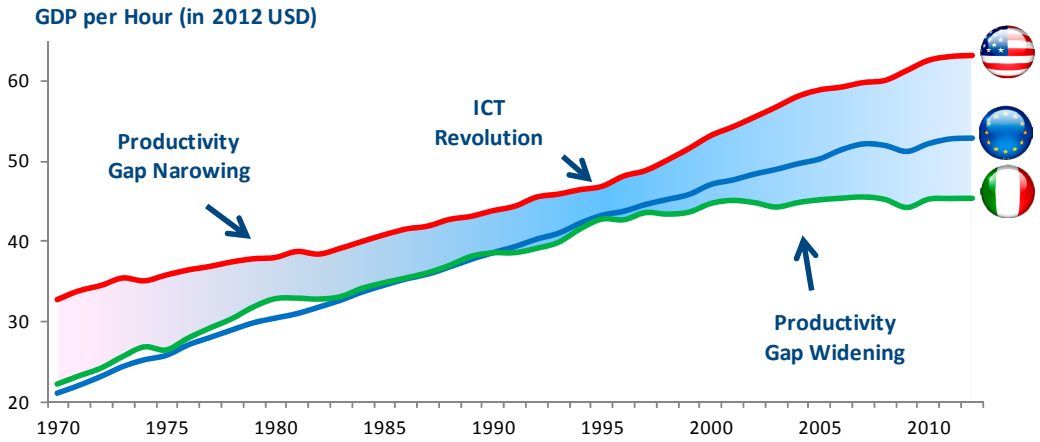
B. Productivity, Innovation, and Exports

Part of the key to this puzzle may lie in the nature of Italy's productivity challenge. Although the underlying causes of Italy's poor productivity are still topics of active debate, part of the explanation most likely involves the changing nature of production, and the increased importance of innovation in securing sustained output growth (Aghion, 2011). As illustrated in the figure below, the Italian productivity experience is perhaps an amplified version of the (average) European experience; in which a process of trend convergence with the world leader ended in the mid 1990s, coinciding roughly with the information and communications technology (ICT) revolution (Bank of Italy, 2009). This latter development has often been described as a game-changing event—analogous to the introduction of steam or electricity—that has dramatically changed the nature of global production, as well as the requirements for firms and countries wishing to maintain their position at the global frontier (Crafts, 2012). In this regard, the ICT revolution has potentially expanded the scope for firms to distinguish between:

i. *Technological competitiveness,* which is associated with the development of new products and requires substantial internal innovation (research, development, and design); and

ii. *Cost competitiveness*, which is associated instead with improved efficiency and lower labor costs (see Bogliacino & Pianta, 2010).

For Italian firms facing increased cost-based competition from emerging-market exporters, the former has perhaps become more and more important.



Source: The Conference Board, Total Economy Database

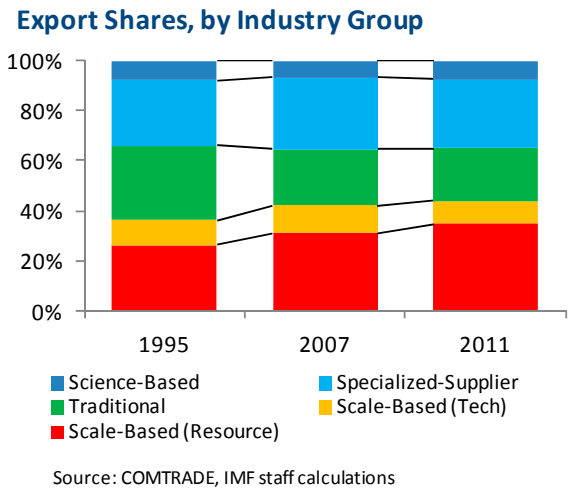
This paper will explore the extent to which the performance of Italian exporters reflects their relative ability to innovate and adapt to a changing global environment. Although the economy as a whole may have faced difficulty integrating and exploiting new technologies to boost performance—reflecting perhaps a broad range of structural and administrative impediments—it may be that Italian exporters have had better success. To this end, the chapter will separate Italy's exporting industries by their sources of innovation: extending the Pavitt (1984) Industrial Taxonomy, and separating each export industry into one of five separate groups:[2]

- *Science-based* industries, such as pharmaceuticals, high-end electronics, and aviation; which are dominated by large firms, and where innovation is typically internal to the firm and based on advances in science.
- *Specialized Supplier* industries; which are often dominated by smaller firms that design, develop and produce equipment tailored specifically to a particular production process or need.
- *Traditional* industries, such as textiles, furniture, food, and basic manufactures; where internal innovation is less relevant, and new technology comes from external suppliers of equipment and material.

[2]See Kubielas (2007) for a Pavitt-based classification of each industry by ISIC Rev.3.

- *Scale-Intensive* industries; where innovations are mainly derived from the exploitation of economies of scale. These can be further broken down into:
  - *Technology-based scale-intensive* industries, such as motor vehicles and other transport equipment.
  - *Resource-based scale-intensive* industries, such as industrial chemicals, refined petroleum products, basic metals, and processed foodstuffs.

Italy's export mix has a substantial weight of traditional products, but also has a large proportion stemming from specialized-suppliers. Indeed, although a key development over the past 15 years has been the shrinking importance of the traditional sector, and the growing importance of scale-intensive resource-based industries, a more singular feature of Italy's export mix is the large and stable share originating from specialized suppliers. In comparison to other countries, the share owing to these suppliers is more akin to that seen in Germany or the United States (Figure 1).



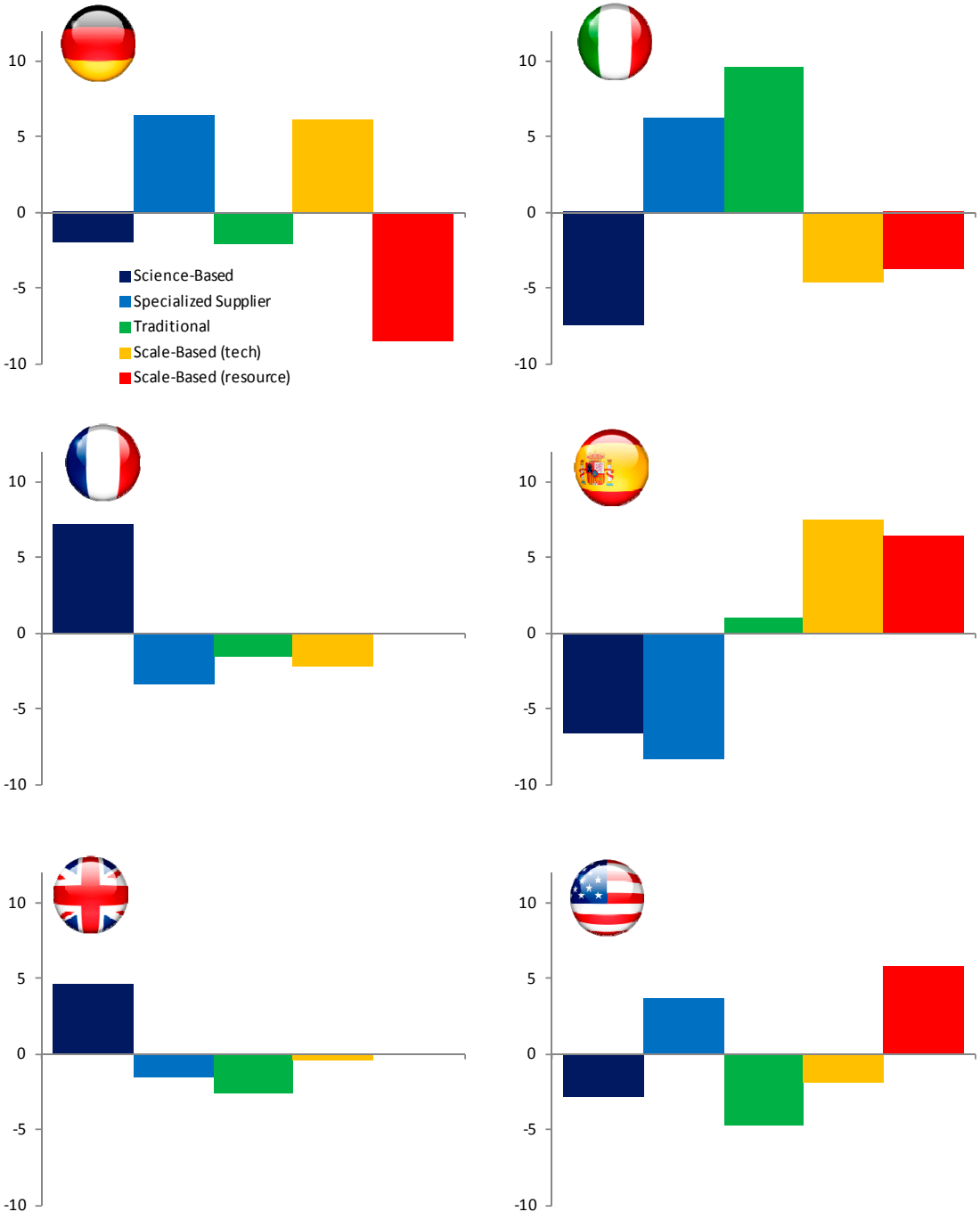
Source: COMTRADE, IMF staff calculations

It is the specialized-supplier sector that has often been viewed as a key source of Italy's export prowess. Firms in this sector tend to be small and medium in size, with a marked capacity for incremental innovation and a diversified range of high-quality, high-margin products with few substitutes (such as machine tools, precision instruments, and specialized machinery for industry and agriculture). Often organized within a flexible network of small firms or industrial districts, it is the inventiveness and agility of this sector that has been highlighted in the past as one of the main factors allowing Italy to maintain its relative world position.[3] This paper will explore the extent to which this sector has continued to remain competitive despite apparently adverse developments across Italy's price-based competitiveness indicators.

[3]See Porter (1990) and Ginsborg (2003).

Figure 1. Exports Shares, by Industry Group

(Deviation from EU average, percentage points)

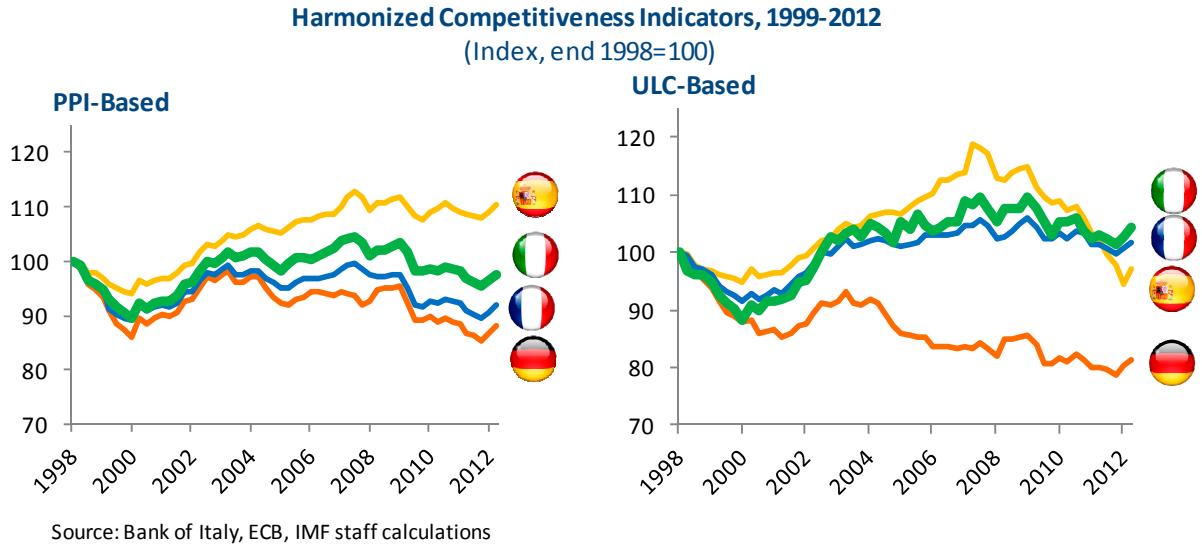


Sources: COMTRADE, Fund staff calculations.

III. Price Competitiveness

A. Unit Labor Costs vs. Price-Based Measures

Italy's standard price-competitiveness indicators present a mixed picture. Although the dispersion of different competitiveness indexes is a feature in many European countries, it is particularly evident in Italy, where ULC-based indicators routinely suggest a substantially larger loss in competitiveness compared to other CPI- or PPI-based indicators (Bayoumi and others, 2011). Using a total-economy ULC-based measure, Italy's competitiveness appears to have deteriorated by up to 5 percent since adoption of the euro, compared to an improvement in Germany of nearly 20 percent. Using a PPI-based measure, on the other hand, the gap between the two countries is considerably narrower, and Italy is not materially less competitive than it was in 1999.



Source: Bank of Italy, ECB, IMF staff calculations

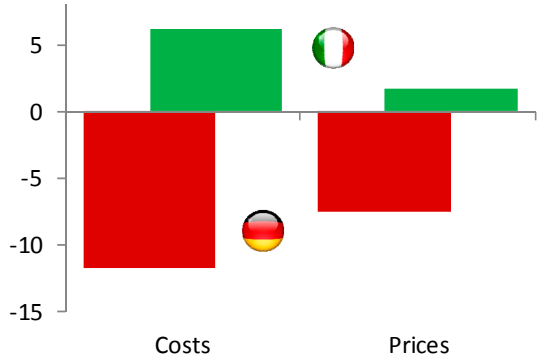
But labor-cost measures may present an incomplete picture, and should perhaps be complemented. Part of the discrepancy between the different types of measures may again reflect the changing nature of global production. In an era of globalization and international supply chains, the share of domestically employed labor in total production costs is decreasing, albeit to a different degree in different countries—indeed, wage shares in the manufacturing sector fell sharply in Germany between 1998 and 2007, but only marginally in Italy over the same period (Giordano & Zollino, 2013). Labor-cost-based indicators, therefore, may reflect a subset of costs that are perhaps becoming less and less representative, and so may not accurately represent Italy's overall price competitiveness. Similarly, drawing on the above distinction between **technological** competitiveness and **cost** competitiveness, rising wages may reflect the creation of higher-level jobs in an increasingly innovative and technologically competitive economy. As a sign of deteriorating competitiveness, therefore, such cost-based measures may tend to overstate the problem. Arguably, *price*-based indicators may provide a better guide.

B. Supply-Chain Based Indicators

IMF Staff have developed alternative measures that address the implications of global supply chains on the assessment of price competitiveness. Conventional measures are typically not well suited to instances when imports are used to produce exports, as they tend to assume that countries compete against one another to sell 'products' that they produce entirely at home, using only domestic inputs. A possible alternative, the "Value-added Real Effective Exchange Rate (VA-REER)," tackles this issue by adapting the usual REER framework to a world in which countries compete in the supply of value-added (or "tasks") rather than goods (Bems & Johnson, 2012). In this framework, to take the typical example, China is not competing with other countries in the supply of iPhones, but rather in the supply of final-assembly services, which form only a small portion of the iPhone's final price. Accounting for a country's supply-chain position, and improving on the (labor-focused) ULC indicator in the previous section, the VA-REER thus captures the overall *cost* competitiveness of the full range of a country's factors of production. A similar approach addresses the same issue by instead modifying the standard *price*-based REER approach, to include an additional term that reflects the role of outsourcing in offsetting the impact of domestic factor-price inflation (Bayoumi, Saito, & Turunen, 2013).This measure is therefore more focused on the actual price competitiveness of a country's gross exports, rather than its factors of production.

For Italy, the differences between these alternative supply-chain measures are illustrative. Considering the cumulative real appreciation since adoption of the euro, the (modified) cost-based VA-REER for Italy gives roughly the same assessment as a standard (unmodified) CPI-based REER; which in turn provides a less pessimistic assessment than the standard (unmodified) ULC measure. The modified price-based measure, on the other hand, suggests an even less-marked decline in competitiveness than the VA-REER. Overall, this suggests that rising factor costs in Italy have not translated into an equivalent increase in the relative price of Italian goods, owing in part to role of low-cost imports from low inflation countries. Interestingly, Germany presents the opposite picture. The sharp increase in competitiveness implied by falling factor costs in Germany has not been fully matched by lower export prices, owing to the fact that Germany imports a large and increasing proportion of its inputs from countries with relatively high inflation. Looking at a wide range of indicators, therefore, the competitiveness challenge in Italy may not be as immediately dire as suggested by a focus solely on cost-based measures.

Supply-Chain Based Real Effective Exchange Rates
(Cumulative Appreciation, percent, 1999-2012)

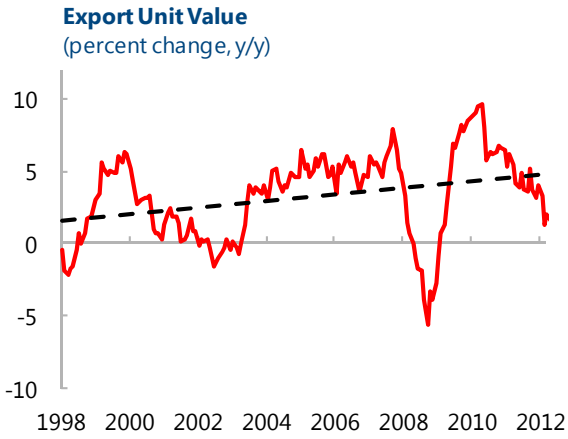


Source: Bayoumi, Saito & Turunen (2013)

IV. Non-Price Competitiveness

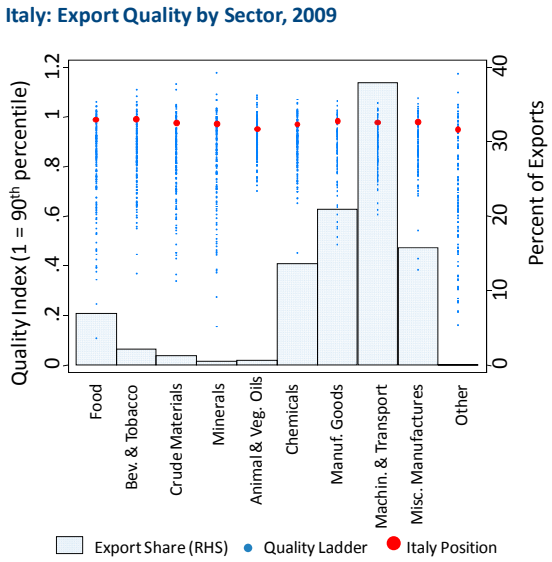
A. Quality Indicators

The relative strength of Italian exporters may also reflect their ongoing efforts to fend off competition by upgrading the quality of their products. Past Fund Staff research has emphasized the important role of non-price factors in supporting Italy's export performance (Lissovolik, 2008), and quality upgrades have featured prominently in this regard (Codogno, 2009). Export quality cannot be observed directly, but the clearest evidence of this trend is in the persistent upward movement of export unit values, which are generally taken as a key proxy for quality. Indeed, averaging across all export sectors, unit values in Italy are around 1½ times higher than the global mean.[4]



Source: ISTAT, IMF staff calculations

Recent Fund staff research confirms Italy's continued success in maintaining the high quality of its export mix. Although unit values are useful, they are a somewhat noisy indicator of quality, as they also reflect a range of other factors, including cost differences. Henn, Papageorgiou, & Spatafora (2013) calculate a more consistent, less noisy, set of quality indicators; based on unit values, but estimated within a sector-specific gravity-equation framework. The results suggest that Italy remains at the top of the global quality ladder across all its major exports, even those associated with more *traditional* industries.



Source: Henn, Papageorgiou & Spatafora (2013)

The above non-price developments all highlight the difficulty of assessing a country's competitiveness on the basis of a select few price- or cost-based measures. In a stable world economy, changes in competitiveness might indeed be captured by changes in relative prices. In an evolving global economy, however, a country's competitiveness may also reflect the ability of its exporting firms to adapt successfully to a changing external environment; upgrading the quality and composition of their export mix,

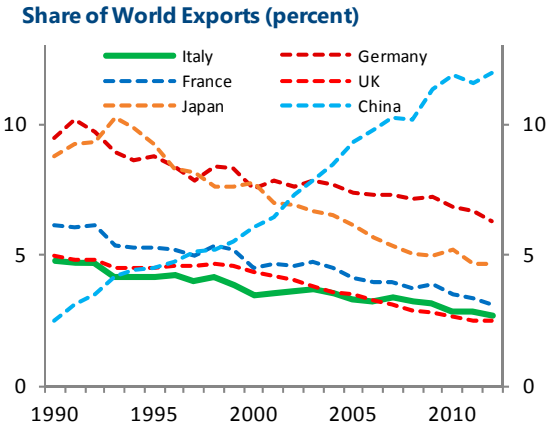
[4]WTO/UNCTAD relative unit-value data is available at: http://www.intracen.org/country/italy/

rapidly seeking out new destinations, building a global reputation, outsourcing low value-added activities, and identifying new high-margin niches. Micro data on Italian firms confirms that this indeed has been a large part of the Italian story—where the manufacturing sector has undergone a significant process of ongoing restructuring over the past 20 years, with a significant impact on overall export performance (Leichter, Mocci, and Pozzuoli, 2011).

V. Market-Share Dynamics

A. Shift-Share Analysis

In light of the mixed picture presented above, perhaps a more telling indicator of Italian competitiveness is the ex post evolution of its global market share. But a simple investigation of markets shares raises the following issue: two countries with similarly competitive exporting firms may nonetheless display different performances over the short- to medium-term, if one has a more favorable mix of products (at the time), or if it exports to a particularly dynamic set of destinations. A more representative measure of a country's underlying competitiveness, therefore, will strip out such product and geographical effects.



Source: DOTS, IMF staff calculations

The following analysis employs a shift-share approach to arrive at an "adjusted" measure of market-share growth. Also known as constant market-share analysis (CMSA), shift-share analysis (SSA) is an econometric approach that allows the decomposition of changes in a country's market share over time. The key intuition is that a country's export growth does not occur in a vacuum, but is shaped instead by: the growth of world trade itself; the country's mix of trading partners; and the bundle of goods that it exports. Keeping all these factors constant, a country's market share should also remain constant—but if it decreases even after for controlling for its export/destination mix, then this adjusted market share serves as a key sign that the country's exporters are underperforming. In the following analysis, market shares are measured in value terms, and so incorporate the non-price competitiveness factors outlined above.

The approach is outlined in detail in the appendix, and is based on a fixed-effects regression of detailed bilateral trade flows. Drawing on the methodology outlined by Cheptea (2005) and revised by Bricongne and others (2013), the methodology starts with the following equation:

$$\dot{X}_{ijkt} = \alpha_{it} + \beta_{jt} + \gamma_{kt} + \varepsilon_{ijkt}$$

Where α_{it}, β_{jt}, and γ_{kt} are exporter, importer, and product fixed effects that can vary across time. The dependent variable $\dot{X}_{ijkt}$ is disaggregated export growth; based on a mid-point measure so as to take into account the possibility of entry and exit from a particular export line (i.e., the extensive margin of trade). For any country, estimation of these fixed effects allows the decomposition of market-share growth into three separate components:

- A sectoral component measuring growth due to the mix of products exported
- A geographical component capturing changes due to the distribution of trading partners.
- An "adjusted" market share, or performance component that reflects growth due to a country's underlying price and non-price competitiveness.

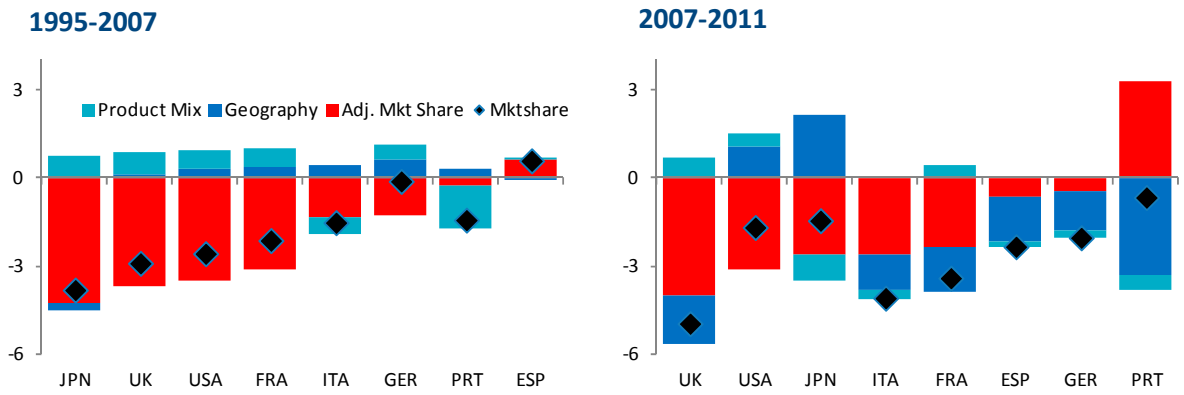
The estimation draws from the bilateral dataset developed by Gaulier & Zingano (2010), which provides reconciled values of all international trade flows for about 5000 product headings from the 6-digit Harmonized System (HS) classification over the years 1995–2011 (See Appendix I for a more detailed treatment of the methodology and dataset).

B. Results: Sources of Innovation and Market Share

For exports as a whole, like most other advanced-market countries, Italy's share of global exports has fallen with the introduction of emerging-market exporters into the global trading system. A detailed decomposition of growth rates for a number of countries is presented in Table 1, but for the precrisis period (1995–2007), the figure below suggests that Italy has generally managed to orient its exports to markets with a rapidly expanding demand for imports, while its product mix has been biased towards products where growth has been less dynamic.[5] Taking these two effects into account, it appears that Italy's adjusted market share measure, although disappointing, is not as critical as it might appear at first. Indeed, its underlying competitiveness compares favorably to countries such as France or the United Kingdom, and is broadly comparable to that of Germany. Looking at export-share developments over the post crisis period (2007–11), most European countries suffered from a sudden downturn in demand from their main (European) export partners. And again, Italy seems to have been additionally held back by a poor product mix, but the adjusted measure is nonetheless broadly in line with that of France or the United States, where price-competitiveness measures have typically been more favorable than those in Italy.

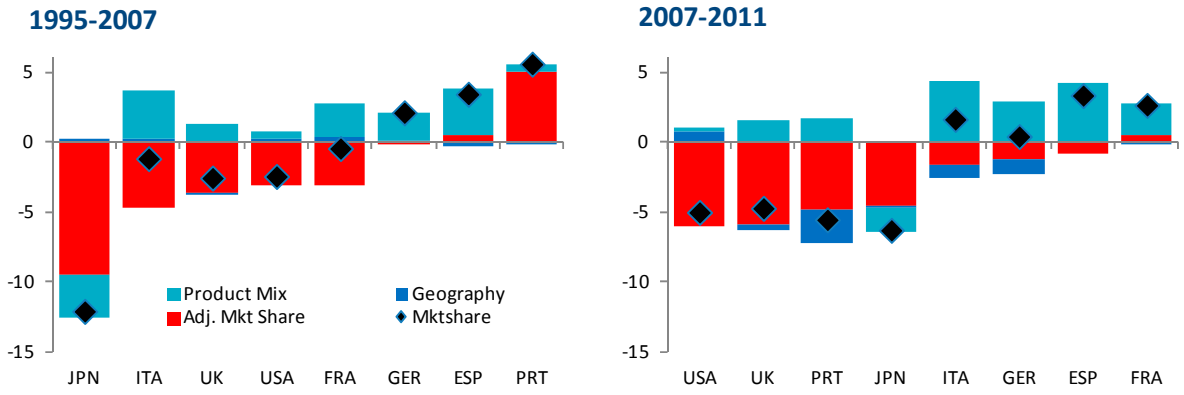
[5]The sample length is chosen to take advantage of the full dataset, but it should be noted that this period includes a number of years prior to the introduction of the euro, when Italian exports were still benefitting from the lira devaluation of the early 1990s. This devaluation may have created additional room to absorb the loss of competitiveness recorded in subsequent years.

Decomposition of Market Share Growth, All Exports
(percent annualized)



Focusing on science-based industries, Italian exporters have generally been much more successful in targeting products with better prospects for growth. Indeed, Italy has mostly managed to maintain or even increase its market share in this sector. But this represents only a small fraction of Italian exports, and the adjusted market-share measure paints a less rosy picture; suggesting that exporters in this sector are still being held back by an underlying lack of competitiveness.

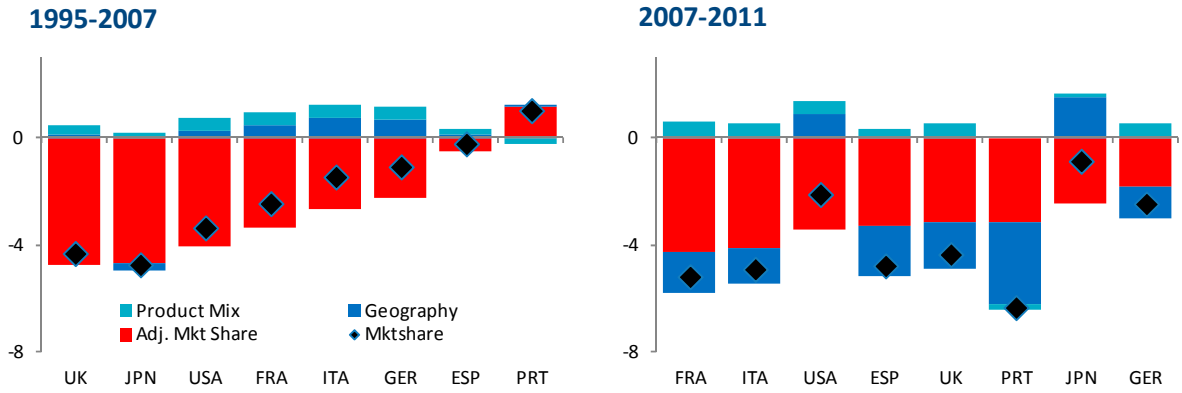
Decomposition of Market Share Growth, Science-Based Exporters
(percent annualized)



Turning to specialized suppliers, Italy again seems to have had some success in focusing on high-growth products, but the underlying competitiveness measure is nonetheless worrisome. In context, the competitiveness of the sector is perhaps not an issue of critical concern—as it still fares favorably compared to countries like France and the United Kingdom, and historically is not too far removed from Germany. But looking forward, the fact that weak underlying competitiveness continues to erode Italy's global market share suggests that specialized-supplier exports may not be the source of strength that they once were. Partly,

this may be the cumulative result of the distortions, rigidities, and administrative impediments that have helped stifle growth in the broader Italian economy; and which are now weighing even on this once-dynamic sector. Alternatively, it may also reflect the changing nature of global production; where larger scale firms now tend to be more successful in generating worldwide brand recognition, securing access to finance, and integrating into global supply chains. And where small firm size—which once helped ensure the agility and resilience of the Italian export sector—is now less of an asset. Indeed, from a policy viewpoint, if firm size and global reach are now more important, there is perhaps a growing need for structural reforms that can remove the barriers to firm growth and encourage inward FDI. These reforms would also help the science-based sector described above, which appears relatively successful, but so far is only a small part of Italy's export base.

Decomposition of Market Share Growth, Specialized Product Exporters
(percent annualized)



VI. Conclusion

In Italy, as in many countries, price competitiveness measures have not always served as an accurate guide to subsequent trade developments. These measures, such as relative unit labor costs, are simple to communicate and are often linked closely to the instruments available to policy makers. But globalization is reshaping the relationship between trade performance and price factors, with the latter providing less and less explanatory power for export growth (Di Mauro and others, 2008).

This paper has offered a more comprehensive assessment of Italy's competitiveness. In light of the dispersion of Italy's price- and cost-based indicators, it is perhaps more instructive to look at the ex post evolution of Italy's export market share; focusing in particular on the non-price factors—such as quality, innovation, and flexibility—that have underpinned Italy's success in the past. The overall appraisal is that Italian competitiveness is indeed a matter of concern; although perhaps not as critical as some assessments have claimed. Indeed, Italy's underlying competitiveness (as captured by the evolution of its adjusted market share)

compares favorably to many of its peers. Italy still maintains a high-quality export mix, and the adaptability of Italian firms is still a source of strength. But even the most innovative and flexible sectors are being weighed down by the structural impediments that have depressed Italian productivity more broadly.[6] Italy's future competitiveness will thus depend on the institutional and macroeconomic conditions that allow productive firms to innovate and expand, which in turn will require the successful implementation of the authorities' full structural- and institutional-reform agenda.

[6] This analysis does not identify these specifically, but these include labor- and product-market rigidities, high network-industry costs (e.g. electricity) and a relatively inefficient and overburdened judicial system. For more detail, a comprehensive treatment of Italy's main economy-wide bottlenecks is provided in the most recent Article IV Staff Reports for Italy; available at http://www.imf.org/external/pubs/ft/scr/2013/cr13298.pdf and http://www.imf.org/external/pubs/ft/scr/2012/cr12167.pdf .

Table 1. Changes in World Market Share and Shift-share Decomposition: Large Exporters, 1995–2011

(Annualized growth, percentage points)

		Market Share	Adjusted Mkt Share	Structural Effects	
				Geography	Product Mix
All Export Industries					
China	1995-2007	8.6	12.8	-1.8	-2.0
	2007-2011	5.1	6.6	0.0	-1.4
France	1995-2007	-2.1	-3.1	0.4	0.6
	2007-2011	-3.4	-2.4	-1.5	0.4
Germany	1995-2007	-0.1	-1.3	0.6	0.5
	2007-2011	-2.0	-0.5	-1.3	-0.3
Italy	1995-2007	-1.5	-1.4	0.4	-0.6
	2007-2011	-4.1	-2.6	-1.2	-0.3
Japan	1995-2007	-3.8	-4.3	-0.2	0.7
	2007-2011	-1.5	-2.6	2.1	-0.9
Portugal	1995-2007	-1.4	-0.3	0.3	-1.4
	2007-2011	-0.7	3.3	-3.3	-0.6
Spain	1995-2007	0.6	0.6	-0.1	0.1
	2007-2011	-2.3	-0.6	-1.5	-0.2
United Kingdom	1995-2007	-2.9	-3.7	0.1	0.8
	2007-2011	-5.0	-4.0	-1.7	0.7
USA	1995-2007	-2.6	-3.5	0.3	0.6
	2007-2011	-1.7	-3.1	1.1	0.4
Science-Based Industries					
China	1995-2007	15.7	21.1	-1.1	-3.4
	2007-2011	6.3	11.5	0.3	-5.0
France	1995-2007	-0.4	-3.1	0.3	2.4
	2007-2011	2.6	0.4	-0.1	2.3
Germany	1995-2007	2.1	0.0	0.1	2.0
	2007-2011	0.4	-1.3	-1.1	2.8
Italy	1995-2007	-1.2	-4.7	0.2	3.4
	2007-2011	1.6	-1.7	-0.9	4.3
Japan	1995-2007	-12.1	-9.5	0.3	-3.1
	2007-2011	-6.3	-4.6	-0.1	-1.6
Portugal	1995-2007	5.6	5.0	0.0	0.6
	2007-2011	-5.5	-4.9	-2.3	1.7
Spain	1995-2007	3.4	0.5	-0.4	3.3
	2007-2011	3.3	-0.9	0.0	4.3
United Kingdom	1995-2007	-2.6	-3.6	-0.2	1.2
	2007-2011	-4.7	-6.0	-0.3	1.6
USA	1995-2007	-2.4	-3.1	0.2	0.5
	2007-2011	-5.0	-6.0	0.7	0.3

Table 1. Changes in World Market Share and Shift-share Decomposition: Large Exporters, 1995–2011

(Annualized growth, percentage points)

		Market Share	Adjusted Mkt Share	Structural Effects	
				Geography	Product Mix
Specialized Supplier Industries					
China	1995-2007	13.0	15.2	-1.4	-0.5
	2007-2011	6.5	7.3	-0.2	-0.6
France	1995-2007	-2.5	-3.4	0.5	0.5
	2007-2011	-5.2	-4.3	-1.5	0.6
Germany	1995-2007	-1.1	-2.2	0.7	0.5
	2007-2011	-2.5	-1.8	-1.2	0.5
Italy	1995-2007	-1.5	-2.7	0.7	0.5
	2007-2011	-4.9	-4.1	-1.3	0.5
Japan	1995-2007	-4.7	-4.7	-0.3	0.2
	2007-2011	-0.9	-2.5	1.5	0.2
Portugal	1995-2007	1.0	1.1	0.1	-0.2
	2007-2011	-6.3	-3.2	-3.1	-0.2
Spain	1995-2007	-0.2	-0.5	0.1	0.2
	2007-2011	-4.8	-3.3	-1.9	0.3
United Kingdom	1995-2007	-4.3	-4.7	0.1	0.3
	2007-2011	-4.4	-3.2	-1.7	0.5
USA	1995-2007	-3.4	-4.0	0.2	0.5
	2007-2011	-2.1	-3.4	0.8	0.5
Traditional Industries					
China	1995-2007	5.4	8.6	-1.9	-1.0
	2007-2011	3.4	4.3	-0.4	-0.4
France	1995-2007	-1.9	-2.6	0.6	0.1
	2007-2011	-3.5	-3.0	-0.7	0.2
Germany	1995-2007	0.1	-2.0	1.4	0.8
	2007-2011	-3.1	-2.2	-0.2	-0.7
Italy	1995-2007	-2.2	-2.5	0.5	-0.3
	2007-2011	-5.1	-4.4	-0.6	-0.2
Japan	1995-2007	-4.2	-4.7	0.3	0.1
	2007-2011	0.4	-2.9	3.5	-0.1
Portugal	1995-2007	-3.7	-4.0	0.8	-0.4
	2007-2011	-1.5	1.6	-2.2	-0.9
Spain	1995-2007	0.7	0.4	0.6	-0.3
	2007-2011	-1.7	-0.7	-0.5	-0.6
United Kingdom	1995-2007	-2.9	-4.5	1.1	0.5
	2007-2011	-5.3	-4.7	-1.4	0.7
USA	1995-2007	-2.9	-5.6	1.8	1.1
	2007-2011	-0.5	-2.1	0.9	0.7

Table 1. Changes in World Market Share and Shift-share Decomposition: Large Exporters, 1995–2011 (concluded)

(Annualized growth, percentage points)

		Market Share	Adjusted Mkt Share	Structural Effects	
				Geography	Product Mix
Scale-Intensive Technology-Based Industries					
China	1995-2007	14.6	17.4	-2.4	0.0
	2007-2011	14.3	11.4	1.4	1.3
France	1995-2007	-2.3	-2.6	0.3	0.0
	2007-2011	-6.7	-3.8	-2.7	-0.2
Germany	1995-2007	0.8	0.4	0.4	0.0
	2007-2011	-0.5	1.1	-1.2	-0.4
Italy	1995-2007	-0.7	-0.1	-0.5	0.0
	2007-2011	-5.7	-4.3	-1.4	0.0
Japan	1995-2007	-3.1	-2.3	-0.8	0.1
	2007-2011	-2.3	-4.4	2.3	-0.1
Portugal	1995-2007	-0.2	0.3	-0.7	0.1
	2007-2011	3.9	8.9	-4.1	-0.4
Spain	1995-2007	-0.3	0.5	-0.9	0.0
	2007-2011	-4.0	-2.1	-1.7	-0.4
United Kingdom	1995-2007	-0.7	-0.3	-0.4	0.0
	2007-2011	-2.7	-1.2	-1.2	-0.3
USA	1995-2007	-2.0	-3.0	1.1	-0.1
	2007-2011	-0.3	-1.0	1.0	-0.2
Scale-Intensive Resource-Based Industries					
China	1995-2007	8.2	11.0	-2.2	-0.3
	2007-2011	3.1	4.3	0.6	-1.7
France	1995-2007	-2.7	-3.1	0.2	0.2
	2007-2011	-4.0	-2.1	-1.8	-0.1
Germany	1995-2007	-0.9	-1.4	0.5	-0.1
	2007-2011	-2.4	-0.3	-1.6	-0.5
Italy	1995-2007	-0.8	-1.0	0.2	0.0
	2007-2011	-3.3	-0.9	-1.7	-0.6
Japan	1995-2007	-1.8	-1.4	-0.7	0.3
	2007-2011	0.4	-1.2	2.9	-1.2
Portugal	1995-2007	0.6	1.0	0.7	-1.1
	2007-2011	0.9	3.9	-2.6	-0.3
Spain	1995-2007	1.0	1.5	-0.1	-0.4
	2007-2011	-1.3	1.1	-1.9	-0.6
United Kingdom	1995-2007	-3.1	-3.6	0.1	0.4
	2007-2011	-6.1	-4.7	-1.8	0.3
USA	1995-2007	-2.5	-2.4	0.0	-0.1
	2007-2011	-0.2	-1.9	1.1	0.6

Source: IMF Staff calculations using BACI database, developed by Gaulier & Zingano (2010)

Appendix.
Shift-Share Analysis and Competitiveness (from ECB, 2012)

The method envisages a decomposition of export growth based on a weighted variance analysis (ANOVA) of bilateral export data, disaggregated by product. The methodology is based on Cheptea and others (2005), and seeks to identify the export growth of each exporting country as if all exporters had the same geographical and sectoral specialization. With this methodology, "pure" exporter performance can be assessed separately from geographical and sectoral effects. The computation of the method consists of four main steps:

Step 1: Compute mid-point growth rates

For a country *i* exporting a value *x* to a country *c* of product *k* at time *t*, the mid-point growth rate is defined as follows:

$$g_{ickt} = \frac{x_{ickt} - x_{ick(t-1)}}{\frac{1}{2}\left(x_{ickt} + x_{ick(t-1)}\right)}$$

Similarly, the weight attributed to each flow g_{ickt} is given by the relative share of the flow in total exports, where total refers to the exports of the whole sample of countries:

$$s_{ickt} = \frac{x_{ickt} + x_{ick(t-1)}}{\left(\sum_c \sum_i \sum_k x_{ickt} + \sum_c \sum_i \sum_k x_{ick(t-1)}\right)}$$

The year-on-year growth rate of the total value of world exports is given by summing each individual flow g_{ickt} weighted by s_{ickt}.

Step 2: Fixed-effect regression

Starting from a bilateral dataset disaggregated by destination and sector (or product), the ANOVA methodology is used to decompose export growth into a sectoral effect, a geographical effect and a pure export competitiveness effect. Specifically, the mid-point growth rate is regressed on three sets of fixed effects, i.e., exporter, importer and sector/product fixed effects, using weighted OLS. A separate regression is carried out for each year in the data. Hence, if α is the intercept, φ is the regression coefficient for exporter fixed effects, β the one for importer fixed effects, γ the one for product/sector fixed effects, and ε the error term, this can be written as:

$$g_{ick} = \alpha + \sum_i \varphi_i + \sum_c \beta_c + \sum_k \gamma_k + \varepsilon$$

In the regression, one exporter *i*, one importer *c* and one sector *k* is omitted to avoid perfect multicollinearity with the constant term α. This constant term α corresponds to the export growth of the reference country, and the coefficients should be interpreted as deviations from the performance of this country. In Step 3, however, the effects are normalized so as to quantify them as deviations from the average growth rate of exports for the overall sample (in our case, this roughly corresponds to world export growth).

Step 3: Computation of the indices from the estimated coefficients

From the estimated coefficients, growth is decomposed for each exporter (i.e., aggregating destination and product dimensions). First, however, the coefficients need to be normalized. Below, φ_i^t indicates the performance for exporter *i* relative to the omitted destination and

sector. By contrast, $\tilde{\varphi}_i^t$ is the marginal average for *i*'s performance independent of the choice of omitted destination. It gives the export growth that country *i* would have if its geographical and sectoral specialization were equal to the average for the full sample. This is our measure of export performance (competitiveness). This method generates identical results regardless of the choice of the omitted term in the estimation procedure, so that:

$$\tilde{\varphi}_i^t = \hat{\alpha}^t + \hat{\varphi}_i^t + \sum_c s_c^t \hat{\beta}_c^t + \sum_k s_k^t \hat{\gamma}_k^t$$

This then allows the decomposition of a country's export growth into three components:

$$g_i^t = \sum_{c,k} g_{ick}^t s_{ick}^t = \tilde{\varphi}_i^t + \sum_c \frac{s_{ic}^t}{s_i^t} \tilde{\beta}_c^t + \sum_k \frac{s_{ik}^t}{s_i^t} \tilde{\gamma}_k^t$$

Where $\tilde{\beta}_c^t = \hat{\beta}_c^t - \sum_c s_c \hat{\beta}_c^t$ and $\tilde{\gamma}_k^t = \hat{\gamma}_k^t - \sum_k s_k \hat{\gamma}_k^t$. The first component is the adjusted export growth rate, and the second and third components are the geographical and product-mix effects, respectively. The sum of annual growth rates provides the cumulative change over time so that:

$$g_i^{95-07} = \sum\nolimits_t g_i^t = \sum\nolimits_t \tilde{\varphi}_i^t + \sum\nolimits_t \sum\nolimits_c \frac{s_{ic}^t}{s_i^t} \tilde{\beta}_c^t + \sum\nolimits_t \sum\nolimits_k \frac{s_{ik}^t}{s_i^t} \tilde{\gamma}_k^t$$

The change in export shares is then simply the country-specific growth rate, less the overall growth rate of world trade, and the adjusted export share measure is the country-specific competitiveness measure, less the world growth rate.

Data

The analysis draws from the BACI product-level database developed from COMTRADE data by Gaulier & Zingano (2010), which provides reconciled USD flow figures on more than 200 countries over roughly 5000 products of the Harmonized System (HS) classification. Following Cheptea and others (2012), flows below USD10,000 and those involving micro states are excluded, as are mineral, specific and nonclassified products. For the regressions, 6-digit product data are aggregated down to the 2-digit level.

Caveats

Given the structure of the HS classification, some of the HS 2-digit categories include a very large set of products. This implies that any product mix effects that happen within these very large two-digit categories would be captured by the residual component (adjusted market share) and not by the product-mix component. Also, although the ANOVA-based approach improves on traditional CMSA techniques, it is still the case that the results of this approach may depend on the choice of the selected time-span, or the level of breakdown of the product data.

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