AN ANALYSIS OF REGIONAL EXPORT PATTERNS: THE CASE OF CALABRIA IN SOUTHERN ITALY*

1. Introduction

The recent financial and economic crisis caused a severe contraction in Italian trade flows at the national and regional levels. This situation has increased concern about the perspective for international competitiveness of a country characterized by a strong North-South divide. Although internal economic disparities are evident in almost every single country in the EU, Italy presents strong regional contrasts in terms of *per capita* GDP, which ranges from 135.2 per cent of the Italian GDP in Valle d'Aosta to 63.1 per cent in Calabria; unemployment rate, which varies from 5.1 per cent in Trentino to 19.3 per cent in Campania and Calabria; and export values, which go from 35.1 per cent of GDP in Emilia Romagna to 1.1 per cent of GDP in Calabria in 2012 (ISTAT, 2014). At a more aggregated level, *per capita* GDP in the Italian Mezzogiorno (South) is about 66 per cent of that of the rest of the country (ISTAT, 2014). Although there were some improvements from the 1950s to 1970s, the divide is estimated to be similar to post-war levels, with employment rates dropping and migration to the North increasing, especially among the most well educated population (González, 2011; SVIMEZ, 2009; D'Antonio and Scarlato, 2007).

In this context, the present study provides a deep analysis of external competitiveness and investigates the main drivers of export performance of Calabria, a region located in the southwest corner of Italy (the toe of the boot-shaped Italian Peninsula). The focus on this specific region stems from the fact that Calabria is one of the less developed areas of the country. Understanding the dynamics of

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its external position and the possible reasons of its economic gap in comparison to the rest of the country becomes, hence, important in light of possible policy interventions to promote regional competitiveness and foster general development useful for the entire country.

The study provides several contributions to the regional trade literature.

It explicitly examines diversity across the trade specialization structure of the region compared to the national average using a series of indicators of export performance, including the specialization indices suggested by Balassa.

While I am admittedly not the first to flag diversity between trade structures, a systematic analysis has so far not been undertaken. Furthermore, a specific investigation of export flows at a regional level has not been carried out. Generally, most of the empirical literature on Italy has explored export patterns at the national level (Algieri, 2015; Federico and Wolf, 2011; Vasta, 2010) or has evaluated the impact of export structure on economic growth at the provincial level (Boschma and Immarino, 2009). Instead, I devote considerable attention to the analysis of price competitiveness and income impact on regional export performance, with the purpose to gauge how price and non-price variables affect trade and regional competitiveness. Estimations of price and income elasticities of export demand are important, since exports are considered a potential growth enhancing tool, adopted by many developing countries, due to their significant role in generating adequate levels of revenue necessary to finance imports and investments.

In addition, price elasticities play a key role in the measurement of the effects of real exchange rate changes in the regional trade balance, and are also crucial in deriving some indications concerning the Marshall-Learner condition. A higher income elasticity of export demand would suggest that exports can act as an engine of growth, while a higher price elasticity would suggest that a region can increase competition by varying relative prices (Senhadji and Montenegro, 1998).

A further novelty of the study relates to the examination of an export demand equation through the aggregation of micro-data at a sectorial level in order to identify regional export elasticity, as well as the comparison of the results with a macro-data analysis. Generally, the two approaches have been considered as alternative procedures to estimate trade elasticities: one based on aggregated cointegration, the other on panel analysis. This study adopts both approaches in order

to have a comprehensive perspective of export price and income elasticities. This double exploration of export demand drivers and specialization structure at a regional level using disaggregated and aggregated data could be extended to other regions to better identify the points of strength and the weakness of their economies.

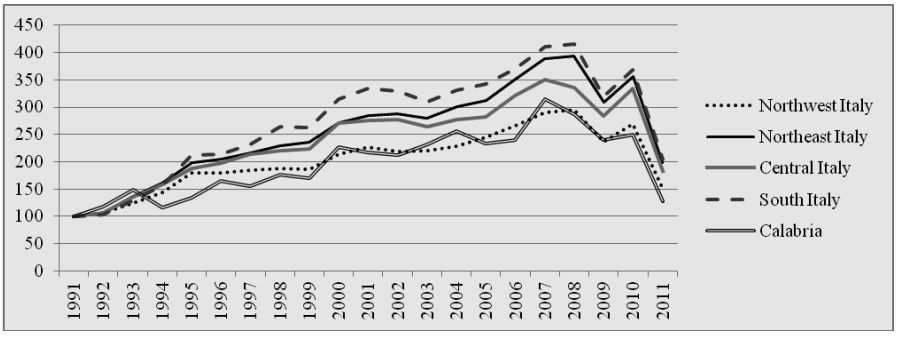
The remainder of the paper is organised as follows: Section 2 analyses the external competitiveness of Calabria and other Italian regions and presents the Balassa indices of comparative advantages. Section 3 investigates the relationship of price competitiveness and foreign demand with the region's export performance in a time series and panel setting. Section 4 concludes.

2. Trade pattern

2.1 Export Indicators and Market Shares

To evaluate export patterns at a disaggregated level for Italy, trade data extracted from the Coeweb database by the Institute of National Statistics (ISTAT) has been considered. Figure 1 shows that exports, distinguished by macro-areas, experienced exponential growth between 1991 and 2007, registering a severe drop soon after that coincided with the global financial crisis. The increase was particularly intense during the first eight years of the new millennium, and total world exports reached their peak in 2008. It is interesting to note that export increases were more pronounced in Southern Italy, followed by the Northeast, Centre and Northwest (Figure 1). The Calabria region experienced less of an export increase than the Northwest.

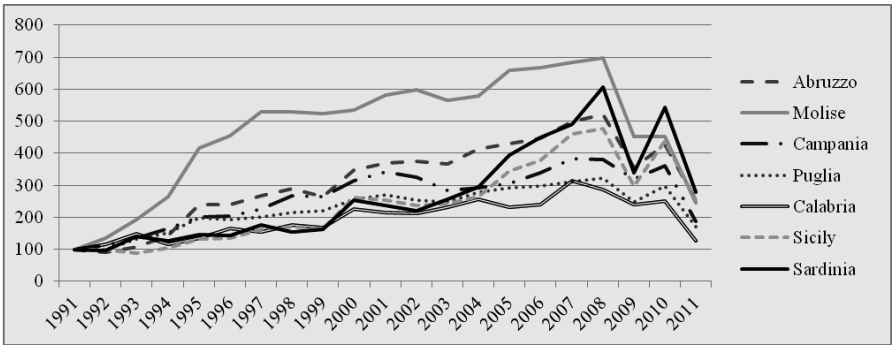
Figure 1 - *Export Trends. Index 1991=100. Current Values*



Source: Own elaborations on Coeweb (2014).

When considering only regions in the Southern part of Italy (Figure 2), it emerges that the most active increases in export flows occurred in Molise and Abruzzi, while the least active regions were Calabria and Puglia.

FIGURE 2 - *Export Trends of the Mezzogiorno Regions. Index 1991=100. Current Values*



Source: Own elaborations on Coeweb (2014).

In 2012, 27.7 per cent of Italian exports originated from Lombardy, 13.1 per cent from Veneto, 12.7 from Emilia Romagna, and 10.2 per cent from Piedmont; all the rest of the regions have a percentage share of total Italian exports that is less than 9 per cent.

This process has been triggered, especially in Veneto and Emilia Romagna, by the formation of industrial districts, i.e. systems of small businesses that have been able to overcome the disadvantages of small size thanks to knowledge spill-over, economies of scales, supply links and cooperation.

The share composition did not change much over the period 1999-2012 (Table 1).

TABLE 1 - *Percentage Share of Total National Exports by Region*

REGIONS	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Piedmont	11.9	11.4	11.2	11.1	11.4	11	10.7	10.5	10.2	10.3	10.2	10.2	10.3	10.2
Valle d'Aosta	0.1	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Lombardy	28.6	28.2	28.7	28.1	28.7	27.8	28.4	28.1	28	28.2	28.2	27.9	27.7	27.7
Liguria	1.3	1.3	1.5	1.4	1.4	1.3	1.4	1.3	1.3	1.4	2	1.7	1.8	1.8
Trentino Alto Adige	1.8	1.7	1.6	1.7	1.8	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8
Veneto	14.6	14.3	14.4	14.8	14.5	14.1	13.6	13.9	13.9	13.6	13.5	13.5	13.4	13.1
Friuli-Venezia Giulia	3.5	3.4	3.4	3.4	3.1	3.5	3.2	3.3	3.4	3.6	3.7	3.5	3.3	2.9
Emilia-Romagna	11.8	11.5	11.5	11.9	12	12.1	12.4	12.5	12.7	12.9	12.5	12.6	12.8	12.7
Tuscany	8	8.3	8.2	8.1	7.8	7.7	7.3	7.4	7.3	6.8	7.9	7.9	8.1	8.3
Umbria	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1	1	0.9	0.9	0.9	1.0	1.0
Marche	2.9	2.9	3.1	3.2	3.3	3.1	3.2	3.5	3.4	2.9	2.7	2.6	2.6	2.6
Lazio	4.4	4.6	4.1	4.4	4	3.9	3.7	3.7	3.7	3.9	4.1	4.4	4.5	4.6
Abruzzi	1.8	2	2	2	2	2.1	2.1	2	2	2.1	1.8	1.9	1.9	1.8
Molise	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1
Campania	3	3	3.1	3	2.6	2.5	2.5	2.5	2.6	2.6	2.7	2.6	2.5	2.4
Puglia	2.3	2.3	2.3	2.2	2.2	2.3	2.3	2.1	2	2	2	2.1	2.2	2.3
Basilicata	0.5	0.4	0.4	0.6	0.6	0.4	0.4	0.5	0.6	0.5	0.5	0.4	0.4	0.3
Calabria	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sicily	1.6	2.1	1.9	1.8	1.9	2	2.4	2.4	2.6	2.7	2.1	2.8	2.9	3.3
Sardinia	0.7	0.9	0.8	0.8	0.9	1	1.3	1.3	1.3	1.6	1.1	1.6	1.4	1.6

Source: Own elaborations on Istat data (2014).

The North as a whole is responsible for 70.4 per cent of the national flow of exports; the South, with 11.9 per cent of total exports, represents the other extreme, though it has registered three percentage point increase since 2011 (Table 2). It is interesting to notice that the percentage shares of exports were higher in the middle of the year in 2000 than in the second half, with the exception of Mezzogiorno.

TABLE 2 - *Percentage Share of Exports*

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
North West	41.9	41.1	41.6	40.7	41.6	40.3	40.7	40	39.7	40.1	40.5	40	39.9	39.9
North East	31.6	30.9	31	31.7	31.4	31.5	31	31.4	31.7	31.7	31.4	31.4	31.3	30.5
Centre	16.2	16.6	16.2	16.6	16	15.7	15.1	15.5	15.4	14.6	15.6	15.9	16.1	16.6
Mezzogiorno	10.2	11	10.9	10.7	10.6	10.6	11.3	11.1	11.4	11.8	10.5	11.5	11.5	11.9

Source: Own elaborations on Istat data (2014).

The degree of openness of the individual regions confirms the heterogeneity in regional export performance: the indicator, in fact, varies significantly, from regions such as Lombardy, Veneto, Piedmont, Liguria, with a share of exports exceeding 20 per cent of the gross national product, to regions such as Calabria, where the index value is close to zero (Table 3).

Over time, the poor performance of Southern Italy is offset at the national level by the rise in trade performance of the North-East-Centre.

The causes of these different dynamics can be manifold: a specialization structure focused on sectors or markets characterized by dissimilar demand patterns, exogenous factors related to structural changes may have pushed some areas to a greater degree of openness towards international markets, finally, a heterogeneous evolution of the weight of the manufacturing sector may have influenced the relative performance of the regional export shares.

These trends, however, may simply reflect the different behaviour in the relative prices of goods exported from each area on the international markets, so that the different dynamics of price competition could have induced different dynamics of exports (Anitori and Bronzini, 2005; Aquino, 1999).

TABLE 3 - *Trade Openness Index*

REGIONS	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Piedmont	22.1	20.6	19.6	19.4	19.8	19.8	21.8	23.1	22.1	18.9	21.3	23	21.4
Valle d'Aosta	10.7	10	7.6	10.8	10.8	7.1	9.5	12.4	9.3	5.7	8.4	7.7	5.9
Lombardy	39.1	38.2	35.9	35.5	36.9	37.8	39.2	39.1	36.7	30.8	36	37.3	35
Trentino-Alto Adige	16	16.1	16.7	16.4	16.1	16.3	16.9	17.8	18	15.3	18.8	18.7	17
Veneto	25	24.8	25.1	23.4	23.8	24.1	26.3	27.1	27.1	21.6	26.5	27.4	25.6
Friuli-Venezia Giulia	16.9	16.5	14.9	14.4	15.5	15.7	16.2	18.3	20.7	15.2	18.2	19.6	19
Liguria	17.5	17.9	17.8	19.1	18.4	20.6	22	21.9	24.2	18.6	22.1	26.1	25.4
Emilia-Romagna	16.2	16.1	16.8	16.5	16.5	17.8	19.1	20.8	20.4	16.2	19.5	21	20.1
Tuscany	20.7	20.4	18.2	16.9	16.7	17.7	18.6	19.2	19	15.6	19.4	20.8	21
Umbria	10.1	9.3	9.9	10.1	10.8	11.6	13.3	13.1	11.4	8.6	12.1	12.9	11.5
Marche	11.3	11.7	11.1	11	10.9	12.9	16.3	17.7	16	13.1	16.2	17.9	17.9
Lazio	17.4	17	16.3	15.5	14.5	15.9	16.5	16.6	16.2	15.4	17.3	19.7	17.6
Abruzzi	17.3	16.2	16	15.1	14.8	14	14.7	14.8	13.8	10.1	13.2	13.6	11.6
Molise	6.5	8.5	8.4	5.3	5.2	5.9	6.2	6.4	7	6.2	8.1	7.8	6.2
Campania	10	9.9	9.2	9.2	9.2	9.1	10.1	10.2	10.3	8.8	12.1	13.2	11.2
Puglia	8.5	8.7	8.1	7.8	9.6	10.5	10.9	12	13.2	10.4	14.1	16.8	14.1
Basilicata	5	5.4	4.4	4.9	5.9	7	10	9.9	8.9	8.3	9.8	9.3	6.9
Calabria	**1.7**	**1.9**	**1.7**	**1.9**	**1.8**	**2**	**1.9**	**2.2**	**1.7**	**1.7**	**2**	**1.7**	**1.8**
Sicily	20.7	18.8	16.3	16.4	17.9	23.4	18.8	19.6	20.8	13.3	19.2	22	24.7
Sardinia	17.8	14.3	14.5	14.4	15.6	20.7	22.8	23.6	28.9	17.3	24.2	30.3	32.3
Italy	**21.6**	**21**	**20.1**	**19.6**	**20.4**	**21.5**	**23.6**	**24**	**24.3**	**19.6**	**23.7**	**25.4**	**24.3**

Source: Own elaborations on Annuario Statistico Regionale, Lombardia http://www.asr-lombardia.it/ASR/regioni-italiane/.

2.2 A Competitiveness Analysis: Inter-Industry Trade Specialization in Calabria

Due to Calabria's poor economic performance, it is interesting to investigate its international trade specialization in more detail. To this end, inter-industry indices have been computed at the sectoral level. Inter-industry trade refers to the simultaneous exchange of different goods.

Countries specialize by exploiting comparative advantages arising from differences in technology (Ricardo, 1817), innovation (Posner, 1961), and relative factor endowments (Heckscher, 1919; Ohlin, 1933).

To carry out our empirical analysis, the Balassa index (1965) was computed to measure inter-industry specialization. This index evaluates comparative advantages as *revealed* by international trade, so that trade "reflects relative costs as well as differences in non-price factors".

The Balassa index is formally given by:

$$B_{yi} = 100 \cdot \frac{x_{yi}}{\sum_{y=1}^{N} x_{yi}} \Bigg/ \frac{\sum_{i=1}^{M} x_{yi}}{\sum_{y=1}^{N}\sum_{i=1}^{M} x_{yi}} \tag{1}$$

where x_{yi} stands for region i's exports of commodity y. The Balassa index has a lower bound of zero and no upper bound.

A region (or a country) that is more specialized in an industry than the average of all regions (or countries) taken together has an index value greater than 100 for that industry, and, conversely, a value below 100 reveals a lack of specialization compared to the average for all regions (or countries).

Thus, values above 100 indicate the presence of comparative advantages. The greater the degree of inter-industry specialization, the greater the Balassa index. Disaggregated national and regional trade data were collected from ISTAT. I have used two-digit level data classified according to the ATECO 2007 system as the commodity set.

A finer level of product disaggregation could not be achieved due to data limitations. The calculated values for the Balassa index, show that Calabria has always exhibited a comparative advantage in

the agro-food product category. In particular, since 1991, the region has strengthened its advantage in manufactured food products, going from a Balassa index of 356.15 in 1991 to 470.38 in 2011, which means that the region has gained competitiveness in the production and trade of this product group.

The region shows a significant specialization pattern in non-manufactured agricultural and fishery products, with a Balassa index varying from 802.94 in 1991 to 751.67 in 2012. Calabria also has a strong comparative advantage in chemicals and wood products; this specialization started in the mid-90s. A wave-like specialization intensity has been recorded for rubber and plastic products, metallurgic products, machines and apparel, and waste treatment products.

This means that in some years they were strongly competitive, while other years were slower (Table 4). Overall, the region shows a comparative advantage in a few product categories, namely food and chemicals.

This is interesting, given that Italian export specializations are mainly polarized in two categories: traditional sectors, such as textiles and clothes, and mechanical production (Vasta, 2010). However, regional figures should be taken with caution due to likely compiling problems at the regional level.

Finally, similarly to the rest of Italy, Calabria is characterized by an almost total absence in the high technology sectors, which are the most affected by global demand. Put differently, the Italian pattern of specialization similarly to that one of Calabria, oriented predominantly towards sectors and markets in which the global demand is relatively slow, has slowed down a better positioning on international markets.

This implies that policy measures should be addressed to the diversification of the model of specialization towards more dynamic sectors and products with higher added value and at the same time policy interventions should encourage product innovation in traditional sectors. Therefore, policy makers at both regional and national level should try to encourage the processes of accumulation and diffusion of innovations, even in the organization of business functions.

TABLE 4 - *Balassa Specialization Index*

Calabria	1991	1992	1995	1996	2000	2001	2005	2006	2011	2012*
CA10-Food products	356.15	290.76	300.04	324.39	370.13	355.36	360.40	462.93	470.38	426.97
CA11-Beverages	52.04	65.07	89.44	133.36	128.82	109.37	66.91	84.63	97.20	103.51
CA12-Tabacco	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CB13-Textiles	17.23	23.18	27.87	26.75	141.99	134.72	77.61	135.92	8.66	7.54
CB14-Clothes (also in leather and fur)	91.34	64.34	146.62	106.09	46.20	39.82	21.29	23.49	12.20	62.14
CB15-Leather (except clothes)	27.43	18.48	7.19	6.47	6.05	6.89	6.11	9.87	9.85	5.46
CC16-Wood products (except furniture)	55.79	31.22	191.21	175.32	183.47	265.00	239.04	208.27	140.85	184.90
CC17-Paper and paper products	3.18	28.84	5.93	23.55	36.60	30.22	26.32	28.62	9.28	16.43
CE20-Chemicals	269.37	313.21	378.65	315.07	261.97	326.13	296.09	305.49	286.88	218.40
CF21-Pharmaceutical and medical prod	9.42	12.79	9.55	29.72	16.25	0.70	0.06	34.71	61.08	74.25
CG22-Rubber and plastic products	78.06	86.30	161.08	153.89	159.11	170.18	238.78	144.66	24.63	29.79
CG23-Non-metallic mineral products	20.76	35.35	19.15	26.68	41.47	43.41	50.99	59.03	32.24	23.67
CH24-Metallurgical Products	127.49	179.68	46.18	120.60	15.68	9.92	10.05	6.71	223.80	255.39
CH25-Metal products (no machines & equipment)	76.64	37.55	33.08	43.33	69.50	55.27	78.77	49.60	26.32	35.82
CI26-Computers, optical and medical apparels, watches	18.25	28.78	6.09	3.77	17.61	18.50	21.75	23.54	21.32	41.88
CJ27-Electrical and non-electrical apparels	13.48	13.15	3.75	3.35	7.89	15.54	13.62	16.86	52.70	18.44
CK28-Machines and apparels nca	131.30	147.34	89.09	129.72	148.39	81.11	62.76	69.95	62.74	72.79
CL29-Automobiles motor vehicles	0.78	15.75	35.58	24.34	8.58	13.81	17.75	26.77	13.09	26.53
CL30-Other transportation vehicles	30.94	14.85	18.49	11.68	20.81	54.17	67.10	20.65	24.87	42.36
CM31-Fornitures	15.95	20.91	19.07	10.48	14.58	28.86	10.06	21.27	41.83	40.45
CM32-Other manufactures	21.32	9.27	13.52	10.00	34.24	28.77	11.43	25.83	7.09	0.79
AA-Agricultural and fishery products	802.94	625.75	…	904.16	976.56	…	…	…	726.39	751.67
EE-Waste treatment products	410.59	823.37	466.49	72.00	1.30	102.89	7.87	18.29	212.53	265.61
JA-Press and audio/video products	9.78	37.76	12.32	6.01	4.44	3.96	0.41	2.26	5.03	40.87
MC-Other scientific and technical products	0.00	5.37	0.36	0.83	0.00	70.36	8.28	78.80	0.29	24.83
RR-Entertainment, art and leisure products	5.37	9.55	5.62	0.00	14.78	5.09	55.44	29.85	11.13	30.22

* Only the cumulative values of the first three quarters have been considered.

3. Calabria export demand

To evaluate the drivers of the comparative advantages, a traditional export equation has been estimated for Calabria over the period 1991-2012.

The classic workhorse model for estimating export demand elasticities at the country level is the imperfect substitute model (Goldstein and Khan, 1985), which relates the volume or value of exports to foreign income and relative prices. The model assumes that domestic and foreign tradable goods are imperfect substitutes, and that price homogeneity holds (e.g., that the estimated coefficients of the trade price and domestic price are equal, thus allowing for a single relative price term). All studies find that increases in foreign economic activity ("income") will raise the foreign demand for domestic exports. A rise in the price of a country's export goods relative to the price of foreign competing goods lessens the demand for exports. The sizes of the coefficients of income and relative price vary greatly by study, time period, countries analysed, coverage of commodity groups, and the inclusion of different or additional explanatory variables in the model. Generally, two alternative approaches have been implemented to estimate trade elasticities: one based on macro-data, the other based on micro-data. Among the others, Rose (1991; 1990); Ostry and Rose, (1992) Senhadji and Montenegro (1999); OECD (2005; 2000); Algieri (2015; 2011), Bussière *et al*. (2013) have evaluated export demand using aggregate national level figures. Conversely, Imbs and Mejean (2010; 2008) and Dekle *et al*. (2007) derive export equations at the firm level and then aggregate them to the macro-level. The idea behind the use of microeconomic data is that price elasticities in the aggregate trade equation are biased downward, given the "aggregation bias" observed by Orcutt (1950). Explicitly, in his words

> "goods with relatively low price elasticities can display the largest variation in prices and therefore exert a dominant effect on the estimated aggregate price elasticity, thereby biasing the estimate downwards".

One reason for the bias is that not all goods respond homogeneously to changes in relative prices.

To combine the two different approaches and evaluate the determinants of Calabria's exports, two specifications have been implemented, one using aggregated data at a regional level and adopting a time series approach, and the other using disaggregated data at a sectoral level in a panel setting. A time series analysis is used to explore the aggregate export behaviour of regional exports;

using panel data makes it possible to investigate changes in the series over time while taking into account the heterogeneity of the different sectors in the dataset. Furthermore, the panel approach also means that the estimation will be based on a much larger set of observations, which is of particular importance in the case of regional data, where the length of available time series is limited by the annual frequency of the data.

The two export demand equations are expressed as follows:

$$\ln Cal\exp_t = \varphi - \alpha \ln rex_t + \beta \ln w\_gdp_t + \varepsilon_t \quad (2)$$

$$\ln \exp_{it} = \gamma_i - \delta \ln p_{it} + \lambda \ln w\_gdp_t + \xi_{it} \quad (3)$$

where the dependent variable in equation 2 *Cal exp* is the total regional exports, *rex* is the euro's real effective exchange rate, and *w_gdp* is the foreign income variable, namely the world GDP, φ is a constant, and ε is the disturbance term independently and identically distributed (i.i.d.). In equation 3, exp_{it} represents the exports of manufacturers in 20 macro-sectors in value terms. Put differently, i = 1…20 and t = 1991…2012, with regard to product sector and time period, γ_i is the individual specific intercept, and ξ_{it} is an idiosyncratic error. The chosen explanatory variables, as before, include a price and income variable. The effective exchange rate based on consumer prices is an indicator commonly used to measure international price competitiveness. This index, in fact, allows us to measure, in a common currency, the dynamics in relative prices of a country with respect to its main international competitors. At sub-national level, territorial indicators to measure price competitiveness are not yet available. Although the official statistics have recognized the need to broaden the basis of statistical indicators for spatial analyses, the high costs to construct a territorial information system are often a severe constraint to its realization. For these reasons, a lot of information at regional level are obtained through specific adaptations of the current methodologies related to national surveys such as indices of average unit values[1].

[1] To account for territorial specificities, an alternative specification, that makes use of export price (p) data relative to each sector, was estimated. Unit values (computed as export value/export volumes) were used as a proxy for p; however, this model was less satisfactory than the one using the common real effective exchange rate, therefore this last index was adopted. The possibility of using only time varying regressors is explained in Baltagi (2008).

α, β, δ, and λ are the coefficients that need to be estimated empirically. All variables are in natural logs (*ln*). The dataset consists of regional and sectoral exports at constant prices (2005=100), collected from Coeweb by ISTAT. The sectors are those considered for the Balassa index. The disaggregation allows for a finer identification of manufacturing exports. Yearly data for the world GDP was taken from the IMF World Economic Outlook database via Datastream.

For an initial examination of the data, the correlation matrix has been analysed.

TABLE 5 - *Correlation Matrix*

	ln exp	ln rex	ln w_gdp
ln exp	1		
ln rex	-0.355	1	
ln w_gdp	0.122	0.140	1

(obs=286)

From the matrix, one can infer the expected signs of the variables. A rise in the export price or an appreciation in the real effective exchange rate implies a drop in Calabria's competitiveness and a contraction in manufacturing exports. So the expected sign is negative. An increase in world GDP translates as a rise in foreign demand, which would lead to an increase in export flows.

1.1 A Time Series Analysis of Aggregate Manufacturing Exports

Johansen's cointegration methodology (2000; 1995; 1991) was adopted to identify the long-run relationship among the variables and to test for the presence of more than one co-integrating vector. In addition, Johansen's (1991) maximum likelihood estimator corrects for autocorrelation and endogeneity parametrically using a vector error correction mechanism specification. Before estimating the cointegrated vector-error correction, the stochastic properties of the data were assessed using conventional unit-root tests, namely the Augmented Dickey and Fuller (ADF) (1979) and the Phillips and Perron (P-P) (1988) tests. The critical values for the rejection of the null hypothesis of a unit root are computed according to the

McKinnon (1996) criterion. The lag length for the ADF test is based on the Schwarz Information criterion. The lag structure for the P-P is selected using the Bartlett Kernel, with automatic Newey-West bandwidth. The two tests were carried out in three settings: with a constant, without a constant, and with a constant plus a linear trend. The ADF and P-P tests show that all the independent and dependent variables are integrated of order one I(1). The presence of non-stationarity implies that standard time-series methods are no longer suitable; consequently, the Johansen methodology of testing for co-integration can be applied (Enders, 2009).

To identify the proper model, the five possibilities considered by Johansen were tested, specifically: (1) the series exhibits no deterministic trends and the cointegrating equations do not have intercepts, (2) the series exhibits no deterministic trends and the cointegrating equations have intercepts, (3) the series exhibits linear trends but the cointegrating equations have only intercepts, (4) both the series and the cointegrating equations have linear trends and (5) the series exhibits quadratic trends and the cointegrating equations exhibit linear trends. The results indicate that the proper model is the third one. To identify the proper lag length, the Akaike Information and the Schwarz Criteria were implemented. Note that the lag length must be short enough to allow estimation yet long enough to ensure that errors are white noise. To determine the number of cointegrating vectors, both the trace test and the Maximum Eigenvalue test using the critical values of Mackinnon *et al*. (1999) were performed. The results of Johansen's test for cointegration indicate that there is one cointegrating vector (Table 6).

TABLE 6 - *Johansen Test*

Selected (0.05 level*)					
Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	1	1	1	1	1
Max-Eig	1	1	1	1	1

*Critical values based on MacKinnon-Haug-Michelis (1999)

Akaike Information Criteria by Rank (rows) and Model (columns)					
0	-5.591	-5.591	-5.630	-5.630	-5.659
1*	-6.469	-6.400	-6.449	-6.351	-6.380
2	-6.134	-6.182	-6.283	-6.171	-6.270
3	-5.576	-5.698	-5.698	-5.858	-5.858
Schwarz Criteria by Rank (rows) and Model (columns)					
0	-5.143	-5.143	-5.032	-5.032	-4.912
1*	-5.722	-5.603	-5.553	-5.405	-5.335
2	-5.088	-5.037	-5.088	-4.876	-4.926
3	-4.231	-4.204	-4.204	-4.216	-4.216

Number of Cointegrating Relations by Model.
Sample: 1991 2012 Lags interval: 1 to 1.

The selected normalized long-run cointegrating relationship[2] is given by:

TABLE 7 - *Vector Error Correction Estimates*

Cointegrating Equation	
ln rex	-1.762***
	(-2.81)
ln w_gdp	1.275**
	(1.88)
@trend(91)	-0.106**
c	-23.429**
Error Correction	-0.366***
	(-2.12)

R-squared 0.452. Sample (adjusted): 1992 2012.
Dependent variable: ln exp , *, ** and *** indicate significance at 10%, 5% and 1%.
t-statistics in ( ).

[2] Short-run dynamics have not been reported but are available from the author upon request.

The findings reveal that the real effective exchange rate and foreign income are highly significant in the final equation and have the expected signs. More specifically, the estimate provides evidence suggesting that higher income leads to a rise in Calabria's exports. An increase in income by 1 per cent brings about an export increase of 1.27 per cent. Conversely, a real appreciation of 1 per cent reduces Calabria's international competitiveness, decreasing exports by 1.76 per cent. This implies that a real devaluation has the potential to increase Calabria's market share.

It should be noted that the higher the price elasticity of export demand, the more competitive the international market for exports from the Calabria region will be, and thus the more effective a real devaluation would be in fostering export revenues. Higher income elasticity makes exports more effective engines of growth.

The coefficient of error correction is estimated to be -0.37, and has the correct negative sign, serving as a negative feedback function. This implies that after any departure from equilibrium, it takes more than three years to restore the equilibrium.

The properties of the residuals of the estimated model have been carefully analysed. The residual Lagrange-Multiplier test for autocorrelation shows that the null of no residual correlation up to lag 12 cannot be rejected (Table 10). The Cholesky Lutkepohl test gives evidence that residuals are multivariate normal, and hence serial correlation is deemed to be absent in the residuals (Table 11). There is also an absence of multivariate heteroskedasticity (Table 12).

3.2 A Panel Analysis of Sectoral Manufacturing Exports

Export demand equation 3 was estimated using panel data with fixed effects. The identification of fixed and random effect models has been extensively discussed in the literature. When N individuals are randomly drawn from a large population, a random effect model is more appropriate. Conversely, when attention is fixed on N specific individuals, a fixed effect model would be more appropriate. The sectors under investigation are those evaluated using the Balassa index, and they are very representative of the structure of Calabria's comparative advantages/disadvantages. This implies that the choice of the sectors is not random. Also the Hausman test indicates significant difference between the fixed and random effect models, thus a fixed effect model has been used, because random effects turn to be inconsistent.

The OLS fixed effect estimation is based on equation 3, in which γ_i are fixed effects that induce unobserved heterogeneity in the model and contain the omitted variables, which are constant over time for every unit *i*; the dependent variable is the log of exports at the sectoral level; and ξ_{it} contains the remaining omitted variables. The estimated coefficients for the real exchange rate and income are jointly significant, as highlighted by the F-statistics, and have the expected signs (Table 8).

TABLE 8 - *Fixed-Effects Estimations*

	Coef.
ln gdp	0.904*** (6.35)
ln rex	-1.583** (-2.39)
cons	7.544** (2.54)
Rsquared	0.10
Prob F-test	0.000
F(2,418)	20.76
rho	0.384
Hausman (prob)	0.000

Dependent variable: log of sectoral exports.
Panel=balanced.
Number of obs. = 440 and number of groups = 20.
t-stat (FE) in parenthesis.
*, ** and *** indicate significance at 10%, 5% and 1%.
Hausman Test: Prob< 0.05 indicates that FE is preferred to RE.

The alternative way to estimate fixed effects is to use dummy variables, which leads to the least square dummy variable model (LSDV). Fixed effects using dummies generate the same coefficient estimates of the fixed effect, but allow us to distinguish each specific intercept, since each dummy is absorbing the effects particular to each sector. Formally, equation 3 is modified as follows:

$$\ln \exp_{it} = \gamma_1 D_i^1 + ... + \gamma_n D_i^n - \delta \ln rex_t + \lambda \ln w\_gdp_t + \xi_{it} \qquad (4)$$

where D is the number of dummies corresponding to n-1 sectors, where D^1 is 1 when i = 1 and 0 otherwise, D^2 is 1 when i = 2 and 0 otherwise, and so on.

TABLE 9 - *Fixed-Effects Using Dummies (LSDV)*

	Coef.	t-stat
ln w_gdp	0.904***	(6.35)
ln rex	-1.583**	(-2.39)
_Iproduct_2	0.230	(-0.88)
_Iproduct_3	-0.552**	(-2.12)
_Iproduct_4	0.687***	(2.63)
_Iproduct_5	0.496*	(1.90)
_Iproduct_6	-0.275	(-1.05)
_Iproduct_7	-0.418	(-1.60)
_Iproduct_8	0.008	(-0.03)
_Iproduct_9	-0.807***	(-3.09)
_Iproduct_10	-0.749***	(-2.87)
_Iproduct_11	-0.282	(-1.08)
_Iproduct_12	0.967***	(3.71)
_Iproduct_13	-0.536**	(-2.06)
_Iproduct_14	-1.836***	(-7.04)
_Iproduct_15	-0.295	(-1.13)
_Iproduct_16	0.434	(-1.67)
_Iproduct_17	-0.357	(-1.37)
_Iproduct_18	-0.473*	(-1.82)
_Iproduct_19	0.690***	(2.65)
_Iproduct_20	0.891***	(3.42)
_cons	7.653**	(2.57)
R-squared	0.4197	
Prob > F	0.0000	
F(21, 418)	14.4	

Dependent variable: log of sectoral exports.
Number of obs. = 440 and number of groups = 20.
Panel=balanced.
*, ** and *** indicate significance at 10%, 5% and 1%.
Food products omitted.

While the first model cancels out the group difference, reporting the same intercept for all groups, the LSDV model takes into account the difference between groups. The t-tests for several dummy parameters reject the null hypothesis of no difference in intercepts at the 0.05 level.

Consequently, one can conclude that the LSDV model describes the data better than the first model, considering fixed group effects.

The goodness of fit statistics of the LSDV model are also better than those of the general model (e.g., R-squared, and SSE).

The general fixed effect and the fixed effect using dummies reveal that the long-run elasticity of export demand with respect to foreign GDP is 0.90, and with respect to real exchange rate is -1.58. Thus, it can be argued that Calabria's exports can be mainly explained by real exchange rate changes from the demand side rather than foreign income changes. These results support the hypothesis that exchange rate policies may be successful in promoting export growth, and real devaluation does affect trade balance. In the time series analysis, exports in Calabria are price (exchange rate) elastic, while they register as income inelastic in the panel approach. An income elasticity that varies between 0.90 and 1.27 means that trade has not been a powerful engine of growth in the region. The income elasticity of exports from the region makes Calabria more similar to an African country. Senhadji and Montenegro (1998) found that while Asia benefits from high income elasticity, Africa has the lowest income elasticities, largely reflecting the type of products the region exports.

The income elasticity of 0.90 found for the panel sectorial model would suggest that increasing Calabria's long-term exports may require varying its export mix in favour of goods for which demand – both globally and locally – is highly income-elastic.

4. Conclusions

This study has investigated the specialization pattern and export drivers of Calabria, a region located in the extreme southern part of the Italian peninsula. The results reveal that the region's export profile is strongly inclined towards food, chemical, and wood products. This specialization pattern if, on the one hand, differs from the national profile, which is more focused on the traditional sectors – the so called "Made in Italy" – on the other is similar to

it for the fact that it is oriented towards sectors and markets which exhibit a relatively slow demand.

Given that

> "not all goods are alike in terms of their consequences for economic performance" (Hausmann *et al*., 2007),

the structure of trade matters for economic development and growth. Specifically, exports in high-technology-intensive industries tend to create larger spill-overs – such as innovation and accumulation of human and physical capital – and higher *per capita* GDP growth rates and linkages for development than lower-technology and labour intensive ones (Demir and Dahi, 2011; Hausmann *et al*., 2007; Imbs and Wacziarg, 2003; Feder, 1983), like those of Italy and especially Calabria. In this context, it is clear that the international financial crisis has found fertile ground when the competitive decline of the traditional manufacturing activities squeezed by competition from Asian countries and Eastern Europe has not been offset by a sufficient development of activities in sectors characterized by innovative and technological level less similar to those competitors. In addition, Calabria has a highly concentrated trade structure. Since it has been estimated that economic development is accompanied by increasing diversification of production rather than specialization in few sectors (An and Iyigun, 2004), policy makers should try to enact manoeuvres to stimulate more diversification across sectors and avoid too much sectoral concentration. With reference to the determinants of exports, the results show that the coefficients of the real effective exchange rate and foreign income are significant and have the expected signs. An appreciation of the euro causes a drop in Calabria's exports, whereas a rise in foreign income leads to higher export revenues. Since the estimated real effective exchange rate elasticities exceed unity, the demand for exports is price elastic. A 1 per cent euro appreciation reduces regional exports by 1.58-1.76 per cent, implying that the Marshall-Lerner condition is satisfied, while a 1 per cent increase in income raises exports by 0.90-1.27 per cent.

The coefficient of the relative price should be interpreted as an indicator of competitiveness, such that if strong competition is overcome, the pay-off could be significant. This because the offsetting effects of changes in profit margins directly influence the way that trade quantities respond to changes in the exchange rate. The price variable has a higher elasticity than the income variable, meaning that price competitiveness is the major factor that drives Calabria's exports, and that the real exchange rate could be effectively used

as a trade policy instrument. This implies that an undervaluation of the real exchange rate can be used to promote exports, while overvaluation will tend to reduce exports. Given that the euro area shares the same currency, an undervalued real exchange rate could be accomplished by containing regional labour costs in order to profit from external demand, achieving a much-needed increased in the growth rate and reducing the trade deficit. Furthermore, since income elasticity does not exceed unity, but is approximate to unity, manufacturing exports are regarded as "normal" goods, and thus an increase in income is expected to raise the demand for exports by almost the same amount. In this respect, exports have not been a powerful engine of growth. Enhancing Calabria's long-term export potential would require changing its export mix in favour of goods for which global and local demand is highly income-elastic. In addition to avoiding a loss in competitive advantages through real devaluation, Calabria should promote non-price competitiveness by implementing a range of policies to expand regional technological prowess, innovative skills, and scientific capacities.

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ABSTRACT

This study aims to provide an overview of recent developments in the export performance and international competitiveness of one of the less developed regions in Southern Italy: Calabria. After computing the comparative advantages/disadvantages of the region, a double empirical approach based on time series and panel estimations has been adopted to assess the extent to which price competitiveness and foreign income affect export behaviour at the regional level. The analysis shows that Calabria presents a specialization structure focused on a few product categories mainly in agro-food, wood, and chemical products, which condition its international competitiveness. The finding reveals that a 1 per cent drop in price competitiveness has caused a contraction in regional exports by 1.59-1.76 per cent, and a 1 per cent decrease in foreign income has brought about a narrowing of exports by 0.90-1.27 per cent. This indicates that the erosion of price competitiveness plays a larger role than income in affecting export performance.

Keywords: Comparative Advantages, Price Competitiveness, Calabria
JEL Classification: C32, C33, F14

RIASSUNTO

Un'analisi dei modelli di esportazione regionale: il caso della Calabria

Questo studio si propone di fornire un quadro dei recenti sviluppi dell'andamento delle esportazioni e della competitività internazionale di una delle regioni meno sviluppate del Sud Italia: la Calabria. Dopo aver calcolato i vantaggi e gli svantaggi comparati della regione, è stato adottato un doppio approccio empirico basato su un'analisi di serie storiche e un'analisi di panel per valutare in che misura la competitività di prezzo e la domanda estera influenzino il comportamento delle esportazioni a livello regionale. L'analisi mostra che la Calabria presenta una struttura di specializzazione incentrata su una ristretta gamma di prodotti (agro-alimentare, legno e prodotti chimici) che condiziona la sua competitività internazionale. I risultati evidenziano che un calo di competitività di prezzo dell'1 per cento provoca una contrazione delle esportazioni regionali fra l'1,59 e l'1,76 per cento, e una diminuzione del reddito estero dell'1 per cento determina una riduzione delle esportazioni

fra lo 0,90 e l'1,27 per cento. Ciò indica che l'erosione della competitività di prezzo ha un ruolo più significativo rispetto al reddito nell'influenzare le esportazioni.

APPENDIX

Data Sources and Definitions

Series going from 1991 to 2012	Source and Construction
Real Effective Exchange Rate (2005=100)	A real effective exchange rate index represents a nominal effective exchange rate index adjusted for relative movements in national price or cost indicators of the home country and selected countries. This index is adjusted for relative changes in consumer prices indices of the reference and partner-competitor, countries. Data have been taken from the IMF, International Financial Statistics via Datastream. ITY..RECE
World Gross Domestic Product, Constant Prices Nadj (2005=100)	Figures were extracted respectively from the IMF World Economic Outlook via Datastream. Code WDWOGDPXR
Sectoral exports	Data were collected from COEWEB, ISTAT

TABLE 10 - *VEC Residual Serial Correlation LM Test*

Lags	LM-Stat	Prob
1	6.110	0.7289
2	8.236	0.5105
3	4.227	0.8959
4	8.141	0.5200
5	5.440	0.7944
6	10.369	0.3215
7	8.706	0.4649
8	5.307	0.8068
9	3.643	0.9333
10	3.381	0.9472
11	2.942	0.9665
12	5.465	0.7921

Null Hypothesis: no serial correlation at lag order h.
Sample: 1991 2012.
Probs from chi-square with 9 df.

TABLE 11 - *VEC Residual Normality Test*

Component	Skewness	Chi-sq	df	Prob.
1	-0.103	0.037	1	0.8475
2	-0.022	0.002	1	0.9671
3	-0.438	0.671	1	0.4126
Joint		0.710	3	0.8709

Component	Kurtosis	Chi-sq	df	Prob.
1	4.008	0.889	1	0.3457
2	2.908	0.007	1	0.9315
3	2.519	0.202	1	0.6530
Joint		1.099	3	0.7774

Component	Jarque-Bera	df	Prob.
1	0.926	2	0.6294
2	0.009	2	0.9955
3	0.873	2	0.6461
Joint	1.809	6	0.9364

Null Hypothesis: residuals are multivariate normal. Orthogonalization: Cholesky (Lutkepohl). Sample: 1991 2012.

TABLE 12 - *VEC Residual Heteroskedasticity Test*

Sample: 1991 2012

Joint test:

Chi-sq	df	Prob.
34.58791	24	0.0747

No Cross Terms (only levels and squares).