FONDAZIONE ARISTIDE MERLONI

ECONOMIA MARCHE **Journal of Applied Economics**

Vol. XXXIII, No. 1, June 2014

Trade and change: A meso perspective from four Italian provinces

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Abstract

We investigate the evolution of the economy of the four provinces of the Marche region using information derived from international trade flows. Although mainly descriptive, the analysis reveals several aspects on the changes of their economic structure associated to economic growth. We first compare the Marche provinces' features to the ones of other Italian provinces; this evidences a loss of export shares, but also an intensity of structural change in line with that of the Italian provinces and a positive evolution in terms of the complexity/sophistication of the goods produced. Nevertheless, a comparison with the dynamics of several international emerging and dynamic economies reveals that the pace of evolution in the Marche region is for some aspects slower than what is probably possible.

JEL Classification: *F10; O47; O57*

Keywords: *Structural change; Economic growth; Complexity; Sophistication.*

Affiliations and acknowledgements

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Suggested citation

De Benedictis L., Lavoratornovo M. and Tamberi M. (2014), Trade and change: A meso perspective from four Italian provinces, Economia Marche Journal of Applied Economics, XXXIII(1): 14-36.

1 Introduction

Economic growth is not simply growth, it is a change! What we generally perceive (and measure in terms of per capita income growth, productivity growth, and population and employment dynamics) and focus on is the outcome of that change. Since Colin Clark's book in 1936, it has become evident that this "change" is a prerequisite for growth and improvement, and also for backwardness and falling behind. In other words, the direction of change matters. What has also become evident is the fact that this "change" is more difficult to capture in a meaningful way (United Nations, 2006). In the early years of the industrial revolution, the focus was on moving from an agricultural society to an industrial one, measured by the share of the primary sector value added in national gross domestic products. In contemporary years, the notion of structural change has moved from a macro perspective to, let's say, a *meso perspective*, going beyond the phenomenon of tertiarization and focusing on the characteristics of the sectoral structure of production; in general terms, we will adopt the idea of "complexity" of an economy as developed with different methodologies in several papers by a group of authors (Hausmann *et al.*, 2007; Hausmann and Hidalgo, 2011). A root of those concepts can be found in the idea of "sophistication" which was previously proposed by Lall *et al.* (2006).

In this paper, we are going to follow this contemporary stream of research taking a *meso regional perspective*. Given the unavailability of production, value added or employment data at a very narrow spatial *and* sectoral disaggregation, we have used Italian sectoral data on exports at the provincial level in order to quantify the change in the structure of production between 1997 and 2011. In particular, we are going to look at the export structure of the four Italian provinces of the Marche region, both from a quantitative point of view and from a qualitative one.

The Marche region is an economy that could be regarded as "small Italy", in the sense that it reflects many of the economic characteristics of the Italian economic structure. In particular, the so-called "Italian districts" are widely represented together with some areas with big companies. The sector structure is also typically "Italian": mainly traditional sectors (above all footwear) and the mechanical sector. Moreover, in the past, a small part of the region was included in the area affected by the "Cassa per il Mezzogiorno", an institution whose aim was to finance investment in poor areas of the country (south of Italy).

Recently, a big part of the regional industrial system has been strongly hit by the economic crisis, and many small and big firms closed down or were forced to resize their activities. This happened suddenly, and many actors were not prepared for it. As in many parts of the country, this recent and a not-so-short negative trend is intensely debated at both academic and institutional levels, and by the general public and press. The debate on the effects of the crisis, whose effects are still unknown at structural level, can be linked to past reflections on the weaknesses of the so-called "Italian model", considered by some scholars, unsuitable for the process of growth of a wealthy nation such as Italy. This is due to several reasons, such as absence of big firms, low R&D activity, high share of traditional sectors, etc. As a result, an inextricable mix of structural and cyclical aspects are at work in defining the size and quality of the present crisis. The aim of this paper is to recall those long term characteristics of the economy of the Marche provinces (and of a big part of Italy in general) which should be considered in understanding the deep origin and the far-reaching effects of the present economic trends.

The paper has been structured in the following way. Section 2 describes the data used in the

analysis. In Section 3, we compare the international trade performance of the four provinces of the Marche region, which are: Ancona, Ascoli Piceno, Macerata, and Pesaro and Urbino, with that of other Italian provinces, pointing out the lack of a strong and dynamic change in the structure of the Marche region's economy. The intensity of the change in the provinces of the Marche region is in line with that of the Italian provinces in terms of income per capita. Moreover, we explore the qualitative evolution of the Marche region's trade in terms of the complexity/sophistication of the goods produced which appears to be positive. In Section 4, we take an international comparative perspective by comparing the structural change that has occurred in Ancona, Ascoli Piceno, Macerata, and Pesaro and Urbino with the dynamics of several international emerging economies and by showing that the evolution in the four provinces has been remarkably slower with respect to that occurring at an international level. Section 5 concludes.

2 Data and methodology

In the analysis that follows we make use of three distinct data sources. The first one regards *world exports* between 1997 and 2011. It is collected by the United Nations at a fine level of sectoral disaggregation and diffused as the United Nations Commodity Trade Statistics Database (COMTRADE), available online from the WITS repository (http://wits.worldbank.org). The classification method used in the analysis is the Harmonized Commodity Description and Coding System 1992 (HS 1992) at 4-digit level.

The second source of data comes from the World Bank. The methodology (Hausmann *et al.*, 2007) that we will be using in subsequent sections to calculate the complexity inbred in specific sectoral production which requires data on the per capita income of countries. We use the data, in PPP, constant US dollars 2005, included in the World Development Indicators (WDI) of the World Bank.

Finally, both the *per capita income* data and the *export sectoral data* for the Italian provinces (1997-2011) come from the Italian National Statistical Institute ISTAT which is available at the COEWEB repository (http://www.coeweb.istat.it). Provincial exports are classified according to the national classification system ATECO (used here at 3-digit level),[1] while the COMTRADE international data is structured according to the HS 1992 classification. We re-classified the HS 1992 sectors according to the ATECO taxonomy in order to make the international data comparable to the Italian provincial data.[2]

Moreover, in order to maintain the comparability of data along the time span of the analysis, we worked with a territorial classification that comprises 103 Italian provinces. This was the actual number of provinces in 1997. Even if seven new provinces were established between 1997 and 2011 we opted for an aggregation of the new territorial units according to the state

[1] The national classification system ATECO is a national variant of the European NACE classification system, which in turn is derived from the ISIC international codification.

[2] We re-classified the HS data according to the ATECO classification instead of doing it the other way round since the HS classification adopts a finer sectoral disaggregation. Because of difficulties in correctly attributing some sectoral data during the conversion from one classification to the other, we had to eliminate seven ATECO sectors: 021 (Legno Naturale), 370 (Acque e fanghi di depurazione), 382 (Prodotti dello smaltimento dei rifiuti), 383 (Prodotti del recupero di materiali), 581 (Libri e periodici), 899 (Merci dichiarate come provviste di bordo, merci nazionali di ritorno e respinte, merci varie), 960 (Prodotti di altre attivita' di servizi per la persona). They represent around 1% of the total external trade of the Italian provinces in the time span of the analysis.

that was in progress in 1997.[3]

Finally, we have data on provincial value added (1998-2008), both total and per capita, from the statistical office of the Marche region (original data from ISTAT)

3 A comparison within the national boundaries

3.1 Quantitative evolution of the export structure

Italy is a developed country with a very high share of industrial (manufacturing) activities (Ciocca, 2007; Toniolo, 2013) on a comparative basis. Moreover, it is substantially open to foreign trade, especially of goods (De Nardis and Traù, 2005). The Marche region, among the Italian regions, is characterized by a very high share of manufacturing and a high degree of openness:

- In 2008, the last year for which we have availability of data on regional accounts, Industry accounted for 31.2% of regional value added, and only one Italian region, Veneto, had a higher percentage.
- In terms of per capita industrial value added, Marche is the fifth region in Italy, and its level is 32% higher than the EU average (Centro Studi Confindustria, 2011).
- In 1997, the starting year of our analysis, the region exported 6.6 billion euro of products, 3.13% of Italian exports (to have a term of comparison, the regional share of the Italian population was around 2.4%). In 2008, imports plus exports of industrial products were around 171% of industrial value added, and 53% of total value added of the region.

Even if not strictly related to the subject of this paper, it could be useful to inform the reader that the Marche region was considered to be mostly characterized by the presence of the so-called Industrial Districts (ISTAT, 2005).

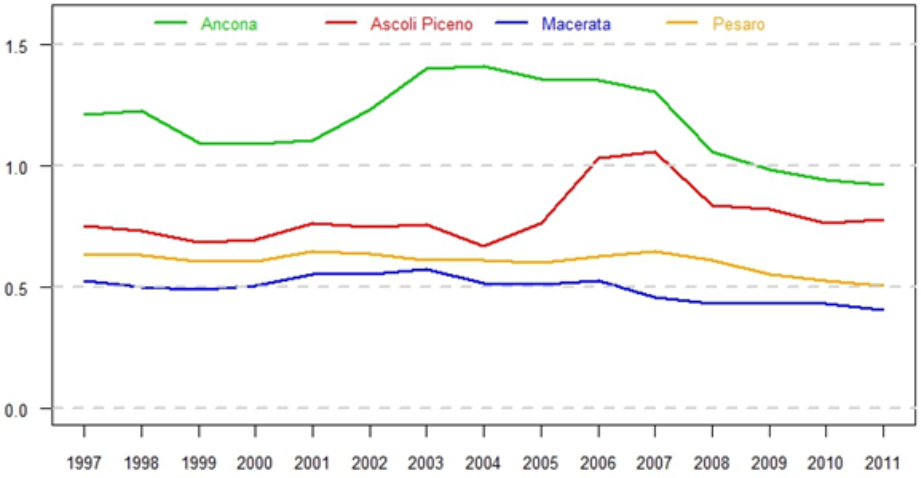
In Figure 1, we can observe the evolution that took place between 1997 and 2011 in terms of the export shares for the four provinces of Ancona, Ascoli Piceno, Pesaro e Urbino, and Macerata.[4] In the starting year, around 40% of the regional exports came from Ancona (characterized by the presence of big firms including those which manufacture home appliances).

After 14 years, the share of regional export dropped to 2.62% (9.7 billions): in short, in this period the regional export performance was slower than the Italian average performance. Only Ascoli Piceno's share increased slightly, while the other three provinces show a generalized decrease; in particular, Ancona made a drastic change after 2004. Its national export dropped from around 1.4% to 0.9%. This decrease has been particularly drastic since 2007 onward (see ICE, 2013, also on this matter) and shows a peculiar sensitivity to the consequences of the international financial crisis. The case of Ascoli Piceno will be discussed later (see comments to Figure 4).

[3] Fermo has been added to Ascoli Piceno; Monza to Milano; Barletta to Bari; Medio Campidano and Sulcis to Cagliari; Ogliastra to Nuoro; Olbia to Sassari. In the other five cases, we aggregated the new province into the old province which contained most of the municipalities now included in the new one before the reshuffling of administration. This introduces an approximation, but it should not play a major influence on the result of our analysis.

[4] The new province of Fermo was established in 2004 and has been operative since 2009, but, as previously explained, we retained the initial number of provinces for the sake of comparability.

Figure 1: *Export shares of Marche provinces (Italy = 100), 1997-2011*



Source: authors' elaboration.

We may suppose that the intensity of change is related to the level of development: international evidence on the processes of catching-up indicates that economies with a low level of per capita income are able to grow faster than the leading economies through a process of what is known with the generic term of "imitation".[5] In turn, this implies that the intensity of structural change should be more intense in the catching-up economies.

Looking for evidence that supports this proposition, we computed an index of structural change for all Italian provinces, and we related it to their level of per capita income.

The index takes the following form:

$$SC_i = \frac{1}{2} \sum_k \left| \frac{x_{ik(t)}}{X_{i(t)}} - \frac{x_{ik(t-n)}}{X_{i(t-n)}} \right| \tag{1}$$

The Structural Change index SC_i measures the intensity of the change in sectoral export share in the province i; it compares, by means of the summation of absolute differences, sectoral shares for all k products, in a period t, with the same shares in a previous period $t-n$; x_{ik} is the export value of the product k, while X_i is the export value for all products (i.e., $X_i = \sum x_{ik}$).

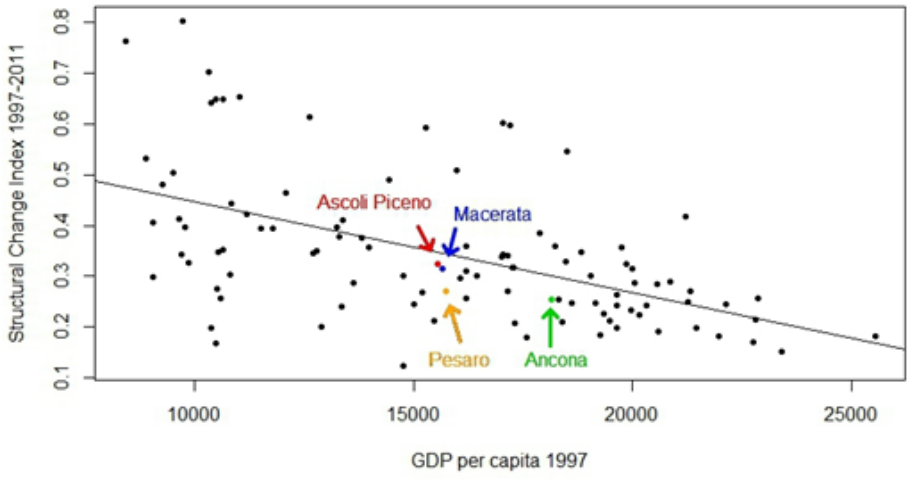
The range of variation of SC_i is between 0 (no change: export shares do not change over time) and 1 (maximum change), thanks to the normalization utilized (reparametrizing the index multiplying the summation by $^1/_2$).[6]

In Figure 2, we plotted the SC_i index of all Italian provinces in relation with their level per capita income in 1997: each data point refers to a specific province. It is easy to see that there is a negative correlation between the two variables, which is also evident from the negative slope of the linear regression line interpolating the dots: high degrees of structural change are associated with low levels of per capita income, but low levels of per capita income are also associated with a high variance in the SC_i index.

[5] By the term "imitation" we summarize, as is common in literature, a lot of different processes whose common denominator has to do with technology transfer. For a simple and clear explanation, see Sachs (2000).

[6] This index can be found in introductory statistical texts, as in Piccolo (1998); in the international literature, it was applied by Krugman (1990).

Figure 2: *Structural change intensity and development*



Source: authors' elaboration.

As shown in Figure 2, the four provinces of interest are sufficiently near the regression line indicating that the intensity of their structural change is around the "expected level", taking into consideration their income per capita level. Pesaro is a partial exception, given that the SC_i index is a little bit too low with respect to the "expected level" (showing a relatively high rigidity in the export structure).

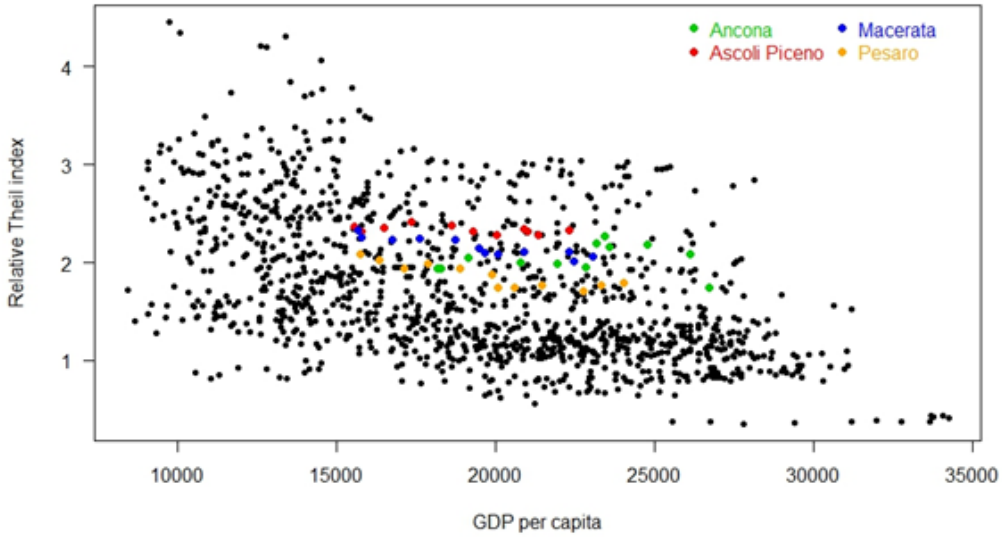
We took a step forward and built on the research results of a recent stream of empirical literature that looks at structural change processes from the point of view of the evolution of product diversification of countries along the development path (Imbs and Wacziarg, 2003; De Benedictis *et al.*, 2008, 2009; Cadot *et al.*, 2011; Parteka and Tamberi, 2013). While each contribution differentiates itself due to the use of different data aggregation, in different time spans, and because it makes use of different diversification indices, results are still consensual in stating that economies tend to progressively diversify their production and export (and import) structures. Results are less consensual on what happens at high levels of income per capita. Imbs and Wacziarg (2003) and Cadot *et al.* (2011) state that the evolution of product differentiation takes an inverted U shape, growing at the early phases of economic development and decreasing after a certain level of income per capita. De Benedictis *et al.* (2008, 2009) and Parteka and Tamberi (2013) state that the evolution of product differentiation takes an inverted L shape, growing at the early phases of economic development and becoming stable after a certain level of income per capita. In essence, countries diversify along the development path.

In the present analysis, we repeated a similar exercise for the Italian provinces. We computed the degree of diversification of the Italian provinces using a *Relative Theil index*. It measures the level of concentration of a province export structure, compared to the world benchmark; this can be interpreted as an inverse diversification index, since high values of the index mean high concentration, or, in other words, low diversification.

The index is derived from Theil (1967), and takes the following form:

$$RT_{it} = \sum_{k} s_{kit} ln(s_{kit}/S_{kt}) \tag{2}$$

Figure 3: *Structural change: diversification and development from 1997 to 2011*



Source: authors' elaboration.

where s_{kit} is the sectoral share of good k in province i at time t, and S_{kt} is the same for the benchmark (total world exports); RT_{it} ranges from a minimum of 0 (i.e., the province structure is exactly the same as that of world exports) to $ln(K = \sum k)$ in case of maximum (relative) concentration.

In Figure 3, each data point represents a concentration-income pair for a specific province and a specific year (13 years for each one of the 103 provinces). The concentration index (on the vertical axis) shows minimal values at high level of income per capita (on the horizontal axis) and a high level of dispersion at low level of income per capita.

Results are very clear: there is a strong negative relation between the two variables. Less developed provinces have a higher degree of concentration, i.e. a lower degree of diversification. This result mirrors the one found in cross-country evidence, as reminded above: trade structure tends to become more diversified when countries move along the development path.

In general, the relative position of the Marche region provinces seems, on average, in line with the average of the sample, indicating a "regular" evolution (not far from the average tendency). Also, if we look at the specific time evolution, we can appreciate a (weak) decrease in the concentration index with an increase in the income per capita level of the four provinces; this decrease is more evident in the case of Ancona and Pesaro.

3.2 Qualitative evolution of the export structure

In the previous section, we observed the dynamics of trade structure from a purely quantitative perspective. It can be interesting to understand if the changes that we have identified also have a qualitative nature. In particular, we should consider that it can be different for an economy to produce some kinds of goods more than others because of multiple reasons which are in particular linked to the capacity to induce and sustain long term growth. Jokingly, it could be said that it may make a difference if an economy produces potato chips or micro-chips (Thurow, 1994).

In order to highlight this point, we calculated the index $EXPY$ for all Italian provinces.. The index $EXPY$ is a measure proposed by Hausmann *et al.* (2007) that measures the level of average productivity associated to the export structure of a specific geographical area (in our case the Italian provinces). Previous contributions applied this index to the Italian case (Di Maio and Tamagni, 2008; Stafforte and Tamberi, 2012) using country-level data. Several contributions have also shown that $EXPY$ is a significant predictor of the economic performance of an economy (Hausmann *et al.*, 2007; Hidalgo *et al.*, 2007). Recently, more sophisticated methods for calculating an "index of complexity" of an economy have been proposed (Hausmann and Hidalgo, 2011). The general meaning of this index is largely the same, even if it is based on a more sophisticated methodology (the so called "methods of reflections"). Nevertheless , in spite of some disadvantages, $EXPY$ has also got two advantages: its meaning is more direct (i.e., it averages "the content of productivity of the export mix of a country" as explained below), and it is easier to compute.

We should add, for completedness, that the "index of complexity", is a predictor of economic growth (Felipe *et al.*, 2012; Poncet and Starosta de Waldemar, 2013), similarly to the $EXPY$ index.

In order to calculate the $EXPY$ index, we need to classify all products on the basis of their implicit sophistication, or, in short, productivity. This is done in a preliminary phase, through the index $PRODY$. Being k and j indexes for product and country, respectively:

$$PRODY_{kt} = \sum_j \left[\frac{\frac{x_{jkt}}{X_{jt}}}{\sum_j \frac{x_{jkt}}{X_{jt}}} \right] y_{jt} \tag{3}$$

The above symbology corresponds to the one in the previous formulas, while y is per capita income. In short, $PRODY$ is a measure of the average productivity associated to a given product, calculated as an average of the productivities (per capita income) of all the countries of the world, weighted by an index of revealed comparative advantages (Hausmann *et al.*, 2007) in square brackets.

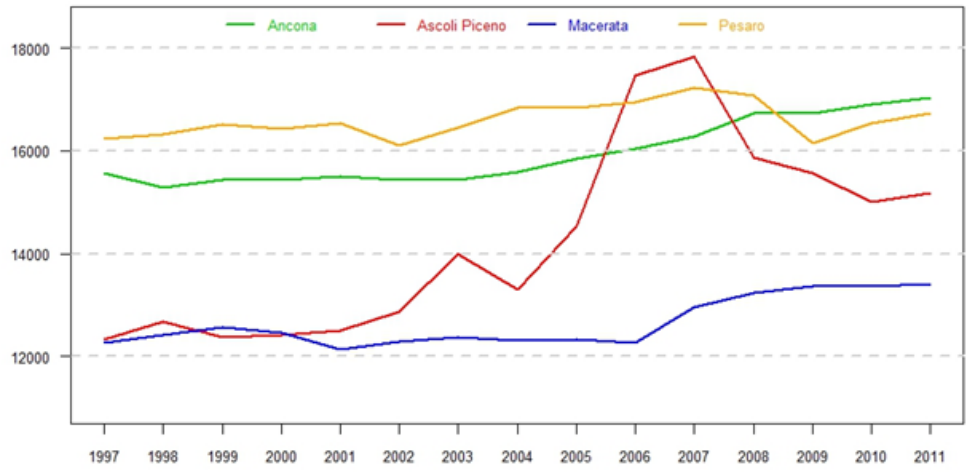
When ranking products according to the $PRODY$ index, the goods that are mainly exported by rich countries will be ranked higher than those goods that are exported from mainly poor countries. The basic assumption of the $PRODY$ index is that in general the goods exported by rich countries, being characterized by higher productivity, are more complex, and their comparative advantage is determined by other factors rather than labour costs, such as human capital, technology, infrastructure, or the quality of intermediate inputs. The $EXPY$index for province i is defined as follows:

$$EXPY_{it} = \sum_k \left(\frac{x_{jkt}}{X_{jt}} \right) PRODY_{kt} \tag{4}$$

It represents a weighted average of $PRODY$ values, where the weights are the product export shares of the considered province. In short, the $EXPY$ index captures the content of "productivity", measured through $PRODY$ and associated to the export basket of a specific province.

The basic idea is that since the $EXPY$ index considers exports instead of production data, it captures the most dynamic and competitive part of the productive base of an economy; in the course of time, the remaining part of the economy will converge to the efficiency and productivity standards of export-oriented sectors and, as a consequence, the per capita income of a country should converge to the level of $EXPY$.

Figure 4: *Export quality: EXPY – 1997-2011*



Source: authors' elaboration.

We calculated $PRODY$ in the initial (1997) and final (2011) years. We then calculated $EXPY$ for the whole period using a constant $PRODY$,[7] using $PRODY$ 1997 and 2011, alternatively. Obviously, using $PRODY$ 1997 instead of $PRODY$ 2011, we get different levels of $EXPY$, but trends remain largely unchanged. For this reason we showed and commented only on $EXPY$ calculated with $PRODY$ 2011. At country level, the Italian $EXPY$ increased between 1997 and 2008 and later decreased. Since the evolution of $EXPY$ (given a constant $PRODY$) only depends on the changes of the export structure, it is evident that the decrease can be explained by the fact that the recent economic crisis negatively influenced high productivity sectors more than the others. In any case, the $EXPY$ values did not substantially change over time (as showed in Table 5 below, where values are in constant 2005 international dollars, PPP), and this can be a sign of a general strong persistence of the Italian productive system.

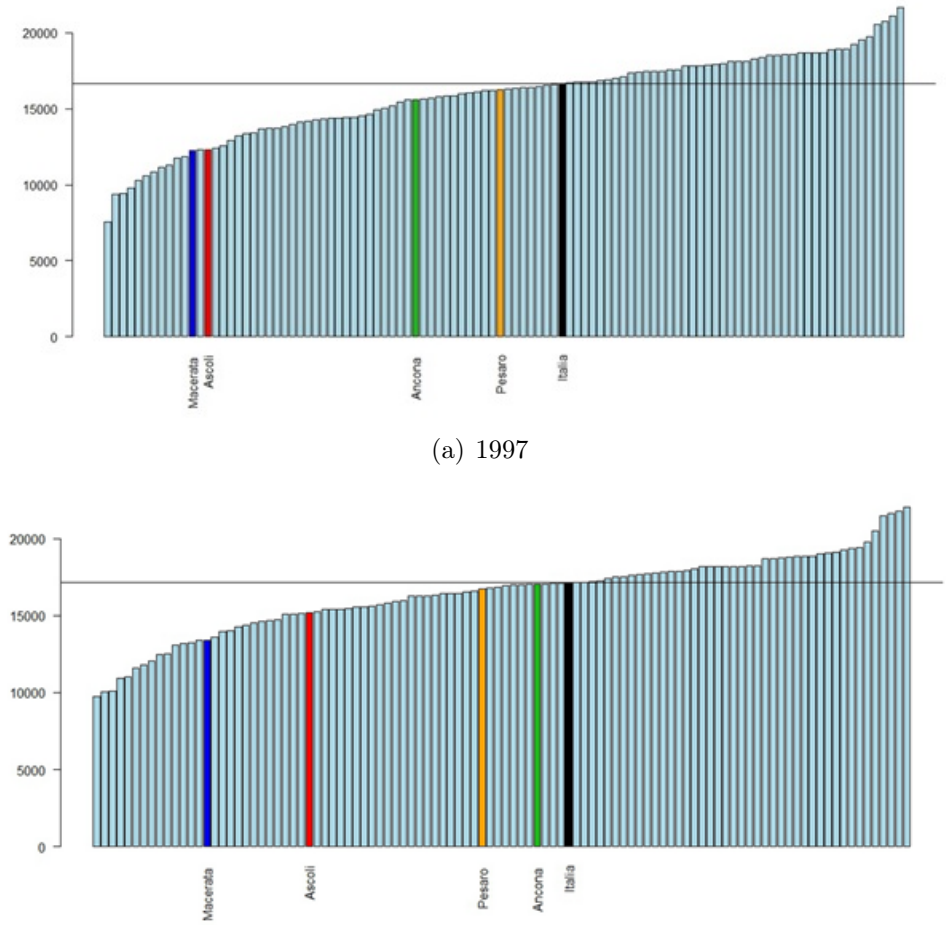
In Figure 4, the time series of the $EXPY$ index for the four Marche region provinces is showed, while in Figure 5, we compared the level of $EXPY$ with the analogous index for all the remaining 99 Italian provinces, depicting the four Marche provinces with the same colors used in previous figures, and indicating in black the Italian average level of $EXPY$.

As a benchmark, the evolution of the Italian $EXPY$ can be considered: in general, it is quite stable for the entire period with minimal variations, and in 1997-1998 it had the same values as in 2008-2009 (around 16,000); it decreased in the last two years, 2010 and 2011 (1% in all). In **?**, the reader can appreciate the relative level of the Italian $EXPY$: in short, it is lower than that of other developed European countries and higher than that of the developing countries; interestingly, dynamic developing countries approached Italy's $EXPY$level (China) or even overcame it (South Korea and Hungary). In the case of the Marche provinces, we report some interesting evolution.

First, the $EXPY$ values increased more or less considerably during the fifteen years under scrutiny (Figure 4), especially in the case of Ascoli (with a peculiar "hump" in 2004-2007 that will be discussed in a while); in the light of the previous point, this means that the four provinces had relatively good behavior with respect to that of the country. We analyzed this

[7] This procedure of using a constant $PRODY$ is common in literature in order to avoid some possible biases.

Figure 5: *EXPY (Italian provinces)*



(a) 1997

(b) 2011

Source: authors' elaboration.

point through Figure 5: in 1997, the level of $EXPY$, for all four provinces was lower than the (unweighted) Italian average, i.e., the "average" province of the country, as showed in figure 5-A, indicates a lower level of sophistication in terms of the export structures, which is particularly marked in the southern Marche provinces of Macerata and Ascoli.

Nevertheless, a relative positive change is also evident with respect to the rest of the Italian provinces as shown in Figure 5 (panel B) when compared to Figure 5 (panel A), where the four provinces increased their ranking positions; this was especially true for the provinces of Ancona and Ascoli Piceno.

All in all, we can interpret this evidence as a sign of a dynamics in the direction of higher sophistication of the productive system of the Marche provinces, at least when compared to other Italian provinces.

In order to better qualify previously shown evidence, in Table 1 , we have listed, the sector with the highest export share by each province. It is to be noted that this sector remains the same for the whole period. As is well known, these sectors are footwear (Ascoli and Macerata), furniture (Pesaro), and home appliances (Ancona).

Table 1: *Most exported goods in 1997 and 2001, Marche provinces, and relative PRODY values*

Province	Ateco 3	*PRODY* 2011	Share 2011	Share 1997
Ancona	275 – Household Appliances	14.429	21.45%	37.69%
Ascoli Piceno	152 – Footwear	8.537	35.93%	49.85%
Macerata	152 – Footwear	8.537	26.39%	45.68%
Pesaro	310 – Furniture	12.965	16.48%	36.09%

Source: authors' elaboration.

Remarkably, those three sectors share a *PRODY* index under the national average, and this is particularly evident in the case of the footwear sector. Another remarkable evidence reported in the last two columns of Table 1 is that the export share of the top sector is in 2011 well below the 1997 sectoral share. In other words, these sectors are losing their relevance in the provincial economy as a whole. Moreover, the decrease in the sectoral export share reflects a decrease in the absolute export values of the sectors (with the exception of Pesaro).

A final note is on Ascoli Piceno. In Figure 4, a big hump of *EXPY* for this province is quite evident. This mainly depends on the path of the export share of sector ATECO 212 (medicine and pharmaceutical products), a sector characterized by a very high value of *PRODY*: its share moved up from 3.2% in 1997 to 43.6% in 2007 and then to 24.4% in 2011. It should be recalled that in the past a part of the Ascoli Piceno province was given financial incentives for investments as it was classified under the depressed areas of Italy, which explains the presence of a few big plants in a small area. This privileged regime came to an end recently. Therefore, this cycle of investments and disinvestment driven by the fiscal incentives resulted in the sudden changes in the provincial values of *EXPY*.

We can also build a bridge between the quantitative and the qualitative side of the analysis. Since the Structural Change index, *SC*, is a summation over different sectors, we can easily attribute the contribution of every sector to the overall change. In Table 2, we have presented: first, the 5 sectors, among those with increasing share, which most contributed to the overall *SC* index; then, the first 5 sectors, among those with decreasing share, which most contributed of the overall *SC* index; third, their cumulative percentage contribution.

The picture that emerges is a mixed one, but it provides some clear insights. First of all, these 10 selected sectors account for around 70-80% of the *SC* index for all provinces: in other words, most of the structural change showed in figure 1 is explained by this small number of sectors.

Second, in several cases, sectors with decreasing dynamics are traditional sectors, like footwear (in Ancona, Macerata and Ascoli Piceno), sectors related to clothing (141, clothing apparel, and 143, knitwear in Ancona and Pesaro). Moreover, we can observe that the four sectors in Table 1, which are the most relevant in the four provinces, always appear in the set of the decreasing sectors in Table 2: footwear for Macerata and Ascoli Piceno, furniture for Pesaro Urbino, domestic appliances in the case of Ancona.

Nevertheless, we can say that if this is the most evident tendency, some changes in the opposite direction also exist. For example, sector 151, Leather, Travel Goods, etc., has a growing share in the provinces of Macerata and Ascoli Piceno, while sector 261, Electronic components and electronic integrated circuits is decreasing in Pesaro.

Finally, it should be reminded that some of the positive dynamics evidenced in the province

Table 2: *5 increasing and decreasing sectors with the highest contribution in index SC*

	ANCONA	PESARO E URBINO
Increasing	171 - Pulp, paper and paperboard	244 - Non ferrous metals, precious metals, etc
	289 - Other special purpose machinery	282 - Other general purpose machinery
	252 - Reservoirs, tanks, radiators, etc	109 - Animal feeding stuffs
	192 - Petroleum products	222 - Plastics and articles thereof
	222 - Plastics and articles thereof	254 - Arms and ammunition
Decreasing	283 - Agricultural, horticultural or forestry machinery	289 - Other special purpose machinery
	141 - Articles of apparel	261 - Electronic components and electronic integrated circuits
	143 - Sweaters, socks & other hosiery, knit or crochet	141 - Articles of apparel
	152 - Footwear	143 - Sweaters, socks & other hosiery, knit or crochet
	275 - Household appliances	310 - Furniture
Incidence (%)	67.6	73.3

	ASCOLI PICENO	MACERATA
Increasing	212 - Medicaments and pharmaceutical goods	151 - Leather, Travel Goods, etc
	151 - Leather, Travel Goods, etc	274 - Electrical lighting equipment
	203 - Paints and varnishes, printing ink	203 - Paints and varnishes, printing ink
	201 - Basic chemicals, fertilizers, tanning or dyeing extracts	141 - Articles of apparel
	325 - Medical or surgical instruments and accessories	201 - Basic chemicals, fertilizers, tanning or dyeing extracts
Decreasing	222 - Plastics and articles thereof	233 - Ceramic building material
	279 - Other electrical equipment	302 - Rail locomotives and rolling stock
	252 - Reservoirs, tanks, radiators, etc.	322 - Musical instruments
	221 - Rubbers and articles thereof	222 - Plastics and articles thereof
	152 - Footwear	152 - Footwear
Incidence (%)	80.1	71.1

Source: authors' elaboration.

of Ascoli Piceno (i.e. sector 212) has been linked to specific characteristics of this area, as already discussed in relation with Figure 4.

4 An international perspective

The analysis developed in the previous sections conveys a simple message: the four Marche provinces seem to be aligned with the "average" dynamic path of the Italian provinces. In other words, there are "more lights than shadows", and the signs of change are moving towards higher sophistication of provincial exports. Nevertheless, this process of change does not appear to be marked. This is not a new fact at the national level: some authors (De Nardis, 1997; De Benedictis and Tamberi, 2004) have already showed in the past decades that the Italian process of structural change measured through trade exchanges is the slowest in the whole OECD area. Moreover, the Italian economy is not going through a good period, at least since the beginning of the 1990s. The whole country shows a very bad productivity growth performance, both in absolute and relative terms.

It is therefore important to add to the national perspective developed could be not sufficient; as a consequence an international perspective on trade and change of the Marche region provinces is needed. In order to do this, we compared the export structure of Ancona, Ascoli Piceno, Macerata, and Pesaro e Urbino to that of a small but significant set of international economies. We opted for benchmarks constituted by leader and emerging European economies (France and Germany; Spain and Poland); two rapidly emerging or already emerged Asian economies (South Korea and Thailand), and Turkey, an emerging country that can be considered to be in an "intermediate position" in terms of its geographical position (between Europe and Asia) and per capita income. In all the above cases the size of the countries, in terms of population, is not so far from that of Italy (the biggest is Germany, with about 130% of the Italian population; the smallest is Poland, with about 63%).

The comparison was done for two years, 1997 and 2011, using the rank correlation of the sectoral Balassa indexes as a measure of structural similarity.[8] Results refer to both Italy and to the four Marche provinces of interest.

One of the peculiarities of the Italian economy discussed in the literature is the fact that the Italian export structure, if not corrected for the quality of products, is more similar to that of a developing country than to that of a developed one (De Nardis, 1997; De Nardis and Traù, 1999; De Benedictis, 2005). In fact, the evidence summarized in Table 3 shows that in 1997 the value of the rank correlation index was very low when the benchmark country is France (0.15) or Germany (0.25), and clearly higher when (with the exception of Poland) developing economies are chosen as benchmark; in particular, the rank correlation is 0.4 with Spain and Turkey, and 0.34 with South Korea. Therefore, the evidence seems to be in line with the literature on the peculiarities of the Italian export structure.

In 2011, the situation got more complex. The rank correlation with France and Germany diminished; if we look at the other countries acting as benchmarks, the picture is mixed: Italy's rank correlation with Turkey increased which was already strong; the rank correlation with Spain remains high as well (but low with Poland); however, the similarity with the export structure of Korea and Thailand disappeared. Especially noteworthy is that these two countries have been among Asia's highly successful areas in recent times; in particular, Korea has had a strong industrial evolution, substituting exports based on textiles and similar products (with low technological content) with the production of ships, automobiles and electronic goods (TV sets, computers, cellular phones, cameras, etc.) at a higher level of technological intensity, and

[8] We used the rank correlation index instead of the simple correlation index in order to take into account the problem arising from the statistical limits of the Balassa indexes (De Benedictis and Tamberi, 2004).

Table 3: *Balassa index – Rank Correlation Index*

Province	France		Germany		Korea, Rep.	
	1997	2011	1997	2011	1997	2011
Ancona	0.065	0.084	0.193	0.285	0.423	0.325
Ascoli Piceno	0.086	0.149	0.137	0.189	0.388	0.223
Macerata	0.089	0.196	0.145	0.216	0.347	0.230
Pesaro	0.055	0.099	0.267	0.242	0.312	0.169
Italy	0.156	0.131	0.255	0.230	0.345	0.103

	Poland		Spain		Thailand		Turkey	
	1997	2011	1997	2011	1997	2011	1997	2011
Ancona	0.152	0.282	0.245	0.198	0.344	0.250	0.316	0.357
Ascoli Piceno	0.190	0.119	0.359	0.259	0.388	0.232	0.400	0.280
Macerata	0.212	0.295	0.335	0.275	0.376	0.360	0.266	0.389
Pesaro	0.250	0.285	0.236	0.203	0.298	0.284	0.268	0.377
Italy	0.187	0.146	0.407	0.330	0.308	0.125	0.400	0.483

Source: authors' elaboration.

it is now a country with a relatively high level of income per capita.

It is possible to appreciate this rapid and intense change in Table 4 where we have reported South Korea's 10 goods with the highest revealed comparative advantages. None of the products present in 1997 are still present in 2011.

With this evidence in hand, it is highly probable that the strong reduction in the rank correlation between Italy and South Korea, evidenced in Table 3, might be a consequence of Italy's relatively slow pace compared to South Korea's rapid change . This hypothesis is noteworthy, and we did it with the purpose of focusing on the four provinces of the Marche region.

Generally speaking, the evidence for the four Marche provinces confirms the evidence seen at the national level: Ancona, Ascoli Piceno, Macerata, and Pesaro e Urbino have different export structures with respect to those of Germany and France; there is a decrease in similarity between the provinces and the emerging Asian countries while they maintain their similarity to Turkey and Spain. Nevertheless, even if these general results are observed, some peculiar differences are quite remarkable. Firstly, the correlation between the provinces and Germany and France remains low, but, while it decreases slightly (from 0.25 to 0.23 and from 0.16 to 0.13, respectively) at the national level, it increases in the case of the four Marche provinces, from values lower than the national average to values that are similar or higher.

In spite of the emphasised trend in the previous paragraph, the Marche provinces on average remain more similar to the export structure of less developed countries, than to the export structure of France or Germany.[9] In order to better understand this point, we have also showed

[9] As for the national case, the similarity with the Asian countries decreases but less severely. In the case of the

Table 4: *Korea – 10 products with the highest Balassa Index in 1997 and 2011*

Commodity Description	1997	Commodity Description	2011
Woven fabric >85% synthetic filament, dyed, nes	25.86	Floating docks, special function vessels nes	21.22
Tunas nes, frozen, whole	18.89	Tankers	13.84
Yarn, polyester, single, untwisted nes, not retail	18.67	Terephthalic acid, its salts	12.73
Inner tubes of rubber for motor vehicles	17.20	Acrylonitrile-butadiene-styrene (ABS) copolymers	12.72
Pile knit or crochet fabric, of manmade fibres, nes	16.89	Parts of electric sound & visual signalling apparatus	12.69
Woven fabric >85% nylon, polyamide, dyed, nes	16.63	Household or laundry-type washing machines, cap >10kg	12.66
Woven fabric >85% textured polyester, dyed, nes	15.86	Drying machines, nes	12.65
Woven fabric >85% non-textured polyester filament, nes	15.70	Optical devices, appliances and instruments, nes	11.58
Staple fibres of polyesters, not carded or combed	15.29	Casings, circular, iron/steel, oil/gas drilling <406mm	10.14
Fishing rods	15.00	Toluene	9.58

Source: authors' elaboration.

Table 5: *Country EXPY in 1997 and 2011*

	1997	2011
Italy	15,955	15,847
France	16,653	16,493
Germany	17,473	17,359
Spain	15,703	15,219
Poland	14,653	15,763
Turkey	12,839	14,269
Thailand	15,121	15,297
Rep. of Korea	16,492	17,162

Source: authors' elaboration.

initial and final values of $EXPY$ (based on 2011 $PRODY$, as above) for all the benchmark countries of our analysis

Marche provinces export structure, the correlation with the Republic of Korea does not go virtually to zero, as in the national case (from 0.345 to 0.085), as an example, it passes from 0.347 0.210 for Macerata, from 0.417 to 0.320 for Ancona. Again, in 2011, while the value of the correlation between Italy and Thailand is 0.16, it varies from form a minimum of 0.233 (Ascoli) and a maximum of 0.332 (Macerata).

It is easy to verify the substantial stability of the $EXPY$ values for rich countries, and an increase for developing countries, with a clear process of "convergence". In particular, among the second group of countries, Korea's strong growth and Thailand's very slight increase are noteworthy. It is also evident that, despite its high per capita income, Italy's $EXPY$ level appears to be too low. If we take into account the $EXPY$ levels of the Marche provinces discussed before, we observe that Macerata has an undoubtedly low $EXPY$ level. Ascoli Piceno is in a better position but still aligned with the $EXPY$ levels of developing countries. Ancona e Pesaro-Urbino (above 16,000) tend to be more similar to the $EXPY$ levels of advanced countries (and Korea).

4.1 Similarity and convergence plots

What can explain the diminishing similarity between the export structure of the four Marche provinces and that of the Asian countries in the period considered?

This kind of evidence, i.e., relatively high dynamics of the export structure of Asian countries and slow change in the Marche provinces, was only a hypothesis/suggestion/proposal; as a consequence, in order to explore this hypothesis more precisely, we have proposed a further visual evidence.

In Figure 6, we present a series of similarity-and-convergence plots (De Benedictis and Tajoli, 2007, 2008), in which we compare the four provinces of the Marche region with Korea and Thailand. In order to implement this point, we first compute an index of auto-correlation in export structure, i.e. we measure how much a province or a country export structure in each year is similar to the initial year (base-year); then, we compute an analogous province/country correlation index, measuring how much a province export structure is similar, in each year, to the one of the benchmark country in the base-year. We plot the first index on the horizontal axis of Figure 6 and the second index on the vertical axis of the same figure.

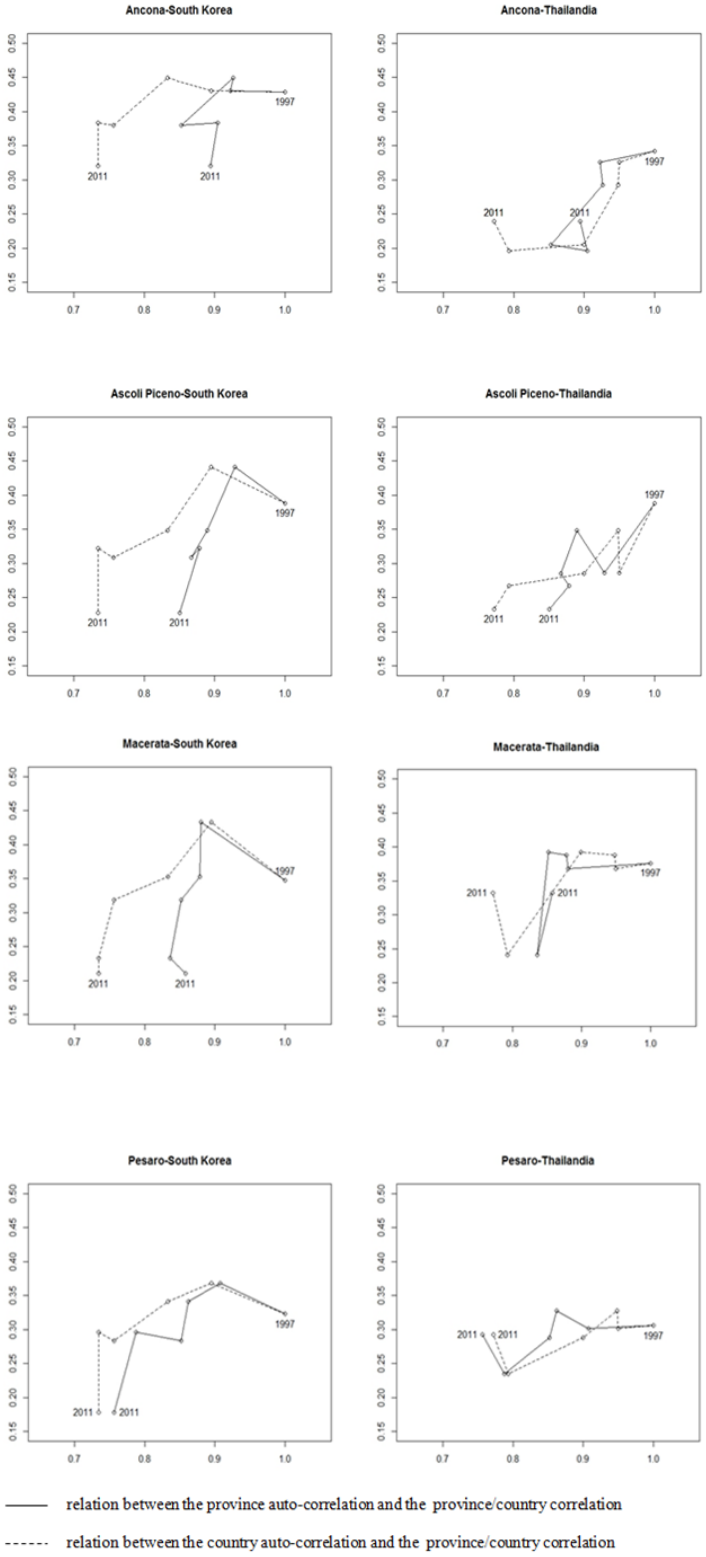
The base year for the index of autocorrelation is 1997, and, as a consequence, the value of the index is equal to 1 in that year. This index might remain unchanged (in the limit case of no-change) or decrease in the subsequent years; the entity of the change depends on how much the export structure changes with respect to the base-year. Every panel in Figure 6 must be looked at in a similar way. The dotted line shows the relationship between the country auto-correlation and the province/country correlation for each year; on the other hand, the continuous line shows the relationship between the province auto-correlation and the province/country correlation for the same period. The values on the vertical axis are therefore the same for the two lines.

In analyzing the dynamics depicted in Figure 6, it would be better to start from the base-year value of the auto-correlation index (i.e., equal to 1 in 1997) and move leftward year-by-year along the dotted line (the benchmark country) and the continuous line (the relevant province). The more pronounced the leftward movement, the more significant the change in the export structure. As regards the province/country correlation measured on the vertical axis, it can increase or decrease (following an upward or downward direction) when the similarity between the province and the benchmark country export structure increases or decreases.

Some relevant dynamics emerge from Figure 6. Firstly, the leftward movement of the dotted lines is more pronounced than the one of the continuous lines. This implies that the structural change in Korea and Thailand has been more intense than that in the Marche region provinces.

Secondly, moving from 1997 to 2011, the similarity of all provinces with both countries decreased (same data showed in Table 3). This suggests that the progressive divergence

Figure 6: *Province and country autocorrelation and province/country correlation*



Notes: x-axis: index of auto-correlation in export structure; y axis: province/country correlation index in export structure.
Source: authors' elaboration.

between the provinces and the Asian countries is linked to the intense change of the productive and export structures of those countries in comparison with a relatively static state of the provincial structures. The only exception is Pesaro. The autocorrelation of this province's export structure shows a change as intense as that of the two Asian countries. Nevertheless, the decrease in the province/country correlation indicates that this change happened not only because of the dynamic evolution in the Asian benchmarks but also because of the change in the province's export structure. The peculiarity of this provincial case requires further research.

The difference in the dynamic evolution of the export structure of this province is bigger with respect to South Korea's than with Thailand's, but in any case, the Asian economies seem to have changed their export structure in a more substantial way.

5 Conclusions: an insufficient dynamism

In this paper we gave an account of the change in the export structure of the four Marche region provinces, and we used this evidence to infer the direction of the overall structural change in the Marche region, in comparison with the rest of the Italian provinces and with some industrial and emerging economies.

Looking at the national aggregate, Italy gives the image of a static country that is unable to modify its production structure. This has also been described and discussed in the literature regarding the development of the Italian economy. The major export sectors are still the traditional ones that prevailed in the seventies and the eighties, and the sophistication or complexity of the export structure – measured through the $EXPY$ index – shows little dynamism.

As a consequence, Italy is lagging behind in terms of and with respect to the export evolution of emerging economies, especially the Asian ones, and also with respect to the industrialized economies, such as France and Germany.

In comparison with the national aggregate, the four Marche region provinces of Ancona, Ascoli Piceno, Macerata, and Pesaro and Urbino show, in some aspects, a more positive trend:

- The evidence obtained from an index of structural change is not far from what could be expected, given the income per capita level of the four provinces.

- As for the level of sophistication of the export structure, we showed that it has gone up, and the four analyzed provinces appear to be more dynamic than the Italian economy as a whole. Nevertheless, the region should be divided in two brad areas, since the northern provinces of Ancona and Pesaro-Urbino, at least in 2011, reached the sophistication levels of the industrialized countries, such as Germany or France, while the southern provinces, Macerata and Ascoli Piceno, still have levels comparable to developing countries.

However, the reduction in the provincial export shares is a sign that the contraction in the traditional sectors has not been compensated by an equally significant increase in the exports of other (more modern) sectors. Some signs of change are evident, but they are not sufficient to radically modify the characteristics of regional exports. The main aspect to be stressed, here, is that in all provinces the main sectors (in terms of export volume) always are decreasing. We want to stress that if this trend continues for long, i.e., diminishing traditional sectors not compensated by the positive dynamics of other, more "modern" sectors, it could be a serious problem for the local economy.

This sort of "insufficient dynamism" becomes more evident when the evolution in the provincial export structure is compared with that of South Korea, in particular, and with emerging economies, in general. With the exception of the province of Pesaro and Urbino, which is showing a more pronounced change (in terms of the Balassa's autocorrelation Index, even if not with other indexes), the evolution of the production structure of the Marche provinces appears, in general, to be too sluggish.

Future research could look for a confirmation of these conclusions by applying other methodologies and using the cited and the more sophisticated "index of complexity" recently developed by some authors (Hausmann and Hidalgo, 2011).

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Commercio internazionale e cambiamento strutturale: una prospettiva "meso" da quattro province italiane

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Sommario

Analizziamo l'evoluzione dell'economia delle quattro province delle Marche utilizzando informazioni provenienti da flussi di commercio internazionale. Anche se prevalentemente descrittiva, l'analisi rivela alcuni aspetti sul cambiamento della loro struttura economica associato alla crescita economica. Per prima cosa confrontiamo le caratteristiche delle province marchigiane a quelle delle altre province italiane; questo evidenzia una perdita di quote di esportazione, ma anche una intensità di cambiamento strutturale in linea con quello delle province italiane e un'evoluzione positiva in termini di complessità/sofisticazione dei beni prodotti. Tuttavia, il confronto con le dinamiche di molte economie emergenti internazionali e dinamiche rivela che il ritmo di evoluzione nella regione Marche è per certi aspetti più lento di quello che è probabilmente possibile.

Classificazione JEL: *F10; O47; O57*

Parole Chiave: *Cambiamento strutturale; Crescita economica; Complessità; Sofisticazione.*