

**Economic growth, competitiveness and innovation:
a firm – level analysis for Sardinia (Italy).**

Maria Giovanna Bosco¹

draft, very preliminary, not for quoting

Abstract

Sardinia is an Italian insular region, the second largest island of the Mediterranean Sea. As for many other peripheral regions, the distance from the core industrial economy of continental Europe has determined the local economic growth to be mainly led by tourism and services and only secondarily by extractive industries (alumina and iron ores). Though, the increasing competitive pressure from the international panorama and the gradual transition to a globalized knowledge economy require an analysis of the performance of the local industries, in order to assess the contribution – by sector – of innovative processes and changes in labor market equilibria to the local economic growth. In this paper I will try to use longitudinal firm level data from the AIDA database (Bureau Van Dijk) to carry out a productivity analysis by means of the Olley and Pakes (1996), methodology, that decomposes total changes in productivity in two sources: one stemming from a pure innovative process at firm level, the second from the reallocation of workforce in the labor market. The results will be of uttermost importance from the economic policy point of view, especially during the global economic downturn that is affecting more heavily those regions as Sardinia, where there are less material possibilities of reallocation in the labor market: supporting more productive industries and helping the transformation of others could depict a Paretian improvement in the perspective of the long-run economic growth.

¹ Dipartimento di Economia, Impresa e Regolamentazione, Università di Sassari and ISLA – Università Commerciale Luigi Bocconi, Milano. Email: mariagiovanna.bosco@unibocconi.it
The author gratefully acknowledges the financial support obtained by Regione Sardegna by means of the “Progetto Giovani Ricercatori”.

1. Introduction

For the economy, the important things that affect the standard of living of large numbers of people are productivity, income distribution, and unemployment. If these things are satisfactory, not much else can go wrong, while if they are not, nothing can go right (Krugman, 1997). This statement embeds one of the main topic in the agenda of international agencies and policy makers, since the disappointing productivity performance of most Western economies with respect to the roaring emerging economies made it clear that investing in knowledge creation and productivity boost is the only way out of the slowdown in the economic growth.

The economic downturn on the other hand is affecting Italy as a whole, and a decrease in total factor productivity (TFP) growth has been observed in Italy broadly in the literature. In particular, several studies showed how in Italy, the negative trend in labor productivity is linked to the reduction in TFP (ISTAT, 2007; Van Ark et al., 2007; OECD, 2007; Fachin and Gavosto 2007; Daveri and Jona-Lasinio 2005; ISAE, 2005; Bassanetti et al., 2004; Venturini, 2004; Milana and Zeli 2003; Brandolini and Cipollone, 2001). Aiello et al. (2009) compared the TFP and labor productivity from AIDA, finding basically an overlapping dynamics, consistent with the findings of the literature.

For instance, Van Ark et al. (2007), underline how TFP has decreased by 0.7% yearly between 1995 and 2004, for the economy as a whole, and 1.1% yearly in manufacturing (different from electro-mechanical). Although these studies indicate a negative trend, on average, actually OECD (2007) estimates prove how this pattern has mainly featured 2000 and 2003, while TFP has remained constant between 1995 and 2000. Concentrating on manufacturing, Daveri and Jona-Lasinio (2005) found that TFP has increased by 0.3% (0.5% for the economy as a whole) in 1995 -2000, while is decreased by 1.8% in 2001-2003 (-0.7% for the economy as a whole). Aligned to this evidence and to the studies from Istat (2007) and Casaburi et al. (2008), Aiello et al. (2009) found a decrease of TFP in 2001 -2003 of 2.1%. Finally, Istat (2007) finds an increase in TFP since 2003, even if less markedly (0.5%) than what found in Aiello et al. (2009).

Recent evidence of labor productivity from OECD (2010) show how Italy scored a negative performance in 2008 (-0.5%) against 1.3% of the USA and the EU15 average of 0.2%.

Sardinia is an insular region in the Mediterranean, sharing with other similar European regions a sluggish economic performance, a mainly services-driven growth and widespread uncertainties about the future because of the highly competitive international panorama. The conditions of the island are quite specific because of the strong peripherality with respect to Continental Europe, that

resulted in high transportation and communication costs that affected the economy and the culture of the island for ages.

My study aims at analyzing the dynamics of productivity, innovation and employment by means of firm – level data in the case of Sardinia, in a comparative perspective with the rest of southern Italy and with Italy as a whole, adopting the productivity analysis originally proposed by Olley and Pakes (1996), that decomposes total changes in productivity in two sources: one stemming from a pure innovative process at firm level, identified by the average labor productivity performance by sector, the second from the reallocation of workforce in the labor market.

The results will be of uttermost importance from the economic policy point of view, especially during the global economic downturn that is affecting more heavily those regions as Sardinia, where there are less material possibilities of reallocation in the labor market: supporting more productive industries and helping the transformation of others could depict a Paretian improvement in the perspective of the long-run economic growth.

The study is organized as follows: the second paragraph provides an introductory framework to the island's economy and some comparative statistics of Sardinia about economic growth, employment and innovation performance and aggregate level from national and international sources; secondly, the AIDA data are presented and discussed. The third paragraph illustrates the methodology of productivity decomposition and provides results. Productivity decomposition results are then compared with industrial specialization indexes to understand more deeply the industrial dynamics. The fourth paragraph draws implication and conclusions.

2. Remoteness and attractiveness: Sardinia.

Sardinia is part of the Kingdom of Italy since the very beginning, as part of the Savoy royal family properties, under which the unification of the nation took place in 1861. Historically, Sardinia has never been independent but continuously predated and allocated by major external political forces.

The region is formally endowed with a special administrative statute but in reality this autonomy has never been exploited, and the economy has always been strongly dependent of trade – imports – for food and services¹. The economy has traditionally been based on agriculture and farming, and since the sixties, tourism plays a leading role in the regional GDP: currently, tourism in Sardinia

¹ Though, Sardinia has a surplus in power production and exports power to the rest of continental Italy. As an example, when in 2003 a huge shut down in the energy supply was registered across all Italy because of a system failure originating from Switzerland, Sardinia was not affected thanks to her autonomy.

makes up for 10% of Sardinia's GDP (ISTAT, 2008) but has negative aspects: it is subject to seasonal influences, is mostly concentrated in the summer months and provides an unstable income². Some authors argue that investing solely in tourism is not a proper guarantee for stable income and development, but a sure guarantee for environmental damages and coastal misuse (Onnis et al., 2009).

Moreover, the region is a "Southern" region that shares with the rest of Italy's South many features as low economic growth, backwardness in industrial development, short-sighted local administration, that all add to the physical distance that separates the island from continental Italy. The common fate of Sardinia and South has been up to now to be the laggard pole in such a polarized (North–South) country as Italy (Bosco, 2008). As an example of the harshness of times, in 2009, economic growth in Sardinia was aligned with the other Italian regions, but far below the average of the other EU regions with similar income. When comparing the PPP per capita income with the EU-27 average, Sardinia falls from 89.4% in 1995 to 78.4% in 2007. Table 1 presents some summary statistics on GDP growth. As a matter of fact, Sardinia has belonged to the Objective 1 regions as for the coverage of EU Structural Funds coverage since the very beginning.

Table 1. GDP statistics.

Area	Euro per inhabitant growth			Euro per inhabitant in percentage of the EU average			GDP at market price growth		
	2005	2006	2007	2005	2006	2007	2005	2006	2007
European Union (27)	3.69%	4.89%	5.51%	100	100	100	4.28%	5.62%	5.81%
European Union (15)	2.97%	4.63%	4.47%	119%	118.4%	117.4%	3.61%	5.20%	5.09%
Italy	2.09%	3.28%	3.17%	108.5%	106.6%	104.5%	2.73%	3.91%	4.01%
South	1.90%	4.35%	2.98%	71.8%	71%	69.3%	2.31%	3.98%	2.93%
Sardinia	1.65%	4.32%	2.07%	82.4%	81.4%	79.2%	2.23%	4.24%	2.74%

Source: elaboration from Eurostat

When looking at the dynamic of unemployment (Table 2), we notice that unemployment in the South and Sardinia has been increasing in the past years, more than the national average, which in turn was just slightly below the EU average.

² Overall, almost two million tourists visit Sardinia every year (ISTAT, 2008b), and because these visits are concentrated during the four summer months from June to September and in the coastal resorts (Banca d'Italia—Eurosistema, 2007), this creates huge problems in terms of damage to the ecosystem to make room for hotels and holiday resorts, overcrowding of roads and difficulties for local administrations in the disposal of waste. The scarce diversification of the tourist industry that relies heavily on the sun-and-sea resorts is also partly responsible for the depopulation of inland villages and towns (Solinas, 1997).

Table 2.Unemployment rates.

Area	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
European Union (27)	:	:	:	:	9.1	9.2	8.9	8.2	7.2	7
European Union (15)	9.4	8.3	7.5	7.8	8.1	8.3	8.2	7.8	7	7.1
Italy	11.4	10.6	9.5	9	8.6	8	7.7	6.8	6.1	6.7
South (IT)	21.2	20	18.6	17.7	17	14.4	13.8	12	10.5	11.4
Sardinia	21	20.6	18.7	18.5	16.9	13.9	12.9	10.8	9.9	12.2

Source: elaboration from Eurostat

The innovation performance for Sardinia is definitely under the Italian average. Both R&D expenditure and patent application are indicators of a poor innovation performance and of laggard position of Sardinia with respect to the rest of Italy.

Table 3.a. R&D expenditure as a % of GDP

Area	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
European Union (27)	1.83	1.85	1.86	1.87	1.86	1.82	1.82	1.85	1.85	1.9
European Union (15)	1.89	1.91	1.92	1.93	1.92	1.89	1.89	1.92	1.93	1.99
Italy	1.02	1.05	1.09	1.13	1.11	1.1	1.09	1.13	1.18	1.18
South	0.69	0.75	:	:	0.81	0.85	0.84	:	:	:
Sardinia	0.67	0.67	:	:	0.71	0.66	0.58	:	:	:

Source: elaboration from Eurostat

Table 3.b. Patent applications to the EPO

Area	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
European Union (27)	45134.9	48819.2	51370.3	50826.5	50462.3	51624.7	54571.6	55289.0	56200.0	57725.1
Italy	3394.8	3717.4	3989.3	3951.4	4167.7	4315.2	4598.3	4811.9	4909.1	5107.1
South	120.3	165.8	151.2	164.2	156.7	134.2	164.7	205.9	212.0	158.6
Sardinia	9.3	14.9	14.5	12.5	13.6	12.4	9.1	19.7	15.9	8.5

Source: elaboration from Eurostat

From the aggregate perspective above it emerges the peripherality condition of Sardinia with respect to the South and overall Italy as a whole.

The national territorial statistics allows us to have a first preliminary outlook of the Sardinian economy, and in particular, to have an insight on the weight of each economic sector in total value GDP of the region. Table 4 summarizes data from ISTAT.

Table 4. Value added by sector as a % of total valued added.

Industry	2000	2001	2002	2003	2004	2005	2006	2007
Agriculture	3.82%	4.03%	3.95%	4.17%	3.84%	3.37%	3.26%	3.18%
Fisheries	0.19%	0.27%	0.29%	0.31%	0.33%	0.35%	0.35%	0.32%
mining	0.51%	0.55%	0.57%	0.43%	0.40%	0.51%	0.47%	0.62%
Food, tobacco and beverages	1.96%	1.96%	2.26%	2.05%	1.80%	1.63%	1.79%	1.70%
Textiles and clothing	0.41%	0.46%	0.46%	0.42%	0.38%	0.36%	0.32%	0.32%
Leather	0.02%	0.04%	0.03%	0.03%	0.03%	0.03%	0.02%	0.02%
Paper and printing	0.42%	0.40%	0.44%	0.42%	0.39%	0.39%	0.34%	0.34%
Coke, oil refineries, chemical and pharmaceuticals	1.96%	1.64%	1.35%	1.25%	1.38%	1.63%	1.48%	2.07%
Non metallic mineral products	0.75%	0.83%	0.96%	0.94%	0.84%	0.96%	0.88%	1.01%
Metal products	1.47%	1.38%	1.37%	1.37%	1.19%	1.18%	1.28%	1.39%
Mechanical, electrical, optical machinery; Transport means	1.26%	1.45%	1.48%	1.50%	1.58%	1.66%	1.66%	1.64%
Wood, rubber, plastic, and others	0.91%	1.06%	1.10%	1.00%	1.03%	0.92%	0.95%	1.02%
Energy, Water, Steam and Gas	3.45%	3.32%	4.18%	3.82%	4.10%	3.77%	3.11%	3.02%
Constructions	5.97%	5.94%	6.57%	6.92%	7.38%	6.87%	6.21%	6.83%
Wholesale and retail trade; cars, motorcycles and white goods repairing	12.76%	13.34%	11.80%	12.00%	11.56%	11.25%	11.36%	11.09%
Hotels and Restaurants	5.00%	4.79%	4.40%	5.04%	4.51%	4.78%	4.81%	4.88%
Transports, Warehousing and communications	7.94%	7.94%	6.96%	6.72%	6.98%	7.45%	7.23%	7.28%
Financial intermediation	3.31%	3.22%	3.10%	3.06%	3.11%	3.29%	3.23%	3.58%
Real estate, renting, IT, research and other professional services	18.83%	18.70%	18.93%	19.35%	19.95%	19.82%	20.11%	19.45%
PA and defense; Social Security	10.35%	10.44%	10.64%	10.49%	10.94%	11.01%	11.58%	11.38%
Education	7.71%	7.42%	7.64%	7.76%	7.25%	7.31%	7.54%	7.67%
Public Health	7.49%	7.33%	8.33%	7.59%	7.65%	8.11%	8.49%	7.97%

Source: re-elaboration of ISTAT data (2009)

The ISTAT data do not overlap with the NACE 2 classification of the AIDA database and therefore no matching is possible. We can anyway detect some general distinguishing features, as the preeminence of services and the marginality of manufacturing in the regions. Real Estate with Wholesale trade represent the bulk of the value added (about 40%, almost constantly, between 2000 and 2007); it must be noted, however, that these aggregates sum together several various sector even quite heterogeneous; from this picture stems also the necessity to study the individual industries into deeper detail.

According to Crenos (2010) the economic structure of the region presents some peculiarities with respect to the rest of Italy. In the primary sector, valued added is higher in Sardinia than in North-Centre and Italy, being on the same levels of South. The share of manufacturing and utilities is instead well lower for Sardinia (13.5%) than in North-Centre (24.3%) 22.1% at country level. As expected, the construction sector has a higher share in Sardinia (6.3%) than in North Centre and country level (5%). For services, shares are aligned with the rest of Italy but for advanced financial intermediation services, lower for Sardinia. Overall, growth rates for valued added per effective

worker, by sector, show higher figures for low valued added - traditional industries, but a slow down in advanced services.

Let us now turn to the micro perspective, presenting the firm – level data from AIDA (Analisi Informatizzata delle Aziende by Bureau Van Dijk). The original extraction contained 20,128 Sardinian firms observed from 2000 to 2009, with P/L and Balance Sheet data. For each firm, I consider the industry code (Nace rev. 2, equivalent to Italian ATECO2007)³, the total value of production, revenues from sales and services, raw consumption in intermediate goods, personnel costs, depreciation, value added, employees, tangible and intangible fixed assets and operating margin. Table 5 reports some summary statistics of the original data.

Table 5. Summary statistics from AIDA Sardinian firms. Values in thousands of Euros.

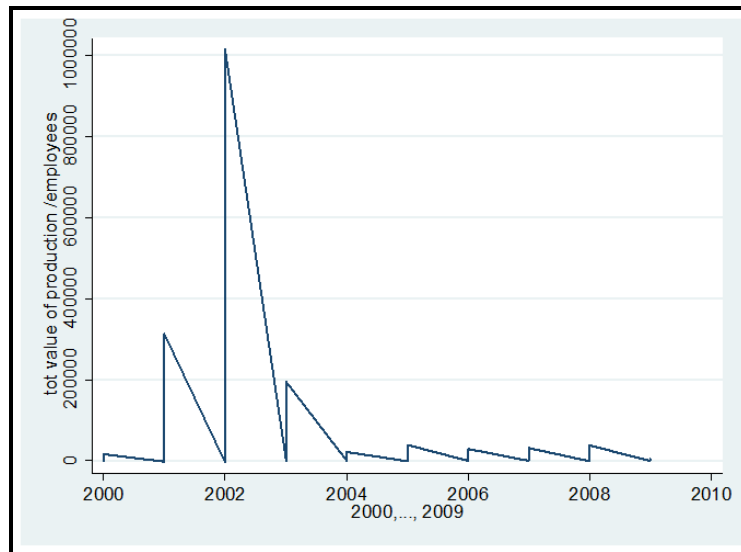
<i>Variable</i>	<i>Obs</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>
Id	50084	10141.73	5851.669	1	20128
Year	50084	2003.881	2.631875	2000	2009
Company name					
Region					
Province					
closing date					
Cciaa number					
Commune					
ateco2007 code	50084	472783.2	210956.5	10000	960909
nacerev11	33357	4919.438	2141.415	110	9305
nacerev11 description					
ateco2007 description					
totalvalue of production	50084	3542.326	71159.62	-3322	8672769
Revenues	50083	3370.977	70028	-207	8555842
Raw, consum. mat. and goods for resale	50084	2011.676	54632.45	-354	7677346
Total personnel costs	50084	434.7333	5026.065	-1	616929
Total depreciation	50084	164.844	3934.804	-1802	492697
Value Added	50084	701.4097	9395.613	-69092	686097
Employees	50084	12.88276	90.26139	1	10776
Total tangible fixed assets	50084	1403.353	23197.78	-137	1937066
Total intangible fixed assets	50084	307.7526	11423.16	-36	1112098
Interest/Operating profit	34201	22.99726	49.99238	0	400
operating margin	50084	93.87878	6154.296	-668227	492430

In particular, I focused on the industrial classification and aggregated the 6-digits codes into 2-digits codes so to run the productivity decomposition at a higher level of aggregation. I have 96

³ This classification is the national version of the European nomenclature, **Nace Rev. 2**, published in the Official Journal of 20 December 2006 (**Regulation (EC) no 1893/2006** of the European Parliament and of the Council of 20 December 2006).

Ateco2007 sectors, whose description is reported in the Appendix. I considered what reported in Aiello et al. (2009) as for the validation of the AIDA sample against the aggregated productivity data from ISTAT, the Italian National Institute of Statistics, and for what concerns the use of labor productivity alternatively to the use of total factor productivity, also reported in Altomonte and Colantone (2006). Labor productivity from AIDA encounters a peak in 2002, hinting for an upward trend in the cycle that is reverted from 2002 onwards.

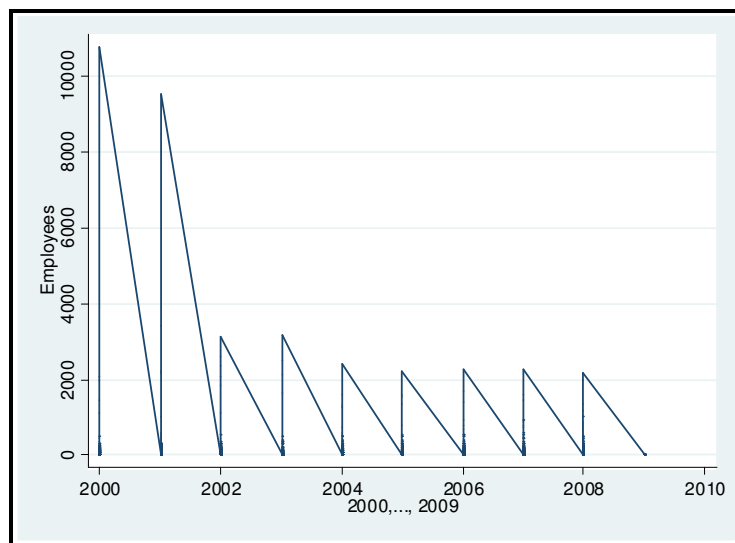
Graph 1. Total value of production over employees



Source: elaboration from AIDA

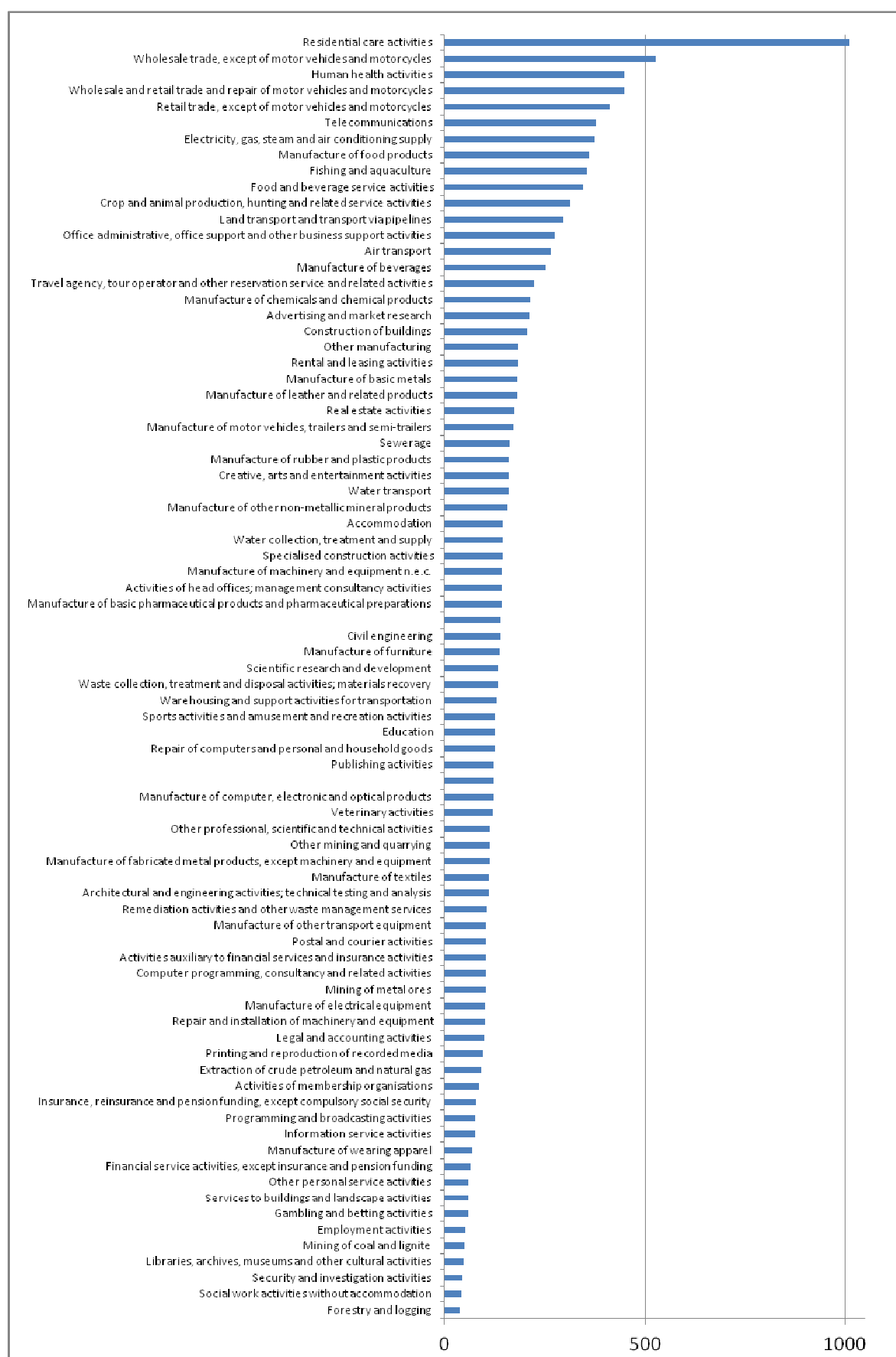
A consistent trend is found in the employment dynamics, where the peak is reached at the beginning of the series, while a downward pattern follows.

Graph 2. Total employees



The average labor productivity across years is larger for services sectors, (but for the exception for the Manufacture of coke and refined petroleum products), with the top industry being Residential care activities, increasingly spread in western economies and across Italy as a whole. The first manufacturing industry ranks 8th, Manufacture of Food Products, being preceded by Utilities as Electricity, gas, steam and air conditioning supply. Graph 3 shows the average value of production over employees across all available years, by Nace Rev.2 sectors.

Graph 3. Average value of production/employees across years, all industries. (/000 of Euros)



3. Productivity decomposition.

Looking at simple indicators for productivity through time is not sufficient to evaluate properly the micro-dynamic efficiency of a system. A positive change in the indicator could be the result of many different underlying processes. First of all, total productivity (Ω_t) could increase more as a result of a technological innovation that makes all firms equally more productive. On the other hand, even without innovation, or even with mature technologies, aggregate productivity could increase as an effect of an intra-sectoral labor reallocation, with larger labor shares for the more productive firms or vice versa.

Without this indication, it is not possible to define a ranking for necessary economic policies, since the aggregate datum for productivity, more or less positive, could stem from heterogeneous factors, some falling under the competencies of both national and regional administrators (productivity dynamics), others of pure national competency (labor market dynamics).

Aggregate productivity may therefore depend from both changes in firm-level productivity (within-firms effect or innovative aggregate effects) and changes in the reallocation mechanisms of resources between firms differing for productivity levels or change in the labor market (between firms effect). Following Olley and Pakes (1996)⁴, it is possible to detect separately these two effects, by decomposing total productivity Ω_t as:

$$\Omega_t = \sum_{i=1}^N s_{it} \omega_{it} = \bar{\omega} + \sum_{i=1}^N \Delta s_{it} \Delta \omega_{it}$$

Where $\Delta s_{it} = s_{it} - \bar{s}_t$ and $\Delta \omega = \omega_{it} - \bar{\omega}_t$, with s_{it} being the share of employees of firm i at time t over total employees (intended here as market share), \bar{s}_t is the simple average of the market share, $\bar{\omega}_t$ is the average labor productivity by sector (the *within – firms* effect) that can also be interpreted as the “pure” or technological component of aggregate productivity, or average efficiency of firms;

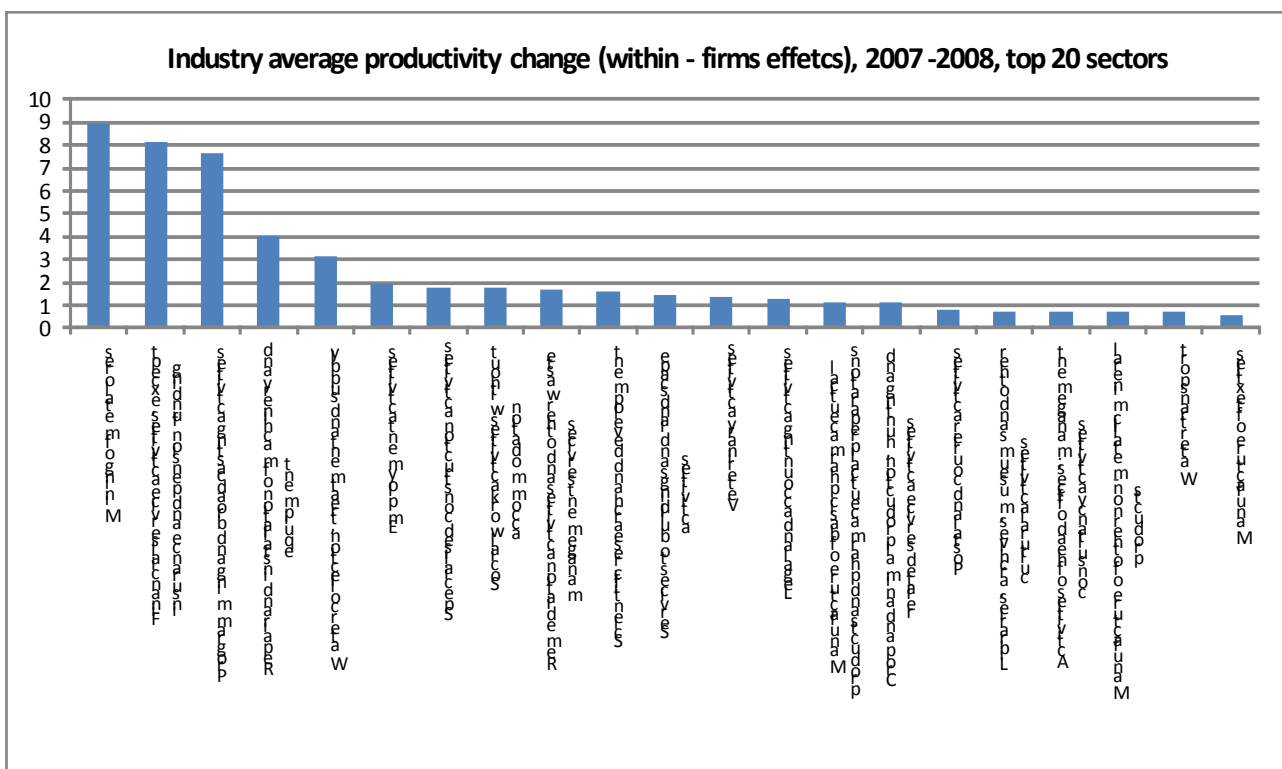
ω_{it} is the each firm’s labor productivity, while $\sum_{i=1}^N \Delta s_{it} \Delta \omega_{it}$ is the covariance between the labor productivity and the firm’s market share (*between - firms* effect). A high value for the covariance means that more productive firms have larger market shares, and, as a result, they increase industry’s global productivity.

⁴ Olley and Pakes (1996) introduce this decomposition for the ICT machinery industry in the UK. This methodology is also adopted by Pavcnick (2002) to verify the trade liberalization effects on manufacturing in Chile, while Rizov and Walsh (2005) and Van Beveren (2007) use it for the analysis, respectively, of British manufacturing and food industry in Belgium.

The preeminence of one component rather than the other in the determination of aggregate labor productivity therefore hints for policies aimed at spurring global innovation in the case of a major role played by Ω_t , where also regional policy makers can and must have a role; policies aimed at the labor market in case of larger weight of the covariance term. Graphs 4.a, 4.b and 4.c show the top 20 industries reporting the highest percentage change for the average labor productivity by sector (*within -firms* effect, the covariance between the labor productivity and the firm's market share (*between - firms* effect) and total productivity Ω_t .

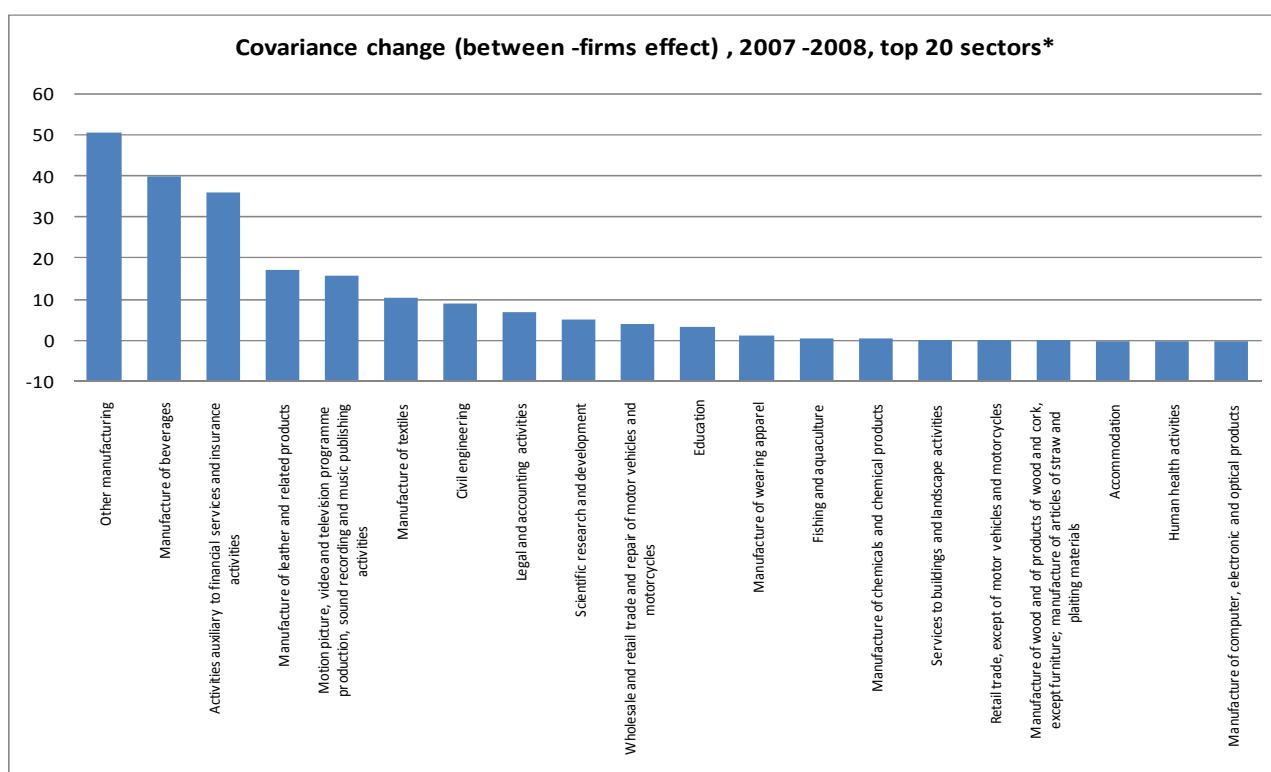
When looking at the average industry labor productivity change, I find that mining activities have the highest labor productivity, and as a scale intensive industry this is quite normal. But surprises stem from the services sectors: the following 12 industries – ranked by average productivity – are services sectors, while the first manufacturing industry concerns another scale intensive industry, pharmaceutical products. In particular, the average labor productivity in the Mining sector (Nace 7) has increased of about 900%, while in Financial services (Nace 64) and Programming and broadcasting activities (Nace 60). The worst performance is recorded by Travel agencies (Nace 79) with -68%, Real estate activities (Nace 68), with -0.72%, and TLC (Nace 61), with -74%. This first picture hints for some structural change in the dynamics and performance of the service sectors, after the shift from manufacturing to services in the past decade, that probably sees the more exploited sectors for tourism (Real estate and Travel) in a descending phase either due to saturation or to the current economic crisis.

Graph 4.a. Within-firms effect.



When looking at the reallocation dynamics of labor between firms (graph 4.b) I had to leave out the Waste Management industry since the figure is well above the 3000% ..this odd figure might be due to the organization of modern waste management services that are relatively new to Sardinia. Other industries that actively attracted employment between 2007 and 2008 are Manufacture of beverages (Nace 11) + 400%, Activities auxiliary to financial services (Nace 66) +385%, Manufacture of leather and related products (Nace 15) +171%. The industries that instead destroyed jobs are Postal and courier activities (Nace 15) -178%, Employment activities (Nace 78) -1801%, Veterinary activities (Nace 75) -2443%.

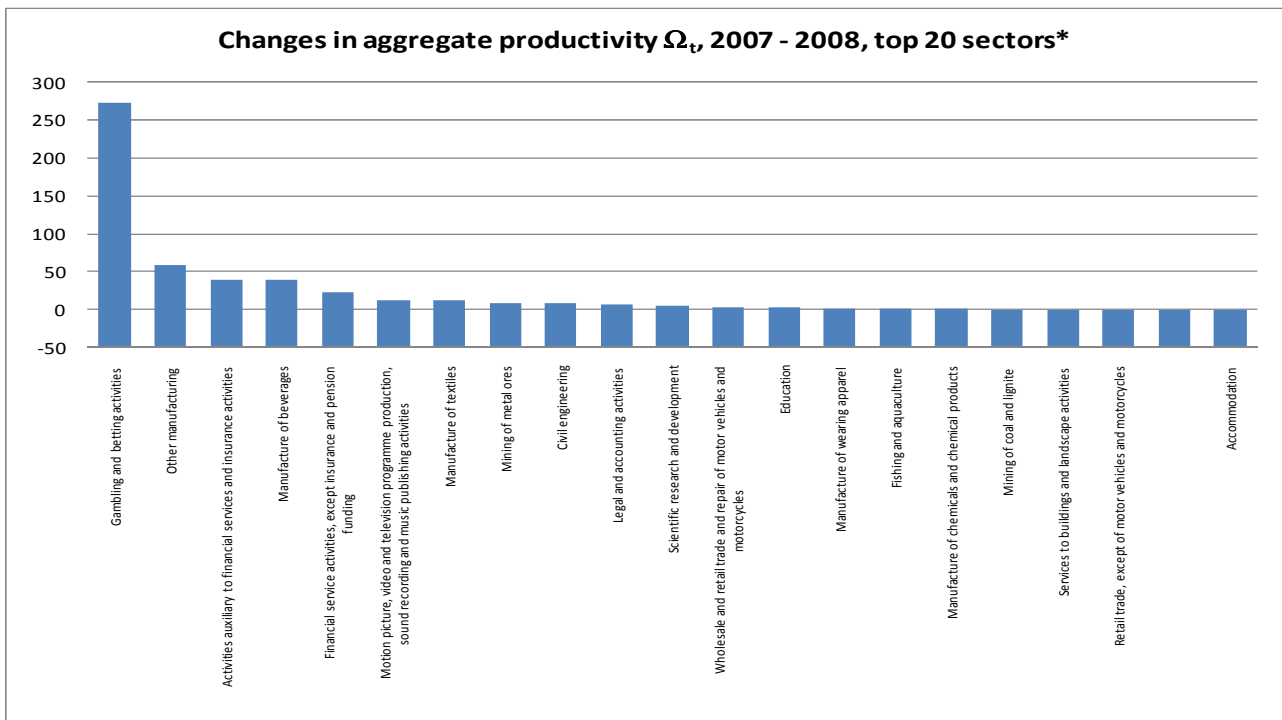
Graph 4.b. Between-firms effect.



As a result, the sectors that experienced the highest increase in total productivity are Waste management services +7476%, Gambling and betting activities +272%, followed by Other manufacturing. Emerging services, not immediately related to tourism, are proving dynamic with respect to more traditional manufacturing and especially services sectors.

Negative changes in total productivity are instead registered for industries as Wearing Apparel manufacturing, manufacture of chemicals, fishing. The worst industry reported in the graph is Accommodation (Nace 55), with a decrease of -13%, still a bad signal for the tourism industry as a whole.

Graph 4.c. Total productivity Ω_t effect.



Computing the averages across all sectors and setting equal to 1 the total productivity in 2000, the following synopsis can be drawn:

Table 2. Summary decomposition table

<i>Year</i>	Ω_t	$\bar{\Omega}_t$	$\Delta\omega_{it}*\Delta s_{it}$	$\Delta\Omega_t/\Omega_{t-1}$
2000	1.0	0.1	1.0	
2001	-0.3	0.1	-0.3	-1.3
2002	1.1	0.8	1.2	-4.8
2003	-0.4	0.1	-0.4	-1.3
2004	0.6	0.1	0.6	-2.5
2005	0.8	0.1	0.8	0.4
2006	0.7	0.1	0.7	-0.1
2007	0.0	0.1	0.0	-1.0
2008	1.2	0.1	1.2	-39.6
2009	0.0	0.1	0.0	-1.0

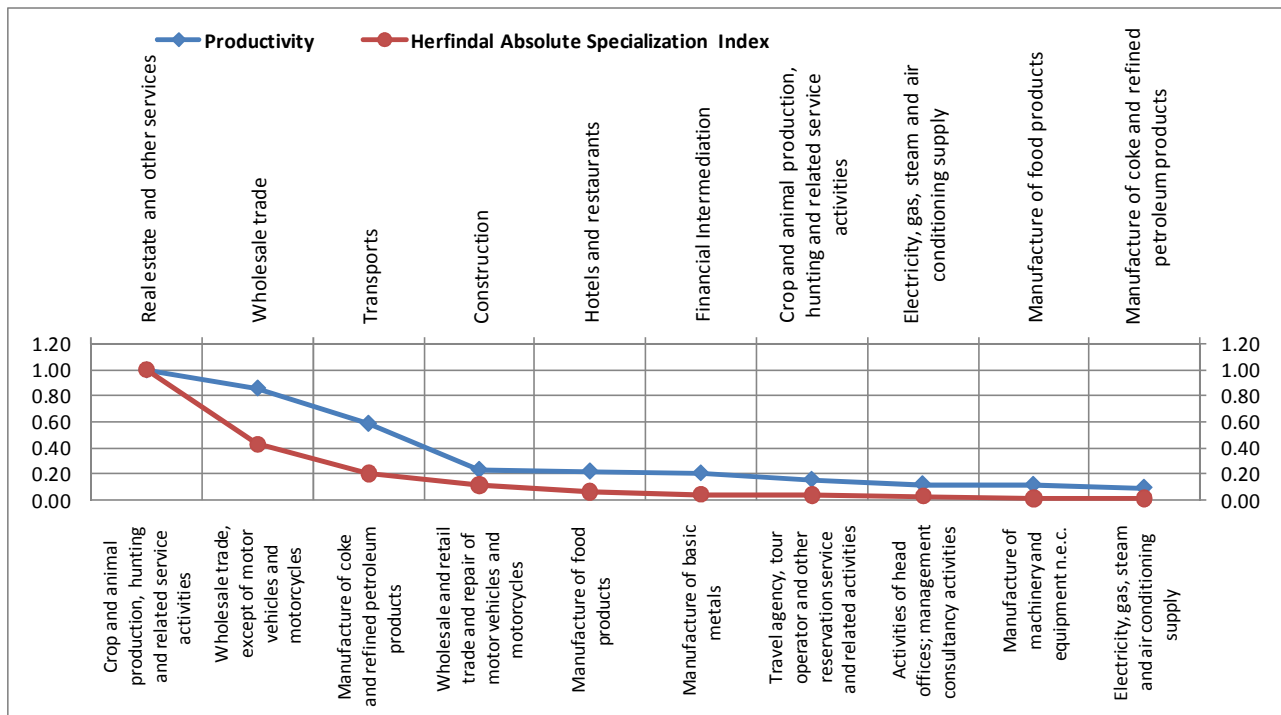
The main information from this synopsis relates to the covariance term $\Delta\omega_{it}*\Delta s_{it}$, which shows a high degree of variability, hinting for some evolutionary picture in the labor market. Since positive values are preceded and followed by negative values, there could be some strong movement of reallocation on the labor market, or some structural change that is seeing some firms rapidly losing

market shares in favor of others, maybe in the same sector or more likely in new emerging – probably services –sectors. Looking at the structural productivity Ω_t instead, an almost always constant pattern is detectable, hinting that all the variability in total productivity is explained by the reallocation in the labor market and not by some changing innovation dynamics that affected the structure of industries. The bad news is that no pattern of innovation is detectable at all, and this is consistent with the disappointing performance already presented in the aggregated statistics.

Perhaps with some better firms' coverage (larger sample size) I could better explain, though, the high variability in total productivity, that could be partially explained by missing data.

Some other insight into the regional industrial structure can be derived by matching those industries that performed better in terms of productivity gains and some specialization indexes. The idea is that under normal conditions, there should be some good matching between the absolute specialization of industries and the most productive industries: if market is competitive, there should a tendency in specializing in those sectors that are naturally more profitable. Should this matching not be perfect, there could be room for policies that may support the reallocation of labor towards the more productive industries. Graph 5 reports the top 10 industries in term of aggregated productivity in 2007 and the Herfindahl absolute index of industrial specialization⁵, with this second index computed on the ISTAT data (therefore a perfect matching is unlikely).

Graph 5. Productivity and Herfindahl Absolute Specialization Index.



⁵ The Herfindahl specialization index has the following formula: $Herf = \sum_i (a_i)^2$ with a_i share of industry i in the region

Some matching between specialization and the most productive industries is detected, in particular for Trade, Food products, crop and animal production, manufacture of coke, electricity and gas. Given the different definition of industrial aggregates some mismatching is implicit, but, though, for 5 industries out of 10, there is actually a coincidence between the two indicators.

4. Conclusions

The ultimate objective of this study is to carry out a study if the industrial distinguishing features of Sardinia, an Italian insular region whose characters of remoteness from the rest of Italy and from Continental Europe has historically shaped the economy into a service-dependent reality.

Services –especially tourism – are the most developed industry, and this is consistent with all major industrialized and emerging economies. But, for Sardinia, the risk of betting completely on tourism is that of misusing and wasting her very unique asset given by the natural environment. And given the past current record of myopic and corrupt local administration, this fear is very well embedded into the common feeling of local people and of minority political parties.

The decomposition of Olley and Pakes allows for detecting the sources for productivity change into the economy, distinguishing the contributions stemming from pure innovativeness at industrial level from the dynamics in the labor market. The structural innovation performance is given by the average productivity of industries, while the labor market dynamics is embed into the covariance term, that ideally sees the “winning” firms attracting more workers, and vice versa. The main result from this analysis is that all the changes into the productivity at aggregate level basically come from the labor market dynamics, while the structural innovative performance very marginally contributes to aggregate productivity. The decomposition will be further analyzed at every industrial Nace sector to assess every single specificity; moreover, it was preceded by the presentation by some aggregated data from ISTAT, and followed by a preliminary specialization analysis by means of the Herfindahl index of absolute specialization. Here the results are encouraging, since I'd expect the market to naturally bring the economy into specializing in the more productive sectors, and at this stage the matching is about 50%.

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Appendix

Nace Rev. 2 –Ateco2007 codes

<i>Code</i>	<i>Description</i>
1	Crop and animal production, hunting and related service activities
2	Forestry and logging
3	Fishing and aquaculture
5	Mining of coal and lignite
6	Extraction of crude petroleum and natural gas
7	Mining of metal ores
8	Other mining and quarrying
10	Manufacture of food products
11	Manufacture of beverages
13	Manufacture of textiles
14	Manufacture of wearing apparel
15	Manufacture of leather and related products
16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
18	Printing and reproduction of recorded media
19	Manufacture of coke and refined petroleum products
20	Manufacture of chemicals and chemical products
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
22	Manufacture of rubber and plastic products
23	Manufacture of other non-metallic mineral products
24	Manufacture of basic metals
25	Manufacture of fabricated metal products, except machinery and equipment
26	Manufacture of computer, electronic and optical products
27	Manufacture of electrical equipment
28	Manufacture of machinery and equipment n.e.c.
29	Manufacture of motor vehicles, trailers and semi-trailers
30	Manufacture of other transport equipment
31	Manufacture of furniture
32	Other manufacturing
33	Repair and installation of machinery and equipment
35	Electricity, gas, steam and air conditioning supply
36	Water collection, treatment and supply
37	Sewerage
38	Waste collection, treatment and disposal activities; materials recovery
39	Remediation activities and other waste management services
41	Construction of buildings
42	Civil engineering
43	Specialised construction activities
45	Wholesale and retail trade and repair of motor vehicles and motorcycles
46	Wholesale trade, except of motor vehicles and motorcycles
47	Retail trade, except of motor vehicles and motorcycles
49	Land transport and transport via pipelines
50	Water transport
51	Air transport

52	Warehousing and support activities for transportation
53	Postal and courier activities
55	Accommodation
56	Food and beverage service activities
58	Publishing activities
59	Motion picture, video and television programme production, sound recording and music publishing activities
60	Programming and broadcasting activities
61	Telecommunications
62	Computer programming, consultancy and related activities
63	Information service activities
64	Financial service activities, except insurance and pension funding
65	Insurance, reinsurance and pension funding, except compulsory social security
66	Activities auxiliary to financial services and insurance activities
68	Real estate activities
69	Legal and accounting activities
70	Activities of head offices; management consultancy activities
71	Architectural and engineering activities; technical testing and analysis
72	Scientific research and development
73	Advertising and market research
74	Other professional, scientific and technical activities
75	Veterinary activities
77	Rental and leasing activities
78	Employment activities
79	Travel agency, tour operator and other reservation service and related activities
80	Security and investigation activities
81	Services to buildings and landscape activities
82	Office administrative, office support and other business support activities
85	Education
86	Human health activities
87	Residential care activities
88	Social work activities without accommodation
90	Creative, arts and entertainment activities
91	Libraries, archives, museums and other cultural activities
92	Gambling and betting activities
93	Sports activities and amusement and recreation activities
94	Activities of membership organisations
95	Repair of computers and personal and household goods
96	Other personal service activities