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Labor Productivity in Europe: Evidence from a Sample of Regions

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Labor productivity in Europe: Evidence from a sample of regions♦

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Abstract

The present paper aims at analyzing the sources of labor productivity in Europe at regional level. We study the productivity performance in a sample of twenty European regions belonging to four countries (France, Germany, Italy and Spain). Exploiting the increasing availability of disaggregated data at regional level, we propose both a descriptive statistics and an econometric analysis of productivity sources since 1995. Our main finding is that the levels and sources of labor productivity are rather heterogeneous across the sample. This heterogeneity is found to be associated with disparities both across sectors and regions.

Keywords: Labor productivity, productivity determinants, European regions.

JEL Classification: J24, O11, O18, O52.

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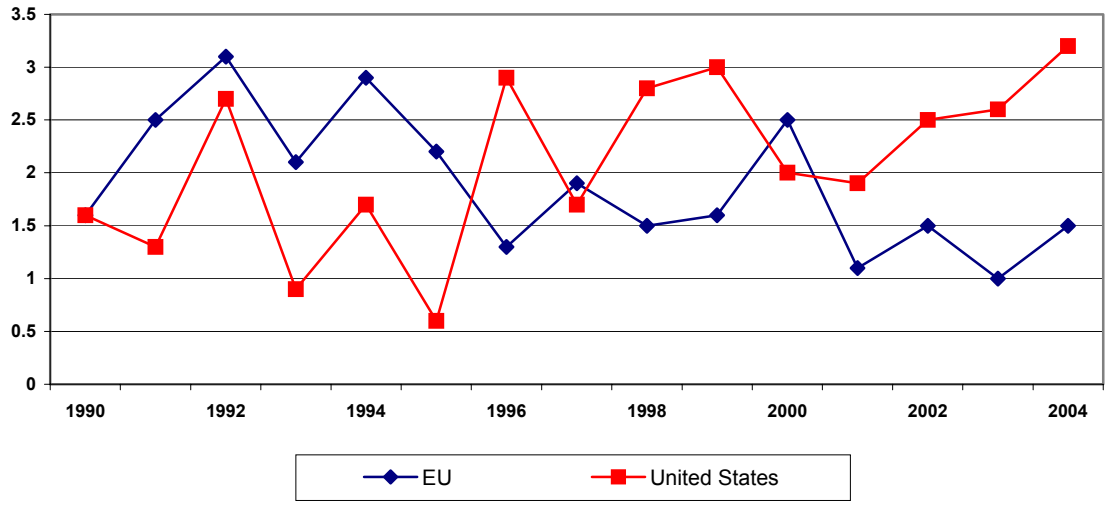
1. Introduction

The lower productivity performance in Europe relative to past performance and to the United States in the last decade has caused some concern about the income growth prospects in Europe and the widening gap with the US living standards (OECD, 2005; Estevão, 2004). The lack of productivity growth is widely seen as the culprit of the sluggish economic growth that Europe has experienced in the last few years and the strategies to remedy it have been high on the agenda of the European Union (European Commission, 2003, Sapir A., 2004). The EU productivity underperformance has raised questions about its causes and the channels through which economic policy could be effective to resume productivity growth.

While the catching-up of Europe with the United States in terms of GDP per capita levels came to an end in the mid seventies, labor productivity continued to grow until 1995. Some of the European productivity gains were used to increase leisure (lower weekly hours and early retirement age) rather than increasing income.[1] Since 1995 a "productivity problem" has emerged in Europe. As shown in Figure 1, the trend of European labor productivity growth has been declining while it has clearly picked up in the US over the same period.

Figure 1: Annual labor productivity growth (%) in the European Union (13 countries) and the United States, 1990-2004. (Source: OECD)



[1] Traditionally, GDP per capita can be decomposed in the following way: *GDP per capita = Productivity per hour worked × Total hours worked × Participation rate × Share of adult population able to work*. GDP per capita is an increasing function of each variable taken separately. From this equation, it is straightforward to observe that an increase in productivity leads to an increase in GDP per capita provided that the variations in the other variables do not totally offset the productivity gains. For instance, productivity gains may be used to work less rather than increase income. Nonetheless, those variables are interdependent and the final result on GDP per capita may be uncertain.

Productivity[2] and income growth are the determinants of the rise in the living standards. They are related to each other but their relationship is complex. Productivity gains in general result in income growth but an economy may grow (at least for some time) without productivity growth. In the latter case, economic growth is driven by demand and is usually considered as unsustainable. On the other hand, productivity may grow faster than income. In this case, productivity gains lead consumers to substitute income for leisure. This is often the argument put forward to explain the Europe-US income per capita and labor productivity differentials until 1995 (Blanchard, 2004). In the long run, however, income growth and productivity growth are expected theoretically to trend jointly provided that labor supply is relatively inelastic.

The trend of the European average shown in Figure 1 masks a more disparate reality across European national economies. Although some convergence is at work, there are still significant national disparities defying univocal explanations. In turn, national economies may exhibit regional inequalities casting doubt on the relevance of the national level to account for the dispersion of productivity performance.[3] Some studies have argued that the European integration process has favored specialization and convergence of regions across national borders rather than uniform geographic convergence (Quah 1997; Fatás, 1997). As integration progresses (reductions in trade costs), firms (at least in the industrial sector) become more geographically concentrated closing wage gaps. The empirical evidence in the US shows that income differentials across states are narrower than in Europe (Puga 1999). The evidence on the EU-US comparison of concentration of industries is much less clear (Combes and Overman 2004). However, according to the economic geography literature the result of increasing integration is conditional on workers' mobility. If workers do not move firms will have to move thus ending the agglomeration process and the firms' productivity gains (Puga 1999).

This paper aims at analyzing the sources of labor productivity (productivity per hour worked) in Europe to account for its recent underperformance and identify potential geographic idiosyncrasies. To do so we study the productivity performance and the sources of productivity in a sample of twenty European regions belonging to four countries (France, Germany, Italy and Spain). As argued above, the regional analysis is motivated by the possible existence of local factors driving productivity dynamics in the course of European integration. A regional analysis allows to shed some light on the relevance of either level - regional or national- to account for the sources of productivity in Europe. Exploiting the increasing availability of disaggregated data at regional level in Europe, we propose both a

[2] This paper addresses the issue of labor productivity. Our main indicator is the productivity per hour worked , i.e. the ratio between the gross added value (at constant prices) and the product between the total employment and the average worked hours.

[3] Bristow (2005) provides an interesting survey on the interest to examine the competitiveness or productivity problem from a regional viewpoint.

descriptive statistics and an econometric analysis of productivity sources in twenty European regions since 1995.

Most of the literature on productivity focuses on country analysis (Blanchard 2004, Estevão 2004, O'Mahony and van Ark 2003, OECD 2005). All these studies point out the increasing gap between Europe and the US since 1995 and the diversity of productivity performance within Europe. Does this diversity also exist within European countries themselves? That was the interrogation which motivated this work. Our results based on a sample of twenty European regions show that regional characteristics matter and even more than national ones.

This paper is organized as follows. Section 2 describes the sample. Section 3 aims at studying GDP growth performance and its sources. Section 4 provides a statistical analysis of labor productivity performance. Section 5 proposes an econometric analysis of the labor productivity determinants in the selected European regions. The final section concludes.

2. The sample

Our sample is purposely limited to twenty European regions to keep the statistical analysis easily tractable. These twenty regions belong to four large European countries (NUTS 2): Alsace, Bretagne, Languedoc-Roussillon, Lorraine Midi-Pyrenées and Rhône-Alpes (France), Baden-Württemberg, Bayern, Niedersachsen, Rheinland-Pfalz and Schleswig-Holstein (Germany), Emilia Romagna, Lombardia, Marche, Piemonte, Toscana and Veneto (Italy), and Catalunya, Comunidad Valenciana and País Vasco (Spain). This sample represents 25% of the EU 15 population and 26.5% of the EU 15 GDP in Purchasing Power Standards (PPS). The sample mean GDP per capita in PPS amounts to 24 943 in 2002 against 23 555 in the EU 15.

The regions of our sample were selected according to two criteria. First, no central government should be located in any of the regions. Our concern was to avoid the political factor as a source of economic performance. Second, regions that were picked up have comparable GDP per capita in PPS and their mean is relatively close to the EU average.

Apart from that, the sample regions differ in land size, in relative economic or demographic size likewise the regions of all Europe. Despite this heterogeneity, a first characteristic that appears to be common to all of them is the strong stability of their share in national income and in national population over the last three decades (Table 1). The variations observed for Germany are associated with the integration of the Eastern German Länders. The income level per capita measured by GDP per inhabitant in PPS in all the

selected French regions lies below the sample mean and the French average (Table 1). This result is due to the enormous weight of Paris-Ile-de-France in the French economy and the strong gap existing between the French Capital city-region and the remaining regions. The situation is opposite in the selected Italian regions. All of them exhibit an income level higher than the sample mean and the Italian average. Due to the sharp disparities between the North and the South of Italy we decided to include only regions of the North and the Center of the peninsula to keep the comparison with the other regions of the sample meaningful.

Regarding the economic structures, homogeneity across the sample prevails (Tables 1.A and 2.A in Appendix). The distribution of total value added by sector shows that the economy of all the sample regions has been increasingly dominated by services over the last three decades with an approximate share of two-third in 2002 against a bit more than half in 1977. The agricultural sector has kept declining in all regions. Overall, the sector distribution of value added is relatively similar across regions and the slight cross-regional variations are due to the differences in the balance between industry and services. The slight cross-regional differences have been very stable throughout the tertiarization of their economies. In the construction sector the Spanish regions and, to a lesser extent, Bretagne from France lie out of the sample. They have seen a strong activity recently accounting for between 7 and 10% of the total valued added in 2002.

3. Income growth performance and sources

Productivity growth and income growth are related to each other. In the long run, they should vary jointly provided that labor supply is relatively inelastic. If labor supply is not so inelastic for some time, due to the change in working time or in the employment/population rate, the evolution of productivity and income growth may be disjoint. In any case, the analysis of the performance and sources of income growth will be useful to identify the sources of labor productivity. In order to learn more about the European productivity sources and its possible geographic differences, we examine the GDP growth performance and its sources in the European regions of our sample.

Table 1 Regional share in national output (%)
(Source: Eurostat and CRENOS database, calculus: authors)

	GDP per capita Current PPS 2002	Regional share of their respective national output (%)		Population (1000) and national share			
		1977	2002	1977	%	2002	%
France	**24164**						
Languedoc-Roussillon	*18700*	*2.7*	*3.0*	*1803*	*3.4*	*2396*	*3.9*
Midi-Pyrénées	*21733*	*3.3*	*3.8*	*2273*	*4.3*	*2637*	*4.4*
Rhône-Alpes	*24069*	*9.1*	*9.6*	*4839*	*9.1*	*5893*	*9.8*
Lorraine	*19924*	*4.2*	*3.2*	*2323*	*4.4*	*2320*	*3.9*
Alsace	*23450*	*2.9*	*2.9*	*1533*	*2.9*	*1774*	*2.9*
Bretagne	*20842*	*4.1*	*4.2*	*2615*	*4.9*	*2962*	*4.9*
Germany	**23402**						
Bayern	*27687*	*16.6*	*17.4*	*10804*	*17.6*	*12329*	*14.9*
Baden-Württemberg	*26593*	*15.8*	*14.8*	*9119*	*14.8*	*10692*	12.9
Niedersachsen	*20507*	*10.2*	*8.6*	*7227*	*11.8*	*7956*	*9.6*
Rheinland-Pfalz	*20690*	*5.3*	*4.4*	*3649*	*5.9*	*4049*	*6.7*
Schleswig-Holstein	*21194*	*3.8*	*3.1*	*2583*	*4.2*	*2804*	*4.8*
Italy	**23705**						
Lombardia	*30554*	*21.1*	*20.6*	*8802*	*15.7*	*9246*	*15.9*
Piemonte	*27109*	*9.8*	*8.5*	*4493*	*8.0*	*4214*	*7.3*
Veneto	*26951*	*8.4*	*9.0*	*4278*	*7.7*	*4530*	*7.8*
Emilia Romagna	*29648*	*9.0*	*9.0*	*3935*	*7.0*	*3984*	*6.9*
Toscana	*25980*	*6.9*	*6.9*	*3557*	*6.4*	*3497*	*6.0*
Marche	*23751*	*2.6*	*2.7*	*1395*	*2.5*	*1471*	*2.5*
Spain	**20497**						
Catalunya	*24858*	*18.5*	*18.3*	*5972*	*15.9*	*6637*	*15.5*
País Vasco	*25237*	*7.3*	*6.5*	*2119*	*5.8*	*2082*	*5.1*
Comunidad Valenciana	*19567*	*9.6*	*10.2*	*3473*	*9.5*	*4163*	*10.2*

At the aggregate level, data on real GDP growth has been available in the Eurostat database only since 2000. Over the period 2000-2003, it can be observed that there are significant growth differential across countries and within countries (Table 3.A in Appendix). The Spanish economy has grown much faster than the EU average in the last few years while the Italian and the German economies have lagged behind. It can also be observed regional disparities within countries. For example, in 2000, Lombardia grew at a rate of 2.5% against 3.6% for Veneto. In 2002 Rhône-Alpes posted a rate of 0.2% while Languedoc-Roussillon

1.7%. Therefore, for a same year and the same country, there are significant regional variations even when regions are geographically very close to each other. Nevertheless these cross-regional variations within countries tend to offset over time since we observed in the previous section that the regional shares in national income had been very stable in the last three decades.

At the sector level, the analysis of total gross value added growth between 1995 and 2002 confirms the rapid tertiarization of the European economies (Table 2). The sector of services has grown faster than agriculture and industry (excluding construction) in all regions except in Midi-Pyrénées and Niedersachen where industry has grown faster than services. Table 2 provides clear information on the sector sources of economic growth in the sample of our regions. The sector of services has been the main engine of economic growth in the economies of these regions. Given the size that this sector has taken (two-third of GDP) and the strong development that it keeps experiencing in all regions, the services will be a very important determinant of overall productivity performance if productivity differences are non-negligible across sectors.

At the level of production factors, it is important to analyze the evolution of the labor supply since it may be both a source of GDP growth and labor productivity decline. Looking at the demographic statistics, the population in the European regions is growing little despite migration inflows and is ageing fast (Table 3). The exception is Spain where the active population and the youth population have grown much faster. However labor supply has increased substantially in the last decade in these European regions except in Germany. The employment rate that was low in the countries of our sample compared to the UK and the US and even declined in the 1980s and the early 1990s has increased at a high speed since 1995 except in Germany (Table 4.A in Appendix). The increase in the employment rate in Spain has been even exceptional. Therefore labor productivity performance in our sample regions is likely to be affected by the labor supply increase in the recent period. Regarding physical capital, the annual growth rate of gross fixed capital formation, another potential source of labor productivity, has been high in the Italian and Spanish regions (Table 3). Due to the volatility of investment, strong disparities can be observed across regions and regions within the same country.

To sum up, it has been observed that services have been the main engine of GDP growth in almost all regions of our sample. Labor supply has increased significantly in all regions but the German while investment in physical capital has grown at very different rates across regions.

Table 2: Average annual growth rates of GDP components at constant prices 1995-2002 (%, price=1995)
(Source: EUROSTAT and IDESCAT – Calculus: authors)

	Total gross V.A.	Agriculture	Industry (excl. construction)	Construction	Services
France	**3.4**	**0.4**	**2.6**	**2.6**	**3.9**
Languedoc-Roussillon	4.2	2.1	3.7	4.8	4.4
Midi-Pyrénées	3.8	0.1	4.3	5.7	3.7
Rhône-Alpes	3.7	-0.1	3.0	3.6	4.1
Lorraine	2.3	2.0	-1.0	2.4	3.4
Alsace	2.5	1.7	-0.6	2.6	3.7
Bretagne	3.9	0.3	1.0	6.9	4.6
Germany	**1.2**	**-0.4**	**-0.1**	**-4.4**	**2.2**
Bayern	2.2	-0.2	1.7	-1.7	2.8
Baden-Württemberg	2.3	-1.7	2.1	-0.4	2.5
Niedersachsen	1.0	0.9	2.1	-1.1	1.0
Rheinland-Pfalz	1.0	-1.2	1.1	-0.4	1.6
Schleswig-Holstein	0.9	-0.9	-1.2	-2.9	2.0
Italy	**5.7**	**2.5**	**4.2**	**5.3**	**6.5**
Lombardia	5.6	3.9	3.6	4.4	6.8
Piemonte	5.2	0.8	2.8	5.7	6.3
Veneto	5.6	3.2	3.7	5.4	6.6
Emilia Romagna	5.8	3.2	4.5	8.6	6.2
Toscana	5.8	2.4	4.1	7.6	6.5
Marche	6.1	-0.4	5.5	5.3	6.8
Spain	**6.1**	**1.6**	**4.1**	**8.9**	**6.1**
Catalunya	5.7	3.2	4.0	7.7	6.1
País Vasco	5.9	3.7	5.3	9.9	5.8
Comunidad Valenciana	6.6	4.4	4.6	10.7	6.8

Table 3: Average annual growth of employment/population ratio and active population (%)
(Source: EUROSTAT and regional statistic offices, Calculus: authors)

	GFCF per unit of employment	**Employment/ population**	**Active population**		**Age: 15-34**	
	1995-2002	**1995-2002**	**1990-1995**	**1995-2001**	**1990-1995**	**1995-2001**
France	**2.2**	**0.8**	**0.8**	**0.6**	**-0.9**	**-0.7**
Languedoc-Roussillon	*-0.4*	*0.8*	*2.4*	*-1.2*	*-0.2*	*-1.8*
Midi-Pyrénées	*1.5*	*0.9*	*0.1*	*1.3*	*-0.3*	*-0.2*
Rhône-Alpes	*3.5*	*0.1*	*2.4*	*0.1*	*3.1*	*-1.7*
Lorraine	*-0.5*	*2.9*	*-0.1*	*2.0*	*-0.7*	*-1,2*
Alsace	*-2.5*	*1.0*	*-0.4*	*1.7*	*-2.9*	*0.8*
Bretagne	*0.6*	*1.3*	*-0.6*	*1.2*	*-2.3*	*-1.1*
Germany	**-1.5**	**0.0**	**4.9**	**0.3**	**3.4**	**-2.3**
Bayern	*-0.1*	*0.2*	*0.6*	*0.4*	*-0.5*	*-1.8*
Baden-Württemberg	*0.3*	*0.3*	*0.6*	*0.6*	*1.2*	*-3.5*
Niedersachsen	*0,6*	*0,1*	*0.8*	*0.4*	*-1.1*	*-2.0*
Rheinland-Pfalz	*0.2*	*0.4*	*0.7*	*0.7*	*-0.9*	*-2.2*
Schleswig-Holstein	*-0,4*	*-0.5*	*0.5*	*0.1*	*-0.6*	*-2.7*
Italy	**5.5**	**1.2**	**-0.8**	**0.7**	**-1.0**	**-1.0**
Lombardia	*6.0*	*1.1*	*-0.5*	*1.1*	*0.6*	*1.1*
Piemonte	*4.9*	*1.1*	*-0.5*	*0.3*	*0.3*	*-1.5*
Veneto	*5.8*	*0.9*	*0.3*	*1.2*	*0.3*	*-1.4*
Emilia Romagna	*5.8*	*1.0*	*-0.1*	*0.8*	*0.4*	*-0.6*
Toscana	*5.8*	*0.8*	*-0.5*	*0.4*	*0.4*	*-1.9*
Marche	*7.0*	*0.8*	*-1.4*	*0.8*	*-2.2*	*-0.1*
Spain	**3.7**	**3.2**	**0.8**	**2.7**	**1.5**	**3.5**
Catalunya	*2.0*	*2.3*	*1.0*	*2.6*	*1.0*	*4.3*
País Vasco	*5.4*	*3.2*	*0.5*	*1.6*	*-0.4*	*0.1*
Comunidad Valenciana	*5.5*	*3.5*	*1.6*	*2.5*	*1.6*	*1.4*

4. Statistical analysis of labor productivity

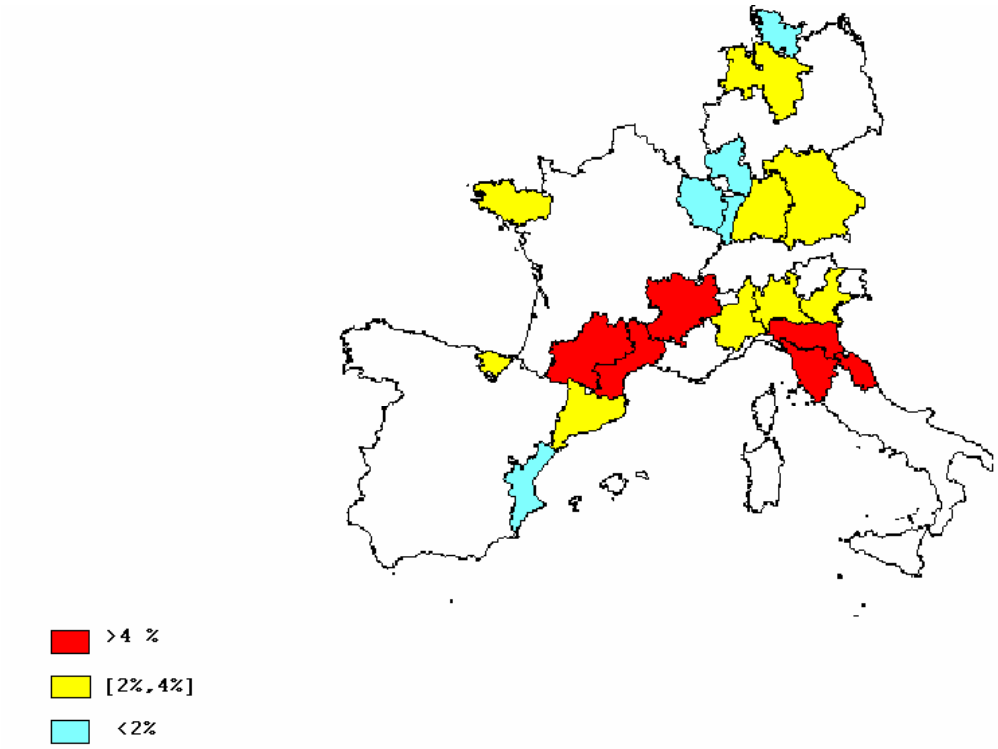
In this section we present a statistical description of productivity level and growth in the twenty regions and compare regions and sectors.

We provided evidence on the tertiarization of the economies in Europe. The sector of services was the fastest growing sector in all the regions of our sample. In terms of employment, the trends are similar. Employment in the industrial sector grew at best little except in Spain and even declined in Germany while in the services has constantly increased over the period. Since services are labor intensive, growth in this sector implies employment growth. What are the effects of employment variations on labor productivity growth in both sectors? Labor productivity (Figure 2) growth was higher in services than in industry in a majority of regions. However there are differences which seem to be driven by national determinants. In all German regions except Schleswig-Holstein labor productivity grew faster in industry than in services. In the Italian and Spanish regions services have been the main engine of labor productivity growth.

In terms of level, the analysis of productivity shows that there are important labor productivity disparities across our sample of European regions but these inequalities are reducing. Table 4 presents cross-regional comparisons for a few statistics. There is a convergence process in both GDP per capita and GDP per hour worked. However, most of French regions are catching up with the level of Baden-Württemberg while, for instance, Lombardia has lost some of its advance and Catalunya has been distanced by the German region. This observation at aggregate level seems to pinpoint national characteristics behind the cross-regional disparities. However, this work draws our attention to the importance of national or regional characteristics of production factors. We would like to verify this hypothesis by looking at a more disaggregated level. Cross-regional comparisons can be made for the following sectors: manufacturing, construction, financial services and wholesale (Table 5).

Figure 2: Average annual growth rate of productivity per hour worked 1995-2002 (%)
(Source: EUROSTAT and regional statistical offices – calculus: authors)

INDUSTRY



SERVICES

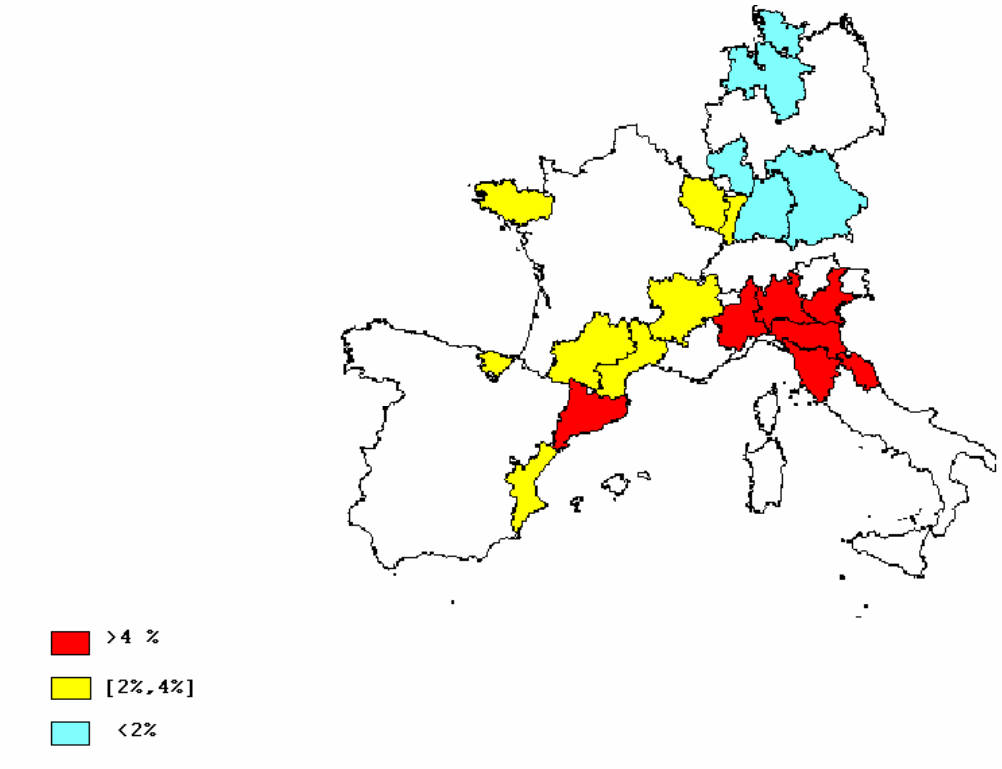


Table 4: GDP per capita, per hour worked and labor input in level (Baden-Württemberg =100)
(Source: Eurostat and regional institutes of statistics – calculus: authors)

	Population		GDP per capita		GDP per hour worked		Employment/ population	
	1995	**2002**	**1995**	**2002**	**1995**	**2002**	**1995**	**2002**
France								
Languedoc-Roussillon	21.5	22.6	66.1	67	76.5	80.2	71.2	73.7
Midi-Pyrénées	24.3	24.9	75.9	76.1	76.1	78.7	81.8	85.2
Rhône-Alpes	53.8	54.4	86.9	91.4	91.5	99.3	88.8	87.6
Lorraine	22.5	21.9	89.7	78.5	83.4	71.4	78.7	94.3
Alsace	16.4	16.7	109.3	92.5	91.6	86.5	87.4	91.8
Bretagne	27.7	27.9	87.2	82.4	75.9	78.1	84.3	90.5
Germany								
Bayern	116.1	116.3	100.9	101.1	93.7	93	108.5	107.9
Baden-Württemberg	100	100	100	100	100	100	100	100
Niedersachsen	75.1	75.1	108.4	87.2	93.7	87.2	92.1	90.5
Rheinland-Pfalz	38.5	38.2	108.7	87.9	93.2	85.7	92.8	93.3
Schleswig-Holstein	26.4	26.5	113.2	90.2	92.6	88.5	97.5	92.3
Italy								
Lombardia	86.4	85.2	114.5	113.6	120.9	108.0	89.1	94.6
Piemonte	41.5	39.7	101.6	85.4	67.5	68.7	91.4	96.9
Veneto	42.8	42.7	101.4	84.2	64.3	65.6	96.1	100.3
Emilia Romagna	37.9	37.6	108.8	105.0	87.9	91.2	91.6	96.2
Toscana	34.1	33.0	92.3	91.7	80.9	87.9	84.5	87.3
Marche	14.0	13.9	85.2	84.0	74.4	80.1	84.7	87.7
Spain								
Catalunya	59.4	59.8	80.0	90.0	84.2	77.0	83.4	95.7
País Vasco	20.3	19.6	78.3	78.5	75.5	69.7	73.2	89.9
Comunidad Valenciana	38.0	39.3	62.6	61.6	59.7	53	71.1	88.7

Table 5: Productivity per hour worked and unit labor cost indicators
(Source: Eurostat and regional statistical offices, calculus: authors)

	MANUFACTURING			CONSTRUCTION		
	1995	**1999**	**2002**	**1995**	**1999**	**2002**
France						
Languedoc-Roussillon	28.4	34.8	40.4	28.4	34.8	40.4
Midi-Pyrénées	26.8	30.6	37.7	26.8	30.6	37.7
Rhône-Alpes	28.0	33.5	39.6	28.0	33.5	39.6
Lorraine	29.8	28.3	26.1	29.8	28.3	26.1
Alsace	31.0	2.9	28.2	31.0	2.9	28.2
Bretagne	22.6	24.8	22.7	22.6	24.8	22.7
Germany						
Bayern	31.7	34.6	37.8	31.7	34.6	37.8
Baden-Württemberg	31.2	34.7	38.7	31.2	34.7	38.7
Niedersachsen	26.6	32.5	35.1	26.6	32.5	35.1
Rheinland-Pfalz	29.2	28.7	33.8	29.2	28.7	33.8
Schleswig-Holstein	28.2	31.6	35.9	28.2	31.6	35.9
Italy						
Lombardia	24.2	28.0	29.4	24.2	28.0	29.4
Piemonte	21.9	25.9	27.2	21.9	25.9	27.2
Veneto	19.4	22.8	25.2	19.4	22.8	25.2
Emilia Romagna	25.0	27.5	31.6	25.0	27.5	31.6
Toscana	20.8	24.7	28.3	20.8	24.7	28.3
Marche	18.1	20.7	22.8	18.1	20.7	22.8
Spain						
Catalunya	20.7	21.7	21.9	20.7	21.7	21.9
País Vasco	22.8	24.1	28.3	22.8	24.1	28.3
Comunidad Valenciana	14.9	17.3	18.5	14.9	17.3	18.5

	FINANCE AND REAL ESTATE			WHOLESALE		
	1995	**1999**	**2002**	**1995**	**1999**	**2002**
France						
Languedoc-Roussillon	71.1	75.1	81.2	22.5	24.5	26.5
Midi-Pyrénées	64.7	64.8	68.5	25.6	26.0	28.5
Rhône-Alpes	77.9	95.5	106.2	31.2	31.8	39.3
Lorraine	75.5	88.3	74.7	27.3	29.2	26.6
Alsace	99.7	87.8	106.1	27.2	28.9	32.9
Bretagne	91.2	92.1	100.6	24.3	29.0	32.3
Germany						
Bayern	80.5	79.2	80.3	24.4	24.4	25.9
Baden-Württemberg	111.3	113.5*	115.2	34.5	35.6	41.5
Niedersachsen	98.2	86.7	91.5	32.8	31.2	34.7
Rheinland-Pfalz	89.4	85.2	86.6	33.0	31.5	33.5
Schleswig-Holstein	96.1	85.5	86.7	30.6	30.9	36.0
Italy						
Lombardia	68.6	72.8	76.6	34.4	50.7	67.3
Piemonte	53.8	63.4	67.3	24.8	30.3	33.7
Veneto	58.0	68.4	74.1	25.1	30.5	33.2
Emilia Romagna	73.0	87.3	96.4	29.5	39.0	45.2
Toscana	71.3	87.1	90.9	26.5	36.9	41.1
Marche	81.1	76.7	95.5	23.6	35.2	38.2
Spain						
Catalunya	50.9	49.9	57.2	23.4	26.1	33.0
País Vasco	53.9	53.2	56.9	22.7	26.1	29.8
Comunidad Valenciana	45.1	45.9	48.9	20.3	21.0	22.7

* 1998

In manufacturing, the productivity levels are very close among regions within a country rather than across national borders. In construction, the levels of productivity are fairly homogenous across all regions. In financial services, productivity levels are much heterogeneous and seem to depend on regional specialization (e.g. Rhône-Alpes and Baden-Württemberg). Finally, in wholesale, another sector of services, productivity levels also seem to depend on regional specialization and regional disparities within a same country are substantially large.

At the sector level our analysis clearly shows strong differences in labor productivity levels across sectors. Regarding the spatial dimension, our findings are mixed. There seems to be national characteristics influencing regional productivity levels especially in manufacturing (a capital intensive sector) while in other sectors like services regional specialization turns out

to be more determinant. It would be therefore interesting to know whether the regional or the national level is statistically the most important spatial dimension in determining regional labor productivity. If the national dimension possesses the largest explanatory power, then it may be concluded that regional labor productivity levels depend on determinants whose characteristics are shared by all the regions of a same country. For instance, national institutions and laws shape the education system, the business environment and the level of competition on the product and labor market, and hence, affect all regions within a country in the same way. If the regional dimension is more important, then this means that the diversity exists at the local level and dominates the national convergence forces. Both types of spatial determinants may be at work but does one dominate the other? This question is the motivation of the econometric analysis of the next section.

5. Econometric analysis of labor productivity determinants in 1995-2002 in a sample of European regions

The statistical analysis of productivity cannot exhaust all the many factors which may account for the sources of labor productivity. Some of these factors, such as institutions or regional idiosyncrasies for example, may have an effect on productivity regardless of sectors.

Therefore we would like to know to what extent the sources identified in the previous section are statistically significant regressors of labor productivity. In addition, we want to test whether regional characteristics matter to determine labor productivity performance. These are the objectives assigned to this econometric analysis. We proceed by first concentrating on the full sample of sectors and regions and then by dealing separately with each sector of the sample. The first approach aims at identifying potential common determinants of labor productivity and assesses the magnitude of country, regional and sector idiosyncrasies. The second approach enables us to stress potential differences in the determinants of labor productivity across sectors and highlight potential regional effects.

In order to study the determinants of labor productivity we estimate an econometric equation derived from a log-linear production function. As in O'Mahony and van Ark (2003) or Connolly *et alii*. (2004), we start from a general production function of sector *(i)* and region *(j)* of the following type:

$$Y_{ij} = \alpha_0 K_{ij}^{\alpha_1} L_{ij}^{\alpha_2} H_{ij}^{\alpha_3} G_{ij}^{\alpha_4}, \qquad (1)$$

where L_{ij} stands for labor, K_{ij} physical capital, H_{ij} total hours worked and G_{ij} for any other factors influencing labor productivity by sector and by region. By applying the logarithm operator to the previous equation and by subtracting *Ln* (L_{ij}) and *Ln*(H_{ij}) from both sides of equation (1) we obtain the following expression:

$$Ln(Y_{ij}) - Ln(L_{ij}) - Ln(H_{ij}) = \alpha_o + \alpha_1 Ln(K_{ij}) + (\alpha_2 - 1)LnL_{ij} + (\alpha_3 - 1)LnH_{ij} + \alpha_4 Ln(G_{ij}), \quad (2)$$

where the left-hand side expression is the productivity per hour worked that we want to estimate econometrically. However, due to its regional dimension, this econometric work has to deal with the possible presence of spatial autocorrelation. Since the European regions of our sample belong to a small number of neighboring countries and are located more or less closely to each other it is necessary to take potential spatial autocorrelation into account.

Spatial correlation (Rodríguez-Pose, 1999) means that regional observations are correlated with those of neighboring regions, and more particularly with those of regions within the same country. This implies losing spatial independence across the organized observational units. Spatial correlation may take the form of interaction effects across regions such as, for instance, technological spillovers or factor mobility (Magrini, 2004). Rodríguez Pose (1999) and Rodríguez Pose et al. (2004) propose a method to get rid of it by using for each region nationally-weighted data. Nevertheless, Magrini (2004) claims that this method is somewhat restrictive because it excludes spatial effects across borders. It often prevents from considering possible interactions across spatial units that cannot be completely grasped by the usual definition of region as in the standard NUTS 2 classification. In order to deal with the spatial autocorrelation effects in our sample, without neglecting the importance of the cross-border effects, we propose to apply a revised version of the Rodríoguez Pose's technique. We estimate an econometric specification of equation (2) in which the regional observations are taken as deviation from the national average[4] and we include some *ad-hoc* dummies to take potential cross border effects across countries into account. We consider the potential interactions among the regions of our sample by including dummies specifying (alternatively) the presence of one or multiple borders both as national or international frontiers.

At the same time we explicitly take into account that a group of regions (Baden Württemberg, Catalunya, Lombardia and Rhône-Alpes) share some common characteristics and economic interests that lead them to create an association (Four motors for Europe) in the middle of 90s.

[4] This is what we obtain by considering nationally-normalized observations in the case of a logarithmic function.

As indicated by equation (2) we regress labor productivity on employment, hours worked, physical capital and a few other factors represented by $G_{ij.}$ As theory suggests[5] we should expect that productivity per hour worked is inversely related to employment and the hours worked. As for employment, we use two different measures: employment by region and by sector in absolute value. Due to the incompleteness of data on physical capital stock we used data on gross fixed capital formation (GFCF) by sector and by region. Therefore, the regressor is not the capital stock but the variation in the capital stock over the sample period.

Regarding the other regressors represented by G_{ij} in the equation, we selected three potential relevant determinants. One of them is related to innovation. The endogenous growth theories claim that innovation is one of the main engines of productivity growth. As a proxy for innovation we use an indicator on R&D which is the share of human resources in R&D activity by region with respect to the total regional employment. Finally, we introduce a measure of the potential market of a region by considering the regional density of population.

This measure can be considered as an approximation of the home market effect which may imply the existence of scale effects and more competition on the product and labor markets At the same time, this variable is a complementary measure of the potential spatial interactions among regions: a high density of people is often associated with a high potential rate of labor mobility. For these reasons we expect this variable being positively related to labor productivity.

5.1 Estimation method

For each region of our sample we build a cross section dataset by collecting information on a number of variables for the period 1995-2002. For each year we select data for six sectors: manufacturing, construction, electricity, finance, wholesale and public administration.[6] The first three sectors belong to the industry whereas the remaining three to services. Some adjustments take place due to missing data for a year or a series depending on the availability from the regional statistical offices. The labor productivity indicator is computed for each region, each sector and every year by dividing total gross value added by the number of employment multiplied by the annual average working hours by employee.[7]

[5] If we assume that the regional sector can be represented by a production function with constant returns to scale, then marginal productivity of labor is decreasing.

[6] This classification is proponed by EUROSTAT statistics and in the Appendix we provide a full description of the sectors as well as the correspondence with the NACE 1.1 Classification.

[7] By using employment and average working hours of employees we assume that employees and self employed people work an equivalent number of hours. Moreover, the working hours for the French and Italian regions are

Our empirical exercise consists in estimating equation (2). First we run a few regressions by considering a matrix putting together all our observations, and then we consider estimations by sector. The estimations are run by using regressors, either lagged or simultaneous with respect to the dependent variable. The use of lagged regressors is to avoid a simultaneity bias between labor productivity and some of its contemporaneous factors (Connolly *et alii*., 2004). The econometric technique we apply is the OLS corrected by White method (for controlling heteroskedasticity problems). We also control for various fixed effects[8] and obtain LSDV or WITHIN estimators. We also compute the F-test statistics to determine which kinds of fixed effects (one for each dimension of our matrix) lead to the most statistical significant results. To sum up, we first concentrate on the whole sample including 960 observations for eight years, twenty regions and six sectors and, then, we consider each sector separately in order to identify potential regional sector idiosyncrasies.

5.2 The pooled sample

The results of the estimations of the full sample are presented in Table 6 and the acronyms standing for the regressors are detailed in Box 1. We built a three-dimensional matrix covering the period 1995 to 2002. For each year we consider the six sectors and for each sector the twenty regions. Starting with the basic specification with simultaneous variables, we refine it by introducing lagged regressors, spatial dummies and then the different types of fixed effects. Finally we carried out F-test statistics (Table 6) to evaluate which type of fixed effect improves the most the statistical significance results.

Our results show a high adjusted R-Squared statistics and a high rate of statistical significance of the regressors. Across all estimations, the explanatory variables that seem to be the most significantly different from zero are LDEMPOY (normalized employment) and LDHOURS (normalized hours worked). They come with a negative sign in line with the theory. The same holds for LDPENS (normalized population density) the relative size of the home market is positively associated with normalized labor productivity. When significant, the other two variables (LDEQ_T and LDFBCF_VA) display a negative sign. Regarding the border effect, only the dummy representing the sharing of a single border (D1) is positive and statistically significant. The other dummies standing for the sharing of more than one border

identical due to national legislations while the German Länders and the Spanish regions may have different average working hours.

[8] This is the most common way to proceed in cross-section estimations as discussed in Greene (2000) and Wooldridge (2002).

or an international border is negative when statistically significant. Finally, the dummy (D4) corresponding to the regions belonging to the association Four motors for Europe, which do not share borders, is positive and statistically significant. These results suggest that there exist interactions among regions that are related to labor productivity.

The statistical dependence among regions is confirmed by the regressions we run with fixed effects. The F-test statistics provide a clear indication that regional and country fixed effects are important implying that labor productivity is related to both its regional dimension and the national dimension of regions of a same country. The F-test statistics also indicates that the sector fixed effects matter. Therefore, there exists a high degree of heterogeneity in our pooled sample in any of its dimension (apart from the time dimension). Moreover, the fixed effects by regions turn out to be the most effective specification to capture the largest share of heterogeneity with respect to the pooled specification and the LSDV with fixed effects by sector. When we add the different fixed effects to obtain the LSDV and WITHIN estimators, the previous results are confirmed. However in the case of the two best estimations (LSDV with fixed effects by region and WITHIN with fixed effects by region and sector) the variables LDEQ_T and LDHOURS are no longer statistically significant. As a consequence, employment, fixed capital formation and population density appear to be the most robust determinants of labor productivity within each region.

Box 1. Variables for estimations

LDPROD*hij* *(proxy for* Ln[Yij / (Lij Hij)]*)* = Normalized productivity index in region *j* and sector *i* (with respect to its own national average) computed as the ratio between the total gross value added at constant prices in sector *i* and total employment (in sector *i*) multiplied by the annual average working hours per worker (in industry or services according to which category sector *i* belongs to) for each year h. (Source: EUROSTAT and regional statistical offices).

LDEMPLOY*hij* *(proxy for* LnLij*)*: Normalized employment in sector *i*, in region *j*, (with respect to its own national average) for each year *h*. (Source: EUROSTAT).

LDHOURS*hij* *(proxy for* LnHij*)*: Normalized annual average working hours per worker in industry or services according to which category sector *i* belongs to, for each year *h* by region *j* (with respect to its own national average) (Source: regional statistical offices).

LDEQ_T*hj* *(proxy for* LnGij*)*: Normalized human capital and R&D index computed as the ratio between the number of human resources in science and technology and total employment for each region *j* and year *h* (with respect to its own the national average). (Source: EUROSTAT).

LDGFCF_Va*hij* *(proxy for* LnKij*)*: Normalized gross fixed capital formation as a percentage of value added (at constant prices) – with respect to its own national average- computed as
1) for Catalunya: value of the gross fixed capital formation in industry or services according to which category sector *i* belongs to, by region *j* and in year *h*. (Source: regional statistics),
2) for the other regions: in region *j* value of the gross fixed capital formation in sector *i*, and in year *h*. (Source: EUROSTAT).

LDPDENS*hj* *(proxy for* LnGij*)*: Normalized density of population of region *j* and year *h* (with respect to the national average) computed as the ratio between the total population and the surface of the region *j* (with respect to its own national average) (Source: EUROSTAT).

D1: Dummy with value 1 (0 otherwise) for regions sharing one border with another region.

D2: Dummy with value 1 (0 otherwise) for the regions sharing a border with two other regions of the sample.

D3: Dummy with value 1 (0 otherwise) for the regions sharing a border with three other regions of the sample.

DINT: Dummy with value 1 (0 otherwise) for the regions sharing a border with at least one other foreign region of the sample.

D4M: Dummy with value 1 (0 otherwise) for the regions belonging to the association Four Motors for Europe (Baden-Württemberg, Catalunya, Lombardia and Rhône-Alpes).

Table 6: Econometric estimations

Dependent variable: **Normalized Logarithm productivity per hour worked (LDPROD)**

Method of estimation**: OLS (with White correction)**

Values in brackets: **Standard Error**

	Pooled sample	**Pooled sample**	**Pooled sample**	**Pooled Sample (LSDV)**	**Pooled Sample (LSDV)**	**Pooled Sample (LSDV)**	**Pooled Sample (LSDV)**	**Pooled Sample (WITHIN)**	**Pooled Sample (WITHIN)**
C	-0.09*** (0.03)	-0.23*** (0.07)	-0.75*** (0.095)	-0.74*** (0.10)	-0.64*** (0.10)	-0.55*** (0.08)	-2.02*** (0.11)	-0.43*** (0.09)	-2.02*** (0.11)
LDEMPLOY	-0.06*** (0.013)	-0.15*** (0.03)	-0.28*** (0.033)	-0.28*** (0.03)	-0.32*** (0.03)	-0.25*** (0.03)	-0.60*** (0.03)	-0.29*** (0.03)	-0.61*** (0.03)
LDHOURS	-1.07*** (0.26)	-2.58*** (0.68)	-3.33*** (0.55)	-3.25*** (0.55)	-1.35* (0.80)	-2.47*** (0.56)	-0.61 (0.58)	-0.21 (0.80)	-0.52 (0.60)
LDEQ_T	-0.02*** (0.002)	-0.04*** (0.01)	-0.03*** (0.004)	-0.03*** (0.003)	-0.03*** (0.003)	-0.03*** (0.003)	-0.001 (0.004)	-0.02*** (0.003)	-0.006 (0.004)
LDGFCF_VA	-0.03 (0.02)	-0.06 (0.05)	-0.08* (0.04)	-0.08** (0.04)	-0.10** (0.04)	-0.09** (0.04)	-0.13*** (0.03)	-0.11*** (0.03)	-0.13*** (0.03)
LDPDENS	0.08*** (0.01)	0.18*** (0.18)	0.13*** (0.02)	0.13*** (0.02)	0.008 (0.03)	0.13*** (0.02)	0.40*** (0.04)	0.004 (0.03)	0.40*** (0.03)
D1			0.17*** (0.03)	0.17*** (0.03)	0.04 (0.04)	0.15*** (0.03)		0.004 (0.04)	
D2			-0.05** (0.02)	-0.05** (0.03)	-0.21*** (0.06)	-0.05** (0.02)		-0.17*** (0.06)	
D3			-0.02 (0.03)	-0.02 (0.03)	0.04 (0.04)	-0.02 (0.03)		0.03 (0.03)	
DINT			-0.20*** (0.03)	-0.20*** (0.03)	0.04* (0.02)	-0.19*** (0.03)		0.04 (0.03)	
D4M			0.49*** (0.05)	0.49*** (0.05)	0.57*** (0.05)	0.48*** (0.04)	0.90*** (0.05)	0.55*** (0.04)	0.90*** (0.05)
Adj R-squared	0.20	0.20	0.45	0.45	0.51	0.48	0.72	0.54	0.73
N. Obs.	883	770	770	770	770	770	770	770	770
LAGGED REGRESSORS	NO	YES	YES	YES	YES	YES	YES	YES	YES
F-Test ♦ *(LSDV vs Pooled)*				-0.37 [2.83]	44.01 [4.63]	10.49 [3.34]	52.95 [2.15]	19.63 [2.66]	41.87 [1.96]
F-Test ♦ *(Within vs LSDV with fixed effects by sector)*								46.18 [4.63]	52.24 [2.15]
FIXED EFFECTS	NO	NO	NO	BY YEAR	BY COUNTRY	BY SECTOR	BY REGION	BY SECTOR AND COUNTRY	BY SECTOR AND REGION

Level of significance: ***1 %, ** 5%. *10%, ♦ F-statistics in square brackets at 1%.

5.3 Estimations by sector

Our analysis in the descriptive statistics section showed that labor productivity performance was disparate both across sectors and across regions. We would like here to carry on the analysis by investigating on the sources of this heterogeneity across sectors. To do so we study each sector separately and we run regressions including regional fixed effects. Thus we build for each sector a matrix with two dimensions (time and regions). For each sector, we build a matrix at two dimensions by considering for each variable and year of our sample (1995-2002) a vector made of the sequence of the twenty selected regions. As in the pooled sample, lagged explanatory variables are introduced to control for potential problems of endogeneity. The results are presented in Table 7.

Two main important results deserve to be emphasized. First, the sources of labor productivity are different across sectors. Second, regional fixed are confirmed to be important. Let us comment in detail the results for each regressor. As for employment and hours, they are statistically significant in almost all the sectors of our sample. The relationship between employment (when significant) and productivity per hour worked is negative for all. The increase in employment, usually a consequence of higher employment/population ratio during that period resulted in a decline in labor productivity. The integration of jobless workers and young workers, generally endowed with less human capital might account for this result. Conversely, the annual average working hours produce a positive effect on labor productivity in sectors like electricity or public administration while a negative one in construction or manufacturing.

Table 7 : Econometric estimations

Dependent variable: **Normalized Logarithm productivity per hour worked (LDPROD)**

Method of estimation**: OLS (with White correction)**

Values in brackets: **Standard Error**

	Manufacturing (LSDV)	**Construction** (LSDV)	**Electricity** (LSDV)	**Finance** (LSDV)	**Wholesale** (LSDV)	**Public Administration** (LSDV)
C	-1.20*** (0.26)	-2.25*** (0.20)	-3.72*** (0.42)	-0.72*** (0.22)	-2.35*** (0.17)	-0.37 (0.43)
LDEMPLOY	-0.31*** (0.09)	-0.79*** (0.07)	-1.01*** (0.12)	-0.23*** (0.07)	-0.70*** (0.05)	-0.10 (0.14)
LDHOURS	-4.30*** (0.54)	-12.0*** (1.44)	17.91** (5.44)	0.07 (1.47)	-0.06 (0.71)	6.22*** (1.56)
LDEQ_T	-0.007** (0.003)	-0.005 (0.005)	-0.008 (0.01)	-0.0009 (0.004)	-0.0004 (0.001)	-0.007*** (0.002)
LDGFCF_VA	-0.13*** (0.02)	-0.21*** (0.06)	-0.19*** (0.02)	-0.69*** (0.16)	-0.202*** (0.56)	-0.02 (0.02)
LDPDENS	0.47*** (0.04)	-0.20*** (0.05)	1.17*** (0.12)	0.004 (0.06)	0.26*** (0.04)	0.46*** (0.05)
D3					0.39*** (0.02)	
D4M	0.54*** (0.11)	0.52*** (0.07)	1.64*** (0.20)	0.47*** (0.07)	0.69*** (0.039	1.33*** (0.09)
Adj R-squared	0.86	0.91	0.81	0.86	0.97	0.99
N. Obs.	140	128	119	128	128	130
LAGGED REGRESSORS	YES	YES	YES	YES	YES	YES
FIXED EFFECTS	BY REGION	BY REGION	BY REGION	BY REGION	BY REGION	BY REGION

Level of significance: ***1 %, ** 5%. *10%

This difference can be associated with the nature of the sectors themselves: electricity and public administration are sectors with little or no competition and, hence, the amount of working hours does not display decreasing returns in labor productivity. For the finance and wholesale sectors, annual average working hours is not statistically significant. The R&D determinant (LDEQ_T) is not always statistically significant in our estimations. Moreover, in the two sectors in which it is really significant (manufacturing and public administration) the size of the coefficient is almost zero and, in any case, it is smaller than in the pooled sample.

The gross fixed capital formation (GFCF) variable turns out to be negative and statistically significant for all sectors except public administration. In the absence of capital stock data it is difficult to interpret this result associated with the change in the capital stock. During the period covered in our study, investment in physical capital has been low in most of

the regions and may have been insufficient to replace depreciated capital (see O'Mahony and van Ark, 2003).

The population density regressor proxying the size of the regional market turns out to be statistically significant for all sectors but finance. The coefficient is positive for manufacturing, electricity, wholesale and public administration. Such a density implies that large markets induce more competition and better matching between the supply and demand for workers providing room for productivity improvement. In the construction sector, the coefficient is negative suggesting perhaps that there are no longer potential scale effects in this sector.

As for the border effects, the D3 dummy representing regions sharing a border with three other regions of the sample is positive and significant for the wholesale sector. The markets for local suppliers generally go beyond the sole regional market and extend to the direct regional neighbors. The D4 dummy remains, as in the pooled sample estimations, positive and statistically significant in all regions.

Finally, the regional fixed effects improve substantially the explanatory power of the estimations. This result confirms the importance of the regional dimension in accounting for the sources of labor productivity.

6. Conclusions

In country-level analyses it is generally found that productivity performance is heterogeneous across European economies. The motivation of this work was to examine labor productivity at a lower spatial scale – regional level – and investigate about the sources of this heterogeneity. The descriptive statistics analysis points out the differences in productivity levels across sectors, the national influence on the sources of labor productivity in manufacturing and regional diversity in sectors of services. The econometric analysis confirms the existence of heterogeneity in productivity determinants but provides in addition statistical evidence on the sources of this heterogeneity. A first source is found to come from the specificity associated with a particular sector. The heterogeneity across sectors confirms the results of the literature at national level. A second source seems to be related to regional idiosyncrasies. Our finding suggests that diversity is present at sub-national level and dominates national determinants in accounting for labor productivity sources.

In both the pooled sample and the estimations by sectors it has been found that the spatial dimension matters. Our results from the multiplicative relationship we assumed among several potential determinants of labor productivity emphasize on the one hand the effect of national and regional characteristics on this relationship and the interactions across regions on the other hand.

As an objective of future research it would be interesting to extend this analysis to other countries of the European Union, investigate at more disaggregated sectors and at local level (NUTS 3). Data availability will probably be the biggest setback of this research agenda.

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7. Appendix

7.1 Classification

Our classification follows that proposed by EUROSTAT that bases on standard classification NACE branches REV 1.1. Here you are the references:

- Industry : from C to F, included (including Construction)
- Services: from G to P, included (excluding extra territorial organization and bodies)

- Manufacturing: D

- Construction: F

- Electricity, gas and water supply (short name: electricity): E

- Wholesale and retail trade, repair of motor vehicles, hotels/restaurants, transport, storage, communication (short name: wholesale): from G to I, included,

- Financial intermediation, real estates renting and business activity (short name: finance): from J to K, included.

- Public Administration and defense, compulsory social security, education, health and social work, other community, social and personal service activities, private household with employed persons (short name: Public administration): from L to P, included.

7. 2 Tables

Table 1.A: Sector shares in total value added in 1977 (%)
(Source: CRENOS database – Calculus: authors)

	Agriculture	Industry	Services
France	**5.0**	**39.4**	**55.6**
Languedoc-Roussillon	*10.9*	*30.1*	*59.0*
Midi-Pyrénées	*7.8*	*33.8*	*58.4*
Rhône-Alpes	*3.3*	*46.0*	*50.7*
Lorraine	*3.9*	*45.8*	*50.3*
Alsace	*4.2*	*45.7*	*50.1*
Bretagne	*10.2*	*32.3*	*57.4*
Germany	**2.7**	**44.4**	**52.9**
Bayern	*4.0*	*42.5*	*53.5*
Baden-Württemberg	*2.4*	*50.8*	*46.8*
Niedersachsen	*5.4*	*41.8*	*52.8*
Rheinland-Pfalz	*3.6*	*46.9*	*49.5*
Schleswig-Holstein	*6.5*	*36.4*	*57.1*
Italy	**7.9**	**39.9**	**52.2**
Lombardia	*3.5*	*52.0*	*44.5*
Piemonte	*4.7*	*51.7*	*43.6*
Veneto	*9.7*	*41.8*	*48.5*
Emilia Romagna	*12.1*	*41.3*	*46.6*
Toscana	*5.1*	*42.0*	*52.9*
Marche	*10.0*	*38.1*	*51.9*
Spain	**10.3**	**29.9**	**59.8**
Catalunya	*5.1*	*38.5*	*56.4*
País Vasco	*4.5*	*45.0*	*50.5*
Comunidad Valenciana	*9.1*	*30.6*	*60.3*

Table 2.A: Sector shares in total value added in 2002 (%)
(Source: EUROSTAT and IDESCAT – Calculus: authors)

	Agriculture	Industry (excl. construction)	Construction	Services
France	**2.5**	**23.5**	**4.7**	**69.3**
Languedoc-Roussillon	*4.4*	*12.9*	*5.7*	*76.9*
Midi-Pyrénées	*3.8*	*19.2*	*6.1*	*70.9*
Rhône-Alpes	*1.5*	*25.5*	*5.6*	*67.4*
Lorraine	*2.7*	*21.5*	*5.5*	*70.3*
Alsace	*2.3*	*23.5*	*5.5*	*68.7*
Bretagne	*5.2*	*15.1*	*7.2*	*72.5*
Germany	**1.1**	**27.6**	**4.3**	**67.1**
Bayern	*1.2*	*25.9*	*4.5*	*68.4*
Baden-Württemberg	*0.8*	*32.0*	*4.8*	*62.4*
Niedersachsen	*2.0*	*25.9*	*4.9*	*67.2*
Rheinland-Pfalz	*1.6*	*27.4*	*4.7*	*66.3*
Schleswig-Holstein	*2.1*	*17.6*	*4.3*	*76.0*
Italy	**2.5**	**25.8**	**4.7**	**67.0**
Lombardia	*1.5*	*29.0*	*4.0*	*65.5*
Piemonte	*1.9*	*27.1*	*5.0*	*65.9*
Veneto	*2.8*	*27.7*	*5.7*	*63.9*
Emilia Romagna	*3.3*	*27.5*	*5.9*	*63.4*
Toscana	*1.9*	*23.5*	*4.9*	*69.7*
Marche	*2.4*	*26.6*	*5.5*	*65.5*
Spain	**3.4**	**18.0**	**9.6**	**65.0**
Catalunya	*1.5*	*25.5*	*8.0*	*65.0*
País Vasco	*1.8*	*30.1*	*8.1*	*60.0*
Comunidad Valenciana	*3.0*	*21.8*	*9.9*	*65.3*

Table 3.A: Real GDP annual growth (%)
(Source: Eurostat)

	2000	2001	2002	2003		2000	2001	2002	2003
EU (15)	**3.6**	**1.7**	**1**	**…**					
France	**4.1**	**2.1**	**1.2**	**0.8**	**Italy**	**3.0**	**1.8**	**0.4**	**0.3**
Languedoc-Roussillon	*3.5*	*3.8*	*1.7*	*3.0*	*Lombardia*	*2.5*	*1.9*	*0.2*	*-0.6*
Midi-Pyrénées	*3.1*	*4.9*	*1.4*	*1.1*	*Piemonte*	*2.8*	*0.8*	*-0.5*	*-0.5*
Rhône-Alpes	*4.3*	*2.4*	*0.2*	*0.9*	*Veneto*	*3.6*	*0.6*	*-0.7*	*0.4*
Lorraine	*3.7*	*1.6*	*0.4*	*0.3*	*Emilia Romagna*	*4.4*	*1.3*	*0.7*	*0.0*
Alsace	*3.6*	*0.8*	*0.3*	*0.1*	*Toscana*	*3.2*	*1.7*	*-0.2*	*0.0*
Bretagne	*5.4*	*1.9*	*0.7*	*1.3*	*Marche*	*2.6*	*1.7*	*-0.3*	*0.8*
Germany	**2.9**	**0.8**	**0.1**	**-0.1**	**Spain**	**5.0**	**3.5**	**2.7**	**3.0**
Bayern	*5.0*	*1.0*	*1.2*	*0.2*	*Catalunya*	*3.4*	*3.5*	*2.3*	*2.8*
Baden-Württemberg	*3.1*	*2.5*	*-0.9*	*-0.1*	*País Vasco*	*..*	*3.2*	*1.9*	*2.5*
Niedersachsen	*2.2*	*-0.8*	*-0.5*	*0.4*	*Comunidad Valenciana*	*..*	*4.3*	*2.6*	*2.6*
Rheinland-Pfalz	*2.7*	*-1.6*	*1.3*	0.2					
Schleswig-Holstein	*2.4*	*1.1*	*0.8*	*-0.1*					

Table 4.A: Employment rate growth % (total annual employment/annual population 15-64)
(Source: OECD, Calculus: authors)

	1980-1990	1990-1995	1995-2003
France	-5.4	-2.0	6.0
Germany		-1.6	-0.2
Italy	-0.9	-6.6	9.8
Spain	-1.6	-8.8	27.0
UK	2.7	-5.3	4.2
USA	9.2	-1.2	-1.2