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The role of new technologies in the economic growth of Andalucia[#]

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RESUMEN

Este artículo explora la contribución de las Tecnologías de la Información y la Comunicación (TIC) al crecimiento económico de Andalucía durante 1995-2004. Nuestros resultados indican que la contribución de las TIC al crecimiento del VAB es modesta. No obstante, la contribución de éstas al crecimiento y al empleo en los sectores intensivos en TIC ha experimentado un considerable crecimiento. Aunque nuestro análisis detecta que los sectores intensivos en nuevas tecnologías muestran un alto nivel de productividad, nuestra principal conclusión es que las ventajas que se podrían derivar del uso de TIC todavía no son claramente observables en la dinámica económica de Andalucía, al menos de un modo similar a como ocurre en las economías más desarrolladas.

Palabras clave: Tecnologías de la Información y la Comunicación, crecimiento económico, productividad, economía regional.

ABSTRACT

This paper explores the contribution of Information and Communication Technologies (ICT) on economic growth and labor productivity growth of Andalucía during 1995-2004. We find that the contribution of ICT assets to total market GVA growth is quantitatively modest. Anyway the contribution to GVA growth and employment growth within the intensive ICT sectors has experienced a considerable increase in Andalucía. Although our analysis detects that intensive ICT sectors exhibit a high productivity level with respect to that of the non intensive ones, our main conclusion is that the advantages that might emerge from the use of ICT are nor yet observable in the economic dynamics of Andalucía, at least in a similar manner to that of the most developed.

Keywords: Information and Communication Technologies, productivity growth, regional growth.
JEL classification: E13, O30, O40, O47.

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1 Introduction

In March 2000, European leaders committed the European Union to become by 2010 "the most dynamic and competitive knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion, and respect for the environment" (Kok, 2004). To achieve this goal, they adopted what was called the *Lisbon Strategy*. In spite of the disappointing performance of European Union and its Member States on pursuing the Lisbon objectives, several recent reports and Commission documents have reasserted the importance of the Lisbon strategy, emphasizing the role of the information society technologies in creating growth and competitiveness in Europe (see for instance Price Waterhouse-Coopers, 2004).

In addition to the review and re-launching of the Lisbon Agenda in 2004, the European Commission adopted the initiative "i2010: European Information Society 2010" in July 2005. It stresses the importance of the Information Society take-up in the EU economy as a major driving force for economic and productivity growth. In order to achieve the best results, every Member State must commit to the objectives of *i2010*, putting into action coherent Information and Communication Technologies (henceforth ICT) related policies (see European Commission, 2004a and b).

However, the situation of the Member States and the European regions with respect to the Information Society take-up vary widely. Social cohesion, one of Lisbon objectives along with growth and employment, might be threatened by such regional imbalances. In order to effectively build policies addressing the needs and challenges posed by an inclusive Information Society, it is necessary to acquire a throughout knowledge of the current economic and social situation at regional level. Developing tools and gathering relevant data on the field of regional studies and ICT, as well as identifying good practices, is thus a requirement to support any political decision (see European Commission, 2005).

Examples of this exercise have been mainly carried out for the US economy (see among others Colecchia and Schreyer, 2001; and Stiroh, 2002). These studies have aimed at ICT as serious contributors to the upsurge of US productivity from 1995 on. However, as regards Europe, indexes measuring the penetration of ICT show that European Union countries are well below the US (see Daveri, 2000; and Timmer, Ypma and van Ark, 2003, 2005).

This paper explores the contribution of ICT on economic growth and labor productivity growth of Andalucía over the period 1995-2004. To the best of our knowledge, no previous references have dealt with this issue at Spanish or European regional level. ICT is considered as a capital input disaggregated into three items: communication, hardware and software. For that purpose, we exploit series estimated by Mas, Pérez and Uriel (2003 and 2005a) and Mas and Quesada (2005a). Although these series are estimated at Spanish level, we have defined a criterion that allows for a regional disaggregation. Due to the lack of data, we will mainly focus on the use of ICT rather than on the production of this type of capital assets (Mas and Quesada, 2005b). Non ICT capital inputs are also decomposed into three items: buildings and constructions, machinery and other equipments, and transport equipments.

Using these assets and those of labor inputs, we will make a growth accounting exercise in order to decompose their contributions to economic growth and labor productivity growth. It should be noticed here that the methodology we have followed is consistent with recent recommendations by the OECD (2001a and b), regarding this kind of studies. Results are then compared with those obtained at Spanish national level by Mas and Quesada (2005, 2006).

We use a period of observations from 1995 to 2004, from which we have a consistent data set on regional accounts disaggregated into 25 market economy sectors (agriculture, cattle farming and fishing sector included). In turn, this period has been also split from 1995 to 2000 and from 2000 to 2004. Although the period only collects observations from the longest expansion in the Spanish business cycles history, this decade is a crucial one regarding the implementation of ICT within the EU area and the US. In an attempt to measure the evolution of labor force qualification, an index of human capital has been also estimated.

We borrow from Mas and Quesada (2006) their typology that classifies sectors according to the intensity in the ICT use. Eight sectors are identified as specially ICT intensive. Our main results are as follows. *First*, Spain appears as one of the least intensive ICT users within the EU-15 area (Timmer, Ypma and van Ark, 2003; and Daveri, 2000). In turn, Andalucía is less ICT intensive than the national level, although a converging process is acknowledged (IEA, 2002-2004). *Second*, the contribution of ICT assets to total market GVA growth is quantitatively modest but higher than their cost shares. *Third*, although the share in gross value added (GVA) and employment generation has remained apparently constant across 1995-2004, the contribution to GVA growth and employment growth within the intensive ICT sectors has experienced a considerable increase in Andalucía. *Fourth*, growth rates and levels of labor productivity are remarkably higher in the intensive ICT sectors. *Fifth*, we detect that ICT assets do already have an important contribution in both GVA growth and productivity growth in a few intensive ICT service sectors. *Finally*, our main conclusion is that the advantages that might be reaped from the use of ICT are not yet intense enough in the economic dynamics of Andalucía. This is not a surprising result when compared with those of Mas and Quesada (2006) and Hernando and Núñez (2002) for Spain.

The structure of the paper is as follows. We first present a methodology based on a standard growth accounting equations. This framework is applied in section 3 to decomposing the growth rates of GVA and productivity to the EU-15 countries and the US economy, using the Groningen database (Timmer, Ypma and van Ark, 2003). Sections 4 and 5 give details on the data set we have used for Andalucía. The growth accounting exercise for Andalucía is then presented in section 6. Section 7 concludes.

2 Framework of analysis

This section briefly describes the standard growth accounting decomposition. All asset types, both ICT and non ICT, are seen in terms of inputs. The production of good Q_{st} in sector s at time t is given by the following homogeneous of degree one technology:

$$Q_{st} = TFP_{st} \left(HL_{st} \cdot KH_{st}\right)^{\alpha_{ls}} \left(\prod_{i=1}^{6} K\left(i\right)_{st}^{\alpha_{is}} \right), \qquad (1)$$

where i = (1) constructions and other buildings, (2) machinery and other equipments, (3) transport equipments, (4) communication equipments, (5) hardware and (6) software, and α_{ls} and α_{is} are, respectively, the share of labor and capital assets over total output. Assets $K\left(i\right)$ labeled as $i = 1, 2, 3$ will be referred as Non ICT capital, and assets labeled as $i = 4, 5, 6$ will be referred as ICT capital inputs. Appendix B discusses how this "primal approach" is converted into the "dual approach", which allows the use of an exogenous rate of return within a non-parametric environment.

TFP_{st} is the total factor productivity. Notice that a change in TFP_{st} impulses or contracts the amount of good Q_{st} produced without altering the combination of inputs employed by the typical firm of sector s at time t. Hence, these changes in TFP_{st} are usually associated to efficiency in the use of productive factors. HL_{st} is total hours worked in sector s at time t, and KH_{st} is a labor qualification index that increases when sector s accumulates skilled in relation to unskilled labor force. Appendix A gives a detailed explanation on how index KH_{st} has been constructed.

Simple algebra goes to the standard growth accounting equation

$$\gamma_s^Q = \Delta TFP_{st} + \alpha_{ls}\left(\gamma_{st}^{HL} + \gamma_s^{KH}\right) + \sum_{i=1}^{6} \alpha_{is}\gamma_s^{K(i)}, \tag{2}$$

where γ_{st}^{χ} is the growth rate of χ in sector s, with $\chi = Q, HL, KH, K(i)$. Therefore, as long as we assume constant return to scale (homogeneity of degree one), output growth can be written as a linear combination of inputs growth rates. Consequently, TFP is estimated as a residual.

Expression (2) can be also expressed as the growth rate of labour productivity:

$$\gamma_s^Q - \gamma_s^{HL} = \Delta TFP_s + \alpha_{ls}\gamma_s^{KH} + \sum_{i=1}^{6} \alpha_{is}(\gamma_s^{K(i)} - \gamma_s^{HL}) \tag{3}$$

In sector s, output per unit of labor ($\gamma_s^Q - \gamma_s^{HL}$) grows because ratios of capital per worker increase and/or the human capital index improves. Moreover, gains (or losses) in efficiency, as measured by ΔTFP_s, has a direct expansion (or contraction) on labor productivity.

We now apply this simple methodology to understand the sources of output growth in an international context and in Andalucía.

3 A look at international evidence

Table 1.a reports calculations of labor productivity growth in hours worked ($\Delta(Y/L)$), total factor productivity growth (ΔTFP), and the ratio of ICT capital over the sum of all asset types of capital (ICT/K), for the EU-15 countries and the US, over four subperiods from 1980 to 2004, as measured by Timmer, Ypma and van Ark (2003). Countries in this table are ordered according to the ICT-capital deepening (ICT/K) during the last period 2000-2004. Some useful statistics are calculated in the lowest rows of the table.

The ratio of capital deepening ICT/K has had a continuous growth from 1980 to 2004, indicating that the proportion of this capital stock accumulated by these economies is on average four times in 2004 than that in 1980 (as measured by the average and the median). According to this criterion, five countries can be considered as intensive ICT users: Belgium, Finland, United Kingdom, Sweden and the United States. The ratio corresponding to the US economy in 2000-2004 is well above the mean and the median. France and Spain appear as ICT non-intensive users (see also Daveri, 2000; and Colecchia and Schreyer, 2002). Interestingly, the heterogeneity in the ICT-use has increased across the total period, as shown by the standard deviation, from 0.0055 to 0.0136.

On the other hand, table 1.a also shows a labor productivity slowdown during the last period, 2000-2004, for the ICT non intensive users. However, for the intensive ones, there is an upwards trend in productivity beginning in 1990. A similar pattern is also worth noticing for the dynamics of efficiency, as captured by the TFP growth.

The lowest panel of this table calculates the correlation coefficients between ICT deepening and productivity, between ICT deepening and TFP, and between Productivity and TFP, for the four subperiods under consideration. Correlation of ICT deepening with the two other variables is rather low and negative. However, for the period 2000-2004 such correlation becomes positive. Relative to its EU partners, Spain exhibits a poor performance in productivity growth and a negative TFP growth, during 2000-2004.

Finally, table 1.b computes a simple decomposition of the GDP growth and the productivity growth for the last period 2000-2004, using the same data base. Output is assumed to be produced by three inputs, labor (in hours worked), ICT capital and non-ICT capital. The first panel of the table collects the growth rates of both GDP and the three inputs. ICT growth rates contrast sharply with those of non-ICT capital. Employment negatively grows in most of the countries. The second panel of table 1.b presents the cost shares. Labor cost share is about 2/3 of total costs, as is usual in this type of analysis. The use of ICT input represent about a 3% of total costs. Using these shares for weighting the growth rates, the following two panels present a decomposition analysis for the GDP growth and productivity growth. TFP growth is calculated as a residual, therefore a part of growth factor unexplained by the use of production inputs.

ICT capital appears as the main GDP growth contributor in the ICT intensive group. Outside of this group, ICT is also the most relevant factor for

German GDP growth. Ireland and Greece are two important particular cases, where GDP growth has been mainly based on non-ICT capital inputs, and TFP growth rates are even higher than those of the ICT intensive group. The contribution of ICT to labor productivity growth always is mores important than that of non-ICT in the ICT intensive group. In the rest of countries, productivity growth is mainly due to the non-ICT input. Hence, ICT account for an important fraction of output growth and productivity growth for the intensive users. In the EU-15 as a whole, non-ICT capital favor output growth and productivity growth more than ICT input. Therefore, comparing all these contributions with those of the US (see the first and the last row of table 1.b), the European growth pattern is totally different to that of the US economy.

Spain is a low intensive ICT user. ICT is the least source to GDP growth while employment is the main one. The effect of non-ICT on productivity is higher than that of ICT ($0.41\% > 0.19\%$), but the negative sign in TFP growth almost absorbs these increases (i.e. $0.41 + 0.19 - 0.53 = 0.07$), implying that productivity poorly grows by 0.07%. The use of ICT in Andalucía are well below that of Spain, as documented by the official survey ETICCE (IEA 2002-2004), although it is worth mentioning that there are some signs of convergence up to the Spanish national levels.[1]

[**Tables 1a and 1b about here**]

4 Data and methodology

On the basis of the framework developed in the section 2, a growth accounting exercise requires the use of growth rates corresponding to output and production factors. This paper follows the main branch of recent literature of growth accounting and the recommendations of OECD (2001a and b; Mas and Quesada, 2005), which uses the concept of *capital services*, instead of *gross* or *net* capital stocks.

The idea is to capture the productive services embedded into the stock of capital. The procedure to obtain series of capital services with the aim of

[1]ETTICE means *Encuesta de uso de las Tecnologías de la Información y de la Comunicación y del Comercio Electrónico en las empresas*, and it surveys the use of ICT by firms and is elaborated by Instituto Nacional the Estadística (INE) according to the methodology proposed by Eurostat.

being used in growth accounting exercises can be summarized in three stages[2]. First, we need to have the capital stock expressed in standard efficiency units (we shall refer to this type of capital stock as productive capital); the OECD (2001b) describes this process, which consists of converting the gross stock of the assets to constant prices and then applying age-efficiency coefficients to the different vintages. Second, we have to aggregate these separate stocks to obtain overall measures of capital services for different kinds of activities or for the economy as a whole; this is done using the user costs of capital as weights. The user costs of capital can be seen as the prices of capital services and are assumed to measure the relative marginal productivity of different kinds of assets. And third, growth rates of capital services series have been computed using Törnqvist indexes. It allows to explicitly consider changes in the structure of capital stock as a result of changes in the relative prices of assets[3].

As regards data, the main drawback we have faced on this paper is that there are not available series for capital assets disaggregated as ICT and non-ICT for Andalucía. We have tried to overcome this problem by combining the works by Mas, Pérez-García and Uriel (2003) and Mas and Quesada (2005 a and b).

Given these data sets, we have used the following criterion to identify the series for private capital at regional level. First, we use the work of Mas and Quesada (2005a), who provide an estimation of eighteen productive capital assets for Spain for 1964-2002. These series are also disaggregated into 25 market economy sectors. Non-ICT series have been grouped into three assets: buildings and constructions, machinery and other equipments, and transport equipments. On the other hand, as standard in this type of analysis, ICT series have been aggregated into three assets: communication equipments, hardware and software. For each sector and for each asset, hence for $25 \times 6 = 150$ series, we then have identified *à* la Box-Jenkins its ARIMA structure and projected its value over the period 2003-2004.

Second, we have borrowed from Mas, Pérez-García and Uriel (2003) their estimation of series for private and public capital for the period 1964-1998. Private capital is also disaggregated by 25 market economy sectors (agricul-

[2]Appendix B contains further details on how series of capital services in Andalucía have been elaborated.

[3]These variations in the relative prices of assets are relevant in the case of ICT capital assets, specially in the case of hardware equipments where a huge reduction is observed across 1995-2004.

ture and fishing sectors included) at regional level. For each sector and for Andalucía and Spain, hence for $25 \times 2 = 50$ series, we have identified its ARIMA structure and projected its value over 1999-2004. We have then calculated the 25 ratios of regional capital stock relative to the national capital stock. These ratios are reasonably stable across the total period 1964-1998 and specially in 1990-1998 in all sectors. As an ARIMA projection, we have checked that these ratios do no suffer from discontinuous jumps for 1999-2004. Within each sector, we assume that these time varying ratios can been used to identify the series of capital at the regional level, that is, series of capital for the national aggregate have been premultiplied by these ratios.

Series for Gross Value Added (GVA) for these 25 sectors come from the Regional Accounting of *Instituto Nacional de Estadística* (INE) for the period 1995-2004. The required level of sectorial disaggregation for the last two years are not available in some cases. Therefore, we have extrapolated the last available observation of the incomplete series by means of the aggregate growth rates of the set of sectors that includes the sectorial breakdown we need. Since residential capital does not belong to the concept of productive capital, we do not considered into the values of GVA (and, consequently, nor into analogous measures of remuneration of employees or human capital), those referred to rents from dwellings, incomes from private households with employed persons and real state businesses.

5 Employment and education

Table 2 presents the distribution of employment by educational levels for Spain and Andalucía during 1987-2004. Education is classified into five levels: illiteracy, primary education, secondary education, professional training and tertiary (university) education. The percentage of illiteracy in Andalucía doubles the national one across the entire period. In 2004, this proportion is 6% for Andalucía and 3% for Spain. A 6% can be found in the mid of the nineties for Spain, implying that, with respect to Spain, Andalucia is about one decade overdue in the reduction of illiteracy. Other interesting point is that the major change in the Andalusian labor force has been undertaken in the reduction of the lowest levels of education, illiterate plus primary education, about 33 percentage points. Regarding the three upper levels, the regional evolution is quite similar to that of Spain but about a 2 percentage points smaller. As a *concluding remark*, Andalucía has undergone an important human capital accumulation although this process is about one decade delayed with respect to the national case.

[**Table 2 here**]

We now construct an index of human capital accumulation that explicitly takes into account these different levels of education. Appendix A gives a detailed technical explanation on how this index has been constructed. We use the estimation of structural wages surveyed in 2002 (our central year) by INE, as a proxy for productivity. Unfortunately, disaggregation into the 25 aforementioned sectors has not been possible due to the pitfall of sampling errors. Data are only available in a disaggregation over 10 groups of sectors, as specified in Table 3. The main problem of this disaggregation is that we are dealing with heterogeneous sectors, according to ICT deepening, and this may induce a fixed effect bias. Table 3 specifies how market sectors have been mapped into these ten groups. The criterion for classifying the different sectors according to their ICT intensity, that is, the ratio of ICT capital over the total stock of capital, is fully borrowed from Mas and Quesada (2005b and 2006). As we can observe from table 3, eight sectors are identified as intensive users, three of them belonging to energy and industry, and the remaining ones to market services.

In table 3, some ICT intensive sectors, like "Energy and water", "Pulp, paper, printing & publishing" and "Electric, electronic & optic equipment", appear grouped together with non-ICT intensive sectors. As the ICT intensity may require a higher demand for qualified workers and a substitution of unskilled ones, this measure of human capital accumulation can be seriously distorted in these sectors. Notice however that intensive ICT users within the service sector are grouped with a higher homogeneity. Another possible source of biasedness can arise from the overqualification problem: skilled workers can be working in occupations where it is only required a lesser level of qualification.

Notwithstanding these problems, the three remaining columns of table 3 present the estimated index for 2000 and 2004 (base year is 1995 and the index has been normalized by 100). The highest increases are probably concentrated into the service sectors (groups 6, 7, 8 and 10). This may indicate that the effect of the fixed effect bias is moderate in these sectors. Not surprisingly, "Transport & communications", "Financial intermediation" and "Business services" present the highest increases in labor force qualification.

[**Table 3 here**]

6 Growth accounting exercise

6.1 A look at some Andalusian growth facts

Andalucía is one of the poorest regions of Spain in terms of income per capita. Since the beginning of regional statistics series in our country until present, Andalusian GDP per capita has never exceeded the 80% of Spanish average value. This fact must not hide the existence of several phases in the comparison of Andalusian income per capita to that of Spain as a whole. Table 4 shows the values of this variable during the period 1980 and 2005.

[**Table 4 here**]

It is worth noticing that relative position of Andalucía over the entire period is highly stable, although a certain convergence in income per capita is detected from 2000. From late seventies onward, Spain experienced a sudden stop in regional convergence (see, for instance, López-Bazo *et al.* (1999)). Andalucía is a clear paradigm on this issue.

This evidence has encouraged a further investigation into the nature and characteristics of Andalusian growth pattern. Rodríguez, Martínez and Romero (2005) give some insights in the context of regional dynamics of Spain over the period 1980-2002. Particularly, we strongly reject the hypothesis of unconditional convergence among Spanish regions. By contrary, they are found to be converging to their own steady states rather than to a common steady state. With regard to this, we consistently find evidence of persistence in inequalities across the Spanish regions, showing that income differences have hardly narrowed down. Thus initial conditions appear to be important in determining the relative position of regions in terms of income per capita.

The results by Rodríguez *et al* (2005) are consistent with the evidence of a maximum level for the relative income per capita of Andalucía. Table 4 showed that Andalusian income per capita has been bouncing against the 80 per cent ceiling of Spanish income per capita. This can be an indication that structural factors such as investment and saving rates, human capital stock, sectorial structure, level of technology and others, are the main reasons behind the relative Andalusian underdevelopment. Consequently, issues such as ICT capital accumulation and the role of new technologies in the production processes (the focus of this paper) become very relevant to understand and modify the growth pattern of Andalucía.

Table 5 presents some descriptive statistics for Andalucía and compare them with those of Spain: the GVA growth rate, the total employment in labor growth rate (in hours worked), and the resulting productivity growth. The regional business cycle is parallel to the national one. The expansion is higher in the first period 1995-2000, and moderates during 2000-2004. Andalusian GVA growth rate is always higher than the Spanish one. Employment creation is also higher during the first subperiod and superior to the GVA growth rate. As a result, labor productivity growth is negative during 1995-2000 and positive during 2000-2004. On average, labor productivity is positive but nearly zero across the decade. Therefore, as well as in Spain, the upsurge in productivity takes place in 2000-2004 due to a moderate employment creation relative to output growth. A detailed description of the properties of the Andalusian business cycle can be consulted at Pérez, Rodríguez and Usabiaga (2003) and Leal, Pérez and Rodríguez (2004).

[**Table 5 here**]

6.2 Aggregate impact

As was shown in section 2, the growth accounting exercises basically consist of relating growth rates of output to those of production factors. A primary approximation is to observe the behavior of the relevant growth rates over the period under consideration. Table 6 presents growth rates for productive capital (considering six types of assets), hours worked and human capital in Andalucia over 1995-2004, within two time interval.

[**Table 6 here**]

The magnitude of growth rates of non-ICT assets was in line with those corresponding to regional output. While regional market GVA grew at an average annual rate of 3.53%, the non-ICT capital inputs increased their stocks at growth rates within a range from 4.51 of machinery to 5.79 of constructions per year. The dynamics of non-ICT capital was the opposite to that of output. Indeed, real GVA showed a deceleration when both subperiods are compared, while the three types of capital assets had higher growth rates in the second part of the studied period.

Hours worked had, however, a parallel behavior to output. With an annual growth rate of employment of 4.82 percent over 1995-2000, the increase during 2000-2004 was of only 1.59 per year. This is again an indication of the high dependence of Andalusian economic growth on the behavior of employment, with a significant correlation between output and hours worked growth.

Things were different in the case of ICT assets. The growth rates of the three ICT inputs capital were notably higher than those corresponding to output and non-ICT capital, especially in the cases of hardware and software. The dynamics of non-ICT assets was not homogeneous. While Communications and Software held their growth rates (the first with a slightly decreasing trend, the second with the opposite behavior), hardware showed a declining evolution: growth rate was of 23.48% in 1995-2000 and of 18.59% in 2000-2004.

In growth accounting exercises, this dynamics of production factors has to be weighted on the basis of cost shares they represent. The expressions we refer are those of Appendix B, in particular the $\alpha' s$ calculated from (B3) and (B4), in which the share of cost of each production factor over total cost is measured. As we have already mentioned, this approach can be seen as the dual approximation to the participation of factors over output. Table 6 also includes the values for these cost shares.

Labor input was the most important production factor in terms of total cost, accounting for three quarters of total costs[4]. Considering the case of traditional non-ICT capital inputs, we find that the ranking was headed by machinery (with 0.085), followed by constructions (0.068) and transport rquipments (0.042). Their values over time were stable, although a slightly decrease is detected in constructions. ICT capital assets had small cost shares over 1995-2004. Their alphas were within the range between 0.016 and 0.026.

One of the reasons behind this fact is related to the small growth rates (even negative in some cases and periods) experienced by prices of ICT assets. This point could be strong enough to compensate the intense growth rates of ICT productive capital stocks (first panel of table 6) and to stabilize their cost shares. Hardware even decreases this value when period 1995-2000 is compared to 2000-2004. Software assets showed the opposite pattern: its

[4]In fact, its values are slightly higher than those corresponding to the traditional figures given by National Accounts (2/3). This is due to the metodology we have used to compute the capital services and the reassigning of mixed incomes.

cost share increased from 0.012 to 0.020.

Expressions (2) and (3) of section 2 are now exploited to calculate the decomposition of growth rates for sectorial output and productivity. These results are also collected in table 6. A number of facts are worthy of noting. First, labor contribution appears as the most relevant engine of aggregate economic growth of Andalucía in both subperiods. Hours worked accounted for over the 72% of the real GVA growth rate during the period 1995-2004. This pattern does not hold by subperiods, however. Labor contributed with 3.61 percentage points to the GVA growth rate of 4.16% over 1995-2000 (86% of total GVA growth) but with only 1.19% when the output grew by 2.75% a year over 2000-2004, 43%.

Second, it is easy to see that non-ICT capital inputs had a bigger impact on growth than ICT capital, which amounted to two thirds of non-ICT assets contribution. It must be noted that this effect of ICT inputs affected Andalusian economic growth more than in the Spanish case (Mas and Quesada, 2006). While the contribution of Andalusian ICT assets was of 18% of GVA total growth (0,64% over 3,53% of GVA growth), this figure was only of 12% for the national level. Other differential issue regarding the Spanish case comes from the fact that both types of capital showed a remarkable stability of their contributions over the entire period, which is not the case for the Spanish sample.

Third, we can confirm the particular behavior (and impact) followed by the different kinds of ICT assets detected when only the growth rates of these variables were studied. Indeed, while the contribution to growth of communications assets kept a stable pattern over time, hardware inputs presented a significant decrease in its contribution and the effect of software capital experienced an uprising trend. This can be interpreted as a sign of the differential stages at which the introduction and use of ICT in Andalucía are. Particularly, it is reasonable to think that investment in hardware precedes that of software, and therefore different dynamics drive their evolutions. Additionally, this point can also be linked to the particular laws of returns to scale of each type of ICT asset.

Fourth, the impact of human capital accumulation was positive although it has decreased from 1995-2000 to 2000-2004 are compared. This is not the case when the Spanish data are involved. At least two partial explanations can be found behind this result. The first is related to the huge empirical literature regarding the ambiguous effect of human capital on growth (De la Fuente (2002)). De la Fuente and Domenech (2006) have pointed out that the insignificant (or even negative) effect of education and qualification on growth is due to measurement errors in the variables used to proxy human capital, which lead to a downward bias. When data at regional level are involved, the probability of suffering this bias is higher. The second reason of the decreasing contribution of labor force qualification might be a certain exhaustion of the model of human capital accumulation, strongly based during the late eighties and nineties on university tuition, which does not necessarily mean an efficient match between job vacancies and labor supply. This hypothetical explanation would be more intense at regional level as long as the regional job matching is not as efficient as in the deeper national labor market, and the overqualification problem appears with more intensity at regional level.

Fifth, the value of TFP was negative for the entire period and for the subdivisions into two time spans. This last fact is similar to the result obtained by Estrada (2006) and Mas and Quesada (2006) for Spain. This negative behavior of TFP is one of the weak points of Spanish and Andalusian economy, although both results should be taken with caution. At this point, we should be aware that this negative TFP could be the result of measurement errors of employment and output growth rates. Some technical considerations may guess that employment growth could be overestimated while output growth underestimated.

Sixth, regarding the decomposition of labor productivity growth, the most significant finding is that ICT assets contributed more to productivity growth than non-ICT assets. The impact of traditional capital inputs was about a 30% smaller than that corresponding to new technologies. This situation was similar to that of Spain (Mas and Quesada, 2006), although in the Andalusian case the relative impact of ICT was not as relevant as in Spain. However, by contrast to the national sample, the influence of ICT on productivity growth was increasing when the period 1995-2000 is compared to 2000-2004. Again, hardware equipments showed a decreasing contribution as time went by, and software remained with an intense and increasing contribution to productivity growth. Considering communications assets, their impact was of around 0.12 percentage points with an increasing trend too.

As a conclusion, the order of dominance for the GVA growth rate can be written as

$$L \succ \textit{non-CT} \succ ICT$$

while the order of dominance for the labor productivity decomposition could be written as

$$ICT \succ non\text{-}ICT.$$

6.3 Sectorial impact

We next follow the typology proposed by Mas and Quesada (2006) to classify sectors between intensive and non intensive users. Table 7 presents the shares and contributions of each sector to total market GVA and employment. The GVA generated in the intensive ICT sectors was about 38% across the decade. Within this sector, five service sectors accounted for a 34% of total GVA: "Transport and communications", "Financial intermediation", "Business services", "Private health and social services", and "Other community, social and personal services". Within the non-intensive ICT sectors, the primary sector plus four industrial sectors accumulated a half of market GVA generation, that widely exceeds the shares in the intensive ICT sector: primary sector, "Food, drink and tobacco", "Construction", "Hotels and catering", and "Wholesale and retail trade and repairs". In this last sector, the share on GVA was the highest one. The stability of these shares throughout time was very high, with only minor differences[5]. Consequently, the way and pattern through which GVA has been generated has not changed between 1995 and 2004. Regional GVA generation concentrates in a few sectors of the economy.

With respect to hours worked, the share of intensive ICT sectors was smaller than that of non-intensive ICT sectors over the entire period. Additionally, as the share of ICT intensive sectors on employment was rather below than its share on GVA, its average labor productivity was higher. This fact was specially clear in the case of Business services: it accounted for 14% of regional GVA but its share on hours worked was only about of 6%. The only exception to this stylized fact among the ICT intensive sectors was "Other community, social and personal services", in which the share on regional employment was slightly higher than its share on GVA over the decade.

Regarding the right-side panel of Table 7, we calibrate the contribution of different sectors to total GVA growth and total employment growth. Inten-

[5] The sector Transport and Communications increased its share on GVA by 1 percentage point between 1995 and 2004, while remained stable in Spain. Construction increased its share by almost 4 pp in the national sample while below 2 pp in Andalucía.

sive ICT sectors have contributed with 1.52% and 1.25% of total GVA growth for periods 1995-2000 and 2000-2004, respectively. Total GVA growth rate has been 4.16% during 1995-2000 and 2.75% for 2000-2004. As a consequence, the contribution of intensive ICT sector has become much more relevant in this second subperiod: for each one percentage point in market GVA growth, the ICT intensive sectors contributed by 0.36 (= 1.52/4.16) during the first period, and by 0.45 (= 1.25/2.75) during 2000-2004. Using a similar arithmetic, for each 1% of employment creation, the contribution of intensive ICT sectors has increased from 0.20 to 0.25.

It should also be highlighted from table 7 that a quarter of total hours worked in Andalucía has taken place in sector "Wholesale & retail; Repairs", this is even more than total hours worked in the intensive ICT group, 23%. "Construction" sector accumulated a 16.38% in total hours worked, this represented a 5% increase from 1995 to 2004. As regards the contribution to hours worked growth, most of the employment creation has concentrated in these two sectors during the whole period, 1995-2004. "Hotels and catering" and the primary sector also showed high rates in the share of hours worked, 9% and 13%, respectively.

[**Table 7 here**]

These results are extended in table 8. Growth rates of the GVA and employment are calculated for the 25 market economy sectors, as well as the productivity growth and the level of labor productivity (aggregate productivity is normalized to 100). We then calculate simple averages over the two subgroups. Productivity growth and the level of productivity were on average higher in the ICT intensive sector. Such a difference increased during 2000-2004. In this sector, the level of productivity increased from 163.7 to 185.2, i.e. a 13%, while in the non-intensive ICT sectors the increase was only 4.63%. Comparing both groups, productivity was 62% higher in the intensive ICT group during 1995-2000 and 76% higher for 2000-2004. Productivity performance in two sectors of the ICT intensive group was rather poor: "Pulp, paper, printing and publishing", and "Other community, social and personal services".[6]

[**Table 8 here**]

[6] It should be noticed that both averages of productivity levels (those of ICT and non-ICT sectors) are above 100 because they have not been obtained as a result of a sectorial weighting, but only a simple average.

Tables 9.a to 9.f present the structural decomposition proposed in section 2 applied to the 25 market sectors. Tables 9.a and b refer to the intensive ICT sectors and the remaining tables refer to the non intensive ones. Calculation of output-input growth rates, cost shares, and the contributions to growth and productivity are presented. Before commenting these results, an important caveat should be carried in mind when executing this analysis: the exercise is based upon a primary and approximative data source and some possible mistakes may arise. For instance, sectorial series of the different capital assets are extrapolations from the national series estimated by Mas and Quesada (2005). Second, data for years 2003 and 2004 are based on ARIMA projections. Third, the human capital index could only be disaggregated in 10 groups of the 25 market economy sectors. This can be biasing the contribution of each asset to growth and productivity.

Taking into account these drawbacks, from this collection of tables we highlight the following results. First, the most important impact of ICT on both GVA growth and productivity growth is observed in some of the intensive ICT sectors, mainly "Electric, electronic & optic equipment", "Transport & communications", "Financial intermediation", "Business services", "Private health" and "Other community services". With the important exception of "Electric, electronic & optic equipment", they all belong to the service sector. The contribution of ICT to growth exceeded those of non ICT assets. As we have seen from tables 7 and 8, the level of productivity was remarkably higher in these intensive ICT sectors. Also, the fraction of market GVA growth accounted by the intensive ICT sectors has been increasing with time. Intensive ICT sectors responded by a 0.45% from each 1% of market GVA growth in period 2000-2004.

In the financial intermediation sector, as a prominent example, the contribution of ICT to growth doubled that of the non ICT assets in the second period. According to this decomposition, the positive productivity growth in this sector was due to investment on hardware and software, mainly, and to a lesser extent on communication networks. The role of hardware was higher than software during the first period, 1995-2000. However, this dominance reversed during the second period. Yet a considerable source of growth in this sector should be associated to human capital accumulation. These results widely reflect the dynamism shown by the Spanish banking and financial industry during the last ten years.

In these intensive ICT sectors, the contribution of hours worked to growth is also a remarkable one. This contribution was higher than that of ICT in most of these sectors and for most of the periods ("Financial intermediation" is an important exception to this rule). As a conclusion, the order of dominance in these decompositions can be written as follows

$$L \succ ICT \succ non\text{-}ICT$$

This means that ICT is already an important contributor to GVA growth and productivity growth in these ICT intensive sector but, in general, not so much as the labor input.

A different pattern is found for the non intensive ICT sectors. ICT has a negligible impact on growth and productivity in most of the ICT non intensive sectors. The labor input is found to be the main contributor of growth in most of these sector. As we observed from table 3, human capital accumulation is now lower, and its contribution to growth is small when compared to that of total hours worked. "Chemicals" and "Machinery & mechanical equipment" are two exceptions to this pattern.

Two paradigmatic cases are "Construction" and "Wholesale &retail trade". They together accumulated about a 40% of total employment and about a 30% of total market GVA in 2004. In both sectors, labor is by no doubt the main source of growth. Productivity growth is negative during the first period, positive in the second one, but negative on average from 1995 to 2004. In "Construction", the effect of all asset types was negligible on the evolution of productivity growth. TFP is what matters in explaining productivity in this sector. On the contrary, non ICT capital assets explained most of labor productivity growth in the "Wholesale &retail trade" sector.

As a conclusion, attending to both GVA growth and productivity growth decompositions, the order of dominance in the ICT non intensive sectors can be written as follows

$$L \succ non\text{-}CT \succ ICT$$

[**Table 9.a through 9.g here**]

Finally, it should also mentioned that TFP growth was higher in the ICT non intensive sectors than in the intensive ones. This is a very striking result, if we consider that TFP is associated to the efficiency by which a combination of inputs is used. Positive expansions in TFP implies that the same combination of resources can reach a higher level of output. Conversely, a contraction in TFP imply that firms must employ a higher combination of inputs to produce the same quantity of output. On the other hand, we have seen that productivity in the intensive ICT sectors is much higher than in the non intensive ones, and in ICT assets explain most of these increases in productivity. Hence, if these calculations are correct, the upsurge in productivity is due to a huge ICT capital accumulation that have overcome the efficiency losses in these ICT intensive sectors.

Table 10 collects all these results on TFP across periods. With the exception of "Energy and water", the rest of ICT intensive sectors presented a negative TFP growth in both periods. This was not the case in the ICT non intensive sector where TFP growth improves in the second period and was higher to that of the intensive sector on average. We propose two complementary explanations to this striking result. First, these calculations might be affected by important measurement errors[7] and by several biasing problems[8]. This is a drawback that we mentioned at the beginning of this section. A second explanation is that the advantages associated to the use of ICT are not yet available. Efficiency gains require some time to blossom. This paradoxical result we obtain, however, is parallel to that obtained by Mas and Quesada (2006) for Spain.

[**Table 10 here**]

7 Concluding remarks

The recent experiences of US and some European countries show that ICT investment encourages economic growth and labor productivity. However, the European Union as a whole are considerably lagged with respect to the US economy in the use of ICT at all economic levels. Since the early eighties, US economy has doubled European investment in ICT. As a way to fill this gap, Lisbon Strategy and the initiative *i2010* collected a number of policy recommendations in order to make significant advances on this issue.

Additionally, world-wide recognized experts like Prof. Dale Jorgenson have claimed that the impact of ICT is sensitive to existing degree of liberalization in the market for factors, goods and services (see El País June 4th 2006). This is a remarkable difference between the US and the EU economy in terms of productivity. Therefore, the use of new technologies should be

[7]These dissagregated series are subject to important sampling errors.

[8]The overqualifiaction bias in the human capital index, or fixed effect biases due to aggregation of heterogeneous firms in some of the sectors.

viewed as an instrument for reversing productivity slowdown but properly combined with other policy tools concerning the liberalization of markets.

This paper has provided some quantitative results on the impact of ICT on economic growth of Andalucía over the period 1995-2004. It should be recalled that Andalucía is a relatively poor region in the context of EU-15, holding severe problems of convergence in income per capita with the remaining Spanish regions. Its growth pattern has been strongly based on employment growth, which has led to small (even negative) growth rates of productivity and negative results in terms of efficiency in use of production factor, measured by the total factor productivity.

We have used the methodology given by growth accounting exercises, which breaks economic growth into the main factors behind that. Particularly, we have related the growth rates of labor and capital inputs (divided into six categories) to the share they represent over the total output. At this point, we have followed the technical recommendations issued by the OECD to study the dynamics of growth, specially when ICT are involved.

First, Spain is one of the least intensive ICT users within the EU-15 area and Andalucía is less intensive than the national level. *Second*, ICT assets account less than non ICT assets for total market GVA growth. As an interesting result, we do find that the contribution of ICT to labor productivity growth exceeds that of the non ICT assets. *Third*, once we have clustered the economic sectors according their ICT deepening, and despite of the fact that the share in GVA and employment generation has remained apparently constant across 1995-2004, the contribution to GVA growth and employment growth within the ICT intensive sectors has experienced a considerable increase in Andalucía.While a 36.5% of total market GVA growth was produced in the ICT intensive group during the period 1995-2000, this percentage increased to 45.4% during 2000-2004. Concerning employment creation, these figures have increased from 20% to 25%, from 1995-2000 to 2000-2004. *Fourth*, growth rates and levels of labor productivity are undoubtedly higher in the intensive ICT sectors. Productivity has been 82.7% higher in the intensive ICT sectors than in the non intensive ones in 2004. This gap in productivity has been increasing since 1995. *Fifth*, for a few intensive ICT service sectors, ICT assets already have an important contribution in both GVA growth and productivity growth. *Finally*, TFP is estimated to have a negative growth. Surprisingly, the negative sign is stronger in the intensive ICT sectors. To the extent that TFP is usually associated to technological change and the efficiency in the use of inputs, we have caveats around the validity of this result. As we have discussed, this growth accounting exercise might be subject to measurement errors and biases from different sources (i.e. the overqualification bias or fixed effect biases due to unobserved heterogeneity). Our main conclusion is that the advantages that might be reaped from the use of ICT are not yet observable in the economic dynamics of Andalucía, ar least in a similar magnitude to that of the most advanced economies.

Obviously, this study can be extended along several directions. One of them is that related to the links between ICT and international trade and globalization. Both on a theoretical and empirical basis, an interesting discussion can be initiated regarding ICT spillovers across national borders, affecting international trade and capital flows. In a sense, the use and diffusion of ICT can be seen as technological revolution which will modify not only the international relative prices of goods and services, but also the economic structure of economies. In a long-term horizon, this fact also will have an impact on outsourcing processes, as some current indications seem to be shown in the case of Asian giants.

Other suggestive issue could focus on the policy implications derived from a study as ours. We think that a part of the debate in terms of policy recommendations have to solve the dilemma concerning the scope of policy design and implementation. In other words, the question is whether policies aimed at encouraging the use of ICT should be mainly defined on a national or European basis or, by contrast, we would have to think of regional tailor-made initiatives. This debate seems not to be easy, because of the political implications derived from it and due to the heterogeneity of successful experiences available so far.

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A Labor force qualification index growth rate

Consider first that labor force qualification is labeled by k. As productivity across different qualifications levels does not vary linearly, we will use the relative wage as a proxy the marginal rate of substitution. In Spain, estimates of relative wages are available through the Survey of Wage Structure (*Encuesta de Estructura Salarial*) for years 1995 and 2002. As our exercise is run over 1995-2004, we have used that of 2002 as the pivotal year. Then, the index is constructed according to the following expression

$$\gamma_{st}^{KH} = \frac{1}{T}\left[\ln\left(KH_{st}\right) - \ln\left(KH_{st-T}\right)\right] = \sum_{k} \omega_{kst}\left(\gamma_{kst} - \gamma_{st}\right), \tag{A1}$$

with

$$\begin{aligned} \gamma_{kst} &= \frac{1}{T}\left[\ln\left(HL_{kst}\right) - \ln\left(HL_{ks,t-T}\right)\right], \\ \gamma_{st} &= \frac{1}{T}\left[\ln\left(HL_{st}\right) - \ln\left(HL_{s,t-T}\right)\right], \\ \omega_{kst} &= \frac{1}{2}\left[\phi\left(k,s,t\right) + \phi\left(k,s,T\right)\right]. \end{aligned} \tag{A2}$$

and

$$\begin{aligned} \phi\left(k,s,t\right) &= \frac{w_{kst}L_{kst}}{\sum_k w_{kst}L_{kst}}, \\ w_{kst} &= \frac{H_{st}}{H_{s2002}}\,\mathrm{wage}\left(k,s,2002\right), \end{aligned} \tag{A3}$$

such that $\sum_k \phi\left(k,s,t\right) = 1$. H_{st} is total hours worked by one unit of labor in sector s at time t, which we suppose identical for all levels of qualification k. On the other hand, $\mathrm{wage}\left(k,s,2002\right)$ is average earning per worker with education k at sector s at year $t = 2002$, as estimated by the *Spanish Survey of Wage Structure 2002*. L_{kst} is total number of workers with level k of qualification in sector s at time t. Finally, notice that

$$\begin{aligned} HL_{kst} &= H_{st}L_{kst}, \\ HL_{st} &= \sum_{k} HL_{kst}. \end{aligned} \tag{A4}$$

B Capital services and the cost shares of production factors

This appendix provides further details on the computation of capital services series and the cost shares of production factors that we have used in the growth and productivity accounting exercise. Capital series services have been obtained according to the three stages described in section 4. Particularly, let $K(i)_{st}$ be the productive capital of asset i in sector s at time t. This concept of productive capital can be seen as a volume index of capital services. The expression driving the concept of capital services in sector s for the asset i is as follows:

$$VCS_{ist} = \mu_{ist} K(i)_{s,t-1}\,, \tag{B1}$$

where μ_{it} is, in turn, the user cost of capital and is defined as

$$\mu_{ist} = p_{is,t-1}\left(r_t + d_{ist} - q_{ist}\right), \tag{B2}$$

where $p_{is,t-1}$ is the price of asset i in sector s at $t-1$, r_t is the nominal interest rate and q_{ist} is the rate of variation of price of asset i. Data we have used to deal with these variables come from several sources. Productive capital $K(i)_{st}$ has been taken from Mas et al (2005) and according to the territorial allocation and projections for not available values explained in section 4.

The prices of assets $p_{is,t-1}$ have been elaborated on the basis of deflators provided by Mas et al (2005), and following the procedure they use for the Spanish case, that is, taken account the US deflators for ICT assets and the relative prices between Spain and USA, as the OECD recommends to overcome the deficiencies of Spanish statistics. The nominal interest rate r_t consists of the sum of the rate of return (exogenously fixed at 4%, as Mas and Quesada (2005) do) and the inflation rate, computed as a three year centered moving average of the Andalusian RPI.

Depreciation rate d_{ist} has been obtained according to the methodology of Mas and Quesada (2005). It has been computed as the ratio of investment resources devoted to depreciation over the wealth capital stock. Finally, q_{ist} measures what extent the prices of assets varies and has been calculated as the three year centered moving average of the variation of prices of assets.

Once the capital services are available, we are able to compute the cost shares which are needed for the growth accounting exercise. Contrary to the standard approach, based on the "primal problem", we follow here a "dual approach". As we have used an exogenous rate of return in determining the capital services of productive capital, the estimates of TFP coming from the "primal problem" will not be the same than those of our methodology. Anyway, as Schreyer (2004) has pointed out, the approximation to equations (2) and (3) via cost shares is a reasonable technique which avoids some of the problems of the "primal problem", such as the need of obtaining econometric estimates of extent of returns to scale, of mark-up set over costs by firms, etc.

The expressions of cost shares are given by the following formulae:

$$\alpha_{lst} = \frac{RE_{st}}{TC_{st}} \tag{B3}$$

$$\alpha_{ist} = \frac{VCS_{ist}}{TC_{st}}, \tag{B4}$$

where RE_{st} is the remuneration of employees in sector s and TC_{st} is the sum of RE_{st} and VCS_{ist}. Mixed incomes have been reassigned into labor and capital according to the weight of remuneration of employees over the GVA.

The next step refers to the way of computing the growth rates of each variable in the growth accounting framework. As was already said in section 4, we have used a Törnqvist index to take explicitly account the changes in the capital structure of sectors. For instance, the growth rate of productive capital as a whole over the period between t and $t-T$ is given by the following expression:

$$\gamma_t^K = \ln K_t - \ln K_{t-T} = \frac{1}{T}\left[\sum_{i=1}^{6}\sum_{s=1}^{25}\nu_{it}\left(\ln K\left(i\right)_{st} - \ln K\left(i\right)_{s,t-T}\right)\right], \tag{B5}$$

where

$$\nu_{it} = 0.5\left[\frac{VCS_{ist}}{\sum_{i=1}^{6}\sum_{s=1}^{25} VCS_{ist}} + \frac{VCS_{is,t-T}}{\sum_{i=1}^{6}\sum_{s=1}^{25} VCS_{is,t-T}}\right].$$

Table 1.a: ICT-Capital deepening, productivity and TFP growth: An international comparison

	1980-1990			1990-1995			1995-2000			2000-2004		
	Δ(Y/L)	ΔTFP	ICT/K	Δ(Y/L)	ΔTFP	ICT/K	Δ(Y/L)	ΔTFP	ICT/K	Δ(Y/L)	ΔTFP	ICT/K
EU-15	2,3%	1,15%	1,55%	2,4%	1,18%	2,32%	1,8%	0,86%	3,30%	1,1%	0,36%	4,99%
France	2,9%	1,37%	1,06%	1,3%	0,01%	1,61%	2,5%	1,45%	2,32%	1,5%	0,45%	3,47%
Spain	3,0%	1,95%	1,26%	2,3%	0,94%	2,02%	-0,1%	-0,35%	2,57%	0,1%	-0,54%	3,60%
Netherlands	2,0%	1,07%	0,83%	1,3%	0,64%	1,41%	0,8%	0,59%	2,25%	0,7%	0,16%	3,90%
Ireland	3,7%	2,71%	0,68%	3,6%	2,99%	0,87%	6,0%	4,45%	1,85%	4,2%	1,98%	4,17%
Greece	-0,1%	-0,50%	1,22%	0,4%	0,01%	1,73%	2,9%	1,91%	2,59%	2,9%	1,80%	4,27%
Austria	1,6%	0,49%	1,94%	1,8%	0,65%	2,60%	3,0%	1,72%	3,31%	1,4%	0,18%	4,74%
Luxemburg	3,6%	2,13%	2,04%	2,3%	0,98%	3,04%	2,7%	1,63%	3,40%	-0,2%	-0,95%	4,76%
Germany	2,6%	1,54%	1,92%	3,1%	1,84%	2,70%	2,2%	1,28%	3,37%	1,2%	0,61%	4,76%
Portugal	1,7%	1,57%	1,67%	3,6%	1,58%	2,32%	2,5%	1,01%	3,31%	0,5%	-0,35%	5,32%
Denmark	2,2%	0,95%	1,26%	2,6%	1,44%	2,27%	2,4%	0,82%	3,58%	1,4%	-0,08%	5,41%
Italy	1,9%	0,86%	1,81%	2,2%	1,00%	2,95%	1,3%	0,24%	4,12%	-0,4%	-1,19%	5,92%
Belgium	2,0%	0,79%	1,01%	2,3%	1,24%	1,97%	2,9%	1,70%	3,36%	0,6%	0,27%	6,16%
Finland	2,7%	1,47%	1,01%	2,0%	0,87%	1,92%	3,4%	3,32%	3,56%	2,8%	2,01%	6,68%
United Kingdom	2,3%	1,17%	1,35%	2,9%	1,60%	2,50%	2,2%	1,06%	4,37%	2,0%	1,51%	7,03%
Sweden	1,4%	0,40%	1,86%	2,0%	0,95%	2,74%	2,6%	1,34%	4,42%	2,6%	1,92%	7,17%
United States	1,5%	0,61%	2,78%	1,2%	0,55%	4,27%	2,3%	1,14%	6,33%	2,8%	1,72%	9,67%
Averages	2,18%	1,16%	1,48%	2,17%	1,08%	2,31%	2,47%	1,46%	3,42%	1,51%	0,59%	5,44%
Median	2,11%	1,12%	1,30%	2,23%	0,96%	2,30%	2,47%	1,31%	3,36%	1,36%	0,36%	5,04%
Standard deviation	0,0093	0,0077	0,0055	0,0087	0,0073	0,0079	0,0130	0,0113	0,0108	0,0130	0,0109	0,0163
Correlation Coefficients												
Product-ICT	-0,2395			-0,1110			-0,1507			0,2672		
TFP-ICT	-0,2471			-0,2162			-0,2540			0,3933		
Product-TFP	0,9351			0,8979			0,9356			0,9435		

Source: Timmer, Ypma and van Ark (2003) and own calculations

Table 1.b.: An international outlook of factors contribution to growth and productivity, 2000-2004.

	Growth Rates					Shares			Contribution to growth						Contribution to productivity		
	Y	L	ICT	Non-ICT	Y/L	L	ICT	Non-ICT	L		ICT		Non-ICT	TFP	ICT		Non-ICT
EU-15	1,46%	0,40%	8,83%	1,70%	1,05%	0,6575	0,0347	0,3077	0,26%	<	0,31%	<	0,52%	0,36%	0,29%	<	0,40%
France	1,35%	-0,20%	8,60%	2,45%	1,54%	0,6441	0,0250	0,3310	-0,13%	<	0,21%	<	0,81%	0,45%	0,22%	<	0,87%
Spain	2,53%	2,46%	9,40%	3,77%	0,07%	0,6623	0,0278	0,3099	1,63%	>	0,26%	<	1,17%	-0,53%	0,19%	<	0,41%
Netherlands	0,63%	-0,09%	8,99%	1,14%	0,72%	0,7158	0,0270	0,2572	-0,06%	<	0,24%	<	0,29%	0,16%	0,24%	<	0,32%
Ireland	5,04%	0,86%	13,47%	5,03%	4,19%	0,5359	0,0255	0,4386	0,46%	>	0,34%	<	2,21%	2,03%	0,32%	<	1,83%
Greece	4,21%	1,26%	15,09%	5,30%	2,95%	0,7803	0,0241	0,1956	0,99%	>	0,36%	<	1,04%	1,83%	0,33%	<	0,79%
Austria	1,14%	-0,22%	10,90%	2,14%	1,36%	0,6318	0,0333	0,3350	-0,14%	<	0,36%	<	0,72%	0,20%	0,37%	<	0,79%
Luxembourg	2,71%	2,90%	12,86%	4,26%	-0,19%	0,6232	0,0313	0,3455	1,81%	>	0,40%	<	1,47%	-0,97%	0,31%	<	0,47%
Germany	0,51%	-0,69%	7,75%	0,32%	1,19%	0,6648	0,0326	0,3026	-0,46%	<	0,25%	>	0,10%	0,61%	0,28%	<	0,30%
Portugal	0,48%	-0,04%	10,16%	2,30%	0,52%	0,7158	0,0283	0,2558	-0,03%	<	0,29%	<	0,59%	-0,36%	0,29%	<	0,60%
Denmark	1,29%	-0,08%	11,16%	2,98%	1,36%	0,6490	0,0456	0,3054	-0,05%	<	0,51%	<	0,91%	-0,08%	0,51%	<	0,94%
Italy	0,88%	1,32%	10,05%	2,46%	-0,45%	0,6047	0,0375	0,3578	0,80%	>	0,38%	<	0,88%	-1,18%	0,33%	<	0,41%
Belgium	1,34%	0,74%	10,97%	0,36%	0,60%	0,7026	0,0400	0,2574	0,52%	>	0,44%	>	0,09%	0,29%	0,41%	>	-0,10%
Finland	2,27%	-0,54%	10,84%	0,24%	2,80%	0,6409	0,0493	0,3098	-0,34%	<	0,53%	>	0,07%	2,00%	0,56%	>	0,24%
United Kingdom	2,32%	0,30%	8,27%	1,09%	2,02%	0,6949	0,0440	0,2611	0,21%	<	0,36%	>	0,28%	1,47%	0,35%	>	0,21%
Sweden	2,05%	-0,60%	6,83%	0,69%	2,65%	0,6927	0,0533	0,2540	-0,41%	<	0,36%	>	0,18%	1,92%	0,40%	>	0,33%
United States	2,38%	-0,40%	9,14%	1,76%	2,78%	0,7005	0,0578	0,2417	-0,28%	<	0,53%	>	0,43%	1,71%	0,55%	>	0,52%

Source: Timmer, Ypma and van Ark (2003) and own calculations

Table 2: Labor force qualification

Employment structure by educational levels.					
Spain	**1987**	**1990**	**1995**	**2000**	**2004**
Illiterate	11,16%	10,78%	6,94%	5,15%	3,09%
Primary education	46,16%	38,49%	30,35%	20,58%	16,29%
Secundary education	26,19%	30,37%	34,90%	39,32%	42,17%
Professional Training	5,46%	8,10%	12,27%	15,81%	16,58%
Tertiary education	11,03%	12,26%	15,54%	19,14%	21,87%
Total	100,00%	100,00%	100,00%	100,00%	100,00%
Andalucía	**1987**	**1990**	**1995**	**2000**	**2004**
Illiterate	21,45%	16,87%	12,73%	10,01%	6,22%
Primary education	41,03%	38,02%	29,54%	21,62%	21,60%
Secundary education	23,30%	28,20%	32,78%	36,44%	38,17%
Professional Training	3,81%	6,30%	10,46%	14,04%	14,52%
Tertiary education	10,41%	10,61%	14,50%	17,89%	19,49%
Total	100,00%	100,00%	100,00%	100,00%	100,00%

Source: INE, IEA and own calculations

Table 3: Labor Force Cualification Index

Group	Sectors		1995	2000	2004
1	Agriculture & cattle farming	Non-ICT intensive	100,00	103,34	105,27
	Fishing	Non-ICT intensive			
2	Pulp, paper, printing & publishing	ICT-Intensive	100,00	104,35	108,21
	Textiles, clothing, leather and footwear	Non-ICT intensive			
	Wood & products of wood & cork	Non-ICT intensive			
	Food, drink and tobacco	Non-ICT intensive			
3	Energy and water	ICT-Intensive	100,00	101,16	104,00
	Mineral oil refining, coke & nuclear fuel	Non-ICT intensive			
	Chemicals	Non-ICT intensive			
	Rubber & plastics	Non-ICT intensive			
	Fabricated metal products	Non-ICT intensive			
	Mining and quarrying	Non-ICT intensive			
	Other non-metallic mineral products	Non-ICT intensive			
4	Electric, electronic & optic equipment	ICT-Intensive	100,00	102,27	103,64
	Machinery & mechanical equipment	Non-ICT intensive			
	Transport equipment manufacturing	Non-ICT intensive			
	Miscellaneous manufacturing	Non-ICT intensive			
5	Construction	Non-ICT intensive	100,00	102,91	104,02
6	Wholesale & retail trade; Repairs	Non-ICT intensive	100,00	104,64	107,00
	Hotels and catering	Non-ICT intensive			
7	Transport and communications	ICT-Intensive	100,00	106,32	111,52
8	Financial intermediation	ICT-Intensive	100,00	108,30	108,85
	Business services	ICT-Intensive			
9	Private health & social services	ICT-Intensive	100,00	101,99	103,50
	Private education	Non-ICT intensive			
10	Other community, social & personal services	ICT-Intensive	100,00	106,14	108,84
	Total market economy		100,00	104,08	106,12

Source: INE, IEA and own calculations

Table 4. Relative GDP per capita AND-Spain, 1980-2005
(euros of 2000)

	Spain	Andalucía	% GDP per capita AND/Spain
1980	2.623	1.944	74,13
1981	2.623	1.944	74,13
1982	2.927	2.168	74,06
1983	3.367	2.543	75,53
1984	3.825	2.896	75,71
1985	4.310	3.227	74,87
1986	4.743	3.642	76,80
1987	5.415	4.117	76,03
1988	6.034	4.644	76,96
1989	6.687	5.097	76,22
1990	7.483	5.611	74,98
1991	8.313	6.387	76,83
1992	9.090	6.970	76,68
1993	9.769	7.373	75,48
1994	10.041	7.476	74,45
1995	10.638	7.926	74,51
1996	11.420	8.394	73,50
1997	12.081	8.877	73,48
1998	12.830	9.427	73,48
1999	13.676	9.941	72,69
2000	14.519	10.531	72,54
2001	15.562	11.433	73,46
2002	16.534	12.228	73,95
2003	17.425	13.071	75,02
2004	18.273	13.942	76,30
2005	19.383	14.960	77,18

Source: INE (several years)

Table 5: Real Gross Value Added, employment and labor productivity

	Andalucía			Spain		
	95-00	00-04	95-04	95-00	00-04	95-04
Real GVA	4,16%	2,75%	3,53%	3,57%	2,25%	2,98%
Hours worked	4,82%	1,59%	3,39%	3,51%	1,58%	2,66%
Productivity growth	-0,66%	1,16%	0,14%	0,06%	0,67%	0,32%

Source: INE, IEA and own calculations

Table 6: Growth accounting exercise for total market economy

		95-00	00-04	95-04
	Real GVA growth	4,16%	2,75%	3,53%
Growth rates	**Constructions**	5,30%	6,40%	5,79%
	Transport equipments	4,56%	4,94%	4,72%
	Machinery	4,41%	4,63%	4,51%
	Communications	8,40%	7,54%	8,02%
	Hardware	23,48%	18,59%	21,31%
	Software	11,98%	12,45%	12,19%
	KH	0,80%	0,48%	0,66%
	Hours (HL)	4,82%	1,59%	3,39%
Cost shares	**Constructions**	0,0728	0,0615	0,0689
	Transport equipments	0,0416	0,0473	0,0442
	Machinery	0,0875	0,0835	0,0856
	Communications	0,0251	0,0270	0,0259
	Hardware	0,0117	0,0101	0,0110
	Software	0,0127	0,0207	0,0164
	All asset types	0,2515	0,2501	0,2520
	Labor	0,7485	0,7499	0,7480
Contribution to growth	**Non-ICT KP**	0,96%	1,01%	0,99%
	ICT KP	0,64%	0,65%	0,64%
	Communications	0,21%	0,20%	0,21%
	Hardware	0,28%	0,19%	0,23%
	Software	0,15%	0,26%	0,20%
	Hours (HL)	3,61%	1,19%	2,54%
Contribution to Productivity	**Labor productivity growth**	-0,66%	1,16%	0,14%
	Non-ICT KP	-0,01%	0,71%	0,32%
	Constructions	0,04%	0,30%	0,17%
	Transport equipments	-0,01%	0,16%	0,06%
	Machinery	-0,04%	0,25%	0,10%
	ICT KP	0,40%	0,56%	0,46%
	Communications	0,09%	0,16%	0,12%
	Hardware	0,22%	0,17%	0,20%
	Software	0,09%	0,22%	0,14%
	KH	0,60%	0,36%	0,49%
	TFP	-1,64%	-0,47%	-1,13%
	TFP-Spain	-2,05%	-1,41%	-1,71%

Table 7: Share and contribution of each industry to GVA and employment

	Shares				Contributions					
	Market Real GVA		Hours worked		Market Real GVA growth			Hours worked growth		
	1995	2004	1995	2004	1995-2000	2000-2004	1995-2004	1995-2000	2000-2004	1995-2004
Total market economy	**100,00%**	**100,00%**	**100,00%**	**100,00%**	**4,16%**	**2,75%**	**3,53%**	**4,82%**	**1,59%**	**3,39%**
Intensive ICT-users	**38,19%**	**38,66%**	**23,47%**	**22,77%**	**1,52%**	**1,25%**	**1,41%**	**0,95%**	**0,39%**	**0,71%**
Energy and water	2,71%	2,82%	0,75%	0,46%	0,09%	0,12%	0,11%	-0,01%	-0,01%	-0,01%
Pulp, paper, printing & publishing	0,75%	0,81%	0,84%	0,74%	0,06%	0,01%	0,03%	0,02%	0,01%	0,01%
Electric, electronic & optic equipment	0,57%	0,59%	0,48%	0,49%	0,04%	0,00%	0,02%	0,04%	-0,01%	0,02%
Transport and communications	8,94%	9,95%	7,34%	6,68%	0,46%	0,42%	0,45%	0,20%	0,12%	0,16%
Financial intermediation	5,27%	5,07%	2,74%	2,15%	0,13%	0,19%	0,16%	0,00%	0,03%	0,02%
Business services	14,72%	14,48%	5,90%	7,09%	0,57%	0,39%	0,49%	0,51%	0,16%	0,35%
Private health & social services	2,21%	2,19%	1,87%	1,86%	0,10%	0,05%	0,08%	0,09%	0,03%	0,06%
Other community, social & personal services	3,01%	2,75%	3,55%	3,31%	0,07%	0,07%	0,07%	0,11%	0,06%	0,09%
Non-Intensive ICT-users	**61,81%**	**61,34%**	**76,53%**	**77,23%**	**2,65%**	**1,50%**	**2,12%**	**3,88%**	**1,20%**	**2,68%**
Agriculture & cattle farming	9,58%	10,05%	14,34%	12,80%	0,75%	0,01%	0,40%	0,57%	-0,04%	0,29%
Fishing	0,47%	0,43%	0,65%	0,37%	0,02%	0,00%	0,01%	-0,02%	-0,01%	-0,01%
Mineral oil refining, coke & nuclear fuel	1,25%	1,15%	0,41%	0,36%	0,00%	0,07%	0,03%	0,01%	0,01%	0,01%
Food, drink and tobacco	4,62%	3,37%	4,04%	2,66%	-0,06%	0,07%	0,00%	-0,08%	0,00%	-0,04%
Textiles, clothing, leather and footwear	0,82%	0,68%	1,70%	1,24%	0,02%	0,00%	0,01%	0,01%	-0,01%	0,00%
Wood & products of wood & cork	0,30%	0,33%	0,71%	0,70%	0,03%	0,00%	0,01%	0,03%	0,02%	0,02%
Chemicals	1,24%	1,10%	0,66%	0,65%	0,04%	0,00%	0,03%	0,04%	0,00%	0,02%
Rubber & plastics	0,42%	0,51%	0,37%	0,37%	0,03%	0,03%	0,03%	0,01%	0,01%	0,01%
Other non-metallic mineral products	1,27%	1,47%	1,21%	1,16%	0,07%	0,07%	0,07%	0,05%	0,02%	0,03%
Fabricated metal products	1,49%	1,41%	1,63%	1,67%	0,05%	0,04%	0,04%	0,11%	0,00%	0,06%
Machinery & mechanical equipment	0,38%	0,63%	0,50%	0,54%	0,04%	0,05%	0,05%	0,02%	0,02%	0,02%
Transport equipment manufacturing	1,47%	1,26%	1,30%	1,11%	0,05%	0,00%	0,02%	0,04%	-0,01%	0,02%
Miscellaneous manufacturing	0,49%	0,59%	1,05%	1,10%	0,04%	0,02%	0,03%	0,09%	-0,01%	0,04%
Construction	10,53%	12,50%	11,88%	16,38%	0,48%	0,76%	0,63%	1,07%	0,82%	0,98%
Wholesale & retail trade; Repairs	17,58%	16,04%	26,05%	25,74%	0,60%	0,22%	0,42%	1,33%	0,25%	0,84%
Hotels and catering	8,31%	8,41%	8,62%	9,09%	0,44%	0,15%	0,31%	0,56%	0,11%	0,35%
Private education	1,58%	1,43%	1,41%	1,30%	0,05%	0,02%	0,04%	0,05%	0,02%	0,03%

Source: INE, IEA and own calculations

Table 8: GVA, employment (hours worked) and labour productivity.

	Market GVA growth			Employment growth			Productivity growth			Productivity level		
	95-00	**00-04**	**95-04**	**95-00**	**00-04**	**95-04**	**95-00**	**00-04**	**95-04**	**1995**	**2000**	**2004**
Total market economy	4,16%	2,75%	3,53%	4,82%	1,59%	3,39%	-0,66%	1,16%	0,14%	100,0	100,0	100,0
Intensive ICT-users												
Energy and water	3,46%	4,59%	3,96%	-2,32%	-1,77%	-2,08%	5,79%	6,36%	6,04%	354,4	488,2	604,7
Pulp, paper, printing & publishing	6,98%	1,09%	4,36%	2,51%	1,03%	1,85%	4,47%	0,06%	2,51%	87,2	112,4	108,0
Electric, electronic & optic equipment	6,88%	0,12%	3,88%	7,60%	-1,11%	3,73%	-0,71%	1,23%	0,15%	117,5	116,9	117,7
Transport and communications	4,99%	4,39%	4,73%	2,82%	1,76%	2,35%	2,17%	2,63%	2,38%	119,2	137,1	144,9
Financial intermediation	2,62%	3,73%	3,11%	0,09%	1,46%	0,70%	2,52%	2,27%	2,41%	188,6	220,6	229,8
Business services	3,89%	2,67%	3,35%	7,91%	2,32%	5,42%	-4,02%	0,36%	-2,08%	244,3	206,0	198,7
Private health & social services	4,37%	2,27%	3,44%	4,69%	1,58%	3,31%	-0,31%	0,69%	0,13%	115,7	117,5	114,9
Other community, social & personal services	2,53%	2,51%	2,52%	3,21%	1,88%	2,62%	-0,68%	0,63%	-0,10%	83,1	82,8	80,8
Average	**4,47%**	**2,67%**	**3,67%**	**3,31%**	**0,89%**	**2,24%**	**1,15%**	**1,78%**	**1,43%**	**163,7**	**185,2**	**199,9**
Non-Intensive ICT-users												
Agriculture & cattle farming	7,26%	0,08%	4,07%	4,08%	-0,32%	2,13%	3,18%	0,40%	1,94%	65,4	79,1	81,2
Fishing	4,35%	0,77%	2,76%	-3,68%	-1,41%	-2,67%	8,03%	2,18%	5,43%	70,5	108,7	119,9
Mineral oil refining, coke & nuclear fuel	-0,39%	6,24%	2,56%	1,97%	1,67%	1,84%	-2,36%	4,58%	0,72%	297,9	273,0	315,0
Food, drink and tobacco	-1,54%	1,96%	0,02%	-2,30%	0,10%	-1,24%	0,77%	1,87%	1,26%	112,2	120,2	124,2
Textiles, clothing, leather and footwear	3,00%	-0,52%	1,43%	0,42%	-0,68%	-0,07%	2,58%	0,16%	1,51%	47,4	55,7	53,7
Wood & products of wood & cork	7,86%	0,64%	4,65%	3,78%	2,45%	3,19%	4,08%	-1,81%	1,46%	41,4	52,4	46,7
Chemicals	3,62%	0,43%	2,20%	5,57%	0,32%	3,24%	-1,95%	0,11%	-1,04%	184,2	172,3	165,9
Rubber & plastics	5,91%	5,57%	5,76%	2,48%	4,11%	3,20%	3,44%	1,46%	2,56%	110,7	135,6	137,8
Other non-metallic mineral products	5,49%	4,64%	5,11%	3,81%	1,82%	2,92%	1,68%	2,82%	2,19%	102,6	115,1	123,5
Fabricated metal products	3,12%	2,60%	2,89%	6,68%	-0,11%	3,66%	-3,55%	2,71%	-0,77%	89,9	77,6	82,9
Machinery & mechanical equipment	9,58%	8,20%	8,97%	4,77%	3,20%	4,07%	4,82%	4,99%	4,89%	74,6	97,9	114,5
Transport equipment manufacturing	3,35%	-0,12%	1,81%	3,28%	-0,50%	1,60%	0,07%	0,38%	0,21%	110,7	114,6	111,5
Miscellaneous manufacturing	7,54%	3,12%	5,57%	7,76%	-0,93%	3,90%	-0,23%	4,05%	1,67%	46,1	47,0	53,0
Construction	4,55%	6,54%	5,43%	8,21%	5,39%	6,96%	-3,66%	1,15%	-1,52%	86,8	74,6	72,2
Wholesale & retail trade; Repairs	3,46%	1,33%	2,51%	5,09%	0,96%	3,26%	-1,63%	0,36%	-0,75%	66,1	62,8	60,6
Hotels and catering	5,18%	1,76%	3,66%	6,24%	1,15%	3,98%	-1,06%	0,61%	-0,31%	94,5	92,4	90,1
Private education	3,02%	1,67%	2,42%	3,44%	1,42%	2,54%	-0,42%	0,24%	-0,13%	110,0	111,1	106,6
Average	**4,43%**	**2,64%**	**3,64%**	**3,62%**	**1,10%**	**2,50%**	**0,81%**	**1,55%**	**1,14%**	**100,6**	**105,3**	**109,4**

Source: INE, IEA and own calculations

Table 9.a: ICT-intensive sectors. Growth and productivity decomposition

		Energy and water			Pulp, paper, printing & publishing			Electric, electronic & optic equipment			Transport & communications		
		95-00	**00-04**	**95-04**	**95-00**	**00-04**	**95-04**	**95-00**	**00-04**	**95-04**	**95-00**	**00-04**	**95-04**
	Real GVA growth	3,46%	4,59%	3,96%	6,98%	1,09%	4,36%	6,88%	0,12%	3,88%	4,99%	4,39%	4,73%
Growth rates	**Hours (HL)**	-2,32%	-1,77%	-2,08%	2,51%	1,03%	1,85%	7,60%	-1,11%	3,73%	2,82%	1,76%	2,35%
	KH	0,23%	0,69%	0,44%	0,85%	0,91%	0,88%	0,45%	0,33%	0,40%	1,23%	1,19%	1,21%
	Constructions	6,76%	8,21%	7,40%	2,37%	6,27%	4,10%	6,13%	6,25%	6,18%	4,76%	7,96%	6,18%
	Transport equipments	6,78%	6,35%	6,59%	1,56%	3,69%	2,51%	0,15%	-0,25%	-0,03%	4,08%	5,52%	4,72%
	Machinery	3,72%	7,01%	5,18%	2,88%	5,54%	4,06%	4,49%	2,81%	3,74%	9,71%	6,60%	8,33%
	Communications	6,22%	7,11%	6,61%	6,49%	9,47%	7,82%	9,06%	6,22%	7,79%	8,72%	6,55%	7,76%
	Hardware	8,00%	25,48%	15,77%	13,95%	20,98%	17,08%	22,41%	20,99%	21,78%	45,02%	19,68%	33,76%
	Software	25,25%	5,48%	16,46%	14,49%	14,35%	14,43%	26,10%	18,46%	22,70%	18,89%	17,21%	18,14%
Cost shares	**Labor**	0,5041	0,4457	0,4780	0,7147	0,7291	0,7187	0,7644	0,7694	0,7648	0,5597	0,5236	0,5426
	Constructions	0,1441	0,1542	0,1503	0,0619	0,0506	0,0581	0,0342	0,0311	0,0335	0,1000	0,0821	0,0936
	Transport equipments	0,0059	0,0083	0,0069	0,0085	0,0092	0,0088	0,0039	0,0037	0,0038	0,1775	0,1936	0,1847
	Machinery	0,3049	0,3412	0,3198	0,1734	0,1716	0,1734	0,1440	0,1391	0,1421	0,0165	0,0185	0,0174
	Communications	0,0277	0,0307	0,0287	0,0163	0,0177	0,0169	0,0123	0,0131	0,0126	0,1130	0,1186	0,1148
	Hardware	0,0070	0,0043	0,0059	0,0223	0,0150	0,0193	0,0392	0,0373	0,0393	0,0062	0,0091	0,0074
	Software	0,0064	0,0155	0,0104	0,0029	0,0067	0,0047	0,0019	0,0062	0,0039	0,0271	0,0544	0,0395
Contribution to growth	**Hours (HL)**	-1,17%	-0,79%	-0,99%	1,79%	0,75%	1,33%	5,81%	-0,85%	2,85%	1,58%	0,92%	1,27%
	Non-ICT KP	2,15%	3,71%	2,82%	0,66%	1,30%	0,96%	0,86%	0,58%	0,74%	1,36%	1,84%	1,60%
	ICT KP	0,39%	0,41%	0,45%	0,46%	0,58%	0,53%	1,04%	0,98%	1,04%	1,78%	1,89%	1,86%
	Communications	0,17%	0,22%	0,19%	0,11%	0,17%	0,13%	0,11%	0,08%	0,10%	0,99%	0,78%	0,89%
	Hardware	0,06%	0,11%	0,09%	0,31%	0,31%	0,33%	0,88%	0,78%	0,86%	0,28%	0,18%	0,25%
	Software	0,16%	0,09%	0,17%	0,04%	0,10%	0,07%	0,05%	0,12%	0,09%	0,51%	0,94%	0,72%
Contribution to Productivity	**Productivity growth**	5,79%	6,36%	6,04%	4,47%	0,06%	2,51%	-0,71%	1,23%	0,15%	2,17%	2,63%	2,38%
	Non-ICT KP	3,20%	4,60%	3,81%	0,05%	1,06%	0,52%	-0,53%	0,78%	0,07%	0,53%	1,33%	0,90%
	ICT KP	0,48%	0,50%	0,55%	0,36%	0,54%	0,45%	0,64%	1,04%	0,83%	1,36%	1,57%	1,48%
	Communications	0,24%	0,27%	0,25%	0,06%	0,15%	0,10%	0,02%	0,10%	0,05%	0,67%	0,57%	0,62%
	Hardware	0,07%	0,12%	0,10%	0,26%	0,30%	0,29%	0,58%	0,82%	0,71%	0,26%	0,16%	0,23%
	Software	0,18%	0,11%	0,19%	0,04%	0,09%	0,06%	0,04%	0,12%	0,07%	0,44%	0,84%	0,62%
	KH	0,12%	0,31%	0,21%	0,61%	0,66%	0,63%	0,34%	0,26%	0,30%	0,69%	0,63%	0,66%
	TFP	1,98%	0,94%	1,48%	3,46%	-2,20%	0,91%	-1,16%	-0,85%	-1,06%	-0,41%	-0,89%	-0,66%

Source: INE, IEA, Mas and Quesada (2005) and own calculations

Table 9.b: ICT-intensive sectors. Growth and productivity decomposition

		Financial intermediation			Business services			Private health & social services			Other community, social & personal services		
		95-00	**00-04**	**95-04**	**95-00**	**00-04**	**95-04**	**95-00**	**00-04**	**95-04**	**95-00**	**00-04**	**95-04**
	Real GVA growth	2,62%	3,73%	3,11%	3,89%	2,67%	3,35%	4,37%	2,27%	3,44%	2,53%	2,51%	2,52%
Growth rates	**Hours (HL)**	0,09%	1,46%	0,70%	7,91%	2,32%	5,42%	4,69%	1,58%	3,31%	3,21%	1,88%	2,62%
	KH	1,60%	0,13%	0,94%	1,60%	0,13%	0,94%	0,39%	0,37%	0,38%	0,39%	0,37%	0,38%
	Constructions	0,10%	6,09%	2,76%	10,51%	10,26%	10,40%	9,28%	8,97%	9,15%	9,72%	8,55%	9,20%
	Transport equipments	10,92%	8,77%	9,96%	13,12%	10,17%	11,81%	10,95%	6,35%	8,91%	9,11%	3,40%	6,57%
	Machinery	10,88%	12,18%	11,46%	9,85%	6,94%	8,56%	7,47%	5,78%	6,72%	2,54%	-1,09%	0,93%
	Communications	6,43%	11,05%	8,49%	18,98%	14,28%	16,89%	14,12%	10,96%	12,71%	4,40%	7,66%	5,85%
	Hardware	15,63%	17,88%	16,63%	26,79%	16,71%	22,31%	30,40%	22,28%	26,79%	27,61%	17,08%	22,93%
	Software	8,55%	13,97%	10,96%	7,59%	4,09%	6,04%	13,68%	9,38%	11,77%	8,02%	4,69%	6,54%
Cost shares	**Labor**	0,7892	0,7685	0,7786	0,7164	0,6780	0,6992	0,8856	0,8928	0,8887	0,7610	0,7530	0,7573
	Constructions	0,0417	0,0304	0,0373	0,0222	0,0197	0,0214	0,0226	0,0196	0,0217	0,0532	0,0563	0,0554
	Transport equipments	0,0044	0,0066	0,0054	0,0630	0,0828	0,0716	0,0015	0,0018	0,0016	0,0305	0,0404	0,0348
	Machinery	0,0430	0,0597	0,0505	0,0968	0,0942	0,0953	0,0660	0,0605	0,0635	0,0454	0,0386	0,0420
	Communications	0,0050	0,0053	0,0051	0,0126	0,0170	0,0144	0,0017	0,0019	0,0018	0,0809	0,0769	0,0789
	Hardware	0,0506	0,0334	0,0433	0,0378	0,0296	0,0341	0,0165	0,0157	0,0160	0,0155	0,0157	0,0155
	Software	0,0662	0,0962	0,0799	0,0425	0,0467	0,0448	0,0060	0,0077	0,0067	0,0136	0,0191	0,0162
Contribution to growth	**Hours (HL)**	0,07%	1,12%	0,54%	5,67%	1,57%	3,79%	4,15%	1,41%	2,94%	2,44%	1,41%	1,98%
	Non-ICT KP	0,52%	0,97%	0,74%	2,01%	1,70%	1,88%	0,72%	0,54%	0,64%	0,91%	0,58%	0,78%
	ICT KP	1,39%	2,00%	1,64%	1,57%	0,93%	1,28%	0,61%	0,44%	0,53%	0,89%	0,95%	0,92%
	Communications	0,03%	0,06%	0,04%	0,24%	0,24%	0,24%	0,02%	0,02%	0,02%	0,36%	0,59%	0,46%
	Hardware	0,79%	0,60%	0,72%	1,01%	0,49%	0,76%	0,50%	0,35%	0,43%	0,43%	0,27%	0,36%
	Software	0,57%	1,34%	0,87%	0,32%	0,19%	0,27%	0,08%	0,07%	0,08%	0,11%	0,09%	0,11%
Contribution to Productivity	**Productivity growth**	2,52%	2,27%	2,41%	-4,02%	0,36%	-2,08%	-0,31%	0,69%	0,13%	-0,68%	0,63%	-0,10%
	Non-ICT KP	0,51%	0,83%	0,67%	0,57%	1,24%	0,86%	0,30%	0,41%	0,35%	0,50%	0,32%	0,43%
	ICT KP	1,38%	1,80%	1,55%	0,84%	0,71%	0,77%	0,49%	0,40%	0,45%	0,54%	0,74%	0,63%
	Communications	0,03%	0,05%	0,04%	0,14%	0,20%	0,17%	0,02%	0,02%	0,02%	0,10%	0,44%	0,25%
	Hardware	0,79%	0,55%	0,69%	0,71%	0,43%	0,58%	0,42%	0,32%	0,38%	0,38%	0,24%	0,32%
	Software	0,56%	1,20%	0,82%	-0,01%	0,08%	0,03%	0,05%	0,06%	0,06%	0,07%	0,05%	0,06%
	KH	1,26%	0,10%	0,73%	1,14%	0,09%	0,66%	0,35%	0,33%	0,34%	0,30%	0,28%	0,29%
	TFP	-0,63%	-0,46%	-0,54%	-6,51%	-1,61%	-4,26%	-1,46%	-0,45%	-1,01%	-2,01%	-0,70%	-1,45%

Source: INE, IEA, Mas and Quesada (2005) and own calculations

Table 9.c: ICT Non-intensive sectors. Growth and productivity decomposition

		Agriculture & cattle farming			Fishing			Mineral oil refining, coke & nuclear fuel			Food, drink and tobacco			Textiles, clothing, leather & footwear		
		95-00	00-04	95-04	95-00	00-04	95-04	95-00	00-04	95-04	95-00	00-04	95-04	95-00	00-04	95-04
	Real GVA growth	7,26%	0,08%	4,07%	4,35%	0,77%	2,76%	-0,39%	6,24%	2,56%	-1,54%	1,96%	0,02%	3,00%	-0,52%	1,43%
Growth rates	Hours (HL)	4,08%	-0,32%	2,13%	-3,68%	-1,41%	-2,67%	1,97%	1,67%	1,84%	-2,30%	0,10%	-1,24%	0,42%	-0,68%	-0,07%
	KH	0,66%	0,46%	0,57%	0,66%	0,46%	0,57%	0,23%	0,69%	0,44%	0,85%	0,91%	0,88%	0,85%	0,91%	0,88%
	Constructions	3,26%	4,94%	4,01%	-0,57%	-1,67%	-1,06%	6,90%	7,95%	7,37%	1,97%	2,14%	2,05%	0,55%	3,01%	1,65%
	Transport equipments	1,15%	3,33%	2,12%	-1,55%	-2,40%	-1,93%	4,15%	5,94%	4,95%	1,00%	-2,40%	-0,51%	0,01%	-0,42%	-0,18%
	Machinery	2,24%	3,68%	2,88%	-11,13%	-10,68%	-10,93%	3,16%	5,41%	4,16%	1,83%	1,05%	1,48%	-0,24%	1,46%	0,51%
	Communications	6,42%	11,64%	8,74%	15,93%	9,34%	13,00%	6,23%	9,46%	7,66%	5,40%	4,97%	5,21%	3,54%	5,94%	4,61%
	Hardware	46,36%	23,19%	36,06%	26,39%	16,30%	21,90%	22,19%	17,37%	20,05%	16,87%	13,44%	15,35%	16,00%	9,08%	12,92%
	Software	24,75%	-2,32%	12,72%	9,60%	-8,07%	1,75%	29,05%	9,51%	20,37%	13,57%	4,68%	9,62%	19,18%	8,86%	14,59%
Cost shares	Labor	0,6960	0,7121	0,7015	0,4120	0,4137	0,4141	0,6401	0,6358	0,6380	0,6490	0,6362	0,6441	0,8273	0,8358	0,8302
	Constructions	0,1179	0,1024	0,1128	0,0569	0,0434	0,0516	0,0993	0,0891	0,0959	0,1162	0,1076	0,1136	0,0394	0,0334	0,0375
	Transport equipments	0,0124	0,0137	0,0130	0,5066	0,5223	0,5116	0,0199	0,0246	0,0219	0,0196	0,0231	0,0209	0,0102	0,0111	0,0106
	Machinery	0,1732	0,1712	0,1722	0,0178	0,0103	0,0145	0,2148	0,2187	0,2157	0,1789	0,1924	0,1835	0,1058	0,1021	0,1043
	Communications	0,0005	0,0006	0,0006	0,0052	0,0085	0,0066	0,0192	0,0234	0,0210	0,0169	0,0197	0,0180	0,0096	0,0103	0,0099
	Hardware	0,0000	0,0000	0,0000	0,0008	0,0010	0,0009	0,0050	0,0039	0,0045	0,0152	0,0132	0,0142	0,0069	0,0052	0,0062
	Software	0,0000	0,0000	0,0000	0,0007	0,0008	0,0007	0,0016	0,0047	0,0030	0,0042	0,0078	0,0057	0,0009	0,0021	0,0014
Contribution to growth	Hours (HL)	2,84%	-0,23%	1,49%	-1,52%	-0,58%	-1,11%	1,26%	1,06%	1,17%	-1,50%	0,06%	-0,80%	0,35%	-0,57%	-0,06%
	Non-ICT KP	0,79%	1,18%	0,98%	-1,02%	-1,44%	-1,20%	1,45%	2,04%	1,71%	0,58%	0,38%	0,49%	0,00%	0,24%	0,11%
	ICT KP	0,00%	0,01%	0,01%	0,11%	0,09%	0,11%	0,28%	0,33%	0,31%	0,41%	0,31%	0,37%	0,16%	0,13%	0,15%
	Communications	0,00%	0,01%	0,00%	0,08%	0,08%	0,09%	0,12%	0,22%	0,16%	0,09%	0,10%	0,09%	0,03%	0,06%	0,05%
	Hardware	0,00%	0,00%	0,00%	0,02%	0,02%	0,02%	0,11%	0,07%	0,09%	0,26%	0,18%	0,22%	0,11%	0,05%	0,08%
	Software	0,00%	0,00%	0,00%	0,01%	-0,01%	0,00%	0,05%	0,04%	0,06%	0,06%	0,04%	0,06%	0,02%	0,02%	0,02%
Contribution to Productivity	Productivity growth	3,18%	0,40%	1,94%	8,03%	2,18%	5,43%	-2,36%	4,58%	0,72%	0,77%	1,87%	1,26%	2,58%	0,16%	1,51%
	Non-ICT KP	-0,45%	1,27%	0,34%	1,12%	-0,63%	0,34%	0,79%	1,48%	1,10%	1,30%	0,35%	0,89%	-0,07%	0,34%	0,12%
	ICT KP	0,00%	0,01%	0,00%	0,13%	0,10%	0,13%	0,23%	0,28%	0,26%	0,49%	0,31%	0,41%	0,15%	0,14%	0,15%
	Communications	0,00%	0,01%	0,00%	0,10%	0,09%	0,10%	0,08%	0,18%	0,12%	0,13%	0,10%	0,12%	0,03%	0,07%	0,05%
	Hardware	0,00%	0,00%	0,00%	0,02%	0,02%	0,02%	0,10%	0,06%	0,08%	0,29%	0,18%	0,24%	0,11%	0,05%	0,08%
	Software	0,00%	0,00%	0,00%	0,01%	-0,01%	0,00%	0,04%	0,04%	0,05%	0,07%	0,04%	0,06%	0,02%	0,02%	0,02%
	KH	0,46%	0,33%	0,40%	0,27%	0,19%	0,24%	0,15%	0,44%	0,28%	0,55%	0,58%	0,56%	0,71%	0,76%	0,73%
	TFP	3,17%	-1,21%	1,20%	6,50%	2,51%	4,73%	-3,53%	2,37%	-0,92%	-1,57%	0,64%	-0,61%	1,79%	-1,08%	0,51%

Source: INE, IEA, Mas and Quesada (2005) and own calculations

Table 9.d: ICT Non-intensive sectors. Growth and productivity decomposition

		Wood & products of wood & cork			Chemicals			Rubber & plastics			Other non-metallic mineral products			Fabricated metal products		
		95-00	**00-04**	**95-04**	**95-00**	**00-04**	**95-04**	**95-00**	**00-04**	**95-04**	**95-00**	**00-04**	**95-04**	**95-00**	**00-04**	**95-04**
	Real GVA growth	7,86%	0,64%	4,65%	3,62%	0,43%	2,20%	5,91%	5,57%	5,76%	5,49%	4,64%	5,11%	3,12%	2,60%	2,89%
Growth rates	**Hours (HL)**	3,78%	2,45%	3,19%	5,57%	0,32%	3,24%	2,48%	4,11%	3,20%	3,81%	1,82%	2,92%	6,68%	-0,11%	3,66%
	KH	0,85%	0,91%	0,88%	0,23%	0,69%	0,44%	0,23%	0,69%	0,44%	0,23%	0,69%	0,44%	0,23%	0,69%	0,44%
	Constructions	7,63%	6,64%	7,19%	2,55%	0,97%	1,85%	7,03%	4,67%	5,98%	5,56%	4,31%	5,00%	7,99%	8,22%	8,09%
	Transport equipments	6,09%	5,88%	6,00%	2,74%	-3,54%	-0,05%	5,31%	-2,11%	2,01%	2,64%	2,04%	2,38%	7,01%	8,66%	7,74%
	Machinery	7,33%	6,52%	6,97%	1,80%	-1,02%	0,55%	6,62%	2,71%	4,89%	4,25%	2,33%	3,40%	6,79%	7,57%	7,14%
	Communications	11,58%	10,27%	11,00%	6,24%	4,24%	5,35%	10,73%	7,96%	9,50%	8,42%	8,10%	8,28%	10,34%	11,54%	10,87%
	Hardware	15,19%	23,39%	18,83%	14,97%	8,49%	12,09%	23,54%	14,45%	19,50%	16,56%	17,36%	16,92%	25,14%	30,35%	27,46%
	Software	6,36%	30,35%	17,03%	17,94%	-5,25%	7,63%	17,74%	1,23%	10,40%	15,71%	12,21%	14,15%	29,05%	18,64%	24,42%
Cost shares	**Labor**	0,7775	0,7808	0,7773	0,6887	0,7193	0,7008	0,8373	0,8550	0,8459	0,6486	0,6659	0,6563	0,5371	0,5387	0,5337
	Constructions	0,0679	0,0584	0,0648	0,0974	0,0794	0,0910	0,0457	0,0363	0,0419	0,0881	0,0755	0,0836	0,1718	0,1541	0,1669
	Transport equipments	0,0177	0,0204	0,0190	0,0117	0,0127	0,0121	0,0060	0,0059	0,0059	0,0235	0,0253	0,0242	0,0149	0,0186	0,0167
	Machinery	0,1196	0,1225	0,1211	0,1694	0,1574	0,1641	0,0950	0,0875	0,0908	0,2099	0,2026	0,2056	0,2422	0,2480	0,2456
	Communications	0,0109	0,0126	0,0117	0,0155	0,0164	0,0159	0,0089	0,0093	0,0089	0,0188	0,0209	0,0196	0,0220	0,0245	0,0231
	Hardware	0,0057	0,0038	0,0050	0,0140	0,0091	0,0119	0,0063	0,0045	0,0054	0,0095	0,0067	0,0083	0,0104	0,0109	0,0108
	Software	0,0008	0,0015	0,0011	0,0033	0,0056	0,0043	0,0009	0,0015	0,0011	0,0016	0,0031	0,0023	0,0016	0,0052	0,0033
Contribution to to growth	**Hours (HL)**	2,94%	1,91%	2,48%	3,84%	0,23%	2,27%	2,08%	3,51%	2,71%	2,47%	1,21%	1,92%	3,59%	-0,06%	1,95%
	Non-ICT KP	1,50%	1,31%	1,42%	0,59%	-0,13%	0,26%	0,98%	0,39%	0,71%	1,44%	0,85%	1,17%	3,12%	3,31%	3,23%
	ICT KP	0,22%	0,26%	0,24%	0,37%	0,12%	0,26%	0,26%	0,14%	0,20%	0,34%	0,32%	0,34%	0,54%	0,71%	0,63%
	Communications	0,13%	0,13%	0,13%	0,10%	0,07%	0,08%	0,10%	0,07%	0,09%	0,16%	0,17%	0,16%	0,23%	0,28%	0,25%
	Hardware	0,09%	0,09%	0,09%	0,21%	0,08%	0,14%	0,15%	0,06%	0,11%	0,16%	0,12%	0,14%	0,26%	0,33%	0,30%
	Software	0,00%	0,05%	0,02%	0,06%	-0,03%	0,03%	0,02%	0,00%	0,01%	0,03%	0,04%	0,03%	0,05%	0,10%	0,08%
Contribution to Productivity	**Productivity growth**	4,08%	-1,81%	1,46%	-1,95%	0,11%	-1,04%	3,44%	1,46%	2,56%	1,68%	2,82%	2,19%	-3,55%	2,71%	-0,77%
	Non-ICT KP	0,73%	0,81%	0,77%	-0,97%	-0,21%	-0,61%	0,62%	-0,14%	0,26%	0,22%	0,30%	0,26%	0,26%	3,35%	1,66%
	ICT KP	0,15%	0,22%	0,18%	0,18%	0,11%	0,16%	0,22%	0,08%	0,15%	0,23%	0,27%	0,25%	0,31%	0,71%	0,49%
	Communications	0,09%	0,10%	0,09%	0,01%	0,06%	0,03%	0,07%	0,04%	0,06%	0,09%	0,13%	0,11%	0,08%	0,28%	0,17%
	Hardware	0,07%	0,08%	0,08%	0,13%	0,07%	0,11%	0,13%	0,05%	0,09%	0,12%	0,10%	0,12%	0,19%	0,33%	0,26%
	Software	0,00%	0,04%	0,02%	0,04%	-0,03%	0,02%	0,01%	0,00%	0,01%	0,02%	0,03%	0,03%	0,04%	0,10%	0,07%
	KH	0,66%	0,71%	0,68%	0,16%	0,50%	0,31%	0,19%	0,59%	0,37%	0,15%	0,46%	0,29%	0,12%	0,37%	0,23%
	TFP	2,54%	-3,55%	-0,17%	-1,33%	-0,29%	-0,89%	2,41%	0,93%	1,78%	1,08%	1,80%	1,40%	-4,24%	-1,73%	-3,15%

Source: INE, IEA, Mas and Quesada (2005) and own calculations

Table 9.e: ICT Non-intensive sectors. Growth and productivity decomposition

		Machinery & mechanical equipment			Transport equipment manufacturing			Miscellaneous manufacturing			Construction			Wholesale & retail trade; Repairs		
		95-00	**00-04**	**95-04**	**95-00**	**00-04**	**95-04**	**95-00**	**00-04**	**95-04**	**95-00**	**00-04**	**95-04**	**95-00**	**00-04**	**95-04**
	Real GVA growth	9,58%	8,20%	8,97%	3,35%	-0,12%	1,81%	7,54%	3,12%	5,57%	4,55%	6,54%	5,43%	3,46%	1,33%	2,51%
Growth rates	**Hours (HL)**	4,77%	3,20%	4,07%	3,28%	-0,50%	1,60%	7,76%	-0,93%	3,90%	8,21%	5,39%	6,96%	5,09%	0,96%	3,26%
	KH	0,45%	0,33%	0,40%	0,45%	0,33%	0,40%	0,45%	0,33%	0,40%	0,57%	0,27%	0,44%	0,91%	0,56%	0,75%
	Constructions	0,66%	-0,40%	0,19%	4,31%	7,58%	5,76%	6,50%	4,84%	5,76%	4,75%	5,31%	5,00%	7,43%	6,61%	7,07%
	Transport equipments	1,42%	-2,40%	-0,28%	2,69%	2,67%	2,68%	5,99%	1,03%	3,79%	5,48%	5,69%	5,57%	7,22%	3,23%	5,45%
	Machinery	1,83%	-0,79%	0,67%	5,33%	7,61%	6,34%	6,07%	3,59%	4,96%	5,63%	5,39%	5,52%	4,27%	3,32%	3,85%
	Communications	5,64%	4,57%	5,16%	8,65%	10,77%	9,59%	10,83%	9,15%	10,08%	23,97%	17,63%	21,15%	15,57%	10,56%	13,34%
	Hardware	13,90%	7,08%	10,86%	22,23%	27,64%	24,63%	22,13%	17,55%	20,09%	25,18%	16,51%	21,33%	26,54%	19,01%	23,19%
	Software	23,32%	2,21%	13,93%	21,93%	10,77%	16,97%	24,59%	12,44%	19,19%	6,43%	3,65%	5,19%	8,67%	8,58%	8,63%
Cost shares	**Labor**	0,8520	0,8973	0,8719	0,7644	0,7188	0,7424	0,8327	0,8309	0,8313	0,9216	0,9383	0,9285	0,8453	0,8411	0,8422
	Constructions	0,0330	0,0189	0,0272	0,0290	0,0282	0,0293	0,0384	0,0340	0,0371	0,0383	0,0261	0,0334	0,0701	0,0668	0,0697
	Transport equipments	0,0121	0,0099	0,0111	0,0552	0,0670	0,0607	0,0094	0,0109	0,0100	0,0078	0,0079	0,0078	0,0145	0,0180	0,0160
	Machinery	0,0821	0,0597	0,0720	0,1310	0,1584	0,1439	0,1008	0,1033	0,1018	0,0296	0,0254	0,0277	0,0493	0,0473	0,0483
	Communications	0,0077	0,0062	0,0070	0,0122	0,0158	0,0139	0,0092	0,0110	0,0100	0,0000	0,0000	0,0000	0,0040	0,0053	0,0046
	Hardware	0,0120	0,0057	0,0093	0,0065	0,0072	0,0069	0,0083	0,0069	0,0077	0,0018	0,0014	0,0016	0,0095	0,0097	0,0097
	Software	0,0012	0,0022	0,0016	0,0017	0,0045	0,0030	0,0012	0,0030	0,0020	0,0009	0,0010	0,0009	0,0073	0,0117	0,0095
Contribution to growth	**Hours (HL)**	4,06%	2,88%	3,55%	2,50%	-0,36%	1,19%	6,46%	-0,77%	3,24%	7,57%	5,05%	6,46%	4,30%	0,81%	2,74%
	Non-ICT KP	0,19%	-0,08%	0,05%	0,97%	1,60%	1,24%	0,92%	0,55%	0,76%	0,39%	0,32%	0,36%	0,84%	0,66%	0,77%
	ICT KP	0,24%	0,07%	0,16%	0,29%	0,42%	0,35%	0,31%	0,26%	0,29%	0,05%	0,03%	0,04%	0,38%	0,34%	0,37%
	Communications	0,04%	0,03%	0,04%	0,11%	0,17%	0,13%	0,10%	0,10%	0,10%	0,00%	0,00%	0,00%	0,06%	0,06%	0,06%
	Hardware	0,17%	0,04%	0,10%	0,14%	0,20%	0,17%	0,18%	0,12%	0,16%	0,05%	0,02%	0,03%	0,25%	0,18%	0,22%
	Software	0,03%	0,00%	0,02%	0,04%	0,05%	0,05%	0,03%	0,04%	0,04%	0,01%	0,00%	0,00%	0,06%	0,10%	0,08%
Contribution to Productivity	**Productivity growth**	4,82%	4,99%	4,89%	0,07%	0,38%	0,21%	-0,23%	4,05%	1,67%	-3,66%	1,15%	-1,52%	-1,63%	0,36%	-0,75%
	Non-ICT KP	-0,42%	-0,36%	-0,40%	0,27%	1,73%	0,87%	-0,24%	0,68%	0,18%	-0,23%	0,00%	-0,12%	0,16%	0,53%	0,33%
	ICT KP	0,14%	0,03%	0,09%	0,22%	0,43%	0,32%	0,17%	0,28%	0,22%	0,03%	0,01%	0,02%	0,27%	0,32%	0,29%
	Communications	0,01%	0,01%	0,01%	0,07%	0,18%	0,11%	0,03%	0,11%	0,06%	0,00%	0,00%	0,00%	0,04%	0,05%	0,05%
	Hardware	0,11%	0,02%	0,06%	0,12%	0,20%	0,16%	0,12%	0,13%	0,13%	0,03%	0,02%	0,02%	0,20%	0,18%	0,19%
	Software	0,02%	0,00%	0,02%	0,03%	0,05%	0,05%	0,02%	0,04%	0,03%	0,00%	0,00%	0,00%	0,03%	0,09%	0,05%
	KH	0,38%	0,30%	0,35%	0,34%	0,24%	0,30%	0,37%	0,28%	0,33%	0,53%	0,25%	0,41%	0,77%	0,47%	0,63%
	TFP	4,71%	5,03%	4,86%	-0,76%	-2,02%	-1,27%	-0,53%	2,81%	0,95%	-3,99%	0,89%	-1,84%	-2,83%	-0,95%	-2,00%

Source: INE, IEA, Mas and Quesada (2005) and own calculations

Table 9.f: ICT Non-intensive sectors. Growth and productivity decomposition

		Hotels and catering			Private education		
		95-00	00-04	95-04	95-00	00-04	95-04
	Real GVA growth	5,18%	1,76%	3,66%	3,02%	1,67%	2,42%
Growth rates	**Hours (HL)**	6,24%	1,15%	3,98%	3,44%	1,42%	2,54%
	KH	0,91%	0,56%	0,75%	0,39%	0,37%	0,38%
	Constructions	7,72%	6,48%	7,17%	6,15%	8,99%	7,41%
	Transport equipments	4,55%	0,29%	2,66%	13,39%	12,71%	13,09%
	Machinery	2,77%	0,27%	1,66%	5,79%	8,21%	6,87%
	Communications	13,35%	11,76%	12,65%	11,48%	15,88%	13,44%
	Hardware	25,40%	15,94%	21,20%	31,93%	30,82%	31,44%
	Software	4,31%	-0,68%	2,09%	16,47%	15,46%	16,02%
Cost shares	**Labor**	0,8742	0,8960	0,8828	0,9500	0,9514	0,9500
	Constructions	0,0481	0,0405	0,0456	0,0326	0,0282	0,0312
	Transport equipments	0,0020	0,0020	0,0020	0,0020	0,0032	0,0025
	Machinery	0,0655	0,0508	0,0591	0,0106	0,0105	0,0106
	Communications	0,0047	0,0056	0,0051	0,0012	0,0014	0,0013
	Hardware	0,0024	0,0020	0,0022	0,0026	0,0034	0,0030
	Software	0,0031	0,0031	0,0031	0,0010	0,0018	0,0013
Contribution to growth	**Hours (HL)**	5,46%	1,03%	3,51%	3,27%	1,35%	2,42%
	Non-ICT KP	0,56%	0,28%	0,43%	0,29%	0,38%	0,34%
	ICT KP	0,14%	0,10%	0,12%	0,11%	0,16%	0,13%
	Communications	0,06%	0,07%	0,06%	0,01%	0,02%	0,02%
	Hardware	0,06%	0,03%	0,05%	0,08%	0,11%	0,09%
	Software	0,01%	0,00%	0,01%	0,02%	0,03%	0,02%
Contribution to Productivity	**Productivity growth**	-1,06%	0,61%	-0,31%	-0,42%	0,24%	-0,13%
	Non-ICT KP	-0,16%	0,17%	0,01%	0,13%	0,32%	0,22%
	ICT KP	0,07%	0,08%	0,08%	0,10%	0,15%	0,12%
	Communications	0,03%	0,06%	0,04%	0,01%	0,02%	0,01%
	Hardware	0,05%	0,03%	0,04%	0,08%	0,10%	0,09%
	Software	-0,01%	-0,01%	-0,01%	0,01%	0,03%	0,02%
	KH	0,79%	0,50%	0,66%	0,37%	0,35%	0,36%
	TFP	-1,76%	-0,14%	-1,06%	-1,03%	-0,57%	-0,83%

Source: INE, IEA, Mas and Quesada (2005) and own calculations

Table 10: Total factor productivity growth.

Andalucía	95-00	00-04	95-04
Total market economy	-1,64%	-0,47%	-1,13%
Intensive ICT-users			
Energy and water	1,98%	0,94%	1,48%
Pulp, paper, printing & publishing	3,46%	-2,20%	0,91%
Electric, electronic & optic equipment	-1,16%	-0,85%	-1,06%
Transport and communications	-0,41%	-0,89%	-0,66%
Financial intermediation	-0,63%	-0,46%	-0,54%
Business services	-6,51%	-1,61%	-4,26%
Private health & social services	-1,46%	-0,45%	-1,01%
Other community, social & personal services	-2,01%	-0,70%	-1,45%
Average	**-0,84%**	**-0,78%**	**-0,82%**
Non-Intensive ICT-users			
Agriculture & cattle farming	3,17%	-1,21%	1,20%
Fishing	6,50%	2,51%	4,73%
Mineral oil refining, coke & nuclear fuel	-3,53%	2,37%	-0,92%
Food, drink and tobacco	-1,57%	0,64%	-0,61%
Textiles, clothing, leather and footwear	1,79%	-1,08%	0,51%
Wood & products of wood & cork	2,54%	-3,55%	-0,17%
Chemicals	-1,33%	-0,29%	-0,89%
Rubber & plastics	2,41%	0,93%	1,78%
Other non-metallic mineral products	1,08%	1,80%	1,40%
Fabricated metal products	-4,24%	-1,73%	-3,15%
Machinery & mechanical equipment	4,71%	5,03%	4,86%
Transport equipment manufacturing	-0,76%	-2,02%	-1,27%
Miscellaneous manufacturing	-0,53%	2,81%	0,95%
Construction	-3,99%	0,89%	-1,84%
Wholesale & retail trade; Repairs	-2,83%	-0,95%	-2,00%
Hotels and catering	-1,76%	-0,14%	-1,06%
Private education	-1,03%	-0,57%	-0,83%
Average	**0,04%**	**0,32%**	**0,16%**