LABOUR PRODUCTIVITY AND CYCLICAL DYNAMICS IN THE SERVICE SECTOR

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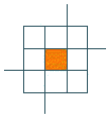

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ABSTRACT:

A longstanding basis of empirical economics is that average labour productivity declines during recessions and increases during booms, behaves procyclically. In the short run, output growth and productivity tend to move together in many countries and across a wide range of industries. In recent years this observation has gained increased prominence, as each proposed explanation for the observed procyclicality has important implications for modelling the business cycle and measuring technical change. By filtering out the influence of business cycles, it is possible to isolate changes in the long run, or structural rate, of productivity growth and so assess the importance of any source for economic growth.

The aim of this paper is to better understand short-run changes in productivity growth within the service sector industries, necessarily different from the ones existing within manufacturing sector. Another goals of this research are to assess if this observed procyclicality remains if service sector is the scope of analysis, and if this fact is homogeneous among different activities within this miscellanous sector or not. Empirical evidence for Spanish economy is presented.

KEY WORDS: Productivity, cycles, services

RESUMEN:

Un hecho ampliamente documentado empíricamente es que la productividad aparente del trabajo decae durante las recesiones y crece en las expansiones económicas, es decir, tiene un comportamiento procíclico. A corto plazo, el crecimiento de la producción y la productividad tienden a moverse conjuntamente en la mayoría de países y sectores de actividad económica. En los últimos años, ha aumentado la importancia de esta observación, ya que las diferentes explicaciones que se han dado para esa prociclicidad tienen importantes implicaciones al modelizar el ciclo económico y estimar el cambio tecnológico. Eliminando la influencia del ciclo económico, es posible aislar los cambios estructurales, o crecimiento a largo plazo, de la productividad y analizar su papel en el crecimiento económico.

El objetivo de este documento de trabajo es profundizar en los cambios a corto plazo del crecimiento de la productividad dentro de las actividades de servicios, necesariamente diferentes de aquellas dentro del sector manufacturero. Otros objetivos son estudiar si la prociclicidad se mantiene cuando el sector servicios es el centro de análisis, y si este hecho es homogéneo entre las diferentes ramas que lo componen. Se presenta evidencia empírica para el caso de la economía española durante el período 1980-2002.

PALABRAS CLAVES : Productividad, Ciclos, Servicios

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1. INTRODUCTION

One of the most outstanding debate in recent years is the productivity gap between European countries and the United States. Low productivity growth in most advanced countries has historically been related to structural changes and, more precisely, to the performance and weight of service industries (both in terms of labour and value added). Conventional theories (Fisher, Clark, Bell, Fourastie or Baumol, among others) outlined the low productivity of tertiary activities and its negative contribution to aggregate growth. However, most recent studies (Wölfl, Triplett, Bosworth, Oulton, van Ark, among others) show that some service branches reach growth rates close to, or even higher than most dynamic manufacturing ones, and its contribution to aggregate growth plays a major role than people traditionally believed.

As is usually the case in studies focusing on industry productivity, the analysis usually adopts a long-run framework and ignored complications arising from economic cycles and related macroeconomic factors. The key question addressed in this paper is how much service sector productivity growth can be attributed to cyclical macroeconomic factors instead of structural forces. If most of the upsurge in productivity growth is associated with short-term macroeconomic factors, then it is possible that its effects will not stand up at the long run. To answer this question, productivity can be decomposed into a trend, or structural, component and a cyclical component. By filtering out the influence of the business cycle, it is possible to isolate changes in the long run, or structural rate, of productivity growth and so assess the importance of service sector in the development patterns of aggregate productivity growth and economic growth in general.

A deeper understanding of the business cycle and the role of service industries is interesting for obvious reasons having to do with macroeconomic stability. But it is also important to recognise that the structural growth rate can be affected by cyclical episodes. For example, recessions are often thought of as times of restructuring and reallocation that set the stage for enhanced growth and faster job creation later. On the other hand, deep recessions can lead to the degradation of human capital during long spells of unemployment and this can reduce the long-term growth rate over considerable periods of time.

After this brief introduction to research topic, the next section surveys the relationshipts between productivity and business cycles. Using the Groningen Growth and Development Centre (GGDC) 60-Industry database, second section investigates the relationship between labour productivity and real output for 9 service subsectors (Nace 2 digits): commerce, hotels and restaurants, transport, communications, financial services, real state, business services, public services and social and

personal services. The adopted approach for analysing cyclical dynamics in the service industries has been based on the decomposition of productivity growth rates into cycle and trend components. There are a wide variety of methods used to accomplish this task, but here it has been used Hodrick and Prescott (1997) filter. Final section concludes. The analysis has focused on labour productivity measured as the relation between real value added and employment (in number of persons employed and hours worked) for Spanish economy. Finally, the time series used range from 1980 to nowadays.

2. RELATIONSHIP BETWEEN LABOUR PRODUCTIVITY AND BUSINESS CYCLES

The term 'cycle'[1] is used to describe a process that moves sequentially between a series of clearly identifiable phases in a recurrent of periodic fashion. Economists of the 19th and early 20th centuries were persuaded that they saw such a pattern exhibited in the overall level of economic activity and enthusiastically sought to characterize the observed regularities of what came to be known as the 'business cycle' (Hamilton, 2005). On the other hand, productivity is pro-cyclical. That is, whether measured as labour productivity or multifactor productivity, productivity rises in booms and falls in recessions. Recent macroeconomic literature views this stylized fact of pro-cyclical productivity as an essential feature of business cycles, largely because of the realization that each explanation for this stylized fact has important implications for the workings of macroeconomic models.

Until recently, economists generally regarded the long-run average rate of productivity growth as important for growth and welfare, procyclical productivity, by contrast, seemed irrelevant for understanding business cycles. Since the 1990s. productivity fluctuations have taken center stage in modeling ouput variations and are now viewed as an essential part of the cycle. This growing interest is due to the realization that procyclicality is closely realted to the impulses of propagation mechanisms underlying business cycles. Even the cyclical mismeasurement that was formerly dismissed as unimportant turns out to play a main role.

According to Basu and Fernald (2000), there are four main explanations for high-frequency fluctuations in productivity. First, procyclical productivity may reflect procyclical technology. Second, widespread imperfect competition and increasing returns may lead productivity to

[1] The most sistematic and still-enduring notion that economy inhabits distinct phases traces back to Mitchell (1927, 1951) and Burns and Mitchell (1946).

rise whenever inputs rise. Third, as already mentioned, utilization of inputs may vary over the cycle. Finally, reallocation of resources across uses with different marginal products may contribute to procyclicality[2]. The increasing care about the relative importance of these four explanations in recent times is related to changes in the methodology of macroeconomics and the expansion in the utilization of dynamic general equilibrium (DGE) models.

According to the first of the before mentioned explanations, if high-frequency fluctuations in productivity reflect high-frequency fluctuations in technology, then comovement of output and input are a natural byproduct. DGE approaches to business cycle modeling began with so-called real business cycles models, which explore the extent to which the frictionless one-sector Ramsey-Cass-Koopmans growth model can explain business cycle correlations. These models use Solow's productivity residual – interpreted as aggregate technology shocks – as the dominant impulse driving the cycle (Cooley and Prescott, 1995). Other impulses[3] may affect output in these models, but technology shocks must dominate if the model is to match the key stilized fact of business cycles: the positive comovement of output and labour input (Barro and King, 1984).

Second, recent papers show that increasing returns (Beaudry and Devereaux, 1994) and imperfect competition (Rotemberg and Woodford, 1995) can modify and magnify the effects of various shocks in an othewise-standard DGE model. In response to government demand shocks, for example, models with countercyclical markups can explain a rise in real wages while models with increasing returns can explain a rise in measured productivity. Furthermore, if firms are not all perfectly competitive, then it is not approapite to use the Solow residual as a measure of technology shocks, since it becomes endogenous.

Third, variable utilization of resources turns out to improve the propagation of shocks. If firms can vary the intensity of factor use, then the effective supply of capital and labour becomes more elastic. Small shocks can then lead to large fluctuations (Burnside and Eichenbaum, 1996; Dotsey et al., 1997; Wen, 1998).

Finally, reallocations of inputs, without any change in technology, may cause aggregate productivity to be procyclical. For example, in the sectoral shifts literature (e.g., Ramey and Shapiro, 1998; Phelan and Trejos, 1996), demand shocks cause differences in the marginal product

[2] For examples of these four explanations, see, respectively, Cooley and Prescott (1995), Hall (1988, 1990), Basu (1996), Bils and Cho (1994), Gordon (1993) and Basu and Fernald (1997a,b).

[3] DGE models without technology shocks can match this stylized fact with counter-cyclical markups of price over marginal cost, arising from sticky prices (Kimball, 1995) or from game-theoretic interactions between firms (Rotemberg and Woodford, 1992). Models with an exterme form of increasing returns can also produce a possitive comovement between output and labour input (Farmer and Guo, 1994).

of immobile factors across firms. Output fluctuations then reflect shifts of resources among uses with different marginal products (Basu and Fernald, 1997a; Weder, 1997). Reallocations, can also help propagate sector-specific technology shocks (Lilien, 1982).

Both theoretical and empirical papers and studies on productivity growth have reached a stage where only few researchers question the stylised fact that average labour productivity is pro-cyclical. Current research is concentrated primarily on discriminating among competing economic explanations of this phenomenon. Ever since the pioneering work of Oi (1962) and Becker (1964), the labour hoarding hypothesis has consistently led the field of contenders[4], although the role of technology shocks and true increasing returns in production have featured prominently in more recent times. Despite the strength of these explanations, it is likely that significant sectors of industry do not display pro-cyclical labour productivity. The view that recessions provide opportune times for firms to clean up resources offers a potentially important source of counter-cyclical effect[5]. For example, Caballero and Hammour (1994) model the process whereby productivity is enhanced during recessions as firms scrap outdated capital and invest in the latest product and process innovations[6]. If these and other related activities play a role, then might counter-cyclical productivity behaviour predominate in such industries? Caballero and Hammour suggest that, while the contrasted effect is likely to be small and may be dwarfed by other factors, such as externalities, the likely answer is no. accordingly, this may help to iron-out cyclical peaks and troughs in these industries and to facilitate the ability to undertake long-term output planning and production scheduling.

Nevertheless, outside of these arguments, for structural and other reasons pro-cyclical labour productivity may not be a predominant industrial feature. In the first instance, the demand for certain industrial products, such as medical chemicals and burial caskets for example, is unlikely to follow typical cyclical patterns. Secondly, industries with low set-up and other fixed capital and labour costs, may feel better able to vary short-run factor inputs so as to attain relatively stable labour productivity growth paths. These lines of reasoning point to the

[4] See the discussion in Hart and Malley (1996). Some leading examples include Fair (1969, 1985), Fay and Medoff (1985), Aizcorbe (1992), Bernanke and Parkinson (1991) and Marchetti (1994).

[5] Caballero and Hammour (1994) and Aghion and Saint-Paul (1991) stress technological and capital related activities. Saint-Paul (1993) provides a review of these models. Recent empirical work by Malley and Muscatelli (1996) provides strong evidence.

[6] Models of recessionary cleansing do not necessarily predict counter-cyclical productivity. Bean (1990) argues that during recessions firms may reallocate a larger part of their labour force towards human capital enchancing activities that do not directly add to current output while, during booms, they shift emphasis towards current production. Davis and Haltiwanger (1989) and Gali and Hammour (1991) also emphasize labour-related cleansing activities.

possibility that significant instances of counter-cyclical and acyclical productivity behaviour have not been observed because studies to date have failed to disaggregate the industrial data sufficiently.

3. METHODOLOGY: DECOMPOSING PRODUCTIVITY GROWTH INTO TREND AND CYCLICAL COMPONENTS

Business cycles are traditionally defined as sequences of expansions and contractions in the level of economic activity. In other words, classical recessions and expansions are signalled by negative and positive growth in economic activity. In contrast, growth cycles are sequences of high and low growth rates. Growth cycles involve slowdowns, where growth rates decline, but remain positive. All recessions involve slowdowns, but not all slowdowns include recessions. Therefore, growth cycles occur with greater frequency then business cycles. While they are related, they represent distinctly different phenomena and are typically analysed separately (see The Conference Board (2001) and Zarnowitz and Ozyildirim (2001)). Here we are interested in identifying the growth in trend productivity so the focus is on growth cycle analysis.

Because cyclical slowdowns and speedups in growth rates characterise growth cycles they require trend estimation in order to separate the long run or structural component from cyclical or short-run deviations in the productivity series. There are a wide variety of methods used to accomplish this task. Zarnowitz and Ozyildirim (2001) compare and contrast various methods for separating trend and cycle and find that several alternative methods provide very similar results. They show that the more widely used Hodrick and Prescott (1997) filter, hereafter referred to as HP, also does a good job of separating trend and cycle.

The HP filter[7], which is based first on Lucas' (1977) definition of cycle component of a variable as the deviations from its smoothed trend, estimates a trend by minimizing the deviations from this trend. This minimization is constrained by a smoothness parameter, generally referred to as the 'lambda' parameter. This is realized minimizing:

$$\sum_{t=1}^{N}(Y_t - T_t)^2 + \lambda \sum_{t=k+1}^{N}(\nabla^k T_t)^2 ,$$

[7] The HP filter has been analysed in details in the time and frequency domain by King and Rebelo (1993) and Blackburn and Ravn (1991).

where Yt represents the original series and Tt the trend $\nabla T_t =$ T^t - T^{t-1}, $\nabla^k = \nabla(\nabla^{k-1})$, for some appropriately chosen smoothness trade-off parameter λ. The first term is a measure of 'goodness-of-fit' and the second term is a measure of the 'degree-of-smoothness' which penalises decelerations in the growth rate of the trend component. Variations in the smoothing parameter λ alter the trade-off between the goodness of the fit and the degree-of-smoothness. The previous formula makes clear that if lambda is set to zero, cyclical deviations are minimised without constraint so the trend will be equal to the original series. Conversely, if lambda goes to infinity the trend converges to a linear trend.

The primary reason for the choice of the HP filter is that recent analysis of the cyclical aspects of productivity growth has employed this filter and its use provides a convenient way to compare the results with those in the literature, particularly Inklaar and McGuckin (2003) and Maroto and Rubalcaba (2008) on the EU countries and Gordon (2003) on the US economy. In addition the HP filter provides estimates for trend growth at the end of the sample. Although such estimates are less reliable than those in the middle of the sample, in this case they are most interesting.

End-points (years in this case) are always a problem with trend filters because they generally use a form of (weighted) moving averages to smooth the time series. This means filters need both past and future values of the times series to calculate the trend at a certain point in time. Although the most commonly used filters produce similar trends for intermediate points of the sample (as long as the appropriate parameters are chosen well), the behaviour at the end of the sample will generally deviate. Given the short series and the importance of the recessions and/or slowdowns at the end of the here referenced period, the HP filter provides a sensible filter choice. Nevertheless, various experiments suggest that the results would not change if alternative filters were used.

A key characteristic of all the decomposition techniques investigated is that they estimate non-linear trends. This is an essential characteristic since the use of a non-linear trend component makes it possible to identify shifts or changes in the structural or trend growth rate. Arguably, this kind of approach provides an opportunity to examine the structural component for changes to assess the role for services industries. There are other methods of looking at structural changes. For example breakpoint tests such as described in Hansen (2001) can also be used to test for (sequential) breaks8.

[8] These methods essentially use dummy variables to look for piece-wise discontinuities, rather than rely on an estimate of a non-linear trend. Some experiments with these methods on data for the US found results similar to those in Stiroh (2002). In this research, the most likely break in the sample period was 1995.

Implementation of the HP filter requires setting a value for the smoothing parameter λ. This is not unique to HP, as all filters require similar choices. Hodrick and Prescott (1997) suggested in their seminal paper for quarterly data that λ was set equal to 1600. Ravn and Uhlig (2002) suggest a simple formula to find the lambda for a different frequency of observations that delivers the same amount. In this paper it is used their formula, dividing the quarterly lambda of 1600 by 44 and arriving at a λ for annual9 data of 6.25.

Despite certain advantages, the statistical properties of the detrended components of the data remain controversial (King and Rebelo, 1993; Cogley, 1990; Harvey and Jager, 1991; Fiorito and Kollintzas, 1992). For this reason, it is also examined the sensitivity of most of our findings to the detrending method by computing measures of volatility persistence and co-movement of the underlying productivity series in the Spanish economy. In order to achieve this goal, the standard deviation of detrended series is given as a measure of the volatility of the cyclical component in percentage terms. In addition, the cross-correlations of the productivity and output growth series provide information both on whether the productivity of each sector is procyclical or countercyclical and on the phase-shift relative to the aggregate economic cycle. A positive (negative) number and a significant magnitude indicate that market share is procyclical (countercyclical), while a number close to zero indicates that is contemporaneously uncorrelated. For the annual data we chose the cut-off point of 0.35 – which roughly correspond to the required values to reject the null hypothesis that the correlation coefficient is zero at the 5% significance level of the two-sided *t*-statistic. Furthermore, if the cross-correlation of productivity has the largest value (in absolute terms) in entries *t-i*, *t* o *t+j*, we say that the cycle is leading by *i* periods, is synchronous, or is lagging by *j* periods the economic cycle, respectively.

[9] In order to move from quarterly to annual data, number of observations in a year drop from 4 to 1. Ravn and Uhlig (2002) use spectral methods to arrive at lambda should be divided by 4^4. Accordingly, moving from monthly to quarterly data, lambda should be divided by 3^4.

4. RESULTS: PRODUCTIVITY GROWTH AND CYCLICAL BEHAVIOUR IN THE SPANISH ECONOMY.

Many recent and well-known U.S. and other studies[10] have provided economy-wide correlations between labour productivity and an output measure of the business cycle. They are all supportive of the view that labour productivity is pro-cyclical and serve to underpin theoretical and empirical macroeconomic studies that incorporate this property. However, these studies are not necessarily inconsistent with the possibility that significant industries within these economies experience acyclical or even counter-cyclical productivity.

As an initial benchmark exercise, it has been correlated detrended productivity – both in terms of number of employees (lp) and worked hours (hp) and equivalent detrended real output (y), since we are interested in the comovement of the cyclical components of these series. An additional motivation for detrending prior to examining the correlations is to avoid the potential problem of nonsense of spurious correlation (Granger and Newbold, 1974; Phillips, 1986) when dealing with non stationary data. Although we ultimate concentrate the present analysis on correlations based on deviations from a HP trend, several other ad hoc methods for removing low frequency fluctuations are presented. These include (i) stochastic detrending using logged first-differences and (ii) deterministic detrending using deviations from a linear trend11. Since it is well known that the HP filter may induce spurous correlations, the latter two filters are presented as benchmarks for comparison.

[10] See, among others, Kydland and Prescott (1982, 1990), Hansen (1985), Prescott (1986), McCallum (1989), Benhabib et al. (1991), Hansen and Wright (1992) or Bencivenga (1992) for the U.S.; Fiorito and Kollintzas (1992) for G-7 ; and Christodoulakis et al. (1995) for the EU countries.

[11] Ad hoc univariate fixed filters have well known pitfalls and limitations (Maravall, 1995). However, they are applied here since alternatives, such as structural time series analysis (Harvey, 1989) are simply not practical when dealing with four so many disaggregated industries.

TABLE 1.A.

Sensiviteness to cycle in the Spanish productivy, 1980-2003

(bivariate correlations)

	TOTAL			MANUFACTURING			SERVICES			MARKET SERVICES		
	hp(y)	d(y)	t(y)	hp(y)	d(y)	t(y)	hp(y)	d(y)	t(y)	hp(y)	d(y)	t(y)
hp(hp)	0.014			0.846			-0.007			0.138		
	(0.067)			(7.459)			(-0.036)			(0.655)		
d(hp)		-0.677			0.732			-0.280			-0.239	
		(-4.412)			(5.155)			(-1.403)			(-1.180)	
t(hp)			-0.718			0.443			-0.110			-0.214
			(-3.268)			(1.565)			(-0.352)			(-0.695)
hp(lp)	0.005			0.877			0.159			0.301		
	(0.024)			(8.556)			(0.757)			(1.481)		
d(lp)		-0.679			0.839			0.056			-0.060	
		(-4.442)			(7.408)			(0.270)			(-0.288)	
t(lp)			-0.742			0.419			0.483			-0.082
			(-3.321)			(1.384)			(1.657)			(-0.246)

Source: Own elaboration

Note: (i) Reported data in the first part of the table refer to the correlation coefficient between detrended productivity and real output. *(ii) hp* denotes the deviation of a coged series from a Hodrick-Prescott trend; *d* refers to the first difference operator; and *t* denotes deviations from a linear trend. *(iii)* t-values are reported in brackets. *(iv)* Coefficients with significance of 1%, 5% and 10% marked, respectively, in red, blue and green.

TABLE 1.B.

Sensiviteness to cycle in the Spanish productivy, 1995-2003

(bivariate correlations)

	TOTAL			MANUFACTURING			SERVICES			MARKET SERVICES		
	hp(y)	d(y)	t(y)	hp(y)	d(y)	t(y)	hp(y)	d(y)	t(y)	hp(y)	d(y)	t(y)
hp(hp)	0.254			0.979			0.127			0.384		
	(0.697)			(12.734)			(0.339)			(1.102)		
d(hp)		-0.932			0.922			0.299			0.011	
		(-6.835)			(6.304)			(0.831)			(0.030)	
t(hp)			-0.044			0.921			0.837			0.786
			(-0.077)			(4.105)			(2.649)			(2.207)
hp(lp)	0.225			0.989			0.494			0.714		
	(0.610)			(17.719)			(1.503)			(2.702)		
d(lp)		-0.934			0.943			0.862			0.626	
		(-6.943)			(7.531)			(4.508)			(2.127)	
t(lp)			-0.020			0.914			0.606			0.790
			(-0.036)			(3.899)			(1.320)			(2.223)

Source: Own elaboration

Correlations were first carried out for the whole sample period (1979-2003) and then for the 1995-2003, so 1995 seems to be the date when divergence between European and US productivity paths. In addition, analysis has been implemented for total aggregate economy, manufacturing and service aggregate sectors, and, finally, market services. Based on two-tailed t-tests, tables 1.a and 1.b reveals that regardless of time period and detrending method, the correlations are, in general, not significantly different from zero. The one potential

exception is the manufacturing sector. In the service sector, correlation between output and productivity cycles is not statistically signficant in most cases, with the exception of market services from mid 90s. (positive correlation, highlighting a pro-cyclical behaviour in these kind of services). Even though measurement problems (Stoker, 1993) with hours of work and the other variables are greatly reduced at this narrower level, the results do not reflect a stylised relationship within Spanish service sector.

The basics results of the decomposition analysis are summarised in tables 2.a and 2.b. Each table (labour productivity and hourly labour productivity respectively) has the same structure and shows the growth in productivity, the growth in trend productivity and the resulting cyclical effect for various subperiods between 1979 and 2003. Although there is some heterogeneity in the magnitude and timing, the basic patterns here shown for Spanish economy are similar for individual European economies.

TABLE 2.A.
Growth in productivity and trend productivity in Spain
(output per employee)

	Total Economy			Manufacturing			Services		
	Actual	*Trend*	*Cycle*	*Actual*	*Trend*	*Cycle*	*Actual*	*Trend*	*Cycle*
1980-1989	2,42	2,40	0,02	3,24	3,22	0,02	0,70	0,64	0,06
1990-1999	0,97	1,04	-0,07	2,72	2,73	0,00	0,14	0,27	-0,13
1990-1995	1,32	1,23	0,09	2,38	2,11	0,27	-0,10	-0,03	-0,07
1996-2003	0,61	0,66	-0,04	3,93	4,13	-0,21	0,57	0,59	-0,03

Source: Own elaboration, based on GGDC data.
Note: Growth in trend productivity has been estimated through a HP filter, with lambda equal to 6.25

TABLE 2.B.
Growth in productivity and trend productivity in Spain
(output per hour worked)

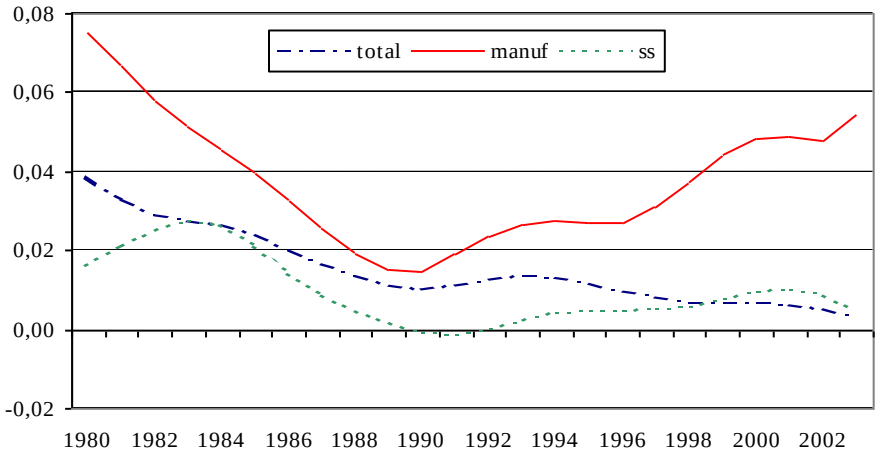
	Total Economy			Manufacturing			Services		
	Actual	*Trend*	*Cycle*	*Actual*	*Trend*	*Cycle*	*Actual*	*Trend*	*Cycle*
1980-1989	2,42	2,40	0,02	4,33	4,28	0,05	1,75	1,67	0,08
1990-1999	0,97	1,04	-0,07	2,76	2,78	-0,02	0,18	0,33	-0,15
1990-1995	1,31	1,22	0,09	2,46	2,22	0,24	-0,01	0,09	-0,10
1996-2003	0,61	0,66	-0,05	4,03	4,25	-0,22	0,68	0,72	-0,04

Source: Own elaboration, based on GGDC data.
Note: Growth in trend productivity has been estimated through a HP filter, with lambda equal to 6.25

The main result in both tables is that cyclical effects are generally pretty small. Another stricking data is the dramatic slowdown of the aggregate productivity growth rates during the reference period. This is as expected as actual productivity growth fell dramatically with the onset of the recession in the US and slowdown in Europe. Notwithstanding the

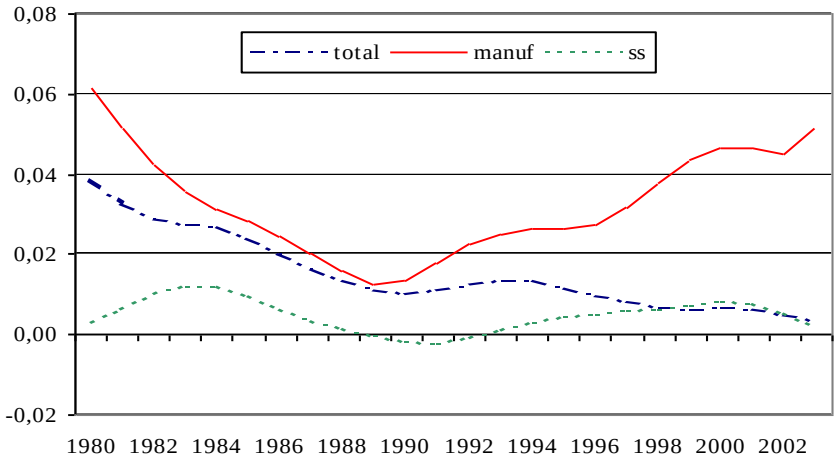
recession, US trend growth accelerated in the second half of the 90s.12, while the EU decelerated and the growth in trend productivity fell below the US level (Maroto and Cuadrado, 2006; Maroto and Rubalcaba, 2007; European Comission, 2004; Inklaar and McGucking, 2003).

FIGURE 1.A.
Growth in trend productivity in Spain
(output per hour worked, annual growth rate)



Source: Own elaboration

FIGURE 1.B.
Growth in trend productivity in Spain
(output per employee, annual growth rate)



Source: Own elaboration

[12] Growth rate in trend productivity per hour worked (worker) in the U.S. rised from 1.10% (1.05) in the first mid 90s. to 2.15% (2.23) from 1995 afterwards, while in the EU-15 fell down from 2.24% (1.85) to 1.85% (1.54).

The focus now turns to the trend or structural component from the decomposition analysis. This allows us to examine whether the relationships identified in the industry data show up for the economy as a whole. The structural or trend effects reported in the earlier tables are graphically reported in figures 1.a and 1.b for hourly labour and labour productivity, respectively. In each figure, growth in structural or trend productivity for aggregate Spanish economy and both manfuacturing and service sectors are reported.

The dominant feature of the trend line both for the Spanish economy and the aggregate service sector since 1980 onwards is a persistent downward movement in the growth of trend productivity, similar to observed patterns in other European countries during the same reference period. Nevertheless, in manufacturing sector the path is quite different, so an acceleration at the beginning of the 90s. is clearly observed.

4.1. Trend and cycles in Spanish service industries

In order to portray succinctly the coverage of the GGDC industry database, table 3 repeats the aggregate estimations of the previous section, but for the different service branches before mentioned. It reveals that 100% of the industries record positive correlations – both in terms of employees and hours worked. For the whole period 1980-2003, the mean correlation within service sector is 0.440. We next tested whether or not the individual correlation coefficients were significantly different from zero. With respect to labour productivity in the full period, around 40% service industries in Spain were significantly[13] pro-cyclical. Of special interest is the case of transports and communications, where the four analized branches behave highly pro-ciclycally (with a mean correlation of 06.44), and financial and insurance services (with the exception of auxiliar activities) with high pro-cyclical patterns too. On the other side, pro-cyclical behaviour in trade and tourism, real state and business services, and non market services is low or not signficative among all analized branches.

At the disaggregated level, the service sector stylized fact of pro-cyclical labour productivity survives in the sense that a majority (around 60% at 10%) of industries exhibit significant degrees of pro-cyclical labour productivity. However, there are enough exceptional cases – with statistically low or no signficance - to warrant caution over its unselective background application to economic analysis.

[13] At a level of statistical confidence equal to 1%. If this level rises to 10%, the amount of service industries which behave pro-cyclically is 60%.

TABLE 3.
Cyclical patterns within Spanish service sector, 1980-2003

Subsector	Branches included	Procyclical hourly productivity[1] (%)	Low procyclical behaviour (<0.3)	High procyclical behaviour (>0.6)
Market services (50-74)	17	0.58 (0.53)	6	6
Trade and tourism (50-55)	4	0.25 (0.25)	2	0
Transport and communications (60-64)	4	1.00 (1.00)	0	4
Financial and insurance services (65-67)	3	0.66 (0.66)	1	2
Real state and business services (70-74)	6	0.50 (0.33)	3	0
Non market services (75-95)	5	0.60 (0.00)	2	0
SERVICE SECTOR (50-95)	22	0.59 (0.41)	8	6

Source: Own elaboration

Note: Third column show the percentage of service branches belonging to each service activity which exhibit cyclical productivity, at 10% of significance (1% between brackets). The two last columns consist on numbers of industries where cyclical productivity shows low (< 0.3) and high intensity (>0.6).

[1]Results for productivity per worker and per hour worked are quite similar.

Tables 4.a-c present the results of the decomposition of productivity growth for the service industries in Spanish economy. The subperiods and sectoral definitions are the same as were used in the earlier analysis for the total economy and aggregate service sector. First note to highlight is the pretty effect of cyclical component in the productivity growth within Spanish service sector during the 80s. and since mid 90s. onwards. The major role in productivity growth is due to structural effects. The exception is the 90s. decade, specially at the beginning of this, when the cyclical component is close to or even high than trend one.

According to the behaviour whithin the different service industries here analysed, the following tables 4.a-c show that transports (during the first mid-90s.) and communications (since 1995) present high productivity growth rates, reaching an average trend annual growth rate of 4.94% and 6.67% respectively. Financial and insurance services reach high trend productivity growth rates too, despite the slowdown movement experienced during the first mid-90s. Public Administration services also behaves dynamically during the 90s. On the other hand, hotels and restaurants (for every analised subperiod), distributive trade (during the 80s.) and business services (with the exception of the first mid-90s.) show negative average rates in the structural productivity growth during the 1980-2003 period.

TABLE 4.A.
Growth in productivity and trend productivity within service industries in Spain, 1980-1989

	Productivity per hour			Productivity per worker		
	Actual	*Trend*	*Cycle*	*Actual*	*Trend*	*Cycle*
Trade	-0.12	-0.15	0.02	-0.12	-0.14	0.02
Hotels and restaurants	-0.54	-0.46	-0.08	-0.54	-0.45	-0.08
Transports	3.07	2.99	0.08	3.07	2.98	0.08
Communications	3.23	3.42	-0.19	3.23	3.42	-0.19
Financial services	4.17	3.88	0.28	4.17	3.88	0.28
Real state	1.18	0.80	0.38	1.18	0.80	0.38
Business services	-0.37	-0.29	-0.08	-0.37	-0.29	-0.08
Public Administration	-0.61	-0.56	-0.06	-0.61	-0.55	-0.06
Social, personal and communitary services	0.22	0.14	0.08	0.22	0.14	0.08
TOTAL SERVICES	1,75	1,67	0,08	0,70	0,64	0,06

Source: Own elaboration

TABLE 4.B.
Growth in productivity and trend productivity within service industries in Spain, 1990-1995

	Productivity per hour			Productivity per worker		
	Actual	*Trend*	*Cycle*	*Actual*	*Trend*	*Cycle*
Trade	0.22	0.10	0.12	0.22	0.10	0.12
Hotels and restaurants	-0.32	-0.44	0.12	-0.31	-0.44	0.13
Transports	5.01	4.94	0.08	5.01	4.93	0.08
Communications	2.82	3.04	-0.22	2.82	3.04	-0.22
Financial services	-4.49	-3.55	-0.94	-4.49	-3.55	-0.94
Real state	2.05	2.09	-0.04	2.05	2.09	-0.04
Business services	1.63	1.81	-0.18	1.62	1.81	-0.18
Public Administration	1.40	1.29	0.10	1.41	1.30	0.11
Social, personal and communitary services	-0.73	-0.61	-0.12	-0.73	-0.61	-0.12
TOTAL SERVICES	-0,01	0,09	-0,10	-0,10	-0,03	-0,07

Source: Own elaboration

TABLE 4.C.
Growth in productivity and trend productivity within service industries in Spain, 1996-2003

	Productivity per hour			Productivity per worker		
	Actual	*Trend*	*Cycle*	*Actual*	*Trend*	*Cycle*
Trade	-0.07	0.05	-0.12	-0.07	0.05	-0.12
Hotels and restaurants	-1.49	-1.50	0.01	-1.49	-1.50	0.01
Transports	0.98	1.14	-0.16	0.98	1.14	-0.16
Communications	7.08	6.67	0.41	7.08	6.67	0.41
Financial services	2.58	2.23	0.35	2.58	2.23	0.35
Real state	-7.75	-7.31	-0.44	-7.75	-7.31	-0.44
Business services	-0.58	-0.82	0.24	-0.58	-0.82	0.24
Public Administration	1.15	1.16	-0.01	1.15	1.16	-0.01
Social, personal and communitary services	0.63	0.64	-0.01	0.63	0.64	-0.01
TOTAL SERVICES	0,68	0,72	-0,04	0,57	0,59	-0,03

Source: Own elaboration

4.2. Cyclical characteristics within service industries in Spain

One the challenging strands in economic research has always been the analysis of how aggregate economies fluctuate between peaks and throughs of economic activity14. Recently, moreover, the need for identifying symmetries and asymmetries in these fluctuations has gathered new momentum, as several countries are preparing to participate to some sort of economic cooperation or integration, such as the EMU (Bean, 1992) or NAFTA agreements (Hufbauer and Schott, 1992). Cohen and Wyplosz (1989) arqued that not only the symmetry but also the persistence characteristics of the shocks affecting the economies are important elements of the efficiency developments.

The purpose of this section is twofold. First, we wish to study the cyclical fluctuations of productivity growth – both in terms of employees and hours worked – and its comovement or symmetry with respect business cycles in the Spanish economy. Second, we wish to examine the extent to which these characteristics are similar across the different service activities. The method of analysis consists on characterizing the stylized facts or empirical regularities of the productivity cycle of the branches we have chosen by computing some certain simple statistics of the underlying data series. We tentatively follow Christodoloukais et al. (1995) and Kydland and Prescott (1990) in using the Real Business Cycle (RBC) model as a guidance for what kind of stylized facts to look for and how to organize them, although we abstain from employing any specific RBC model.

Since we are interested in the percentage (rather than absolute) deviations from trend, all variables are expressed in natural logarithms. Tables 5.a and 5.b summarize the results for productivity per hour and productivity per employee respectively. The same analysis has been repeated for total economy, both aggregate manufacturing and service sectors, and the different industries within tertiary sector (coefficients are reported in tables A.1 and A.2 of the annexe). In the first column, the standard deviation of each detrended series is given as a measure of the volatility of the cyclical component, relative to that of the perninent real output variable in percentage terms. There follow the cross-correlations of the productivity with the real output cyclical components. This provides information both on wether the productivity is procyclical or countercyclical and on the phase-shift relative to the business cycle or cycle of output. Column x(t) in tables A.1 and A.2 gives the contemporaneous correlation between cyclical deviations of productivity with those of the pertinent output variable. A positive (negative) number and a significative magnitude indicate that productivity is procyclical (countercyclical), while a number close to zero indicates that productivity is contemporaneously uncorrelated with the output cycle. For the annual data, we chose the cutoff point of 0.35. Furthermore, it the correlation coefficient of productivity has the largest value (in

[14] See Zarnowitz (1991) for an extensive survey of the pertinent literature. See also Kydland and Prescott (1990) and Danthine and Donaldson (1993).

absolute terms) in entries x(t-i), x(t) or x(t+i), we can say that cycle of productivity is leading by i periods, is synchronous, or is lagging by i periods the business cycle, respectively.

Evidence shows that productivity per hour worked in Spain is strongly procyclical and leading. Both manufactuing and services pictures are similar to aggregate, although their cycle is coincidental and lagging to business one respectively. In terms of production per worker the behaviour in services seem to be quite countercylical, although the intensity is low. Within the service sector, the heterogeneity clearly arises. While some activities, such as some business services, hotels and restaurants, domestic services, and distributive trade, are in some extent countercyclical; most of service industries behaves procyclically. Synchrony also varies across industries, although most of them show productivity cycles coincidental or synchronous to economic cycles.

TABLE 5.A.
Characteristics of the cyclical behaviour of hourly productivity in Spanish services. Summary.

	Volatility	Persistence	Cyclical characteristics		
			Cyclicality	Synchrony	Intensity
Total economy	**0.75**	**0.65**	**Procyclical**	**Leading**	**High**
Manufacturing	*0.88*	*0.85*	*Procyclical*	*Synchronous*	*High*
Services	*1.07*	*0.35*	*Procyclical*	*Lagging*	*Medium*
Nace. 50	1.77	0.62	Countercyclical	Leading	High
51	1.68	0.39	Countercyclical	Leading	Medium
52	1.57	0.52	Procyclical	Synchronous	Medium
55	0.71	0.37	Countercyclical	Lagging	Medium
60	1.14	0.70	Procyclical	Synchronous	High
61	1.48	0.81	Countercyclical	Lagging	High
62	1.48	0.66	Procyclical	Synchronous	High
63	1.53	0.59	Procyclical	Synchronous	Medium
64	1.34	0.70	Procyclical	Synchronous	High
65	1.15	0.94	Procyclical	Synchronous	High
66	1.09	0.92	Procyclical	Synchronous	High
67	2.32	0.28	Procyclical	Leading	Low
70	3.63	0.56	Procyclical	Synchronous	Medium
71	3.87	0.23	Procyclical	Lagging	Low
72	1.51	0.52	Procyclical	Synchronous	Medium
73	1.52	0.38	Procyclical	Synchronous	Medium
741-3	1.49	0.52	Countercyclical	Lagging	Medium
749	1.19	0.54	Countercyclical	Lagging	Medium
75	1.46	0.48	Procyclical	Synchronous	Medium
80	1.21	0.40	Procyclical	Synchronous	Medium
85	3.04	0.28	Procyclical	Synchronous	Low
90-3	2.15	0.26	Procyclical	Leading	Low
95	0.93	0.43	Countercyclical	Leading	Medium

Source: Own elaboration

TABLE 5.B.
Characteristics of the cyclical behaviour of labour productivity in Spanish services. Summary.

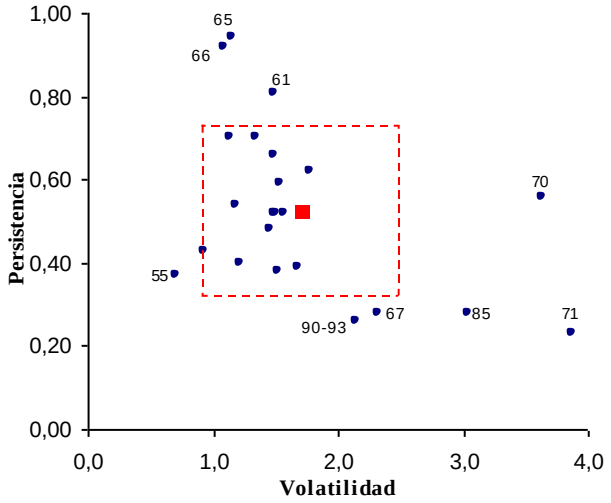
	Volatility	Persistence	Cyclical characteristics		
			Cyclicality	Synchrony	Intensity
Total economy	0.73	0.65	Procyclical	Leading	High
Manufacturing	*0.92*	*0.88*	*Procyclical*	*Synchronous*	*High*
Services	*0.75*	*0.28*	*Countercyclical*	*Leading*	*Low*
Nace. 50	1.76	0.62	Countercyclical	Leading	High
51	1.68	0.40	Countercyclical	Leading	Medium
52	1.58	0.52	Procyclical	Synchronous	Medium
55	0.71	0.37	Countercyclical	Lagging	Medium
60	1.14	0.70	Procyclical	Synchronous	High
61	1.48	0.81	Countercyclical	Lagging	High
62	1.48	0.66	Procyclical	Synchronous	High
63	1.53	0.59	Procyclical	Synchronous	Medium
64	1.34	0.70	Procyclical	Synchronous	High
65	1.15	0.94	Procyclical	Synchronous	High
66	1.09	0.92	Procyclical	Synchronous	High
67	2.32	0.28	Procyclical	Leading	Low
70	3.63	0.56	Procyclical	Synchronous	Medium
71	3.87	0.23	Procyclical	Lagging	Low
72	1.51	0.52	Procyclical	Synchronous	Medium
73	1.52	0.38	Procyclical	Synchronous	Medium
741-3	1.49	0.52	Countercyclical	Lagging	Medium
749	1.18	0.54	Countercyclical	Lagging	Medium
75	1.46	0.49	Procyclical	Synchronous	Medium
80	1.21	0.40	Procyclical	Synchronous	Medium
85	3.05	0.28	Procyclical	Synchronous	Low
90-3	2.15	0.26	Procyclical	Leading	Low
95	0.93	0.42	Countercyclical	Leading	Medium

Source: Own elaboration

Our findings about statistical properties of the cyclical behaviour of productivity in service industries in Spain were summarized in tables 5.a and b. Figures 2.a and b. display the pattern of volatility and persistence for productivity per hour and employee, respectively. Red square in these figures correspond to the unweighted average of the all service subsectors values. Most of them are found to be within the area of one standard deviation range around the mean. These areas are identified by inner boxes. The exceptions, according to hourly productivity (figure 2.a), are financial services (65-67), hotels and restaurants (55), land transport (61), real state (70) and renting services (71), health and social services (85) and other services (90-93). While tourism services are less volatile than the others, renting and real state, and health are more volatile than the average. Transport and financial services show themselves clearly more persistent than the other services, while health and other social and communitary services, and renting business services show relatively less persistence. Results for hourly and labour productivity are quite similar, so a broadly limilar picture emerges when

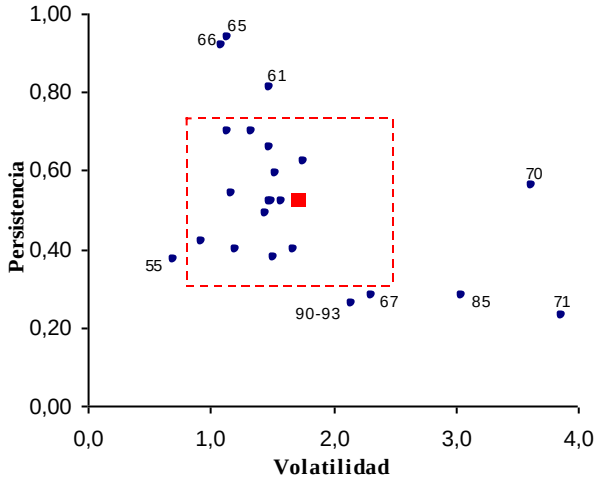
we despict persistence and volatility for the production per employee (figure 2.b). This evidence and the fact that the above results remain robust to detrending, as can be seen from the tables A.1 and A.2, suggest that productivity cycles across most service industries are fairly similar regarding duration and intensity.

FIGURE 2.A.
Volatility and persistence of the hourly productivity in the Spanish services, 1980-2003



Source: Own elaboration

FIGURE 2.B.
Volatility and persistence of the labour productivity in the Spanish services, 1980-2003



Source: Own elaboration

4. CONCLUSIONS.

Within the service research, productivity has been one of the most important issues from an economic point of view. The reasons for why service productivity is important are easy to understand. The concept becomes a key player in the economic growth of developed economies, which as a whole have shown a progressive intensification of the service sector reaching figures of approximately 75 per cent of the economy. For this reason, in the long term, and given the growing service participation in total production and employment, the total overall productivity should converge with growth rates similar to productivity rates in the service sectors. Hence, they affect the living standards of the population.

The debate around service productivity is very important, both in academic and in policy debates. A major concern is produced when stagnant or slow productivity in services may slow to entire economic growth due to a major participation of services in total economy. Since 2001, the so-called 'Baumol's disease' has been submitted to criticism in some important works. Major revisions of his ideas has been made when inter-sectoral relationships are taken into account, the role of ICT has been revised, measuring and conceptual factors are pointed out, and finally, when a set of explanatory factors for services is identify so productivity is just one dimension of the complex service growth.

The driving force behind economic growth is productivity, a product embodied technological progress and capital deepening. A number of factors can affect productivity and, thus, the trajectory of the economy, including demographics and labour force participation. Structural change in the labour market, spurred by innovations in communication or changes in regulations, can also dramaticlly alter the landscape. Understanding these factors is critical to economic policymaking.

As is well known, U.S. productivity growth has been suffered a revival started in 1995, far from the behaviour in European countries where productivity growth has experienced a slowdown during the same period. This negative pattern in terms of productivity is specially significant in the Spanish case, where negative productivity growth rates cohabit with strong economic growth and employment creation rates in recent times. On the other hand, fluctuations in productivity growth give rise to a number of important questions. Specifically, what factors lead to shifts in productivity growth and how these are different from the forces that create cyclical fluctuations.

The paper has specially analyzed the dynamism of services productivity when cycles and trends are considered in isolation. With regards to the cycle, significant differences appear within service industries. On the other hand, structural trend follows its declining pattern confirmed by descriptive data, particularly from the mid-1990s, although some Spanish service activities, such as transport or communications or

financial services, has largely exceeded trend growth experienced by agricultural and manufacturing goods. Another result from this exercise is that it forces us to conclude that it is unsafe to characterise Spanish service industry, let alone the entire economy, as being generally respresented by pro-cyclical labour productivity. On our evidence, labour productivity is roughly two-thirds of service industries is pro-cyclical while it is countercyclical in one third.

Moreover, and beyond the commonly accepted statistical and measurement limits, the empirical evidence regarding services productivity highlights the need to improve those policies associated with this sector. Internal characteristics, such as intensive utilization of labour force, innovation barriers, low competition, smaller size of enterprises or differences within labour market conditions, which shape service industries show the need for a strong services policy that take into consideration the long term. Service productivity policies need to be understood in a framework where policies address to innovation, employment, competitiveness or regulations (Maroto and Rubalcaba, 2008).

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ANNEXE

Complementary tables and figures

TABLE A1.
Characteristics of the economic cycle in productivity per hour within Spanish service sector
(annual data, 1980-2003)

	Cross-correlations with real output								
	X(t-3)	*X(t-2)*	*X(t-1)*	*X(t)*	*X(t+1)*	*X(t+2)*	*X(t+3)*	*Relative Variation*	*Rel. Var. Total*
Total economy	0,65	0,08	-0,36	0,01	-0,13	-0,12	-0,28	0.75	-
Manufacturing	-0,18	0,25	-0,60	0,85	-0,55	0,20	-0,17	0.88	3.19
Services	0,05	-0,05	-0,23	-0,01	-0,12	0,35	-0,11	1.07	1.00
50	0,14	0,01	-0,62	0,21	0,12	-0,09	-0,12	1.77	2.68
51	0,22	-0,22	-0,39	0,20	-0,07	-0,02	-0,20	1.68	2.58
52	-0,16	-0,29	-0,42	0,52	0,19	0,23	-0,44	1.57	2.35
55	-0,21	-0,13	-0,16	0,32	-0,06	0,14	-0,37	0.71	1.86
60	-0,28	0,02	-0,16	0,70	-0,21	0,01	-0,36	1.14	2.90
61	-0,14	-0,11	-0,07	0,62	0,09	-0,81	0,11	1.48	16.11
62	0,30	-0,44	-0,21	0,66	-0,19	-0,25	0,14	1.48	11.84
63	-0,18	-0,04	-0,25	0,59	-0,56	0,38	-0,08	1.53	6.80
64	0,05	-0,54	-0,23	0,70	0,14	-0,39	-0,32	1.34	4.74
65	0,21	0,05	-0,51	0,94	-0,45	-0,10	0,18	1.15	4.95
66	-0,08	-0,33	-0,18	0,92	-0,15	-0,44	-0,12	1.09	12.58
67	-0,16	-0,27	0,28	0,16	0,11	-0,07	-0,20	2.32	11.69
70	-0,10	-0,05	-0,34	0,56	-0,18	0,06	0,14	3.63	6.93
71	-0,13	0,09	-0,10	0,11	-0,10	-0,02	0,23	3.87	11.39
72	0,07	0,26	-0,44	0,52	-0,33	-0,13	0,47	1.51	5.38
73	0,01	-0,02	-0,28	0,38	-0,12	-0,19	0,17	1.52	13.55
741-3	-0,24	0,13	-0,01	0,24	-0,52	0,09	0,26	1.49	3.31
749	-0,24	0,01	0,22	0,13	-0,54	0,07	0,30	1.19	2.66
75	0,09	-0,05	-0,40	0,48	0,25	-0,17	-0,41	1.46	1.73
80	0,04	0,23	-0,36	0,40	-0,14	0,08	-0,13	1.21	1.08
85	0,17	-0,03	-0,14	0,28	-0,26	-0,08	0,09	3.04	3.18
90-3	0,26	-0,08	-0,12	0,11	0,05	-0,17	-0,06	2.15	6.88
95	0,20	-0,43	0,19	0,36	-0,38	0,01	-0,10	0.93	1.94

Source: Own elaboration

TABLE A2.
Characteristics of the economic cycle in productivity per employee within Spanish service sector
(annual data, 1980-2003)

	Cross-correlations with real output								
	X(t-3)	*X(t-2)*	*X(t-1)*	*X(t)*	*X(t+1)*	*X(t+2)*	*X(t+3)*	*Relative Variation*	*Rel. Var. Total*
Total economy	0,65	0,08	-0,35	0,01	-0,13	-0,13	-0,27	0.73	-
Manufacturing	-0,01	0,16	-0,57	0,88	-0,58	0,20	-0,12	0.92	3.34
Services	0,08	-0,04	-0,28	0,16	-0,11	0,13	0,10	0.75	0.70
50	0,14	0,01	-0,62	0,21	0,12	-0,09	-0,12	1.76	2.68
51	0,22	-0,22	-0,40	0,20	-0,07	-0,02	-0,20	1.68	2.57
52	-0,16	-0,28	-0,43	0,52	0,19	0,23	-0,43	1.58	2.36
55	-0,22	-0,13	-0,16	0,32	-0,06	0,13	-0,37	0.71	1.87
60	-0,28	0,02	-0,16	0,70	-0,21	0,01	-0,37	1.14	2.91
61	-0,14	-0,11	-0,07	0,62	0,09	-0,81	0,11	1.48	16.11
62	0,30	-0,44	-0,21	0,66	-0,19	-0,25	0,14	1.48	11.84
63	-0,18	-0,04	-0,25	0,59	-0,56	0,38	-0,08	1.53	6.80
64	0,05	-0,54	-0,23	0,70	0,14	-0,39	-0,32	1.34	4.74
65	0,20	0,05	-0,51	0,94	-0,45	-0,10	0,18	1.15	4.95
66	-0,08	-0,33	-0,18	0,92	-0,15	-0,44	-0,12	1.09	12.57
67	-0,16	-0,27	0,28	0,16	0,11	-0,07	-0,20	2.32	11.70
70	-0,10	-0,05	-0,34	0,56	-0,18	0,06	0,14	3.63	6.93
71	-0,13	0,09	-0,09	0,11	-0,10	-0,02	0,23	3.87	11.39
72	0,07	0,26	-0,44	0,52	-0,33	-0,13	0,47	1.51	5.38
73	0,01	-0,02	-0,28	0,38	-0,12	-0,19	0,17	1.52	13.53
741-3	-0,24	0,13	-0,01	0,24	-0,52	0,09	0,27	1.49	3.30
749	-0,24	0,01	0,22	0,13	-0,54	0,06	0,30	1.18	2.66
75	0,09	-0,05	-0,41	0,49	0,24	-0,16	-0,41	1.46	1.73
80	0,03	0,23	-0,36	0,40	-0,15	0,07	-0,12	1.21	1.09
85	0,17	-0,03	-0,14	0,28	-0,26	-0,08	0,09	3.05	3.18
90-3	0,26	-0,08	-0,12	0,11	0,05	-0,17	-0,06	2.15	6.88
95	0,19	-0,42	0,19	0,37	-0,39	0,02	-0,10	0.93	1.94

Source: Own elaboration

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