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Conference Paper

Different approaches to measure regional industrial production: The Spanish case

39th Congress of the European Regional Science Association: "Regional Cohesion and Competitiveness in 21st Century Europe", August 23 - 27, 1999, Dublin, Ireland

Provided in Cooperation with:

European Regional Science Association (ERSA)

Suggested Citation: Clar, Miquel; Ramos, Raul; Surinach, Jordi (1999) : Different approaches to measure regional industrial production: The Spanish case, 39th Congress of the European Regional Science Association: "Regional Cohesion and Competitiveness in 21st Century Europe", August 23 - 27, 1999, Dublin, Ireland, European Regional Science Association (ERSA), Louvain-la-Neuve

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**39th Congress of the European Regional Science Association
August 23-27, 1999, Dublin**

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Different approaches to measure regional industrial production: The Spanish case

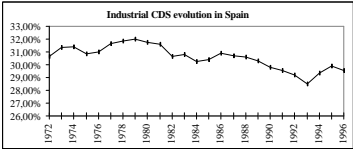
Abstract: The analysis of the conjunctural evolution of the industrial sector, both at a national and regional level, is relevant. In this sense, the delay in the publication of National/Regional Accounts data makes necessary the elaboration of indicators that permit to analyse the short-term evolution of industrial activity. To correct this deficit at the national level, the INE elaborates a monthly IPI from specific data survey. At a regional level, during the last few years, different projects have focused on the elaboration of indicators of industrial activity using non-homogeneous indirect methods. In this sense, one of the most widely accepted methodologies has been the one applied by the IDESCAT to elaborate the indicator for Catalonia. Thus, the INE has recently published IPIs for the Spanish regions following this methodology. In this paper, we analyse the reliability of extending this indirect methodology to all the Spanish regions comparing the INE's indirect indicators with the direct ones elaborated by other institutions in three of the four regions which have it: *Andalucía*, *Asturias* and *País Vasco*.

Keywords: Industrial activity, Industrial Production Index, Regional Indicators, Conjuncture.

1. Introduction

Even though services industries have become more important in developed economies during the last few decades, the industrial activity still has an important weight. In this sense, Spain is not an exception: the participation of the industrial sector in the Spanish total Gross Added Value (GAV) has been around the 30% over the last twenty-five years (see figure 1.1)¹. This fact implies that the growing relative importance of the services sector in the Spanish economy has been produced mainly due to a loss of importance of agriculture and building (see figures 1.2 to 1.6). Moreover, it has to be remarked that an important part of the increase experienced by the services sector is due to the developing of activities connected to manufacturing (in particular, services addressed to firms).

Figure 1.1.



Other relevant factors that have to be taken into account are the multiplier effect on the rest of the economy of the industrial sector and the relative importance of manufacturing on external trade. In accordance with the previously mentioned aspects, it is clear that the analysis of the evolution of industrial activity is still basic to characterize both, the short-term and the long-term evolution of economic activity.

¹ CDS represents the sectorial participation distribution coefficient and measures the relative influence of the considered sector in a given territory. For a particular variable X and a sector j (GAV and manufacturing, in this case), CDS is calculated as follows

$$CDS_j = \frac{X_j}{\sum_{j=1}^J X_j}$$

Figure 1.2.

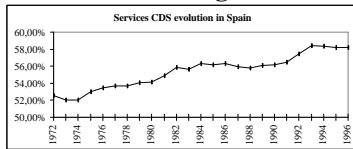


Figure 1.3.

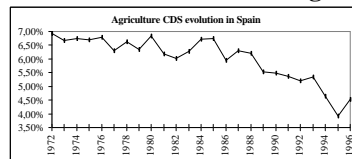


Figure 1.4.

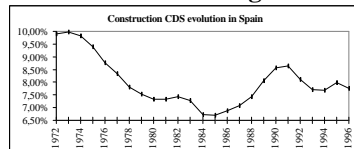


Figure 1.5.

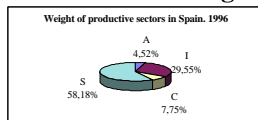
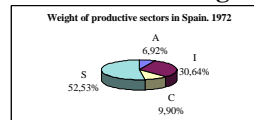


Figure 1.6.



The most commonly used measure to analyse the evolution of the manufacturing sector is the Gross Added Value (GAV) or the Gross Domestic Product (GDP), in strict sense, this is, without including data on the construction sector. However, in Spain, as well as in other countries, the main problem to use this information to analyse the short-term evolution of manufacturing is related to the fact that these data are not available as soon as it would be desirable². This fact makes very difficult to evaluate the short-term behaviour of industrial activity. It is necessary, then, to obtain indicators³ that permits to analyse the conjunctural evolution of industrial GDP overcoming the previously mentioned limitations⁴.

In fact, this kind of indicators are very valuable tools to monitor the short term evolution of the national and/or regional economies due to the following reasons:

² About this point, see the work of Muñoz *et al.* (1996) in relation to the *Instituto Nacional de Estadística* (INE)'s publication of the National Accounts official data (definitive ones). Smith (1993) can also be consulted for an analysis on the delay in the publication of the mentioned data referred to fifteen OECD countries for 1991.

³ See Clar (1998) for a revision on the typology of short-term industrial activity indicators.

⁴ In fact, this is one of the main reasons because the Industrial Production Indexes (IPI) have gained popularity during the last few years not only in industrialised countries but also in non-industrialised ones (Kmietowicz, 1995).

- a) to monitor the industrial production in amount excluding the effect of prices;
- b) to have a descriptive knowledge of the analysed economy's industrial sector;
- c) to have the main instruments for the economic conjuncture analysis at one's disposal, especially if it is used jointly with other indicators;
- d) to have a reference indicator for other economic variables, for example, indicators related to foreign trade or to employment;
- e) to analyse aggregate supply or demand evolution depending on whether the indicator is available by activity branches⁵ or by economic destination of the goods;
- f) from the employers' point of view, to compare the evolution of their output with the rest of firms from the same sector or to monitor the evolution of their sector in the whole of the industry;
- g) to use it like a *proxy* variable of the industrial production value in regional growth models;
- h) to monitor the general economic activity, whether in itself or taking part in synthetic activity indicators like, for example, the one elaborated for the Catalan economy⁶; and,
- i) as an important tool to elaborate Quarterly accounts by indirect methods.

In Spain, the National Institute of Statistics (INE) elaborates a monthly quantitative index to monitor the national industrial activity, called *Índice de Producción Industrial* (Industrial Production Index -IPI-), using data from surveys addressed to a representative sample of productive units from all sectors of activity (direct method)⁷. So, at a national level, the problem of the lack of statistical information to carry out a complete industrial quantitative conjunctural analysis is partially solved⁸.

However, at a regional level (until very recently) there were big difficulties to analyse the short-term industrial activity evolution as there were great deficiencies regarding the availability of statistical information of these characteristics⁹. In front of this situation, during

⁵ In this sense, Revilla (1997) defines the Industrial Production Index as the main supply economic indicator.

⁶ For details about this indicator, see Suriñach *et al.* (1996) and Artís *et al.* (1994, 1997a, 1997b and 1997c).

⁷ For a detail about the process followed by the INE in the elaboration of the national IPI, see INE (1982) and EUROSTAT (1978). Clar (1998) also provides a complete analysis about the differences between the current IPI (basis 1990) and the previous one (basis 1972).

⁸ Moreover, it is important to remark that the *Ministerio de Industria y Energía* (MINER) elaborates, following the methodology proposed by the Economic and Social Affairs General Directorate of the European Commission, a qualitative monthly index for the evolution of national industrial activity called *Indicador de Clima Industrial* (ICI). This qualitative index is elaborated using data from the *Encuesta de Opiniones Empresariales* in relation to three variables: production trend, order level and stock level. For a detail about the elaboration process of this index, see European Commission (1991) or Cordero *et al.* (1996) among others.

⁹ However, it has to be pointed that the MINER also elaborates monthly ICIs for Spanish regions following the

the last years, in some Spanish regions¹⁰ several public and private initiatives were initiated to overcome these deficiencies. Although an important effort was carried out, the real situation was that not every Spanish region had a quantitative indicator of the industrial activity evolution and, moreover, the available regional indicators were not directly comparable as non-homogenous methodologies were used to elaborate them¹¹.

In relation to this topic, in different forums a debate was initiated about which was the most appropriate methodology to elaborate regional industrial production indicators with a high level of reliability and, at the same time, a low cost¹². The result was that, at last, the INE recently published regional industrial production indicators following an indirect method, which is very similar to the IDESCAT methodology for the regional indicator for *Cataluña*¹³. In particular, the published series begin in October 1991 and refer only to the general index, and no information is provided for the different activity branches or for the economic

previously exposed methodology (see previous footnote). Moreover, some of the initiated projects to elaborate regional indicators still continue providing data. For example, in *Cataluña*, the *Cambra Oficial de Comerç, Indústria i Navegació de Barcelona* (COCINB) elaborates a qualitative indicator of bi-monthly periodicity which is published at *Perspectiva Econòmica de Catalunya*.

¹⁰ *Andalucía, Asturias, Baleares, Canarias, Cataluña, Extremadura, Madrid, Navarra, País Vasco* and *La Rioja*.

¹¹ See Clar (1998) for an analysis about the methodologies used by the *Instituto de Estadística de Andalucía* (IEA), the *Sociedad Asturiana de Estudios Económicos e Industriales* (SADEI), the *Baleares, Navarra, La Rioja* and *Canarias* governments, the *Institut d'Estadística de Catalunya* (IDESCAT), the *Dirección General de Planificación y Presupuestos de la Consejería de Economía, Industria y Hacienda de Extremadura*, the *Instituto de Estadística de la Comunidad de Madrid* (IEM) and the *Instituto de Estadística del País Vasco* (EUSTAT), to elaborate the direct quantitative industrial activity indicators of *Andalucía, Asturias, Baleares, Navarra, La Rioja, Canarias, Cataluña, Extremadura, Madrid* and *País Vasco* respectively.

¹² To elaborate quantitative indicators to monitor industrial production evolution, there are mainly two different methods. On one hand, direct quantitative indicators are elaborated taking as the main source specific survey data from the considered economy. In this case, the process of collecting the data implies to design a proper questionnaire and to define a sample of both productive units and products which represent properly the sectoral and geographical composition of the industrial production in the region. This method provides the best quantitative indexes to monitor the evolution of industrial production, but it has the disadvantage that costs are very high as a result of the process of designing the survey, selecting the sample and collecting and treating the data, etc. On the other hand, indirect quantitative indicators of industrial activity approximate the industrial production evolution using pre-existent information. In consequence, this approximation is not as exact as the previous one, but it has the advantage that costs are lower. For this reason, this kind of indicators have been (and still are) widely used in a big number of economies, especially regional as these economies usually suffer stronger budget restrictions to dedicate to obtain statistical information.

¹³ However, it has to be remarked that the INE has not published, at least until today (June 1999), any methodological note about the process of elaboration of the regional indicators. The only thing known is that “the general index for autonomous communities is obtained calculating the relative sectoral weights of each community and applying this system of weights, different in each territory, to the indexes of the different industrial activities according to the Economic Activity National Classification (CNAE). To calculate the relative weights in each community, the added values of industrial activities in the base year of the index have been used, using as the Encuesta Industrial (EI) as the main source. The applied procedure of regionalisation also guarantees that the weighted average of the 17 autonomous communities is equal to the national general index” (see <http://www.ine.es/htdocs/daco/daco43/notaipi.htm>).

destination of the goods¹⁴. In this sense, some of the existing deficiencies have been partially overcome.

In front of this situation, the objective of this paper is to analyse the reliability of the regional indicators obtained with the methodology used by the INE. The structure of the paper is as follows: first, this methodology is presented; second, a comparative analysis between the indexes published by the INE for *Andalucía*, *Asturias* and *País Vasco* and the IPIs elaborated by the IEA, the SADEI and the EUSTAT using direct methods is done¹⁵; next, the IDESCAT methodology is applied for these three regions to obtain longer series of Industrial Products Production Indexes (IPPI)¹⁶ which are compared with the regional direct indexes; and, last, the main conclusions are presented.

2. INE's methodology to elaborate regional industrial activity indicators

Taking into account, on one hand, that the exact methodology applied by the INE to elaborate the regional production indicators is unknown and, on the other hand, that information about the process followed by the IDESCAT to elaborate the regional indicator for *Cataluña* is available, in this section we present the main features of the second one. In this sense, it has to be pointed out that from the information published by the INE it seems plausible that the methodology used by the IDESCAT is very similar to the one applied to the rest of Spanish regions.

2.1. Methodology

The indicator elaborated by the IDESCAT is an indirect quantitative indicator, so basic information comes from pre-existent available information. In particular, the IDESCAT takes as the starting point to elaborate the regional indicator the national IPI series at the maximum

¹⁴ These indexes can be obtained at the database TEMPUS of the INE (at the moment when this paper was written, June 1999, the last update of the methodological section was from May 1998, <http://www.ine.es/tempus>).

¹⁵ The fact of focusing the analysis on the three mentioned regions is due to the fact that they are three of the four only regions where industrial activity direct indicators are elaborated. Extremadura (which is the other region where the indicator by direct method is made) is not included in the analysis because the *Dirección General de Planificación y Presupuestos de la Consejería de Economía, Industria y Hacienda* of Extremadura Government (which is the organisation in charge of the index) started to elaborate and publish the quarterly index (at *Coyuntura Económica de Extremadura*, half-yearly magazine edited by the *Junta de Extremadura*) from the first quarter of 1996, being available at the moment of elaborating this paper data up to the second quarter of 1998, which is a very short sample.

¹⁶ The name of IPPI reflects the fact that these indicators provide information about the production of industrial

sectorial aggregation level (4 CNAE-74 digits). Once these series are available, in a first stage, a censorship process of IPI series corresponding to those activity branches which are not representative of the investigated industry (Catalan) is carried out to guarantee, on the one hand, that the basis information is representative and, on the other hand, that no information about other regions is included in the indicator. As the total number of series is above two hundred and sixty series, it is possible to adjust quite well the basis information to the investigated industrial structure¹⁷. In the next stage, the series selected in the previous stage are stratified (weighed) according to each sector's relative weight in the total production of the analysed industry (Catalan) in terms of GAV in the year chosen as basis¹⁸. Once these stages have been completed, the next stage of the procedure consists of obtaining the series of the lower sectorial aggregation level until the indicator for the total economy is obtained. For this reason, composed indexes (Laspeyres quantities) are obtained from the immediately previous aggregation level indexes (figure 2.1 summarises the whole process)¹⁹.

This methodology has a very reduced cost because the starting point for elaborating the industrial regional production indicators is the same for all the regions: the national IPIs by activity branches at the maximum level of sectorial aggregation.

2.2. Methodological note on the possibility of extending the IDESCAT (INE) methodology to other regions

As it has been previously exposed, the considered methodology takes as the starting point to elaborate the regional indicators, the information about the national IPIs at the maximum sectorial aggregation level (4 CNAE-74 digits). A fundamental question is, then, to analyse to what extent (or under which assumptions) the national IPIs can offer a good approximation to the regional evolution of industrial production. Taking into account the process of elaboration of the direct national IPIs, the general national IPI can be expressed as follows:

products and not about the whole industrial production which also includes energy production.

¹⁷ In particular, to elaborate the Catalan indicator, the IDESCAT does not include the series corresponding to CNAE-74 subsectors 21 (extraction and preparation of metalical minerals) and 37 (ship construction and repairing). The production of the energetical subsector (CNAE-74 division 1) is not included because the excessive variability of these subsectors worsened the indicator instead of improving it (see Costa and Galter, 1994). In this sense, after the censorship process, the number of the national IPI series included in the elaboration of the Catalan indicator is one hundred and fifty three.

¹⁸ In particular, in the Catalan indicator's case, the one hundred and fifty three ponderations are obtained from the *Encuesta Industrial* for 1990 which, in the Catalan territory, is carried out by the INE and the IDESCAT. These ponderations can be found at Costa and Galter (1994) or at Suriñach and Royuela (1995).

¹⁹ For more details about the methodology used by the IDESCAT to elaborate the Catalan industrial activity

$$IPI = \sum_{s=1}^N IPI_s \alpha_s \quad [1]$$

where α_s is the relative weight, in terms of GAV, of each branch s in the total national production:

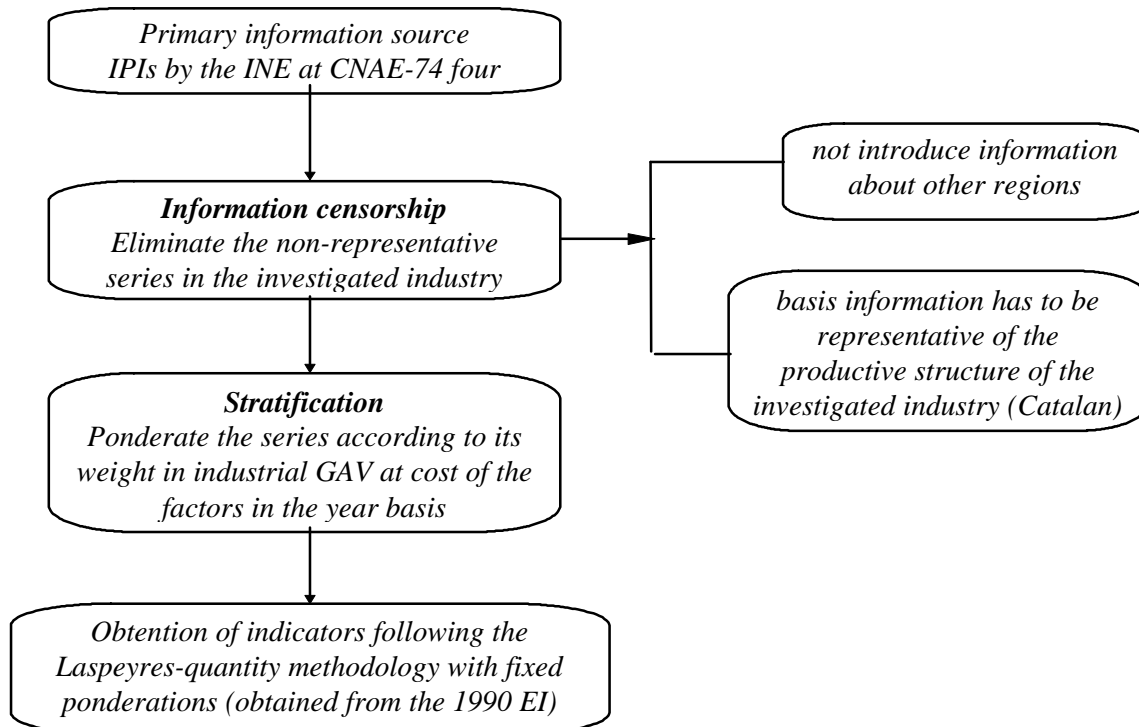
$$\alpha_s = \frac{VAB_{cf_s}}{VAB_{cf}} \quad [1]$$

The variables IPI_s are the national industrial production indexes corresponding to

each of the N branches taken into consideration. Applying the same process, a similar expression to [1] can be obtained for the region j :

$$IR_j = \sum_{s=1}^N IR_{js} \alpha_{js} \quad [2]$$

Figure 2.1. IDESCAT's methodology to elaborate the regional industrial activity indicator (Catalan)



Source: Own elaboration from Costa and Galter (1994).

indicator, see Costa and Galter (1994).

where RI_j is the industrial production index of the region j , RI_{js} are the industrial production indexes of the branch s in the region j , and α_{js} is the relative weight of the branch s for every one of the N considered branches in the total regional production: $\alpha_{js} = \frac{VAB_{cf_{js}}}{VAB_{cf_j}}$. The main difficulty in applying [2] to elaborate the regional indicators is to obtain the estimates of the different sectorial indicators at regional level, RI_{js} . In any case, if each region had its own IPI, the national IPI could be obtained from:

$$IPI_s = \sum_{j=1}^{17} IR_{js} \mu_{js}, \quad [3]$$

where μ_{js} is the relative weight of branch s in the region j in the total production of branch s at national level: $\mu_{js} = \frac{VAB_{cf_{js}}}{VAB_{cf_s}}$. From [3] and, as by definition $\sum_{j=1}^{17} \mu_{js} = 1 \quad \forall s$, if the value of μ_{js} is one in the region j , then it will be zero for the rest of regions, and it means that the region j is the only region producer of the products of the sector s . In consequence, if μ_{js} is near to one in one region it will be practically zero for the rest, so it will be possible to obtain good estimates of the sectorial regional indicators from their national equivalents. So, if the industrial production is very concentrated geographically, [2] can be approximated by:

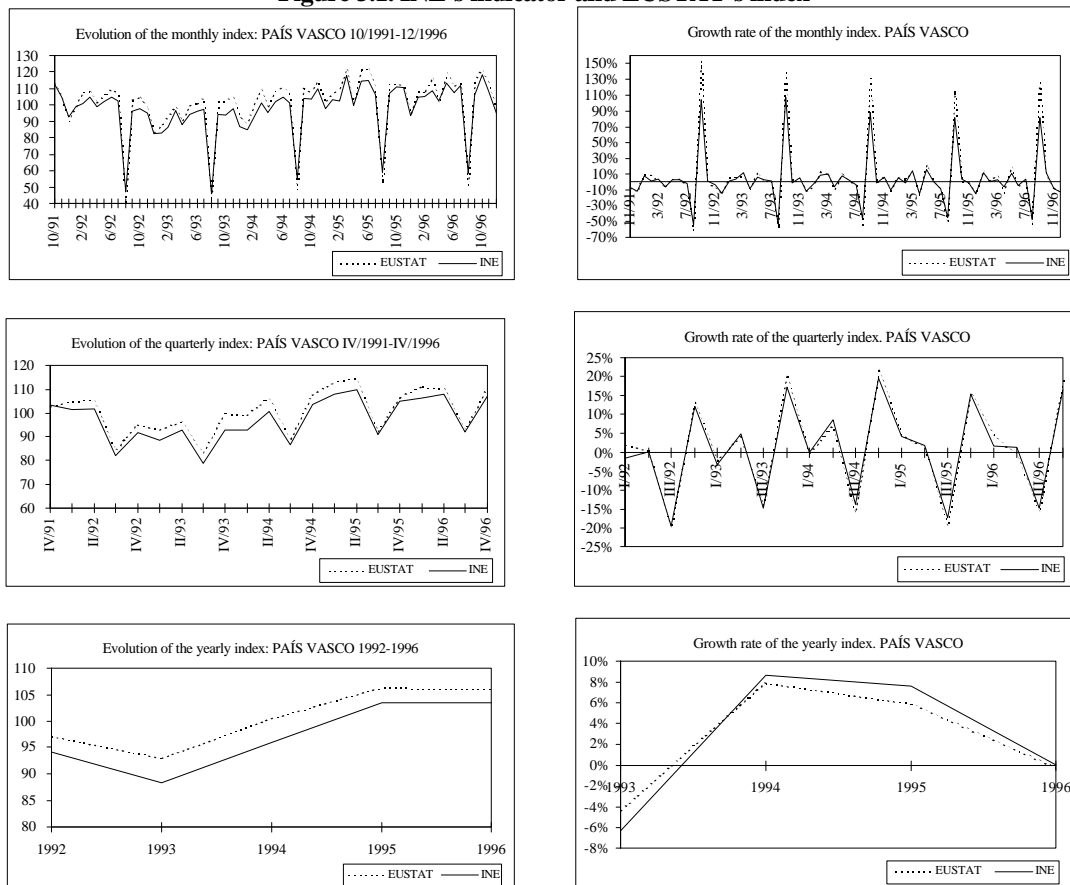
$$IPI_s \approx IR_{js} \Rightarrow IR_j = \sum_{s=1}^N IPI_s \alpha_{js}. \quad [2.bis]$$

It is clear that [2.bis] is an approximation and it will only be a strict equality when the whole production of each industrial branch is done in one region (when the geographical concentration level is 100%). The failure to fulfil this condition implies to introduce information from other regions in the elaboration of the indicator of region j . This problem loses relevance when more disaggregated sectorial national information is used because the level of geographical concentration of the different regions, increases when a higher number of branches is consider.

3. Comparison between direct regional indicators and the ones elaborated by the INE

In this section a comparative analysis is carried out among the indirect indicators elaborated by the INE and the direct indexes elaborated respectively by the EUSTAT, the SADEI and the IEA for *País Vasco*, *Asturias* and *Andalucía*²⁰ for the period within October 1991 and December 1996²¹. So, first, the evolution of both indicators at monthly, quarterly and annual frequencies for the three regions have been graphically compared (figures 3.1 to 3.3).

Figure 3.1. INE's indicator and EUSTAT's index



²⁰ These three regions have been chosen as they are three of the four Spanish regions with long enough series of quantitative indicators obtained through direct method.

²¹ Nevertheless, it has to be remarked that as the INE has not published any methodological note referring to the process followed to elaborate regional production indicators, there are some questions that cannot be answered, as for example: Which are the weights employed in each region? Is a particular censorship process carried out for each region? In this case, which are the national IPI's series that are not included in the regional indicators? Why do regional indicators' series start in October 1991 if the basis information is available from January 1975? Why no information at a sectoral level or by economic destination of goods has been provided, being this one of the main advantages of this methodology in front of other indirect methodologies, like, for example, the electrical energy consumption for industrial purposes?

Figure 3.2. INE's indicator and SADEI's index

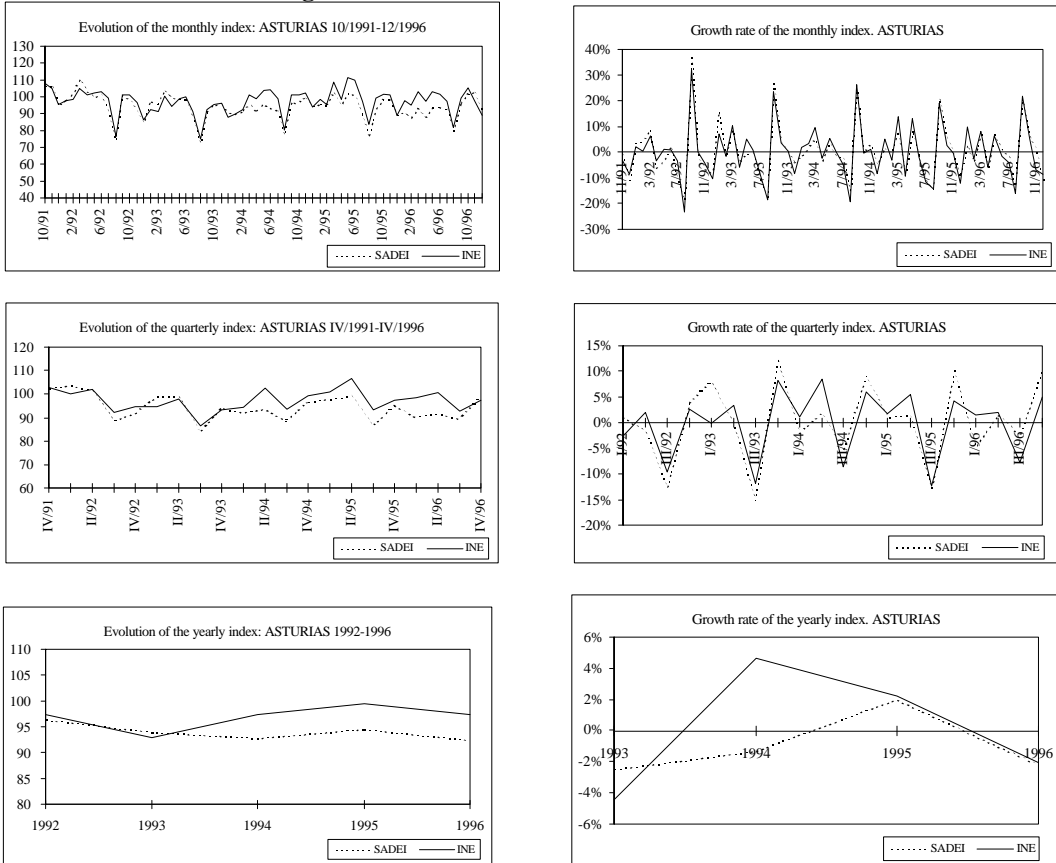
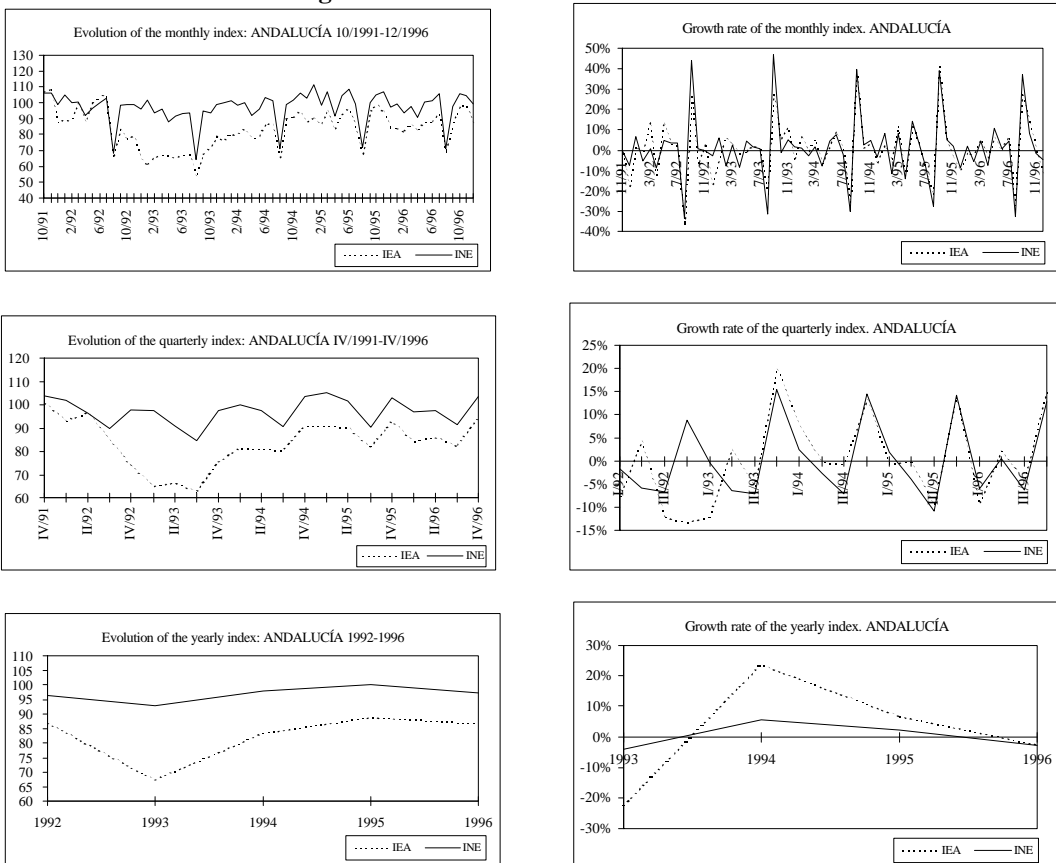


Figure 3.3. INE's indicator and IEA's index



The obtained results show that the adjustment for *País Vasco* and *Andalucía* direct indexes' is satisfactory for the whole considered period (except for *Andalucía* between October 1992 and December 1993²²), but for *Asturias* more disagreements can be observed.

To complement the graphical analysis, the mean absolute percentual error (MAPE)²³ at monthly, quarterly and yearly frequencies between both series (table 3.1) and the percentage of errors between the signs of both indexes growth rates (table 3.2) for the considered regions have also been calculated.

Table 3.1. MAPE values for the comparison between the IEA, SADEI and EUSTAT indexes and the INE's indicators

	Month	Quarter	Year
<i>Andalucía</i>	18.10%	17.73%	18.10%
<i>Asturias</i>	4.42%	4.08%	3.51%
<i>País Vasco</i>	4.83%	3.33%	3.53%

Table 3.2. Percentage of errors between the growth rates signs of the published indexes by the IEA, SADEI and EUSTAT and the INE's indicators

	Month	Quarter	Year*
<i>Andalucía</i>	20.10%	20.00%	0.00%
<i>Asturias</i>	14.52%	30.00%	25.00%
<i>País Vasco</i>	4.84%	10.00%	25.00%

* The results at yearly basis must be taken with cautious given the short period of time analysed (1993 to 1996).

The results obtained confirm, in general terms, the conclusions derived from the graphical analysis. In particular, two facts have to be remarked:

- a) the MAPEs obtained for *Andalucía* are very high (around 18.00% in all cases). This is due, as it has been previously remarked, to the fact that both indicators evolution is very different for the period 10/1992-12/1993. In fact, most part of errors between the signs of the growth rates are in this period: in monthly terms, seven out of thirteen and in quarterly terms, two out

²² However, this graphic analysis shows that for 1994 there are several disagreements between the IEA and the INE indexes that affect the levels but not the signs of the growth rates.

²³ The Mean Absolute Percentual Error is calculated as follows:

$$EPAM = \frac{\sum_{t=1}^T |Y_t - y_t|}{T} \cdot 100$$

where Y_t are the IEA, the SADEI and the EUSTAT indicators and y_t the indicators elaborated by the INE for the t period.

of four. Discounting this effect, at monthly basis, six errors would have been made and MAPE would have been a 9.68%, and at quarterly basis, two errors and a 10.00%; and,

- b) although the results for *Asturias* in terms of MAPE and the equivalence in terms of the signs of the growth rates are satisfactory, it is the region with the worst performance of the INE's indicator (if the effect of the 1992-93 in *Andalucía* is discounted)

The above facts lead to the conclusion that the methodology used by the INE to obtain regional indicators is not completely reliable for all regions at a monthly frequency. In the next section, we try to found out which are the determinants of the indicators' reliability in the different regions at different frequencies.

4. Sensitiveness of the INE methodology to the availability and censorship of the basis information and to the considered period

In this section, and taking into account the footnote 21, we have estimated indicators for the three considered regions following the IDESCAT (INE's) methodology with some little variations due to data availability²⁴ in order to obtain evidence on the determinants of the methodology adequacy for all the Spanish regions. The comparison between the obtained indicators and direct indexes will permit to obtain further results on this point that the evidence obtained in the previous section.

4.1. Analysis of the availability and censorship of the basis statistical information

First, it has to be remarked that the regional sectoral weights have been obtained using Gross Production data from the 1990 *Encuesta Industrial*, carried out by the INE. This is the source that provides a higher level of sectorial detail at a regional level. In particular, it provides information about eighty-nine industrial sectors.

As far as the basis information is concerned, national sectorial IPIs (basis 1990) are available from January 1975. However between January 1975 and September 1991, we have only had access to monthly series at a two digits CNAE-74 sectorial aggregation level and not

²⁴ As a consequence of the application of the *Ley de Secreto Estadístico*.

for the maximum level of detail (four digits). Moreover, information about energetic sectors and CNAE-74 sector 49 have not been available for this period²⁵. For these reasons, the available data offer information of the evolution of twenty-one industrial sectors. However, from October 1991 to December 1996, most sectorial IPI at a CNAE-74 three or four digit of sectorial detail are available²⁶. In this sense, to keep homogeneity with the first period indicators, we have not considered energetic sectors and sector 49. Thus the number of considered sectors in this second period is seventy-eight²⁷.

Taking into account that the available data to obtain the relative weights of each regional branch provides information about eighty-nine branches, to combine these data with the national production indicators, it has been necessary to group the data to twenty-one sectors in the first period. For the second, however, an additional effort has been required as the equivalence between weights and indicators is not exact. In this sense, some of the national indicators have been grouped until data for the seventy-eight sectors was available. Once these calculations have been made, regional indicators can be obtained straight forward.

As far as regional information for *Andalucía* is concerned, the available information for the IPI elaborated by the IEA begins in January 1984 being the basis year 1994. For *Asturias*, the index elaborated by the SADEI starts in January 1990 taking as a basis year 1989. The information about the IPI for the *País Vasco* is elaborated by the EUSTAT and begins in January 1986 taking as a basis year 1990. Thus, in the cases of *Andalucía* and *Asturias*, it has been necessary to estimate in advance a comparable index with the elaborated indicators that have as basis year 1990. Moreover, in the three cases, the direct indexes are not directly comparable with the ones elaborated here, because they include information about energetic sectors. In this sense, it has been necessary to estimate previously an IPPI for each of the three considered regions. The applied ponderations have been obtained from information published by the regional entities that elaborate each region's sectorial indexes and are shown in table 4.1.

²⁵ Then, the indicators elaborated in this section are IPPI, and, as a consequence, they provide information on industrial products evolution.

²⁶ The sectors on which no information is available are 425 (wine industry), 454 (pret a porter clothes) and 495 (other manufacturing industries) from the CNAE-74 (which correspond to EI sectors 60, 73 and 89).

²⁷ For a detail about equivalences between EI and CNAE-74 sectors, see Clar *et al.* (1998).

Table 4.1. Published ponderations for regional IPI and the ones applied to elaborate regional IPPI

Branch	<i>Andalucía</i>		<i>Asturias</i>		<i>País Vasco</i>	
	IPI	IPPI	IPI	IPPI	IPI	IPPI
1	12.94%	---	38.15%	---	11.24%	---
2	11.81%	13.56%	31.49%	50.93%	21.33%	24.03%
3	36.04%	41.39%	15.21%	24.58%	43.10%	48.56%
4	39.21%	45.05%	15.15%	24.49%	24.33%	27.41%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Source: IEA, SADEI, EUSTAT and own elaboration.

For *Andalucía* some additional modifications have been required. In particular, information about national CNAE-74 37 (ship construction) and 42 (different food industries) sectors have not been included in the regional indicator as they show highly atypical behaviours.

As far as sector 37 is concerned (see figure 4.1), important oscillations over a long period of time can be observed and taken into account that its weight is not insignificant²⁸, it increases the IPPI's variability, decreasing in that way its capability as a good conjuncture indicator²⁹.

In respect to sector 42, there is a structural break in the behaviour of the index from 1993 (see figure 4.2) which worsenes considerably the results. As the regional weight of this sector is 9.43%, we have preferred not to include it.

In this sense, the estimated IPPI for *Andalucía* does not include the production of both sectors and relative weights of the rest of sectors have been recalculated without taking into account none of them.

Figure 4.1.

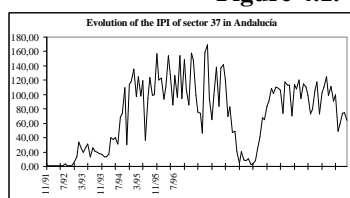
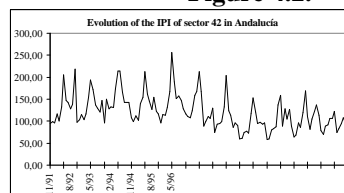


Figure 4.2.

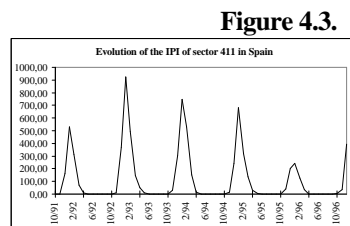


²⁸ In particular, sector 37's weight is 22.35%.

²⁹ See Morales *et al.* (1997) and Predyco (1994).

4.2. Obtention and comparison of indicators for País Vasco, Andalucía and Asturias

As it has been previously exposed, to elaborate the regional indicators for the considered regions following the IDESCAT (INE's) methodology, the national indicators are weighted according to its relative importance in the productive structure of each region starting from the expression [2.bis]³⁰ using the obtained ponderations (one or the other aggregation level depending on the considered period). It has to be pointed that the national index corresponding to CNAE-74 411 sector (olive-oil producing) has not been considered in the elaboration of the indicator for *Andalucía* because it presents a strong seasonality and erracity caused by the evolution of these sector in other Spanish regions (see figure 4.3). In this sense, it has to be taken into account that this sector experienced a deep crisis in *Andalucía* during this period that the national index does not reflect. Thus, the national index consideration of this sector in the elaboration of *Andalucía's* indicator would only introduce a strong bias³¹.



Figures 4.4 to 4.6 show the behaviour of the direct indexes and the indirect indicators at monthly, quarterly and yearly frequencies. The results are satisfactorily enough, mainly from October 1991, because a higher number of sectors are considered in the basis information³². However, the results are not so satisfactory at monthly level because the seasonality of the regional industrial production is not completely well estimated. So, despite the obtained indicators offer a good approximation to industrial production's short-term evolution, they approximate quite better its trend.

³⁰ The considered ponderations have been estimated from the relative weight of each sector in the total gross production from the EI and they can be found at Clar *et al.* (1998).

³¹ One of the limitations of the analysed methodology is that sectors with an anomalous behaviour can only be identified *ex-post* but not *ex-ante*.

³² However, in all three cases, it can be observed that in 1993 a worse adjustment is obtained. This is due to the fact that Spanish economy experienced a stage of recession and the beginning of a expansionary phase in that year. This fact implies that the national index does not approximate well enough the different regional evolutions.

Figure 4.4. Comparison between IPPI elaborated following INE and EUSTAT's methodology

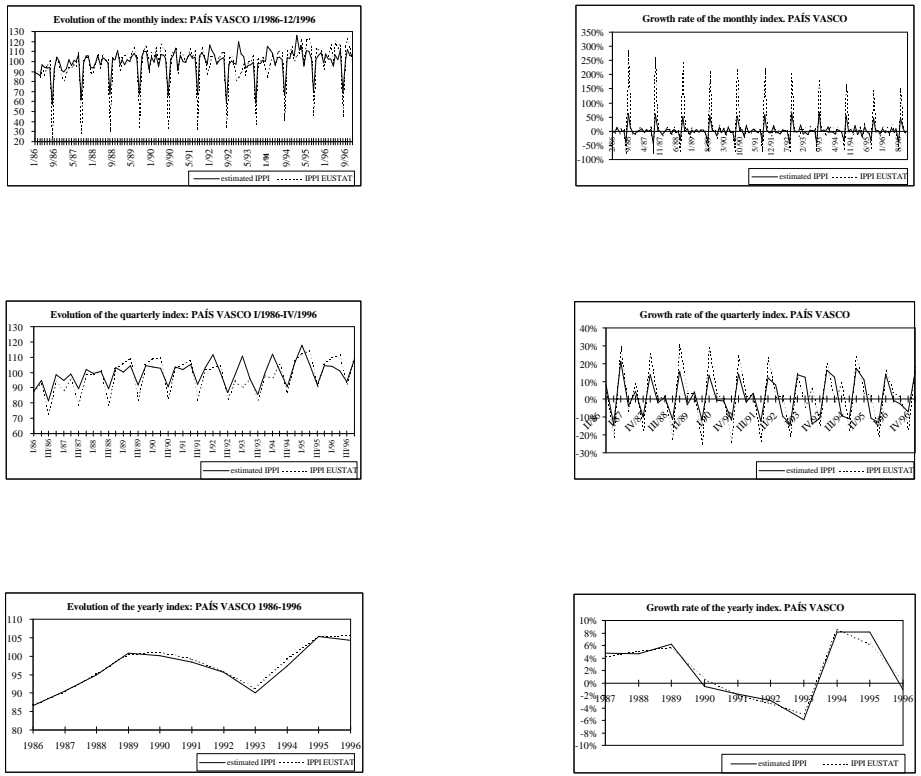


Figure 4.5. Comparison between IPPI elaborated following INE and SADEI's methodology

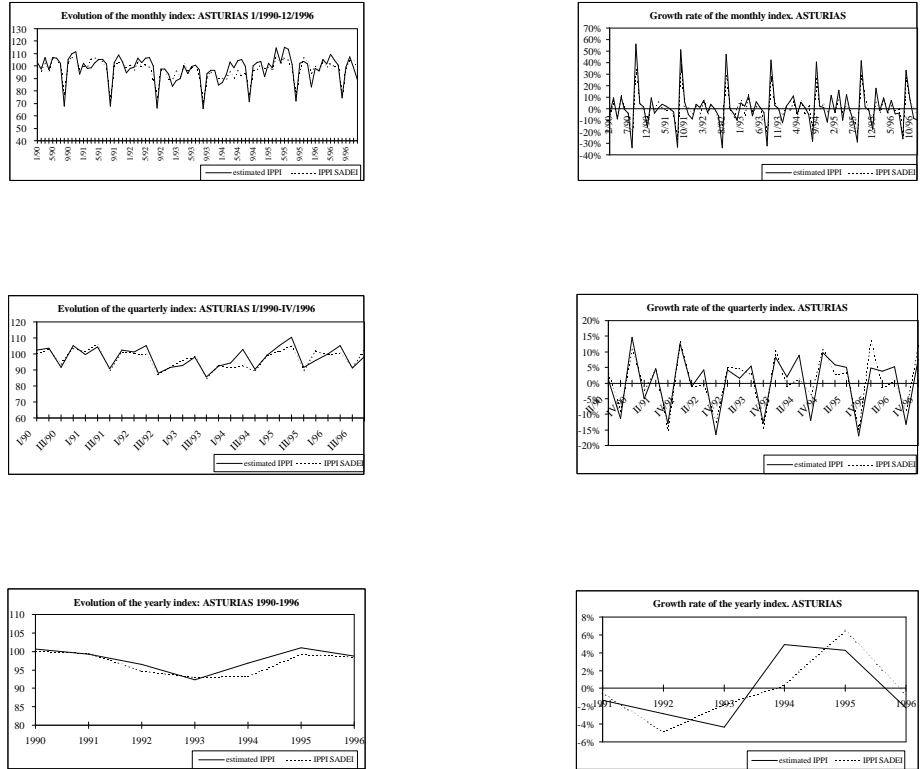
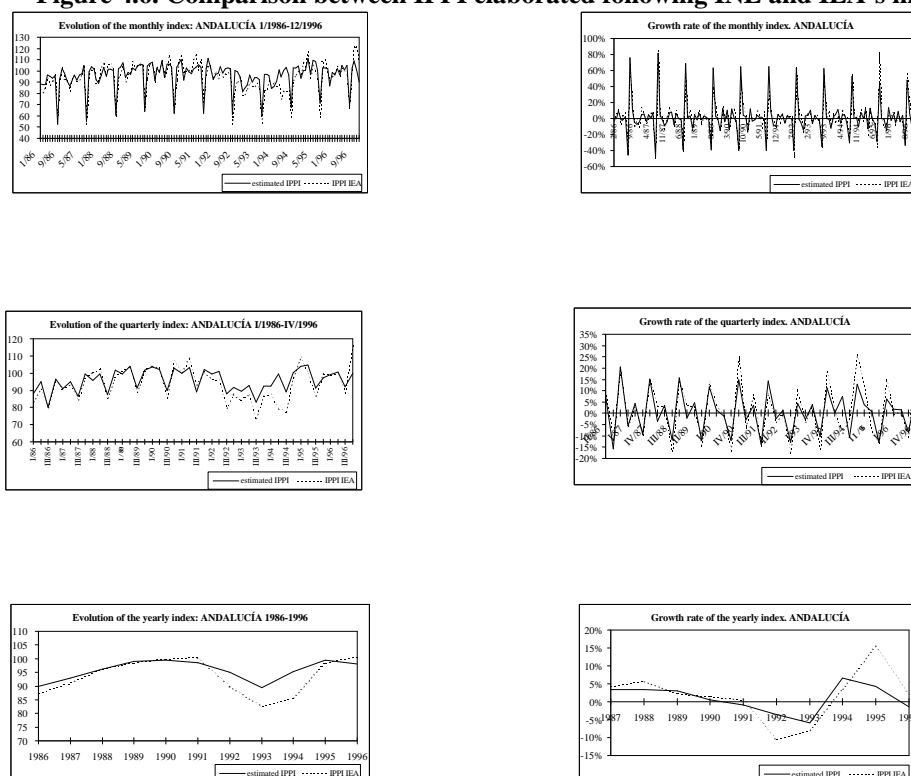


Figure 4.6. Comparison between IPPI elaborated following INE and IEA's methodology



As an additional way to validate these conclusions, the MAPE between the indexes elaborated from the IEA, the SADEI and the EUSTAT data and the estimated indirect indicators have been calculated. The comparison has been made at monthly, quarterly and yearly frequency. The results obtained (see table 4.2) for both quarterly and yearly indicators are under 3%, fact that reflects the good behaviour of the obtained indicators except for *Andalucía*³³. However, at monthly terms the indicators do not present an acceptable behaviour in any of the three cases.

Last, MAPE values have also been calculated comparing the trend-cycle component of both series. The obtained results improve in respect to the formers, confirming the fact that indicators elaborated following the INE's methodology reflect better the trend component than the seasonality (usually more associated to the specific regional factors).

³³ It has to be remembered, though, as it has been possible to observe in the previous section, for the period within October 1992 and December 1993 that the direct index presents a (very) atypical behaviour which makes it that the results are biased rising.

Table 4.2. MAPE values from the comparison between direct indexes and the ones elaborated following the IDESCAT (INE) methodology

<i>ANDALUCÍA</i>			
Indicator	Period	MAPE	MAPE*
Month	01/1986 - 12/1996	5.67%	3.55%
Quarter	I/1986 - IV/1996	4.63%	3.52%
Year	1986 – 1996	3.36%	---
<i>ASTURIAS</i>			
Indicator	Period	MAPE	MAPE*
Month	01/1990 - 12/1996	4.32%	1.72%
Quarter	I/1990 - IV/1996	2.33%	1.72%
Year	1990 – 1996	1.29%	---
<i>PAÍS VASCO</i>			
Indicator	Period	MAPE	MAPE*
Month	01/1986 - 12/1996	6.83%	1.18%
Quarter	I/1986 – IV/1996	2.54%	1.10%
Year	1986 – 1996	0.67%	---

* Calculated using the trend-cycle component of the series obtained applying the new INE's Modified Airline filter.

Last, to guarantee the validity of the conclusions derived from the comparison between the indirect indicators obtained in this section (adapting IDESCAT methodology) and the regional direct indexes, and at the same time to confirm that the methodology used in this section to elaborate IPPIs is very close to the one used by the INE, the correlation coefficients between INE's IPIs and IPPIs monthly, quarterly and yearly growth rates for the three regions considered have been calculated (see table 4.3).

**Table 4.3. Correlation coefficients between the growth rates of the INE's IPI and the elaborated IPPI
Period 11/1991-12/1996**

	Month	Quarter	Year
<i>País Vasco</i>	0.95	0.71	0.84
<i>Asturias</i>	0.98	0.97	0.98
<i>Andalucía</i>	0.96	0.78	0.97

The obtained results show that the methodology used in this section to elaborate regional IPPIs is consistent with the one used by the INE in the elaboration of regional IPIs. In this

sense, as the elaboration of IPPIs series permits to have a longer reference period than the INE's ones, it has been possible to obtain further evidence in the identification of the determining factors of the INE's methodology reliability.

5. Determining factors in regional indicators' reliability elaborated following INE's methodology

The results obtained at the two previous sections allow to affirm that the reliability of the obtained indicators for a particular region depends on five factors:

- a) *On the geographical concentration degree of industrial production.* According to the analysis in the second section, only if the whole production of each considered sector is produced in only one region, the considered methodology would be completely reliable. In this case, the sectorial national index would be the same as the regional one. Nevertheless, a good approximation to the evolution of industrial regional production can be obtained if the geographical concentration degree of the production is high. In this sense, an initial test to evaluate this methodology consists of calculating the Gini coefficients of geographical concentration using data of each sector's gross production in the basis year. On one hand, using data CNAE-74 two digits aggregation level, twelve out of twenty-one considered sectors (57.14%) have a Gini coefficient above 0.7. On the other hand, for the sectorial aggregation level proportionated by the EI, the geographical concentration degree is, higher: fifty-one out of the seventy-eight considered sectors (that is, 65.39%) have a Gini coefficient above or equal 0.7. Nevertheless, these results do not seem to be high enough to apply the considered methodology without introducing important errors.
- b) *On the aggregation level of basis information.* It seems clear from the results obtained through the two different aggregation levels considered in the previous section, that as a higher number of sectors is considered, the better is the behaviour of the considered indicator. In fact, this second factor is related to the previous one as, usually, the higher the level of sectorial detail is, the higher the concentration degree is. Moreover, when a higher number of series is considered, the process of censorship of the basis information is more accurated.

- c) *On the regional industrial production share in the total national.* The considered methodology provides better results for those regions where industrial production has a higher weight in the national total production. This is one of the reasons because the analysed methodology works better in *Cataluña* and *País Vasco* rather than in other regions (see table 5.1).

Table 5.1. Regional ranking according to the weight in the total national industrial production

Region	Relative weight of regional production in the Spanish total (position in relation to the seventeen Spanish regions)*
<i>Cataluña</i>	26.30% (1)
<i>País Vasco</i>	9.63% (4)
<i>Andalucía</i>	9.21% (5)
<i>Asturias</i>	2.39% (11)

* In terms of industrial gross production in 1990.

- d) *On the similarity of regional productive structure with the national one.* The more similar the productive regional structure and the national ones are, the more representative the sample used in the national survey would be at a regional level. As this methodology uses national indexes as basis information to obtain regional indicators, the results will be better.

As it can be seen in figure 5.1 the Catalan and Spanish economy's productive structures are nearly coincident. This fact guarantees that the use of the information employed by the INE to elaborate the index for the whole of the state's industry is representative for *Cataluña*. However, for the regions of *Andalucía*, *Asturias* and *País Vasco* there are more differences (see figures 5.2 to 5.4). In particular, *País Vasco* is a region where the CNAE-74's division 3's weight (Metal transforming industry. Precision Mechanics) is much bigger than in the whole of the state, while the division 4 (Other manufacturing industries) is much smaller. In *Asturias*, the main differences affect division 2 (Extraction and non-energetic mineral transforming and deriving products. Chemical industry) and 4: division 2 has much more importance in *Asturias* than in the rest of the state and, on the contrary, division 4 in *Asturias* has a much smaller weight. As far as *Andalucía*, is concerned, the main differences are within divisions 2 and 3: division 2 has more little weight in *Andalucía* than in the rest of the state while the weight of division 3 is bigger.

Figure 5.1.

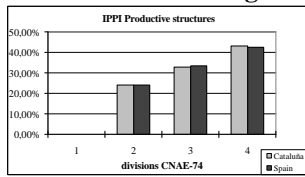


Figure 5.2.

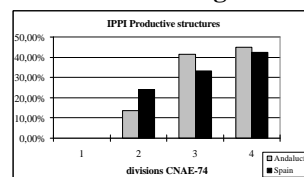


Figure 5.3.

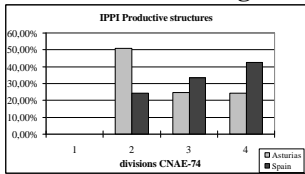
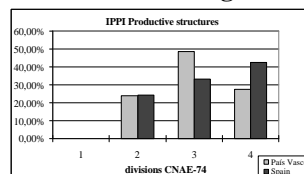


Figure 5.4.



e) *On the availability of a priori information.* As it has been previously exposed in reference to the olive oil elaborating sector (CNAE-74 sector 411) for *Andalucía*, the obtained indicators would be better if more *a priori* information is available. This is related to the fact that the censorship process of basis information can be carried out more efficiently. In any case, this problem is always presented *ex-ante* and it supposes an additional uncertainty element that diminishes the capacity of the methodology to predict the behaviour of regional industrial prediction.

6. Conclusions

The almost certain inexistence of (quantitative) indicators of the industrial production evolution at a regional level in Spain has been partially overcome by the recent publication by the INE of homogenous regional indicator. There is no doubt that the best option would have been to elaborate regional direct indicators, but the high cost associated to this method, together with budget restrictions, has not make it possible. For this reason, the INE has chosen to follow an indirect approach which consists of using pre-existing information. In particular, the INE seems to have adopted the method used by the IDESCAT to elaborate the indicator for *Cataluña*, due to the good performance of the method in this region.

In this paper the idoneity of extending the mentioned indirect method to the rest of Spanish regions has been considered. The obtained results have shown that the indicators elaborated according to INE's methodology offer a good approximation to the regional evolution of industrial production at quarterly and yearly frequencies, but not at a monthly frequency. The explanation of this feature is related with the fact that the reliability of the methodology depends on a long series of hypotheses and assumptions that are not valid for many of the Spanish regions.

As a final conclusion, it has to be said that the considered methodology is fully justified for some regions (such as *Cataluña* and *País Vasco*), but the reliability for other regions cannot be guaranteed at monthly frequency. As a consequence, we propose to obtain regional indicators of industrial activity using information about national IPIs at the maximum level of detail but complementing it with region-specific information, which will permit to obtain a good conjunctural indicator of industrial activity.

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