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Structural Change and Productive Blocks in the Spanish Economy: An Input-Output Analysis for 1980-1994

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Abstract. The objective of this paper is to analyse the technological change produced in the Spanish economy between 1980 and 1994 using the Input-Output tables of 1980, 1986, 1990 and 1994. Firstly we obtain and compare the linkage components of each block throughout the period. Secondly, using Structural Decomposition Analysis, we obtain a technological effect and a demand effect for each of the previous components. These results show the process of the technological modernisation of the Spanish economy as well as its dual character, in which, along with the growth of high and medium technology sectors, the service sectors have an increasing weight in the economy, employing low technologies or purchasing technology that increases the costs.

Keywords: Structural Decomposition Analysis, Technical change, Input-output, Spanish economy.

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1. Introduction

The main objective of this paper is to explain the changes that have occurred in Spanish economic activity in the period 1980-1994 paying special attention to the role that the sectorial blocks of different technological level have played, that is, trying to see to what extent the most recent economic growth has been based on the development of the high, medium or low technology sectors, or on the development of services with high or low technological components. Equally, we are interested in determining whether there has been a process of technological change in the Spanish economy or whether, on the contrary, the growth has been based on a re-dimensioning of the traditional sectors to satisfy larger volumes of final demand. The analysis of how the Spanish economy has changed during this period will, without doubt, serve to evaluate the present situation and to suggest future paths of development.

From the methodological point of view, our starting point will be the instruments of input-output analysis, the concept of vertical integration and some developments close to the hypothetical extraction method. These instruments allow us to decompose the production flows between blocks or sectors into four components: net backward linkage, net forward linkage, internal linkage and mixed linkage, showing us the role that each block or production sector plays as demander of inputs from the other sectors, as supplier of inputs or as driver of its own activities.

With the aim of analysing the evolution of the Spanish economy we study the changes in the four previous components using instruments derived from Structural Decomposition Analysis (SDA). The breakdown of the production flows into four components allows us to amplify the information traditionally obtained with the SDA by applying the decomposition to each of them. In this way, we see that the growth of the Spanish economy in these years is due as much to the increase in demand as to the structural change (change in the coefficients), and that in both types of change net backward linkage, net forward linkage, internal linkage and mixed linkage can be distinguished.

The application of these developments to the Spanish economy requires two additional decisions of empirical nature: what period our analysis should cover and how to construct the sectorial blocks of our study. With respect to the period studied, this runs from 1980 to 1994, having available homogenous input-output tables for 1980, 1986, 1990 y 1994. This period has been chosen because the decade of the 80s and early

90s is a key period for the Spanish economy. 1980 is close in time to the establishment of democracy in Spain, in 1986 Spain entered the European Economic Community and the end of the period saw the fulfilment of the requirements of convergence with the other countries of the Union (1992).

With respect to the production blocks into which the Spanish economy has been divided, we follow the distribution of activities based on technology and knowledge carried out by the OECD (2001) (cited in Trullén et al. (2002)). This classification, however, refers only to the manufacturing and service sectors, so it is necessary to complete it. Thus, we group the 56 sectors of the Spanish economy into nine production blocks: 1: Primary Sector; 2: Energy Sector, 3: High technology activities; 4: Medium-high technology activities; 5: Medium-low technology activities; 6: Low technology activities; 7: Construction Sector; 8: High qualification services; 9: Other services. We should note, however, that in the methodology used, the construction of the blocks does not mean the aggregation of the sectors that compose it. On the contrary, all the sectorial information is conserved, permitting the observation of the relationships that are established between technologically related sectors (those that belong to the same block) as well as those existing between different blocks.

The results suggest that from 1980 to 1994, in the Spanish economy there has been a double process; on the one hand, a strong process of technological renovation that has mainly affected the primary sector and the high, medium and medium-low technology sectors; on the other hand, an increase in the activities of services which is based on low technologies or on the purchase of technology. These processes have opposite influences on productivity and must have decisively marked the evolution of recent years. Another fact that has been observed in the results, and that was to be expected, is that most of the growth in production can be explained by the demand effects, which, due to their larger size, tend to overshadow the effects of the technological transformations.

The rest of the work is organised in the following way. In section 2 we develop the methodological aspects, focussing especially on how the SDA is applied to an economy described by sector blocks and with components linked between blocks. In section 3 we carry out the empirical application for the Spanish economy and divide it into two parts. In the first, and based on the forward or backward character of the different blocks, the principal directions of the technological transformations are analysed. In the second, we

obtain the technological and demand effects of the SDA, which allow us to better explain the technological transformations that have occurred. Section 4 is a final reflection on some of the things that the SDA allows us to say about the Spanish economy of these years.

2. Methodology

The starting point is an input-output model where an economy made-up of *n* sectors can be described by the equality $\mathbf{x} = \mathbf{A}\,\mathbf{x} + \mathbf{y}$, where $\mathbf{x} = (x_i)$ is the production vector, $\mathbf{y} = (y_i)$ is the vector of final demands and $\mathbf{A} = (a_{ij})$ is the matrix of technical coefficients. This economy can also be written as $\mathbf{x} = \mathbf{(I-A)^{-1}}\,\mathbf{y}$, where $\mathbf{(I-A)^{-1}}$ is the Leontief inverse. We use **u'** to denote the vector (1,..,1). Furthermore, if $\mathbf{B_s}$ represents a block of sectors of the economy, $\mathbf{B_{-s}}$ will represent the remaining sectors, and the production of an economy can be represented in the following way:

$$\begin{bmatrix} \mathbf{x}_s \\ \mathbf{x}_{-s} \end{bmatrix} = \begin{bmatrix} \mathbf{A}_{s,s} & \mathbf{A}_{s,-s} \\ \mathbf{A}_{-s,s} & \mathbf{A}_{-s,-s} \end{bmatrix} \begin{bmatrix} \mathbf{x}_s \\ \mathbf{x}_{-s} \end{bmatrix} + \begin{bmatrix} \mathbf{y}_s \\ \mathbf{y}_{-s} \end{bmatrix} \Leftrightarrow \begin{Bmatrix} \mathbf{x}_s = \mathbf{A}_{s,s}\mathbf{x}_s + \mathbf{A}_{s,-s}\mathbf{x}_{-s} + \mathbf{y}_s \\ \mathbf{x}_{-s} = \mathbf{A}_{-s,s}\mathbf{x}_s + \mathbf{A}_{-s,-s}\mathbf{x}_{-s} + \mathbf{y}_{-s} \end{Bmatrix} \Leftrightarrow$$
$$\begin{bmatrix} \mathbf{x}_s \\ \mathbf{x}_{-s} \end{bmatrix} = \begin{bmatrix} \mathbf{D}_{s,s} & \mathbf{D}_{s,-s} \\ \mathbf{D}_{-s,s} & \mathbf{D}_{-s,-s} \end{bmatrix} \begin{bmatrix} \mathbf{y}_s \\ \mathbf{y}_{-s} \end{bmatrix}, \text{ with } \mathbf{D} = \mathbf{(I-A)^{-1}} = \begin{bmatrix} \mathbf{D}_{s,s} & \mathbf{D}_{s,-s} \\ \mathbf{D}_{-s,s} & \mathbf{D}_{-s,-s} \end{bmatrix} \quad (1)$$

From these relationships, and under the demand model, the activity of each block $\mathbf{B_s}$ can be decomposed into four separate components:

Internal linkage component: $\mathbf{IC_s} = \mathbf{u_s'(I - A_{s,s})^{-1} y_s}$ (2)

Mixed linkage component: $\mathbf{MC_s} = \mathbf{u_s'}\left[\mathbf{D_{s,s}} - \mathbf{(I - A_{s,s})^{-1}}\right]\mathbf{y_s}$ (3)

Net backward linkage component: $\mathbf{BC_s} = \mathbf{u_{-s}'D_{-s,s}y_s}$ (4)

Net forward linkage component: $\mathbf{FC_s} = \mathbf{u_s'D_{s,-s}y_{-s}}$ (5)

Furthermore, we can construct the Intra-block linkage component (self-consumption) as the sum of the ICs and the MCs, that is $\mathbf{IBC_s} = \mathbf{u_s'D_{s,s}y_s}$

The $\mathbf{IC_s}$ computes the purchases of inputs that are produced exclusively within block **s**, that is, the purchases and sales of inputs between the sectors of the block, with the aim of obtaining the final demand of the block and without leaving the block. The $\mathbf{MC_s}$ gives the inputs with their origin in the block and their destination in the final

demand of the same block but used, in intermediate stages, in the other blocks. Moreover, both the $\mathbf{BC_s}$ and the $\mathbf{FC_s}$ are net indicators of the relationships between blocks. The $\mathbf{BC_s}$ represents the net direct and indirect input requirements that $\mathbf{B_s}$ does not produce and that it obtains from the other blocks of the economy to produce its final demand $\mathbf{y_s}$. Equally, the $\mathbf{FC_s}$ represents the direct and indirect sales of inputs generated in $\mathbf{B_s}$ and that this block carries out with all the other blocks of the economy so that they can obtain their final demands. Furthermore, the sum of $\mathbf{IC_s}$, $\mathbf{MC_s}$ and $\mathbf{BC_s}$, or, in other words, of $\mathbf{IBC_s}$ and $\mathbf{BC_s}$, constitutes the vertically integrated production (VIP) of block $\mathbf{B_s}$, that is to say, the direct and indirect input requirements of the block to obtain its final demand. Similarly, the sum of $\mathbf{IC_s}$, $\mathbf{MC_s}$ and $\mathbf{FC_s}$, or of $\mathbf{IBC_s}$ and $\mathbf{FC_s}$, is the direct or indirect production sales of $\mathbf{B_s}$ to cover the intermediate or final demand of goods of $\mathbf{B_s}$, which constitute the gross production of block $\mathbf{B_s}$. A deeper analysis of how to obtain and apply these indicators can be found in Sánchez Chóliz and Duarte (2002) and Duarte et al. (2002).

An approach frequently used to analyse the changes produced in an economy through time is called the Structural Decomposition Analysis (SDA) which has its origins in the developments of Carter (1970), and that has produced an important literature (see, for example, Blair and Wyckoff (1989), Skolka (1989), or Rose and Chen (1991), among others, or Rose and Casler (1996) for a critical review of the technique). SDA allows the decomposition of the variation of a product between two temporal moments 0 and 1, as a sum of changes associated with each of the individual factors; thus, for example, if $\mathbf{x = Ax+y}$, $\mathbf{\Delta A = A(}1\mathbf{)-A(}0\mathbf{)}$ and $\mathbf{\Delta x = x(}1\mathbf{)-x(}0\mathbf{)}$, as $\mathbf{(A+\Delta A)(x+\Delta x)-Ax = \Delta A\ x + A\ \Delta x+\Delta A\ \Delta x}$, we can decompose the changes in the direct inputs into two principal effects, the first, $\mathbf{\Delta A\ x}$ which is a substitution effect or direct technological effect and that we can interpret as a measure of the effects of technical change associated with matrix $\mathbf{A}$, and the second, given by $\mathbf{A\ \Delta x}$, which is a production effect obtained under conditions of fixed technology. The third addend of the decomposition, $\mathbf{\Delta A\ \Delta x,}$ is residual and measures in some way the change that cannot be assigned uniquely either to the technical change of $\mathbf{A}$ or to the change in the gross production $\mathbf{x}$. This decomposition, as $\mathbf{\Delta x \approx \Delta A\ x + A\ \Delta x + \Delta y}$, allows us to attribute the changes in $\mathbf{x}$ to three discrete changes: direct technological effect, production effect and demand effect, that are due to three independent factors: technology, gross production and final demand.

A similar analysis, much used in the literature, can be proposed in terms of the vertically integrated production, as $\mathbf{x} = \mathbf{(I-A)^{-1}y} = \mathbf{Dy}$, the change in production between the periods 0 and 1 will be: $\Delta\mathbf{x} = \Delta\mathbf{D}\ \mathbf{y} + \mathbf{D}\ \Delta\mathbf{y} + \Delta\mathbf{D}\ \Delta\mathbf{y}$. The first addend is the substitution or vertically integrated technological effect and measures the effect of technical change under conditions of fixed final demand. The second is the demand effect (vertically integrated), that here gathers the previous demand effect and a large part of the production effect obtained before[1]. Lastly, the residual term here again measures the interaction between both changes, but is different to the previous residual term. Moreover, if we combine the use of SDA with the decomposition of the production in blocks and the definition of their linkage components, it is possible to know which part of these technical changes or of the changes in the final demands is linked to purchases from other blocks, sales to others or to the internal production activity of the block itself.

Let's take a closer look. The variations in the productions of each block can be expressed in the following way:

$$\begin{bmatrix} \Delta\mathbf{x}_s \\ \Delta\mathbf{x}_{-s} \end{bmatrix} = \begin{bmatrix} \Delta\mathbf{D}_{s,s} & \Delta\mathbf{D}_{s,-s} \\ \Delta\mathbf{D}_{-s,s} & \Delta\mathbf{D}_{-s,-s} \end{bmatrix} \begin{bmatrix} \mathbf{y}_s \\ \mathbf{y}_{-s} \end{bmatrix} + \begin{bmatrix} \mathbf{D}_{s,s} & \mathbf{D}_{s,-s} \\ \mathbf{D}_{-s,s} & \mathbf{D}_{-s,-s} \end{bmatrix} \begin{bmatrix} \Delta\mathbf{y}_s \\ \Delta\mathbf{y}_{-s} \end{bmatrix} + \begin{bmatrix} \Delta\mathbf{D}_{s,s} & \Delta\mathbf{D}_{s,-s} \\ \Delta\mathbf{D}_{-s,s} & \Delta\mathbf{D}_{-s,-s} \end{bmatrix} \begin{bmatrix} \Delta\mathbf{y}_s \\ \Delta\mathbf{y}_{-s} \end{bmatrix} \tag{6}$$

From which it is deduced that

$$\Delta\mathbf{x}_s = \Delta\mathbf{D}_{s,s}\ \mathbf{y}_s + \mathbf{D}_{s,s}\ \Delta\mathbf{y}_s + \Delta\mathbf{D}_{s,s}\ \Delta\mathbf{y}_s + \Delta\mathbf{D}_{s,-s}\ \mathbf{y}_{-s} + \mathbf{D}_{s,-s}\ \Delta\mathbf{y}_{-s} + \Delta\mathbf{D}_{s,-s}\ \Delta\mathbf{y}_{-s} \tag{7}$$

$$\Delta\mathbf{x}_{-s} = \Delta\mathbf{D}_{-s,s}\ \mathbf{y}_s + \mathbf{D}_{-s,s}\ \Delta\mathbf{y}_s + \Delta\mathbf{D}_{-s,s}\ \Delta\mathbf{y}_s + \Delta\mathbf{D}_{-s,-s}\ \mathbf{y}_{-s} + \mathbf{D}_{-s,-s}\ \Delta\mathbf{y}_{-s} + \Delta\mathbf{D}_{-s,-s}\ \Delta\mathbf{y}_{-s}$$

So, according to the first of the equations of (7), for a block $\mathbf{B}_s$ the change in the production of the block can be seen as the sum of six addends, the first three coming from the SDA applied within block $\mathbf{B}_s$ and the last three from the SDA of the sales to other sectors. Concretely, the first addend is the variation in the self-consumption of the block due to technical change, the second is the change in the self-consumption due to the variations in its own final demand, the fourth addend is the change in the net forward linkage due to technological change in the other blocks, the fifth is the change

[1] The relationship between both decompositions is deduced from the following relationships:
$\Delta\mathbf{x} = \Delta\mathbf{A}\ \mathbf{x} + \mathbf{A}\ \Delta\mathbf{x} + \Delta\mathbf{A}\ \Delta\mathbf{x} + \Delta\mathbf{y} = \Delta\mathbf{D}\ \mathbf{y} + \mathbf{D}\ \Delta\mathbf{y} + \Delta\mathbf{D}\ \Delta\mathbf{y} \Rightarrow \Delta\mathbf{A}\ \mathbf{x} + \mathbf{A}\ \Delta\mathbf{x} + \Delta\mathbf{y} \approx \Delta\mathbf{D}\ \mathbf{y} + \mathbf{D}\ \Delta\mathbf{y}$

in the net forward linkage due to the variation in the final demand of the other blocks; the third and sixth addends are those of interaction, the third collects the interactions of the block itself and the sixth, the exterior interactions.

Moreover, given that the self-consumption of the block can be decomposed into the part of the production that is generated and consumed within the block, with no relation to the other blocks (internal component), plus the inputs sold by the block and later repurchased (mixed component), the variations in the self-consumption can also be expressed in terms of both components, applying the SDA to each of them individually. As a result, the variation in the production can also be expressed as

$$\Delta \mathbf{x}_s = \Delta(\mathbf{I}-\mathbf{A}_{s,s})^{-1}\,\mathbf{y}_s + (\mathbf{I}-\mathbf{A}_{s,s})^{-1}\,\Delta\mathbf{y}_s + \Delta(\mathbf{I}-\mathbf{A}_{s,s})^{-1}\,\Delta\mathbf{y}_s + \Delta[\mathbf{D}_{s,s}-(\mathbf{I}-\mathbf{A}_{s,s})^{-1}]\;\mathbf{y}_s$$

$$+ [\mathbf{D}_{s,s}-(\mathbf{I}-\mathbf{A}_{s,s})^{-1}]\,\Delta\mathbf{y}_s + \Delta[\mathbf{D}_{s,s}-(\mathbf{I}-\mathbf{A}_{s,s})^{-1}]\,\Delta\mathbf{y}_s + \mathbf{D}_{s,-s}\,\Delta\mathbf{y}_{-s} + \Delta\mathbf{D}_{s,-s}\,\mathbf{y}_{-s} + \Delta\mathbf{D}_{s,-s}\,\Delta\mathbf{y}_{-s} \qquad (8)$$

The second equation of (7) also allows us to see how the changes in demand and technology of block $\mathbf{B}_s$ change the production of $\mathbf{B}_{-s}$ through the backward linkage components. The first addend of this second equation gives us the change in the net backward linkage (purchases) through changes in the technology of $\mathbf{B}_s$, the second, the changes in the net backward linkage due to changes in its final demand, and the third is the estimation of the residual term, generated by changes in the technology and in the demand of $\mathbf{B}_s$, on the production of $\mathbf{B}_{-s}$.

Furthermore, if we remember that the vertically integrated production of a block $\mathbf{B}_s$ can be decomposed in turn into the sum of the internal, mixed and net backward linkage components, its variation can also be broken down into variations of these components in the following way:

$$\Delta \mathbf{PVI}_s = \Delta(\mathbf{I}-\mathbf{A}_{s,s})^{-1}\,\mathbf{y}_s + (\mathbf{I}-\mathbf{A}_{s,s})^{-1}\;\Delta\mathbf{y}_s + \Delta(\mathbf{I}-\mathbf{A}_{s,s})^{-1}\,\Delta\mathbf{y}_s + \Delta[\mathbf{D}_{s,s}-(\mathbf{I}-\mathbf{A}_{s,s})^{-1}]\,\mathbf{y}_s$$

$$+ [\mathbf{D}_{s,s}-(\mathbf{I}-\mathbf{A}_{s,s})^{-1}]\,\Delta\mathbf{y}_s + \Delta[\mathbf{D}_{s,s}-(\mathbf{I}-\mathbf{A}_{s,s})^{-1}]\,\Delta\mathbf{y}_s + \Delta\mathbf{D}_{-s,s}\,\mathbf{y}_s + \mathbf{D}_{-s,\,s}\;\Delta\mathbf{y}_s + \Delta\mathbf{D}_{-s,s}\,\Delta\mathbf{y}_s \qquad (9)$$

where the first three terms are the decomposition of the internal component, the following three, those of the mixed component and the last three, those of the net linkage. Terms 3, 6 and 9 are the interaction terms.

We should note that if we compare (7) and (9), it is obvious that the changes in the production of a block are nothing more than the changes in its VIP plus the changes in the net forward component minus the changes in the net backward component. The previous decompositions obtained with the SDA, do not exhaust the capacity of this

method to analyse production interdependencies, but they gather the fundamental aspects.

We cannot finalise these notes on the methodology without making a brief comment on the themes of exact decomposition and the non-uniqueness of the solutions of the SDA. With respect to the former, in the literature there are numerous studies that propose methods for achieving exact decompositions. In this work, we have opted to carry out an exact decomposition distributing, in all cases, the residual factor in equal parts between its two associated effects, the technological effect and the demand effect.

Furthermore, on obtaining all the decompositions of changes between an initial period 0 and another final period 1, we have supposed that the initial was the period of reference, for which we have $\mathbf{\Delta A} = \mathbf{A}(1)-\mathbf{A}(0)$ and $\mathbf{\Delta x} = \mathbf{x}(1)-\mathbf{x}(0)$. This option is not the only one possible, the period of reference could be the final one, the intermediate moment or any other. The resulting decompositions change slightly with the option chosen, but, except in very exceptional cases, they all allow us to reach similar conclusions.

Taking the above into account, in our work we have opted to maintain the initial year as the period of reference. In any case, we have observed that the qualitative results, the classification of the blocks and the importance of the effects of technical change and demand, are not altered if either we ignore the residual term or we take as reference the final period or an equidistant moment. These results are available upon request.

3. Empirical analysis

The variations in the production and in the VIP described in the previous section have been used to analyse the behaviour of the Spanish economy in the period 1980-1994. The starting point was the input-output tables corresponding to 1980, 1986, 1990 and 1994 elaborated by the Instituto Nacional de Estadística (National Institute of Statistics). The 56 sectors of the input-output tables have been classified according to their technological development into the nine blocks enumerated in the Introduction. The correspondences and the sectors that compose each block can be seen in Annex 1. Furthermore, with the aim of concentrating solely on the real evolution of the economy, the original tables, at current prices, have been converted into constant 1986 monetary

units, using the indexes of sectorial prices that the Fundación BBV (1999) provides. The transformation to constant prices is especially relevant for the period analysed because, during these decades the Spanish economy showed very high rates of inflation. Thus, in nominal terms, the overall production grew 96.5% from 1980 to 1986, 50.8% from 1986 to 1990 and 27.3% from 1990 to 1994. In real terms, the growth figures were, however, 15.2%, 11.7% and 14.61%, respectively. As we have already commented, we will analyse this evolution paying special attention to the changes in the blocks that are significant from a technological point of view. Lastly, given that our interest resides in the study of interior production, we eliminate from the final demand the imports of final goods and services. This justifies that the Energy block, markedly importing in character, presents a negative net final demand and a negative vertically integrated production.

Backward or forward character of the production blocks

In Table 1 appears the decomposition of the production and the vertically integrated production of the blocks for the four years of reference of the tables. To avoid the effect of size, we proposed these decompositions in relative terms dividing the internal, mixed and backward components by the VIP and the forward component by the direct production of block $\mathbf{x_s}$.

Note that the VIP over $\mathbf{x_s}$ and the self-consumption over $\mathbf{x_s}$ of the Energy block are negative because its net final demand is negative. In this block, the VIP does not measure the requirements from other blocks in the economy, but rather the difference between a hypothetical VIP that would be necessary to import and an interior VIP. The negative sign tells us that the VIP to be imported is larger than the interior VIP.[2]

A first characterisation of the blocks, excluding the Energy block because of its special character, allows us to distinguish between those with a VIP superior to their direct production and those in which, on the contrary, the direct production is higher than the vertically integrated. In the first case, we find groups of sectors that pull the economy, that require more inputs from the economic system than they supply, in order to produce their final demands. In the second case the contrary occurs, the sectors produce inputs to be incorporated into other sectors more than those they require of the economy to cover their demands of final private consumption, export or investment**.** In

[2] If,for a block $\mathbf{y_s \leq 0}$**,** we can suppose that $\mathbf{y_s = y_s^{int} - y_s^{imp}}$, in which case the VIP of the block would be $\mathbf{u'D_{.,s}\,(y_s^{int} - y_s^{imp}) = u'D_{.,s}\,y_s^{int} - u'D_{.,s}\,y_s^{imp}} = VIP_s^{int} - VIP_s^{imp}$.

the first group we find, in 1980, the High Technology, Medium-high Technology, Low Technology, Construction and Other Services blocks, with only the Low Technology, Construction and Other Services blocks remaining in this group after 1986. In the second group, in the years 1986, 1990 and 1994, we find the Primary, High Technology, Medium-high Technology, Medium-low Technology and High Qualification Services, while in 1980 this group only contained three of them, Primary, Medium-low Technology and High Qualification Services.

This shows the strong technological transformation of the Spanish economy in the first half of the eighties, in which two such significant blocks as High Technology and Medium-high Technology change their character from puller (backward) to pusher (forward). In these years we also observe an increase in the relative weight in production of these two blocks and the two service blocks, High Qualification Services and Other Services; together they go from 49.17 % of the gross production to 57.53 The Spanish economy has indeed undergone an increase in the participation of the knowledge- based sectors and of the service sectors during this period, although this does not seem to have meant a change towards a more integrated economy. If we compare 1980 with 1994, it can be seen that all the blocks, with the exception of Energy and High Qualification Services, have increased their percentage of internal linkage while reducing the percentage of net backward linkage.

The Energy block has a different evolution, its weight in the total production decreases systematically, its negative VIP is drastically reduced from -147.99 % of its production to -19.67 %, its internal linkage also falls from 62.13 % to 30.81 % and its net backward linkage, goes from 35.49 % to 68.81 %. This tells us that it has much reduced, relatively, its dependence on the exterior and has increased, in compensation, its interior purchases. In other words, it changes its backward character increasing its integration.

Trullén et al. (2002) point out that “competition in the most advanced economies is based more and more not on the intensive use of material resources but on the knowledge factor, immaterial in nature and concentrated in urban locations”. Looked at in this way, the Spanish economy would have been growing along these lines of technological advance but without achieving any outstanding integration of these activities (energy seems to be the exception), and they would have been dedicating higher and higher percentages of their production to obtaining their own inputs.

Looking at specific blocks, Table 1 allows us to see that the Primary block is an important pusher of the economy, its direct and indirect sales to the other blocks amounting to more than 72% of its direct production in all the periods, growing slightly from 72.31 % to 73.91 %. Moreover, its backward character has weakened, taking its VIP from 48.10 % of its direct production to 43.27 %. This fall is very revealing because it has come about essentially in the purchases from other blocks; it can be seen that the net backward linkage has gone from 42.44 % to 39.70 %, having been 35.22 % in 1990. The explanation is the reduction of the inputs used per unit produced, but this is, without doubt, technological progress. Additionally, and as was to be expected, we see that this block has lost specific weight in the total Spanish production. In 1980 it represented 6.24% of the gross production, while in 1994 this percentage dropped to 5.47%.

The High Technology block, whose weight in the economy has increased slightly from 2.50% to 3.17%, in 1980 showed a VIP superior to its direct production, having a slightly backward character. Throughout the period studied, this block had a spectacular loss in its backward linkage capacity, the percentage of its VIP falling approximately 25 %, from 103.99 % to 75.55 % and falling in all the periods. This fall is also seen in its net backward component, that goes from 52.78% of its VIP in 1980 to 42.68% in 1994. On the contrary its net forward component grows from being 50.90% of its direct production in 1980 to 56.70% in 1994, which reveals that its products are in greater demand from the other sectors. A possible explanation for this changeover from backward to forward is a reduction of costs by saving on inputs, which means a strong technological transformation, but we will test this hypothesis later because it could also be due to changes in its final demand. The greater demand could also be because the modernisation of the sector has made its products more interesting.

In Table 1 it can be seen that the Medium-high Technology block has an evolution similar but less intense than the High Technology block.. Its weight in the economy grows from 6.37 % to 8.28%. Its global backward linkage and its proportionate weight of net backward linkage fall. At the same time, its net forward component and the weight of its self-consumption grow, showing a strengthening of its forward character. The same suppositions as before can be repeated for this block. The principal difference is the weight of its mixed linkage and its constant growth, passing from 2.36 % in 1980 to 3.66 % in 1994.

The Medium-low Technology block is a block with a marked forward character, which has been strengthened throughout the four periods analysed (except for a small reduction in 1994). In 1986, 1990 and 1994 it is the block (after Energy) where the net impulse is the biggest percentage of the production. It also presents an internal linkage that grows in percentage over the VIP, but the latter is strongly reduced, falling from 55.71 % of the production to 33.29 %. Globally its forward character is strengthened, with its net impulse increasing from 67.33 % to 78.22 % of its production. It should be pointed out that there is a strong fall in its weight in the global economy, which indicates a loss of the production relevance of this type of technology. From 1980 to 1994 it loses six percentage points, which is the greatest loss of representation of all the blocks.

The Low technology block does not present important changes: it has a backward character that weakens gradually, its VIP passes from 138.70 % to 122.00 % of its production, this weakness also being seen in a small reduction in the weight of its net backward linkage compared to its self-consumption**.** The fall in its VIP tells us that its unitary costs (per unit of net production) have been reduced, also indicating a process of technological change. Its weight in the total production does not increase, confirming that the activities of low technology have lost relevance in the Spanish economy in favour of services or of high technology.

The Construction block also presents a similar evolution to the Low Technology block, probably because its technological level is also low. Its weight in the economy does not change, as was the case in the Low Technology block. In 1980 and in 1994, the percentages of total production are 7.56 % and 7.50 %. Its backward character also weakens slightly over the period, the percentages of both its VIP and net backward component falling, showing modernisation. Practically, in the four years of the sample, half of its VIP is generated in the block itself and half has its origin in other blocks. Surprisingly, its net impulse capacity in relation to production is low and even tends to diminish in the period analysed, passing from 22.15 % of its direct production in 1980 to 16.91 % in 1994.

To finalise, in Table 1 we can see that the service blocks have increased their participation in the Spanish economy throughout the four periods and show a very distinct character in backward linkage. High Qualification Services is a forward block and Other Services is a backward block, insinuating as have other blocks in the Spanish

economy, that the backward character goes hand in hand with low levels of technology or knowledge to be used. Both maintain their character throughout period, the percentage changes of neither the net backward component nor the net forward component being very significant. An explanation of this stability can be found in the weight of the internal linkage of both blocks, always higher than 63% of the VIP. The principal difference between both sectors are the values of the net forward linkage, the High Qualification Services block sells about 45 % to other blocks, whereas Other Services never sells more than 11 %.

Summing up, Table 1 shows us that the Spanish economy in the period studied has increased its technological level because the weight of the three most representative blocks, High Technology, Medium-high Technology and High Qualification Services has increased, and it seems it has reduced costs in others such as Primary, Low Technology and Construction. The most characteristic fact is that this technological improvement seems to be associated with a reduction in purchases from other blocks and thus in backward linkages, which would indicate that a strong reduction in the physical inputs necessary for one net unit of production has been achieved. Along the same lines, it is also significant that the three blocks that remain as backward blocks in the four years analysed, Medium-low Technology, Low Technology and Other Services, are blocks associated with activities of a low technological level.

However, all these conclusions should be taken with care, because Table 1 does not allow us to make totally trustworthy conclusions about technological evolution: let's not forget that in the table the technological effects and the demand effects are not separated. For a better understanding of the real evolution of the technological level of production we must apply the SDA and isolate the technological effects. This is what we do in the second part of this section.

Technological and demand effects of the different blocks

The four tables available allow us to calculate the changes in three successive periods, 1980-86, 1986-90 and 1990-94. To obtain information about the technical changes we apply the Structural Decomposition Analysis to the economy decomposed into 9 blocks. We obtain a demand effect and a technological effect for the changes in production, vertically integrated production, self-consumption (total, internal component and mixed component), net backward linkage and net forward linkage. The

way of carrying this out can be seen in section 2, where the applied methodology is commented. The results are collected in Table 2.

The years that the study covers have been characterised by a permanent increase in production of approximately 3 % annually. Against the 2.53 % average of the first 6 years, it passes to 2.94 in the following 4 years and to 3.65 in the last four. This makes almost all the demand effects of the total economy positive, a negative evolution being indicated if they are negative or below the average annual growth.

On the other hand, the technological effects do not depend on the production growth rate. Because they are calculated for the demands of the year of reference, their sign will depend on the changes in the technical coefficients. For this reason, we should expect negative values in some of the technological effects; a technological change, inasmuch as it means a reduction in unitary costs in inputs, can make the sign of the technological effect negative. If the technological effect is positive, it tells us that the costs in inputs per net unit have grown and that there has been some type of loss of technological efficiency. However, for the Energy blocks, and given its negative final demand, the sign should be interpreted in the opposite way in the technological effects of self-consumption, internal linkage, mixed linkage and net backward linkage.

If we look at Table 2 in the average annual changes of the three principal technological effects, that of net backward, the internal and the net forward component, we see that the Spanish economy has all three negative in the last sub-period, all three positive in the second and two negative with high absolute values in the first. Thus we can say that the Spanish economy as a whole underwent a strong growth process, with an intense technological change especially in the periods 80-86 and 90-94, characterised by a reduction of inputs necessary per net unit produced (note that purchases were also reduced in spite of the growth). In the period 80-86, the change gave rise to a strong reduction in the inputs bought from and sold to others, but the use of their own inputs was intensified (which explains the positive internal effect). On the contrary, in the 90-94 period, the reduction of inputs is generalised, giving rise to similar negative values for the three effects.

When we go on to analyse the effects at block level, the subject gets more complicated because each has a different evolution. To simplify the analysis, we will divide the blocks into three groups. The first contains the blocks with strong production growths and high technological levels, namely: High Technology, Medium-high

Technology and High Qualification Services. Note that these increases in production have also meant a gain in the relative weight of these blocks in all the periods (as can be observed in Table1), only the High Technology block loses weight between 1990 and 1994. The second group contains those blocks with negative growth in some sub-period: Primary, Energy and Medium-low Technology, which has led to a reduction in their relative importance. Finally, the third group is formed by the Low Technology, Construction and Other Services blocks that are the backward blocks.

The growth rates of the first group are superior to the economy average in the three sub-periods, with the only exception of the High Technology block that grew much less than the economy in the period 90-94 (8.41 %), but witnessed a spectacular growth in the period 80-86 (41.90 %). In consequence, as one would expect, the demand effects of all types in the three blocks are positive.

From the point of view of the technological effects, the group exhibits two quite different behaviours: on the one hand, the High Technology and Medium-high technology, and on the other hand, the High Qualification Services. In the first two, the technological effects of net backward linkage are always negative and those of the internal linkage are also negative in the first period and in another period; we can say, in consequence that they have undergone an intense process of technological improvement, principally in the years 80-85. The technological effects of net impulse are always positive for these blocks (with the only exception of High Technology in the third sub-period), revealing that their products are in greater demand by other sectors which thus receive indirectly the technological improvements applied within these two blocks.

The High Qualification Services block coincides with the previous ones in the positive signs of the technological effects of its net impulses, which means it increases the weight of its services in other activities. However, it does not present negative signs in its internal and net backward effects, except in its internal technological effect in the third period. We believe its positive signs and its high values (especially in internal technological effect for 80 to 86) are a reflection of the fact that they buy the technology they use and do not improve it, which leads them to a reduction in their own technological efficiency; the negative sign of the internal effect for the final period could indicate a change of direction of this negative evolution.

The three blocks of the second group, Primary, Energy and Medium-low Technology, also have different evolutions. In the Energy block, production falls in the periods 80-86 and 86-90 and grows in the last one, from 90 to 94. Also, the VIP falls in all three periods, especially in the first (80.38 %) and in the third (22.58 %), but we must remember it was negative; in consequence, the imports lose relative weight compared to the interior activity of the block. It can also be seen that the demand effects of net backward linkage and of internal backward linkage, as a consequence of this production evolution, are negative in the three periods. If we look at the technological effects of net backward linkage and of internal backward linkage, we see that they are negative in the first period and positive in the other two. All this allows us to say that the block has undergone a strong transformation, becoming more interior-focussed and has increased its efficiency, at least in the last two periods.

Moreover, if we look at the forward linkages of the Energy block, we observe that the three demand effects are positive but the technological net forward effects are negative and with high absolute values. This shows that the sector has maintained part of its growth due to the pull of other blocks, but these have heavily reduced the use of inputs produced in the sector, which, although it might reflect an improvement in their technology and efficiency, also explains the loss of weight of the block.

In the Medium-low Technology block, the fall in production only occurs in the first period, bringing with it negative demand effects in backward linkages, that are maintained in the first and second periods. On the other hand, the forward linkage demand effects are positive, which partially compensates the fall in production. The net backward and internal technological effects are negative in the three periods, with the exception of the net backward linkage of the second period, showing that the sector underwent a standard technological transformation, essentially by reducing costs. In this block, the evolution of the net forward technological effects is remarkable; the evolution of this component is negative in the three periods and especially important in the period 80-86, when it meant a reduction of 22% of the gross production of the block. This fact has contributed to the fall in the relative weight of the sector, whose products might be substituted by others of higher technology.

The third block of the group, the Primary block, which includes all the agrarian activities, has followed a similar evolution to the previous block, but slightly more positive. Although its production falls in one of the periods, it has had significant

increases in the first two. This is reflected in the positive signs of the demand effects of net backward, internal and net forward linkages in the three periods and in that the loss of weight of the block in the economy is small.

From the technological point of view, this is a block that has been clearly modernised during the first two periods in which it has negative technological effects of net backward and internal linkage. However, the technological effect of net backward is positive and high between 90 and 94 and the technological effect of internal linkage is negative, revealing a slowing down of the modernization process. The modernisation of the activity seems also to be accompanied by a higher demand for its products by the other sectors. The technological effect of net forward linkage is positive in the first two periods, which tell us that the other sectors buy more inputs per unit than they produce. However, this figure is negative and large in the third period, which seems to indicate the beginning of a process of substitution, the same as occurs in the Medium-low Technology block.

The third group is formed by the blocks that have followed an evolution more similar to the average of the economy, that do not show such spectacular growth in production as those of the first group, but neither show decreases. We can see that all their demand effects, both of backward and forward linkage, are positive.

In the Low Technology block, the technological effects of net backward and internal linkage are all negative, which means that its sectors have undergone an important technological improvement through the reduction of unitary inputs. This is probably why they have maintained their weight in the economy in spite of the low technological level of their processes.

The Other Services block, on the contrary, has five of the six possible effects positive, which tells us that its efficiency or technological level has diminished. We can also note that the growth of its VIP is very similar to that of its production.

The third of the blocks in this group, Construction, has an intermediate behaviour: of its six technological effects, three are zero, two negative and one positive, showing that it has been a block with little technological change. Only in the first period, the technological effect of the net backward linkage is high and negative.

It is worrying that the Construction and Other Services blocks are the ones with the lowest technological change, which is even clearly negative in the latter block. We must

not forget that these blocks are very representative of the Spanish economy with weights of 7.50 % and 31.50 % respectively, in 1994.

4. Conclusions

Although the main results have already been presented, we wish to close this analysis by going back to a previously mentioned aspect, namely the meaning to the Spanish Economy of the lessening of the backward character of some of the blocks and its connection to the intense process of technological modernisation over this period.

The backward character of a sector has usually been associated with a high technological capacity and a high growth rate. The backward processes, especially when they were also forward, were key elements to identify in any process of growth and development. This form of reasoning implies that when a sector stops being a backward sector, we should expect its growth rate to be lower than the economy as a whole.

Under this simple perspective, the evolution of the Spanish economy between 1980 and 1994 would not be optimal because such relevant blocks, from the technological point of view, as High Technology and Medium-high Technology change from backward to forward blocks and the High Qualification Services is clearly a forward block. However, the strange thing is that these are the three blocks with the highest growth rates.

The application of the Structural Decomposition Analysis offers us a different perspective by showing us separately the growth effects due to technological change and those due to an increase in demand. In the traditional analysis, the technological effects are hidden by the demand effect, which is usually bigger. Any technological change, in some way, reduces the quantity of inputs required for a net unit produced.

In any wide-ranging process of technological improvement in an economy, we should expect reductions in technical coefficients and negative technological effects in the backward linkages. When we apply the Structural Decomposition Analysis to the Spanish economy we discover that many of the most representative technological effects of backward linkage (net backward linkage and internal linkage) are negative, showing without doubt, important processes of internal technological improvement. The exceptions seem to be the Construction, High Qualification Services and Other Services blocks.

Finally, we have to note that the Structural Decomposition Analysis reveals a dual evolution of the Spanish economy, an important modernisation in some sectors and a process of increasing the representation of the service sectors with little improvement in efficiency because it has been based on low technology or technological purchases from other sectors. The future will probably depend on which of these two facets dominates.

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TABLE 1. Decomposition of production and VIP of the blocks into four components. (Percentages)

Year	Components	Primary block	Energy Block*	High Technology block	Medium-high Technology block	Medium-low Technology block	Low Technology block	Construction	High qualification Services	Other services	Total
1980	x_s over x	6.24	3.89	2.50	6.34	16.36	16.78	7.56	11.32	29.01	100.00
	VIP over x_s	48.10	-147.11	103.99	105.37	55.71	138.70	171.55	69.63	138.60	100.00
	Self-consumption over x_s	27.69	-94.90	49.10	50.48	32.67	76.79	77.49	55.66	89.84	58.91
	Self-consumption over VIP	57.56	64.51	47.22	47.90	58.63	55.36	45.17	79.94	64.82	58.91
	Internal effect over VIP	53.64	62.13	46.82	45.54	52.41	51.77	44.81	78.61	63.13	56.53
	Mixed effect over VIP	3.93	2.38	0.40	2.36	6.22	3.59	0.36	1.32	1.69	2.38
	Net backward effect over VIP	42.44	35.49	52.78	52.10	41.37	44.64	54.83	20.06	35.18	41.09
	Net forward effect over x_s	72.31	194.90	50.90	49.52	67.33	23.21	22.51	44.34	10.16	41.09
1986	x_s over x	6.36	3.10	3.08	7.11	11.39	16.48	7.05	13.39	32.02	100.00
	VIP over x_s	42.73	-31.44	78.37	93.87	40.55	134.48	160.82	67.35	131.21	100.00
	Self-consumption over x_s	26.56	-21.56	44.41	47.33	26.04	75.00	80.63	54.17	90.08	62.87
	Self-consumption over VIP	62.15	68.58	56.67	50.42	64.21	55.77	50.14	80.43	68.65	62.87
	Internal effect over VIP	57.40	67.23	56.19	47.29	60.98	51.95	49.70	78.95	66.83	60.59
	Mixed effect over VIP	4.75	1.35	0.48	3.13	3.23	3.82	0.44	1.48	1.83	2.28
	Net backward effect over VIP	37.85	31.42	43.33	49.58	35.79	44.23	49.86	19.57	31.35	37.13
	Net forward effect over x_s	73.44	121.56	55.59	52.67	73.96	25.00	19.37	45.83	9.92	37.13
1990	x_s over x	6.35	2.74	3.35	7.82	10.76	16.00	8.21	13.96	30.80	100.00
	VIP over x_s	39.43	-28.15	79.75	93.84	29.03	128.88	169.71	68.95	132.92	100.00
	Self-consumption over x_s	25.55	-12.09	45.63	48.27	18.38	71.97	84.58	54.65	89.61	62.27
	Self-consumption over VIP	64.78	42.94	57.21	51.43	63.31	55.84	49.84	79.26	67.42	62.27
	Internal effect over VIP	60.13	42.26	56.71	47.82	60.02	52.14	49.44	77.58	65.67	60.08
	Mixed effect over VIP	4.65	0.68	0.50	3.61	3.29	3.71	0.40	1.68	1.75	2.19
	Net backward effect over VIP	35.22	57.06	42.79	48.57	36.69	44.16	50.16	20.74	32.58	37.73
	Net forward effect over x_s	74.45	112.09	54.37	51.73	81.62	28.03	15.42	45.35	10.39	37.73
1994	x_s over x	5.47	2.65	3.17	8.28	10.27	16.60	7.50	14.58	31.50	100.00
	VIP over x_s	43.27	-19.67	75.55	91.87	33.29	122.00	164.68	72.60	131.93	100.00
	Self-consumption over x_s	26.09	-6.14	43.30	48.52	21.78	70.36	83.09	54.86	89.21	62.89
	Self-consumption over VIP	60.30	31.19	57.32	52.81	65.43	57.68	50.45	75.57	67.62	62.89
	Internal effect over VIP	55.64	30.81	56.80	49.14	62.44	53.74	50.05	73.54	65.72	60.54
	Mixed effect over VIP	4.66	0.38	0.51	3.66	2.99	3.94	0.40	2.03	1.89	2.35
	Net backward effect over VIP	39.70	68.81	42.68	47.19	34.57	42.32	49.55	24.43	32.38	37.11
	Net forward effect over x_s	73.91	106.14	56.70	51.48	78.22	29.64	16.91	45.14	10.79	37.11

*Note that VIP, self-consumption, internal linkage, mixed linkage and net backward linkage are always negative in the Energy block.

TABLE 2. SDA of changes in VIP and production 1980-1994

	Percentages	1	2	3	4	5	6	7	8	9	Total	Year average. change
1980-1986	Total change in x/xs	17.30	-8.19	41.90	29.23	-19.78	13.09	7.43	36.19	27.13	15.15	2.53
	Total change in VIP/VIP	4.20	-80.38	6.95	15.12	-41.61	9.65	0.71	31.72	20.35	15.15	2.53
	Techonological effect of self-consumption /VIP(0)	0.27	-3.25	-0.55	-1.22	-6.87	-1.84	0.03	22.45	1.00	1.22	0.20
	Demand effect of self-consumption./VIP(0)	6.94	-47.80	13.93	11.35	-14.28	7.63	5.29	3.55	16.81	12.26	2.04
	Technological effect of internal linkage/VIP(0)	-0.26	-3.03	-0.59	-1.72	-3.83	-2.12	0.00	21.97	0.93	1.30	0.22
	Demand effect of internal linkage/VIP(0)	6.43	-45.90	13.87	10.62	-12.98	7.31	5.25	3.41	16.37	11.94	1.99
	Technological effect of mixed linkage/VIP(0)	0.52	-0.22	0.04	0.50	-3.04	0.28	0.03	0.48	0.07	-0.08	-0.01
	Demand effect of mixed linkage/VIP(0)	0.50	-1.90	0.07	0.73	-1.29	0.32	0.04	0.14	0.44	0.32	0.05
	Technological effect of net backward linkage/VIP(0)	-7.67	-7.30	-13.59	-7.12	-10.74	-1.31	-10.45	3.80	-5.89	-5.35	-0.89
	Demand effect of net backward linkage/VIP(0)	4.67	-22.02	7.16	12.10	-9.73	5.16	5.84	1.92	8.43	7.01	1.17
	Technological effect of self-consumption/x(0)	0.13	-4.78	-0.57	-1.28	-3.83	-2.55	0.06	15.63	1.39	1.22	0.20
	Demand effect of self-consumption/x(0)	3.34	-70.32	14.49	11.97	-7.95	10.58	9.07	2.47	23.29	12.26	2.04
	Technological effect of forward linkage/x(0)	6.10	-90.27	13.98	8.07	-22.00	-0.22	-4.71	5.79	0.90	-5.35	-0.89
	Demand effect of forward linkage/x(0)	7.73	6.98	14.01	10.48	14.00	5.27	3.01	12.29	1.54	7.01	1.17
1986-1990	Total change in x/xs	11.65	-1.44	21.43	22.89	5.50	8.49	30.06	16.54	7.49	11.74	2.94
	Total change in VIP/VIP	3.03	-11.77	23.57	22.86	-24.46	3.97	37.25	19.31	8.89	11.74	2.94
	Techonological effect of self-consumption /VIP(0)	-1.35	3.07	-0.56	1.29	-0.22	-0.34	-0.04	2.16	0.52	0.33	0.08
	Demand effect of self-consumption./VIP(0)	5.94	-33.77	14.58	11.48	-16.16	2.62	18.31	11.98	4.23	6.38	1.60
	Technological effect of internal linkage/VIP(0)	-0.95	3.14	-0.55	0.67	-0.49	-0.15	0.00	1.84	0.54	0.31	0.08
	Demand effect of internal linkage/VIP(0)	5.50	-33.08	14.43	10.79	-15.15	2.40	18.15	11.77	4.13	6.23	1.56
	Technological effect of mixed linkage/VIP(0)	-0.40	-0.06	-0.01	0.62	0.26	-0.19	-0.04	0.32	-0.02	0.02	0.01
	Demand effect of mixed linkage/VIP(0)	0.44	-0.68	0.15	0.69	-1.01	0.22	0.15	0.20	0.10	0.15	0.04
	Technological effect of net backward linkage/VIP(0)	-4.99	35.01	-3.26	-0.42	2.20	-0.66	0.67	2.56	2.32	0.66	0.17
	Demand effect of net backward linkage/VIP(0)	3.43	-16.09	12.79	10.50	-10.28	2.34	18.32	2.61	1.81	4.38	1.10
	Technological effect of self-consumption/x(0)	-0.58	0.97	-0.44	1.21	-0.09	-0.45	-0.07	1.46	0.69	0.33	0.08
	Demand effect of self-consumption/x(0)	2.54	-10.62	11.43	10.78	-6.55	3.53	29.44	8.07	5.55	6.38	1.60
	Technological effect of forward linkage/x(0)	4.75	-15.21	2.11	5.60	-1.77	2.98	0.01	1.24	-0.29	0.66	0.17
	Demand effect of forward linkage/x(0)	4.93	4.12	8.33	5.30	13.92	2.43	0.68	5.78	1.54	4.38	1.10
1990-1994	Total change in x/xs	-1.37	10.75	8.41	21.28	9.44	18.86	4.71	19.64	17.20	14.61	3.65
	Total change in VIP/VIP	8.24	-22.58	2.70	18.74	25.48	12.51	1.60	25.97	16.33	14.61	3.65
	Techonological effect of self-consumption /VIP(0)	-0.40	1.57	0.02	-0.65	-1.01	0.20	-0.01	-4.06	0.68	-0.17	-0.04
	Demand effect of self-consumption./VIP(0)	0.88	-20.37	1.63	11.92	19.80	8.85	1.43	19.99	10.56	9.99	2.50
	Technological effect of internal linkage/VIP(0)	-0.72	1.50	0.01	-0.44	-0.46	-0.19	0.00	-4.43	0.51	-0.33	-0.08
	Demand effect of internal linkage/VIP(0)	0.81	-19.91	1.61	10.97	18.80	8.52	1.42	19.49	10.27	9.65	2.41
	Technological effect of mixed linkage/VIP(0)	0.33	0.07	0.01	-0.21	-0.54	0.40	-0.01	0.38	0.17	0.16	0.04
	Demand effect of mixed linkage/VIP(0)	0.07	-0.46	0.02	0.95	1.00	0.33	0.01	0.50	0.28	0.34	0.09
	Technological effect of net backward linkage/VIP(0)	7.23	7.90	-0.58	-4.25	-3.56	-1.53	-1.24	3.93	0.02	-0.42	-0.11
	Demand effect of net backward linkage/VIP(0)	0.53	-11.68	1.63	11.71	10.25	4.99	1.42	6.11	5.07	5.22	1.31
	Technological effect of self-consumption/x(0)	-0.16	0.44	0.02	-0.61	-0.29	0.26	-0.01	-2.80	0.91	-0.17	-0.04
	Demand effect of self-consumption/x(0)	0.35	-5.73	1.30	11.19	5.75	11.40	2.43	13.78	14.03	9.99	2.50
	Technological effect of forward linkage/x(0)	-7.50	-11.75	-1.97	3.47	-7.10	2.95	-0.38	1.74	0.82	-0.42	-0.11
	Demand effect of forward linkage/x(0)	5.95	17.21	9.06	7.24	11.08	4.25	2.67	6.92	1.44	5.22	1.31

Blocks: 1: Primary block; 2: Energy block; 3: High Technology block; 4: Medium-high Technology block; 5: Medium-low Technology block; 6: Low Technology block; 7: Construction; 8: High qualification Services; 9: Other services

ANNEX 1. Block composition

Block	Block name	Sectors
1	Primary block	Agricultura, silvicultura y pesca
2	Energy block	Hulla y aglomerados de hulla, Lignito, Petróleo bruto, Gas natural, Agua, Energía eléctrica, Gas manufacturado
3	High Technology block	Máquinas de oficina y tratamiento de la información, material eléctrico, electrónico, óptico y otros medios de transporte
4	Medium-high Technology block	Productos químicos, máquinas agrícolas e industriales y productos automotores
5	Medium-low technology block	Productos de coquefacción, Productos petrolíferos refinados, Combustibles nucleares, Minerales de hierro, Minerales no férreos y metales no férreos, Cemento, cal y yeso, Vidrio, Tierra cocida y productos cerámicos, Otros minerales derivados no metálicos, Productos metálicos, Productos de caucho, productos de materias plásticas
6	Low Technology	Carnes y conservas, Leche y productos lácteos, Otros alimentos, Bebidas, Tabacos, Productos textiles y vestidos, Cuero preparado, curtido y acabado, calzado, Madera y muebles de madera, Pastas de papel, papel y cartón, Artículos de papel e impresión, Muebles y otros artículos manufacturados, Recuperaciones y reciclaje
7	Construction	Construcción e ingeniería civil
8	High qualification services	Comunicaciones, Créditos y Seguros, Servicios prestados a las empresas, Educación destinada a la venta, Educación no destinada a la venta, Sanidad destinada a la venta, Sanidad no destinada a la venta.
9	Other services	Comercio, Restaurantes y alojamiento, Ferrocarriles, Otros tipos de transporte terrestre, Transporte marítimo, Transporte aéreo y espacial, Servicios anexos al transporte, Servicios inmobiliarios, Servicios recreativos, culturales y deportivos, Administración Pública

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