

**SOCIO-ECONOMIC
IMPORTANCE OF THE**



PULP, PAPER
AND BOARD
VALUE CHAIN

Foreword

The economic industries related to paper have been working together with a value chain vision for more than a decade. Coordination and connectivity along the chain, improving information flows and seeking better efficiency, is the core paradigm of the 4.0 industry, the smart industry, and is something in which we already have an important common trajectory.

The different links of the value chain share a vision and goals. We strive to play a leading role in the new economy, as a bioindustry based on a renewable resource and as a reference for the new industrial model based on the circular economy. We are a powerful value chain with a powerful leverage effect, which provides stability to our economy and creates wealth and quality employment based on sustainability.

Our value chain starts from the wood plantations for paper and includes the manufacture of pulp and paper as well as a large group of converting industries, which produce all kinds of paper products (tissue paper, boxes and bags, stationery items, etc.). The chain continues with advertising and direct marketing services; printing, reproduction and finishing services; the books, newspapers and magazines publishing, and postal and mail services. Finally, the cycle ends with the recycling of paper and cardboard and its return to paper mills.

In a global and highly competitive environment, we are aware that only by working together, adding value throughout the entire chain, we will be able to achieve higher levels of efficiency and quality and respond more effectively to the changes and challenges addressed by consumers.

The goal of this study is to better know each other through a thorough analysis, and at the same time provide our stakeholders with better information about the powerful value chain we form.

As a conclusion to the rigorous work carried out by CEPREDE, we can say that the contribution of the value chain to the economy as a whole is very significant, both because of its multiplier effect in terms of production, employment, income and fiscal balance, and its focus on technological innovation and sustainability.

Our vision and goals for the future rely on the involvement of our companies, the companies of the chain, and on the generous support of our stakeholders. This report is for all of them, and we hope they will find it interesting.

For us, the organizations of the value chain, the results of this analysis are an incentive to deepen our vision of the value chain, as well as to keep working for our common goals and improving the contribution to the economy and employment from a sustainability standpoint.

- AFCO, Spanish Association of Corrugated Cardboard Containers and Packaging Manufacturers
- ASPACK, Spanish Association of Manufacturers of Packaging and Transformed Cardboard
- ASPAPEL, Spanish Association of Pulp and Paper Manufacturers
- FGEE, Spanish Association of Publishers Guilds
- LA BOLSA DE PAPEL, Iberian Association of Manufacturers of Paper Bags
- MESA DE LA NUEVA RECUPERACION, Platform for Recovering Paper and Carboard Companies in Spain
- NEOBIS, Graphic Communication Association
- REPACAR, Spanish Recyclers Paper and Board Association

Introduction

Most of the sectoral studies stick to an internal perspective that, although valuable, leaves out of its scope a genuine evaluation of the economic reality that its productive activity incorporates into the economy as a whole, known as impact analysis in the economic literature. However, this study does not only raise the need to know the overall impact of an activity, but also of the entire value chain that revolves around two products, paper and board.

With this in mind, the proposal made by a large group of business associations, eight to be accurate, was presented to us as a wonderful opportunity to make known a business reality that has undoubtedly been strongly impacted by the economic crisis suffered by the Spanish economy.

Rigor and impartiality have been undoubted premises for its development and, therefore, it has been necessary to define, in the first place, the activities that make up the value chain, considering all the companies that operate in the industry as well as raw material or intermediate suppliers or as final manufacturers, and with it, have a complete and comprehensive study.

It is therefore a unique experience, which has required the definition of the value chain and its acceptance, turning to several European and international studies and the valuable contribution of a numerous group of experts who have become the true protagonists of this study, able to identify, with a 4-digit differentiation, 27 branches of activity contemplated in the National Classification of Activities (NACE-2009) as members of an interconnected process that defines it.

Once the value chain was defined and agreed upon, it was necessary to give visibility to its contribution to the economic and social growth of the Spanish economy, which is the reason why a massive database has been created and managed (more than 340,000 primary data), in which the official figures provided by the Mercantile Registry are combined, for

more than 8,430 companies, in their income statements and balance sheets, together with the Structural Survey of Companies in the Industry and Services sector, the National Economic Accounts (National Accounting and Input-Output Framework) and the Central Companies Directory (DIRCE), developed by the National Institute of Statistics, on which to apply the methodology of the study of impacts based on the creation of an updated Input-Output Matrix in which the defined value chain is explicitly differentiated.

The extensive experience of CEPREDE in the information processing and in the application of this methodology have allowed to fulfill the double goal with which it was formulated, that is, to quantify the socio-economic importance of the value chain and to show the contribution of the chain, in all its dimensions, on the Spanish economy, in a tangible and up-to-date way.

Although the most relevant and significant has been the integrating vocation with which this study has been approached - unique, at least in our own experience, since most of the sectorial studies consulted and even carried out from CEPREDE focus on a single activity and even on a single company -, revealing a shared awareness of the knowledge of reality, which, in turn, denotes a sense of responsibility and commitment of all the institutions that have promoted it.

Therefore, it is fair to acknowledge that the significant involvement of the sponsoring institutions has made this study a reality that contains an exhaustive and realistic assessment of this sectoral conglomerate, of which no precedents are known and which we hope will become a benchmark.

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1.

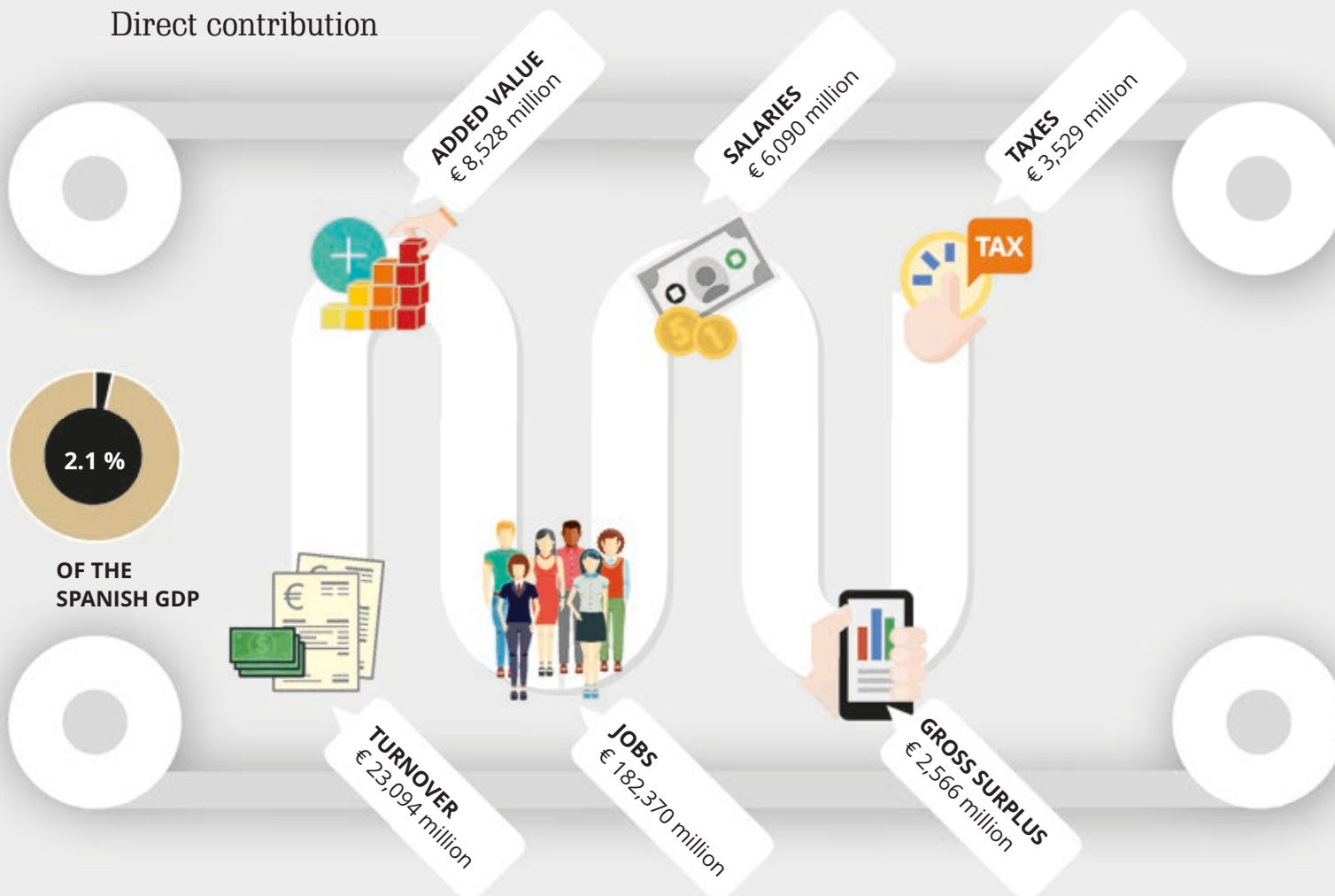
Important figures of the value chain

Behind hundreds of commonly used paper products like a board box, a paper bag, an envelope, a notebook, a roll of toilet paper, a booklet, a newspaper, a magazine or a book, there is a whole chain of companies generating employment and wealth, and contributing to public revenue. Behind a paper product there are 370,000 workers, 12,500 million euros in terms of salaries and 7,400 million in terms of taxes and contributions to the state coffers.

Socio-economic importance of the value chain



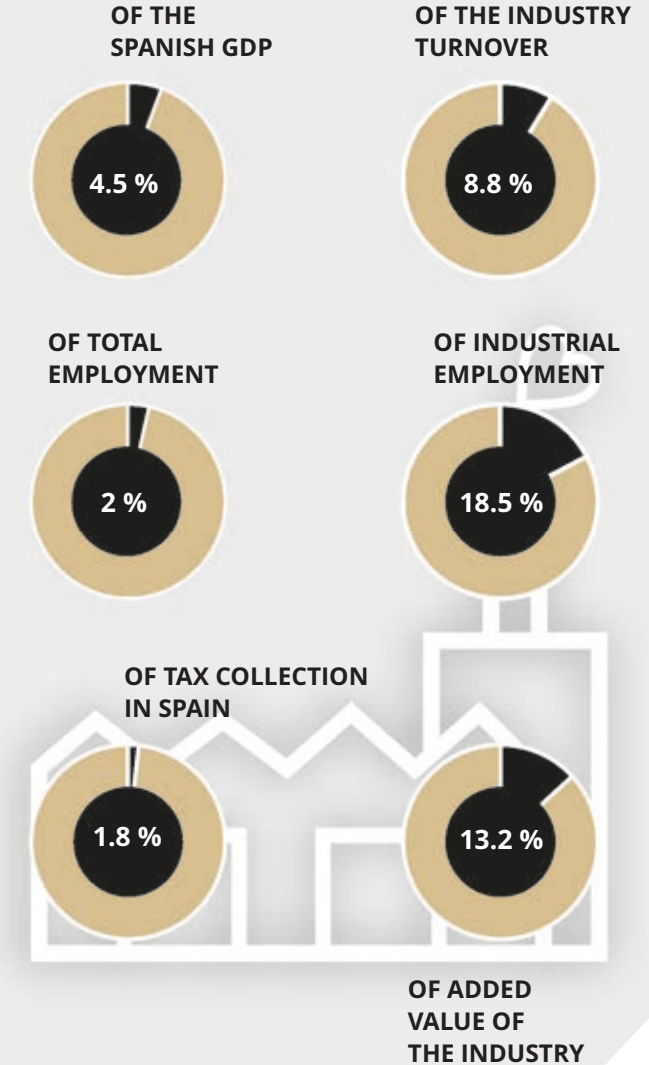
Direct contribution



Total Contribution (direct + indirect + induced)



How much is the Total Contribution?



DIRECT CONTRIBUTION



DIRECT EMPLOYMENT:
182,370 PEOPLE

DIRECT TURNOVER:
23,094 M€

The activities integrated in the value chain of pulp, paper and board are very varied and heterogeneous. They include everything from wood plantations for paper, to pulp and paper manufacturing and the different types of industry and sector services (processing, advertising and direct marketing, printers, publishers), without forgetting delivery logistics (postal and shipping services), ending the cycle with the recycling of paper and cardboard and its return to paper mills.

Made up of 17,377 **companies** with employees, the value chain provides **direct employment** to 182,370 people. **Direct turnover** amounts to 23,094 million euros, a figure that represents 2.1% of Spanish GDP.

The value chain has a significant impact on the Spanish economy, not only direct but also indirect and induced, which must be considered globally.

In terms of labor force, the whole contribution of the chain represents 18.5% of industrial employment and 2% of total employment. With 8.8% of industrial production, it generates 13.2% of the industry's added value. It also contributes 1.8% of the country's tax collection through corporate tax, contributions, income tax and VAT.

The **total contribution** (direct, indirect and induced) of the value chain to the economy as a whole translates into 369,036 **jobs** and a **total payroll** of 12,536 million euros. The **whole turnover** stands at 48,471 million euros, a figure that represents 4.5% of the Spanish GDP. The added value amounts to 18,378 million euros. The overall contribution to the State coffers via **taxes and contributions** stands at 7.424 million euros.

Therefore, the contribution of the value chain to our economy is highly positive and very significant, both due to its economic impact (boosting production, employment, income and fiscal balance) and its striking impulse to innovation through its focus on **technological innovation and sustainability**.

OVERALL CONTRIBUTION TO ECONOMY



18.5 % TOTAL INDUSTRIAL EMPLOYMENT
8.8 % SPANISH INDUSTRIAL PRODUCTION

MULTIPLIER EFFECT

The value chain of pulp, paper and board has a significant **multiplier effect** on the overall Spanish economy.

For each million euros of direct added value (production minus intermediate consumption) brought by this value chain, 2.2 million euros are generated in the circuit of national **added value** (wealth) and 5.7 million euros in the **overall turnover** (production value).

The multiplier effect of the value chain on the overall **labor market** is also remarkable. Specifically, for every million euros of direct added value, it generates a total of 43.3 jobs in the overall Spanish economy. And finally, in the fiscal area, each million euros of direct added value generates 0.9 million euros of revenue for the **public treasury**.



2. ■ The value chain

▼
A powerful value chain, creator of employment and wealth and a perfect example of a circular bioindustry, with a strategic role in the Spanish economy.

The contribution of the value chain of pulp, paper and board to our economy is highly positive and significant, due to its economic impact (boosting production, employment, income and fiscal balance) and its impulse to technological innovation and sustainability.

WHAT IS IT?



**A POWERFUL CHAIN
OF EMPLOYMENT
AND WEALTH**

The value chain begins in nature with the **plantations for paper**, from which the natural and renewable raw material is obtained, for the **paper industry** to produce pulp and paper. In the following link, from the paper, the converting companies produce a huge range of paper and board products such as containers and packaging of all kinds (**boxes, bags...**), **stationery material** (envelopes, notebooks, folders ...) and **tissue products** (toilet paper, tissues, paper towel...). The value chain continues with the **printing, reproduction and finishing services** sector, with **advertising and direct marketing** companies, and with the **publishing industry** for books, newspapers and magazines. This powerful chain of employment and wealth creation also integrates **postal and shipping activities** dedicated to sending letters and parcels. And finally, the chain ends with the sector of **paper collection** that collects and treats the used paper to return it to the paper mills.

Integrated by diverse and heterogeneous productive sectors, whose nexus of union is to be generators of goods that shape vertically integrated production processes, the value chain plays a significant economic role in our country's industrial structure



**WOOD PLANTATIONS
FOR PAPER**

RENEWABLE



**PULP AND PAPER
INDUSTRY**



**PAPER PRODUCTS
MANUFACTURERS**

**CORRUGATED
BOARD
CONTAINERS
AND PACKAGING**



**COATED BOARD
CONTAINERS, PACKAGING
AND TRANSFORMED
PRODUCTS**



**PAPER
BAGS**



**STATIONNARY
MATERIAL
(envelopes,
notebooks...)**



**TISSUE PAPER
(toilet paper,
tissues,
paper towel...)**



**PRINTING, REPRODUCTION
AND FINISHING SERVICES**



**ADVERTISING
AND DIRECT
MARKETING**



**BOOKS, NEWSPAPERS
AND MAGAZINES
PUBLISHING**



**POSTAL AND SHIPPING
ACTIVITIES
(parcels and
letters)**



RECYCLABLE



**PAPER AND BOARD
COLLECTION**



HOW TO ADD VALUE TO THE WHOLE ECONOMY?



DIRECT CONTRIBUTION

• COMPANIES	• TURNOVER
17,377	23,094 M€
• CONTRIBUTION TO THE STATE BUDGET	
	3,529 M€

The value chain refers to the cross-sectional relationship to and from other activities, distinguishing between **direct, indirect and induced effects** generated in the overall Spanish economy.

To start with, the activity of the value chain generates a series of **direct effects** on the whole economy and employment. The 17,377 companies that make up the chain directly contribute to the Spanish economy in terms of job creation, investment, business volume, income generation and contribution to the State's revenue. With a turnover of 23,094 million euros and 182,370 jobs, they bring 3,529 million euros to the state budget.

To achieve these production levels, the chain's companies make **purchases** (14,566 million euros) and **investments** (842 million euros) for a total value exceeding 15,408 million euros.

In its customer role, through purchases and investments, the chain demands goods and services from Spanish companies (12,035 million euros) and foreign companies (3,373 million euros), triggering a whole series of **indirect effects** on the whole economy, contributing to the generation of income, employment and turnover in other economic sectors. These indirect effects sum up to 23,023 million euros in turnover, 167,081 jobs and 3,488 million euros in taxes and contributions.

Covering this demand for goods and services from the value chain of pulp, paper and board requires job creation by suppliers, triggering again the need of productive factors from other activities. And in this circular process, the generation of income boots consumption, which again will act as a driver of the activity, producing the induced effects. The disposable income for consumption derived from the **indirect effects** of the value chain amounts to 4,433 million euros. Of this amount, 3,611 million euros go to national consumption, mainly real estate, hotel and catering services. And in this way, 2,354 million euros of turnover and 19,585 jobs are generated in the overall economy, and 407 million euros are allocated to the state coffers.

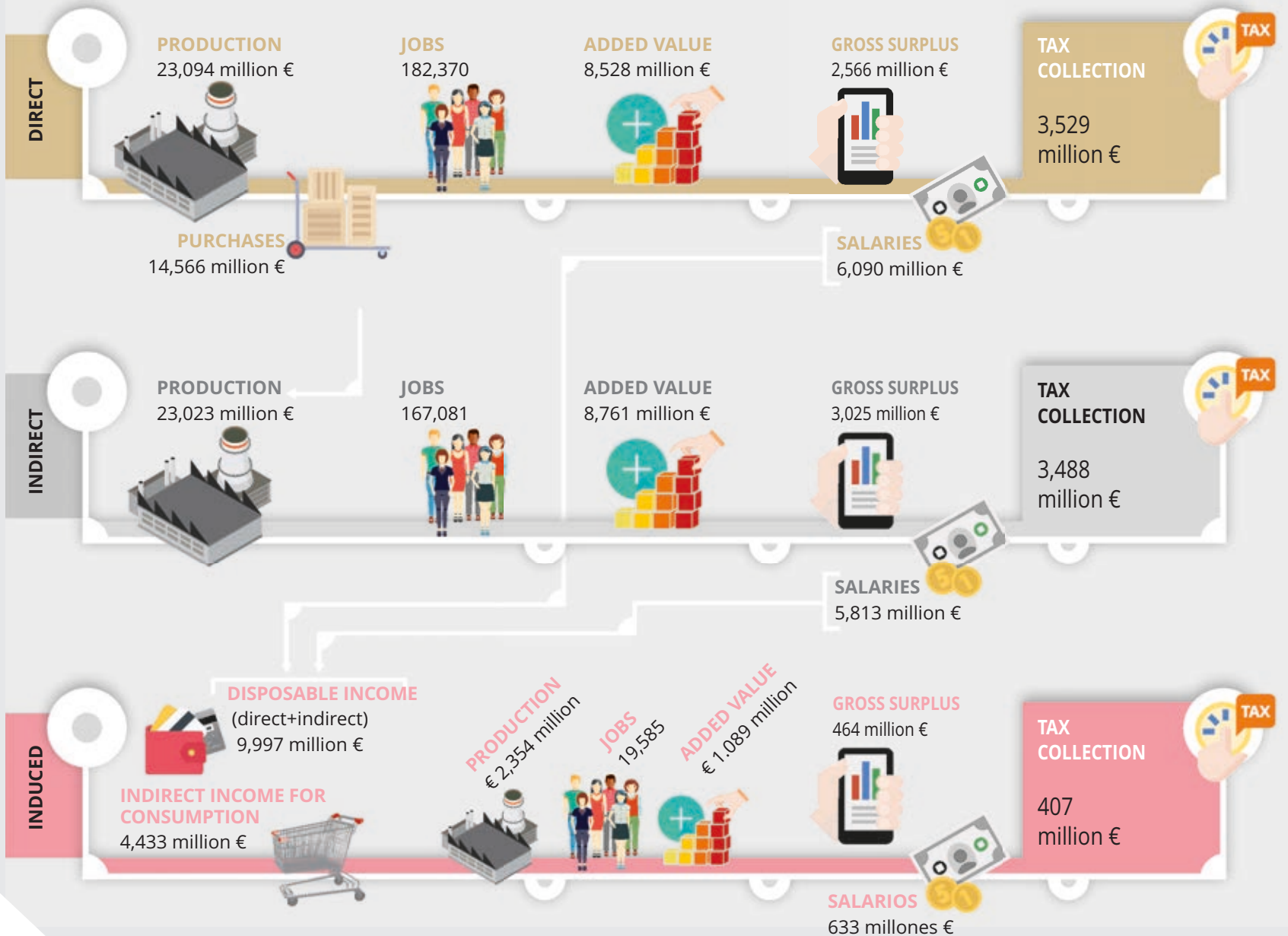
OVERALL CONTRIBUTION TO ECONOMY



DIRECT + INDIRECT + INDUCED

• JOBS	• SALARIES
369,036	12,536 M€
• TAX COLLECTION	
7,424 M€	

HOW DOES THE VALUE CHAIN CONTRIBUTE TO THE WHOLE ECONOMY?

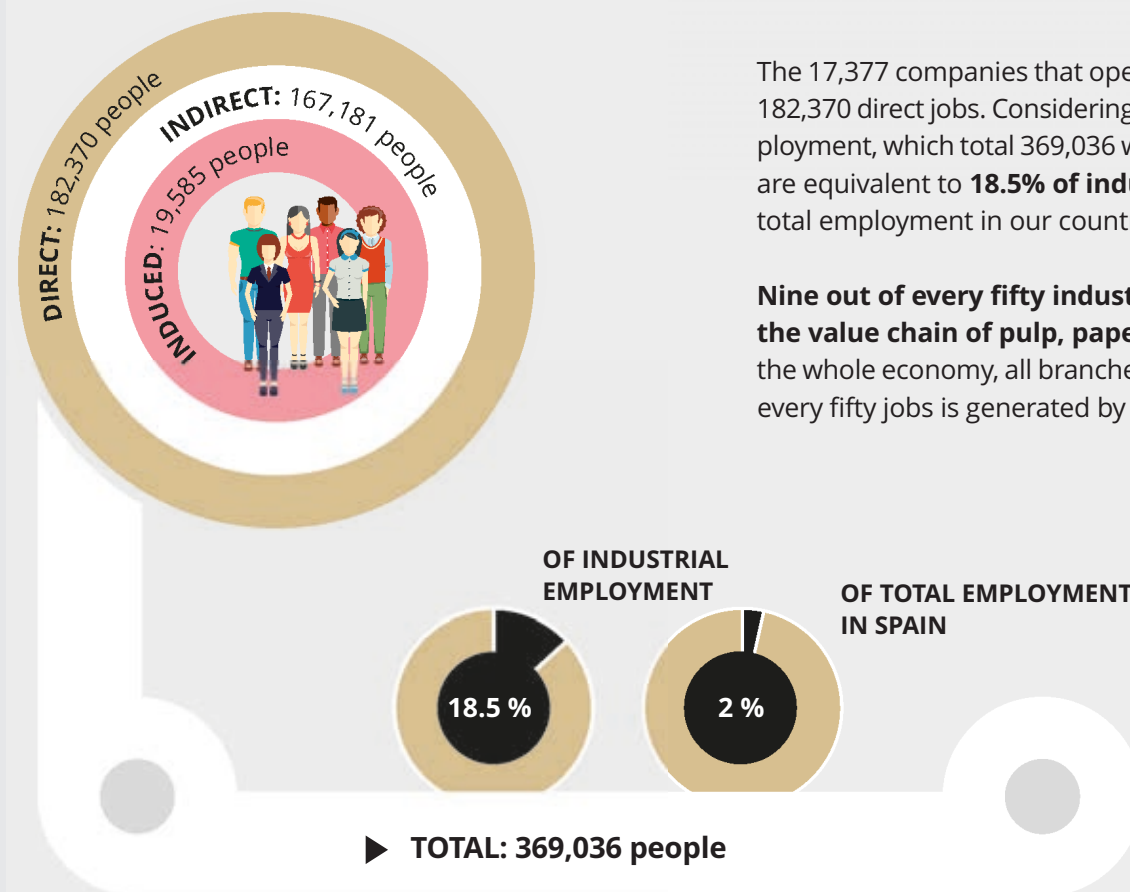


3. ■ Job creation

▼

The value chain of pulp, paper and board is a significant driver for direct, stable and qualified employment creation. It also has a powerful leverage effect on the overall economy, with the generation of indirect and induced employment. Integrated by 17,377 companies, the chain provides direct employment — mainly steady and qualified — to more than 180,000 people. The total employment generated by the value chain accounts for nearly 370,000 jobs, which is equivalent to 18.5% of total industrial employment in our country.

EMPLOYMENT IN THE VALUE CHAIN



The 17,377 companies that operate in the value chain generate 182,370 direct jobs. Considering direct, indirect and induced employment, which total 369,036 workers, the generated positions are equivalent to **18.5% of industrial employment** and 2% of total employment in our country.

Nine out of every fifty industrial jobs in Spain is related to the value chain of pulp, paper and board. And in relation to the whole economy, all branches of activity included, one out of every fifty jobs is generated by the chain.

As far as the type of employment is concerned, **stability** is a characteristic feature of the value chain. 82% of the direct employment generated is stable, with 149,473 permanent employees and 32,897 temporary employees.

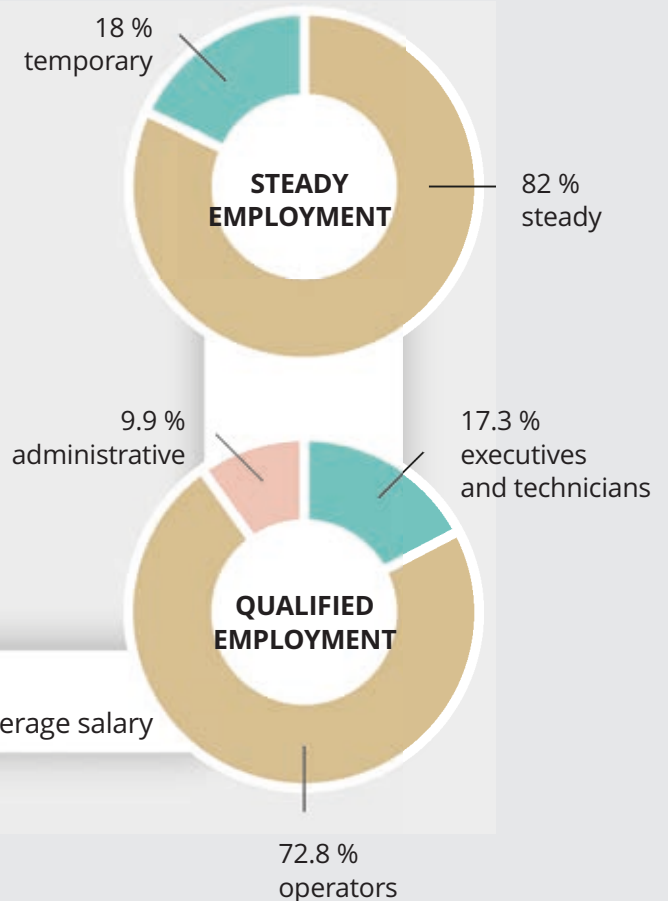
Another characteristic of the chain in regard to the work environment is the **qualification** of workers. 73% of direct jobs are of workers with technical training, along with 17% of executives and technicians and 10% of administrative staff.



▶ **AVERAGE SALARY: 33,391 €**
9% higher than the Spanish average salary

The average salary in the companies of the whole amounts to 33,391 euros, 9% **above the average salary** in our country, which accounts for 6,090 million euros per year in salaries for direct employees and a total payroll of 12,536 million euros if we take into account the direct, indirect and induced employment of the chain.

DIRECT EMPLOYMENT



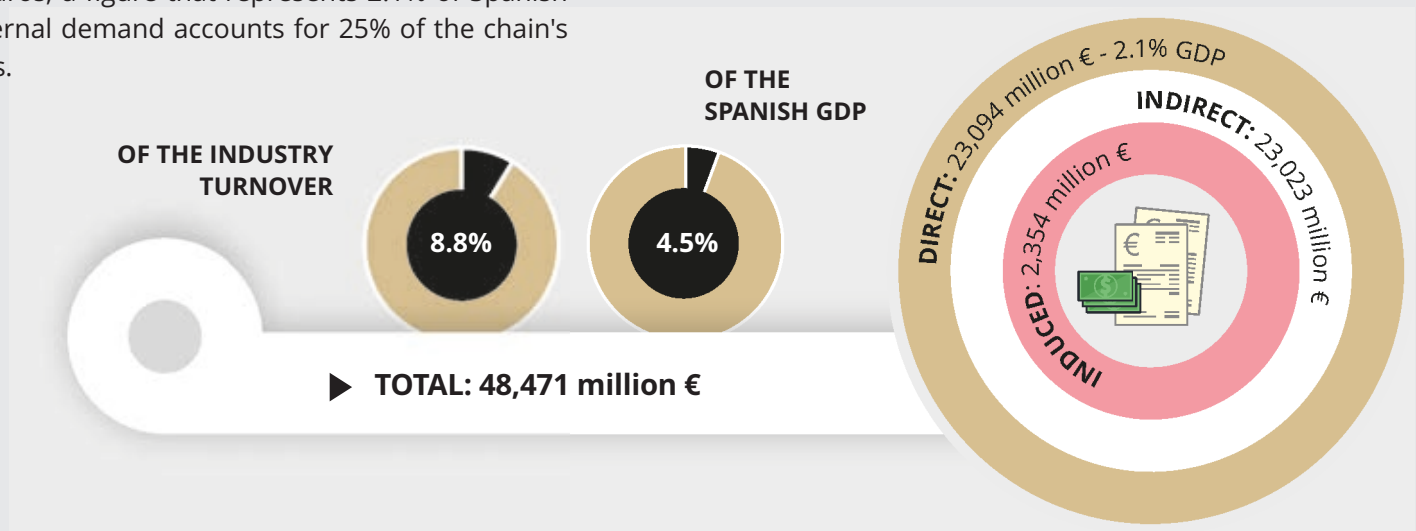
4. ■ Generation of wealth

Through the value of the production generated throughout the chain and with the purchases and investments made in the development of its activity — directed at almost 80% to national producers — the value chain of pulp, paper and board is characterized by its powerful boost on the whole economy. The global turnover generated by the value chain accounts for 4.5% of GDP and 9% of total turnover of the Spanish industry. The total added value generated represents 13% of the added value of the Spanish industry.

4. Generation of wealth

The value chain is one of the main drivers of our country's economy because of its leverage and carry-over effect on the whole economic activity, generating activity in many other branches such as energy, chemistry, metal, machinery, transport, construction, engineering, and the list goes on.

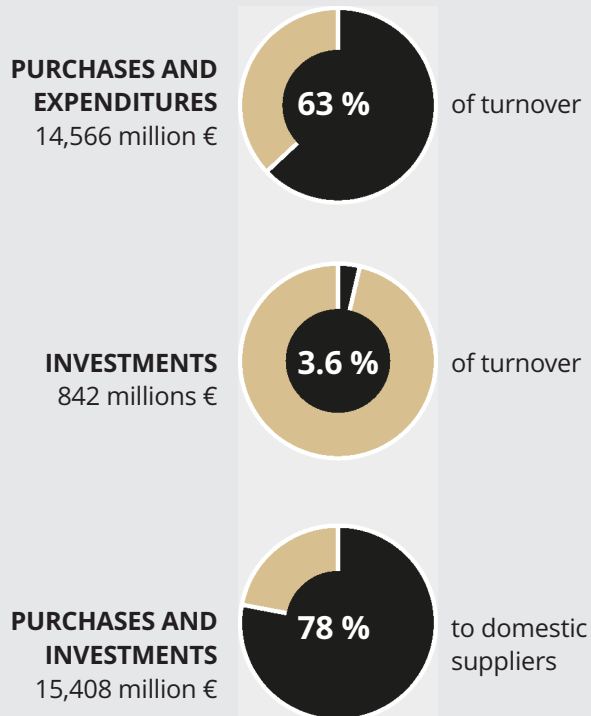
The direct **turnover** of the value chain amounts to 23,094 million euros, a figure that represents 2.1% of Spanish GDP. External demand accounts for 25% of the chain's total sales.



The global turnover generated (48,471 million euros) is equivalent to 8.8% of the turnover of the Spanish industry, representing 4.5% of the Spanish GDP. The total value added generated (18,378 million euros) exceeds 13% of the added value of the Spanish industry.

Four out of every fifty euros billed by the Spanish industry are related to the activity of the pulp, paper and board value chain.

PURCHASES AND INVESTMENTS



The **cost structure** of the value chain highlights the importance of the chapter on purchases of raw materials and supplies, which represents 48% of total costs, followed by salary costs, which represent 28%.

In the development of its activity, the chain makes **purchases** to other sectors for a value of 14,566 million euros and develops **investments** estimated at 842 million euros.

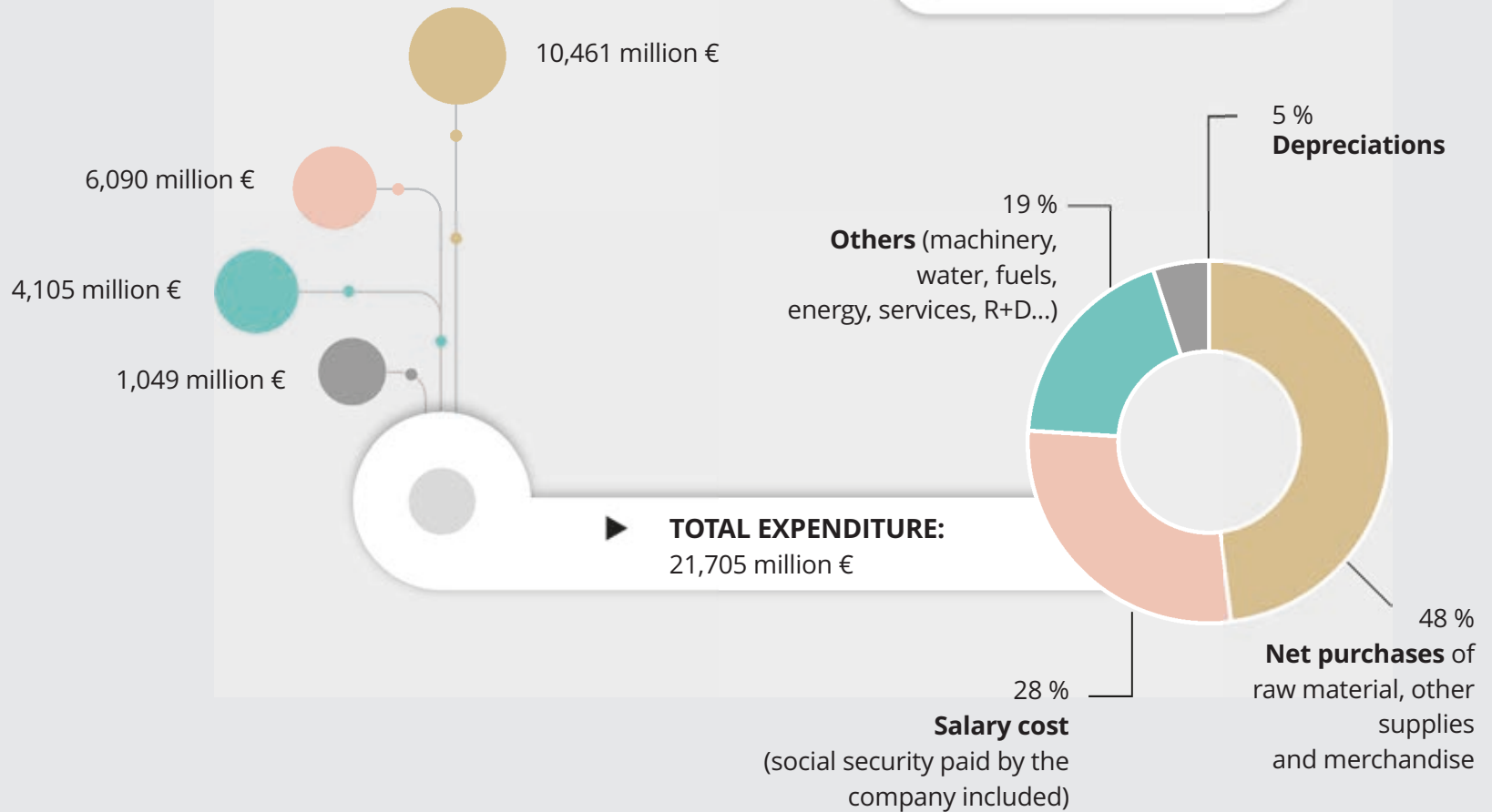
Purchases account for 63% of direct turnover, almost twelve percentage points above what they represent in the economy as a whole. The chain invests 3.6% of its direct turnover, more than one point above the average in the overall manufacturing industry. Moreover, a very high percentage (78%) of both purchases and investment is directed to **domestic suppliers**, which explains the significant carry-over effect of the value chain on the national economy.

In purchases, the energy chapter stands out. And the investments are mainly directed to engineering, construction and machinery technical services. Opting for **technological innovation** as a strategy to expand markets and improve competitiveness is responsible for this high level of capitalization (investment/production).

The innovation cost of the value chain is estimated at 491 million euros, representing 8.1% of the whole manufacturing industry in this chapter.

**OF THE INNOVATION COST
OF THE MANUFACTURING INDUSTRY**

COST STRUCTURE



5. Contribution to public revenue

▼

The value chain of pulp, paper and board makes a significant contribution to the public coffers to meet the collective needs. Through taxes and social contributions, the chain directly brings 3,529 million euros. Adding the taxation generated in an indirect and induced way by the activity of the chain, it amounts to 7,424 million euros, a figure that, for example, would amply finance the R & D & I part in the general national budget.

5. Contribution to public revenue

The value chain, generator of employment and wealth, makes a significant contribution to public revenue through **contributions and taxes**, contributing to meet the needs of citizens with the maintenance of **public services, infrastructures , social benefits...**

Through contributions, VAT, Income Tax and Corporate Tax, the value chain directly contributes to the public coffers with 3,529 million euros. Adding the taxation generated in an indirect and induced way by the activity of the chain, it amounts to 7,424 million euros. A global contribution that represents 1.8% of the total tax revenue of the country. Or in other words, **one in every fifty euros collected by the State through taxes or social contributions is related to the activity of the value chain of pulp, paper and board.**

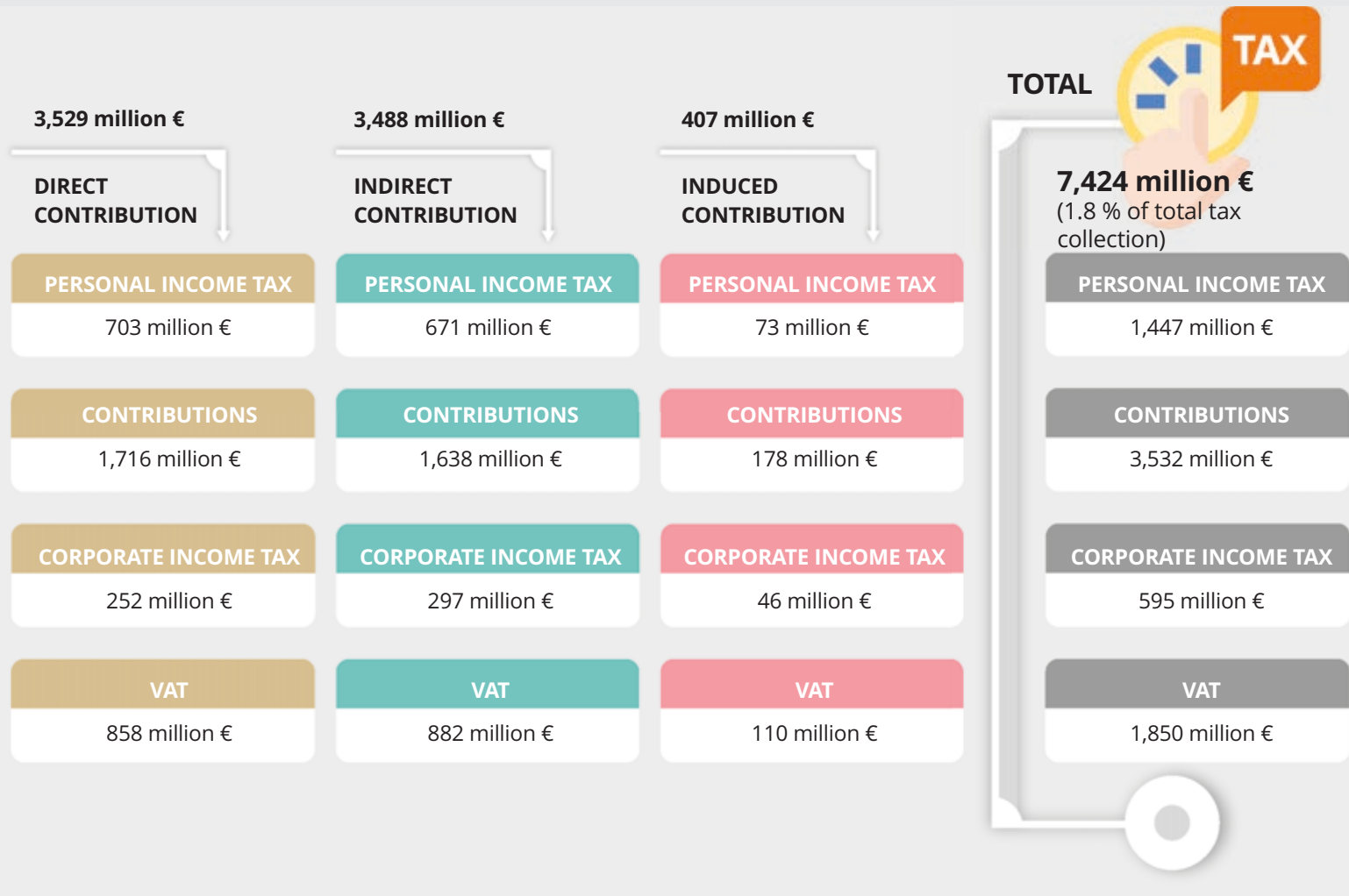
As an example of the magnitude of this global fiscal contribution of the value chain, we can say that, for example, this figure would amply fund the budget allocated to civil and military R & D & I, or that it would almost cover the expenditure allocated to infrastructures in the general national budget.

CONTRIBUTION TO THE COMMON PIGGY BANK



1.8 % TOTAL STATE
TAX COLLECTION

CONTRIBUTION OF THE VALUE CHAIN TO THE PUBLIC REVENUE



6. ■ The study: how was it carried out?

▼
The study *Socio-economic importance of the value chain of pulp, paper and board* has been developed by CEPREDE (Economic Prediction Center) commissioned by eight organizations formed by the companies that make up the chain.

The goal of the study is to quantify the socio-economic importance the value chain in Spain and show their contribution to our country's economy.

INFORMATION SOURCES



officials



Industry experts' opinions



Loss accounts and balance sheets (BORME)

METHODOLOGY: based on the input-output tables

STEPS:

- Delimitation and configuration of the value chain
- Analysis of a sample of 8,434 companies (48.5% of the total number of companies with employees in the industry)
- Aggregate assessment of the sector
- Impact analysis

The use of very diverse official information sources has allowed the development of a **congruency** analysis. The definition of the dimension of the value chain has been approached from the available official information and the analyzes and conclusions provided by several European and international studies, which have allowed to identify the most accepted scheme in the definition of this value chain.

The integration of the opinion of sectoral experts, through a dozen interviews, has added **realism** to the assessment of the dimension of the value chain.

The income statements and balance sheets available in the Official Bulletin of the Mercantile Registry (BORME) add **veracity** to the study. A vast array of companies have been analyzed, adding several corresponding to the NACE activities integrated in the value chain to the ones identified by the experts. Finally, from all this information, a detailed processing of the industry's reality has been carried out.

The sample analyzed includes 8,434 companies and represents 48.5% of the total business population of the value chain with salaried employees, amounting to 17,377 companies.

MEASURE OF THE IMPACT ON THE ECONOMY

The study focuses on the 2015 accounting period, the latest official information available in the analysis instrument used: the **methodology based on the Input-Product Matrices**, one of the most widespread tools around the world.

To sum up, this procedure consists of estimating and assessing the chain of production and income generation that is occurring in the economic system from an initial impact that constitutes the so-called impact vector.

The volume of production, the purchases of goods and services, employment, salary and non-salary income and taxes generated by the activity of the chain represent the **direct impact**. Moreover, from the demand for goods and services to other economic sectors, the chain contributes to the generation of income, employment and turnover (production) in the overall economy, linked to investment items and expenditure originated internally. These items are considered as **impact vector**.

The execution of the analysis focuses on the national framework, excluding international purchases from the vector. Based on this assessment, the process is initiated to materialize the impact of the investments required for the development of their activity and, in general, the various inputs or productive factors they demand to generate their production in the overall economy. By doing so, the direct national suppliers of goods will need to acquire other goods and services (intermediate consumption) from the rest of the productive system, which, in turn, will demand other goods and services from their own suppliers, to finally end up generating new income and demanding new employment. This whole set of income and employment is usually called **indirect effect**.

Besides, the impact analyzes include a third level of effects, called **induced effects**, which usually incorporate the effect of the final consumption derived from all the salary income generated and the tax collection obtained by all public administrations when applying the different tax figures to the total of the activity and the income generated.

CEPREDE Report

SOCIO-ECONOMIC IMPORTANCE OF THE VALUE CHAIN OF PULP, PAPER AND BOARD

May 2018

Developed by CEPREDE - Economic Prediction Center

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1. Goal of the study

- Quantify the socio-economic importance of the value chain of paper and board.
- Show the contribution of the chain, in all its dimensions, to the Spanish economy in a tangible and up-to-date way.
- The clear impulse of new technologies and their commitment to sustainability have transformed this value chain in favor of efficiency.

The innovative processes requiring continuous adaptations to be competitive and, on the other hand, the transformations caused by shocks in the markets, as well as changes in the habits of society, reshape economic and business activities.

In this context, this study is proposed to contribute to the staging of the current value of all the activity that revolves around the paper and board industry, paper products processors, printing, reproduction and finishing services, publishing

services, postal services and paper collection.

It is intended to provide figures and ratios, developed rigorously and objectively, which allow conclusions to be drawn and the relevance of these productive branches to be known, considering that they form a complete cluster of production and distribution, whose results extend to the set of the generated production and services provided by the Spanish economy.

In the large majority of value chain and socio-economic impact studies, the input-output tables (TIO) method is used to extract the direct, indirect and induced impacts in all their dimensions. In this context, the Economic Prediction Center (CEPREDE) has extensive experience and updated TIO from 2015, while the last available official tables are from 2010.

The above is much needed to be able to work with recent productive structures in which the business activity data have greater temporal synchrony.

2. Paper and board as a common factor and support for a set of activities

- Both products, paper and board, are necessary in daily life and in the professional environment.
- They support transversal activities of all kinds, such as food, automotive, reading, hygiene, commerce, communication, etc.
- These activities are widely exposed to national and international competition and, therefore, are constantly innovating.
- Within the impact analysis, the role of recycling that reintroduces inputs is considered as increasing its useful life.
- The industry is very mindful of reforestation and strive to ensure sustainability.

The activities gathered in the study are very varied, sometimes cross-sectional,

since they do not only produce directly but also serve as a complement to other sectors. For example, packaging is necessary for delivery of automotive products, e-commerce, food and beverages.

Or, from the perspective of the services, we can mention the paper bag, with or without handle, used from the mere daily purchase in a super market to wrapping a very special gift.

In the value chain of paper and board, everything from the raw materials (paper plantations, paper and board recyclers, pulp manufacturers) to the delivery logistics (direct marketing companies), without forgetting the different types of industries and sectoral services (processing industries, printers, publishers), are considered.

The configuration of the value chain, and its flows, has a value in itself. This goal is addressed in the first part of the investigation, to proceed with its quantitative assessment, presented in the second part of the study.

This configuration is complex, for all its dimensions, and for

the changes that have been observed in the sectors. In order for the value chain itself to be complete and interactive, the recycling industry is key to reintroducing inputs, increasing its useful life. The same applies to the reforestation endeavors of the industry to ensure sustainability.

3. Configuration and size of the value chain of paper and board

- The value chain configuration has a value in itself.
- An integrated approach that requires incorporating intersectoral demand flows and income transfers they provide.
- Broad connections with the rest of the economy, where the primary sector (reforestation), the industry (energy, chemicals, machinery...) and services (transport, commerce ...) have a place.

- Advanced processing of information, with a highly objective processing.
- Analysis of different official information sources, allowing the development of congruence analysis.
- Contributions from international experiences are incorporated for a consensual definition of the value chain.
- The opinion of the experts takes a prominent place in the definition of the value chain.
- The figures of the Commercial Registry, regarding the companies identified as integral parts of the value chain, add realism to the assessment.
- A thorough work, through a bottom-up analysis to limit biases of duplicated or erroneously identified information.
- erróneamente identificada.

The delimitation and configuration of the paper and board chain is presented as an exercise of significant importance as it gives visibility to a set of activities with strong

common elements, which have limited visibility if not considered through an integrated approach.

In addition, it is necessary to value their interrelations with the rest of economic activities, being able to identify inter-sector demand flows and income transfers they provide to the rest of the economy.

In this respect, from a productive point of view, its connections with the primary sector, from which the raw material is obtained, are obvious, but also the generation of paper and board, the elaboration of articles allocated for final use carried out by other industries and services, boost their presence in the economy as a whole beyond the value of their own production.

At the same time, if their capacity to generate employment is considered, their implications with the labor market are again extended and, as a result of the income generated, contribute to the growth of the internal demand as well as to the components of public deficit and budget

balances.

These two reasons are already arguments that allow us to visualize the reach of this activity, which requires both a through collection of information and its exhaustive analysis for its analysis.

The first task, the definition of the dimension of the value chain, has been addressed by using the official information available for use, in which the figures are considered from a sectoral perspective without considering the sectoral interrelations.

Among them, the Structural Survey of Companies in the Industry and Services sectors, the National Economic Accounts (National Accounts and Input-Output Framework) and the Central Business Directorate, elaborated by the National Institute of Statistics, have been a priority.

The analysis and conclusions provided by several European and international studies have been added to this casuistry of information, which have allowed a precise identification of the

outline, mostly accepted, as a value chain of paper and board, identified by 27 branches of activity contemplated in the National Classification of Activities (NACE-2009).

Additionally, interviews of professionals of the sector have been carried out and have allowed to establish and compare the dimension of this value chain to finally incorporate the income statements and balance sheets from a large number of companies available in the Official Bulletin of the Mercantile Registry (BORME), a vast array of companies have been analyzed, adding several that in said registry were integrated to the NACE activities considered as components the value chain, to the ones identified by the experts. Finally, from all this information, a detailed processing of the industry's reality has been carried out.

Therefore, the use of this last source allows a closeness to reality, although it has been necessary to face duplicities (which have been treated accordingly) and activity

assignments of some companies, within the current NACE classification, have been detected outside its operational place, proceeding to its relocation.

To sum up, an advanced and highly objective processing of the information has been carried out to obtain fully integrated results and, fundamentally limiting the biases potentially generated by erroneous and duplicate locations on the aggregate figures that quantify the size of the sector.

This value chain configuration has a boosting impact on multiple activities, which could be identified through the study of the carry-over effects generated from the Input-Output methodology previously mentioned, of which detailed information is provided in the second part of this study, although the following table summarizes the diversity of implications detected, in terms of production and employment, which are identified as indirect effects.

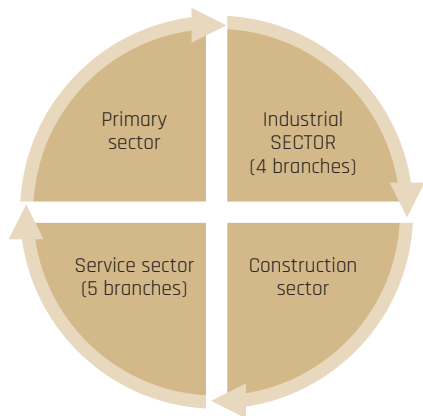
FIGURE 1. THE VALUE CHAIN IS A WIDE ARRAY OF ACTIVITIES
Activities associated with the official activity codes (NACE-2009)



Source: Own development and CEPREDE

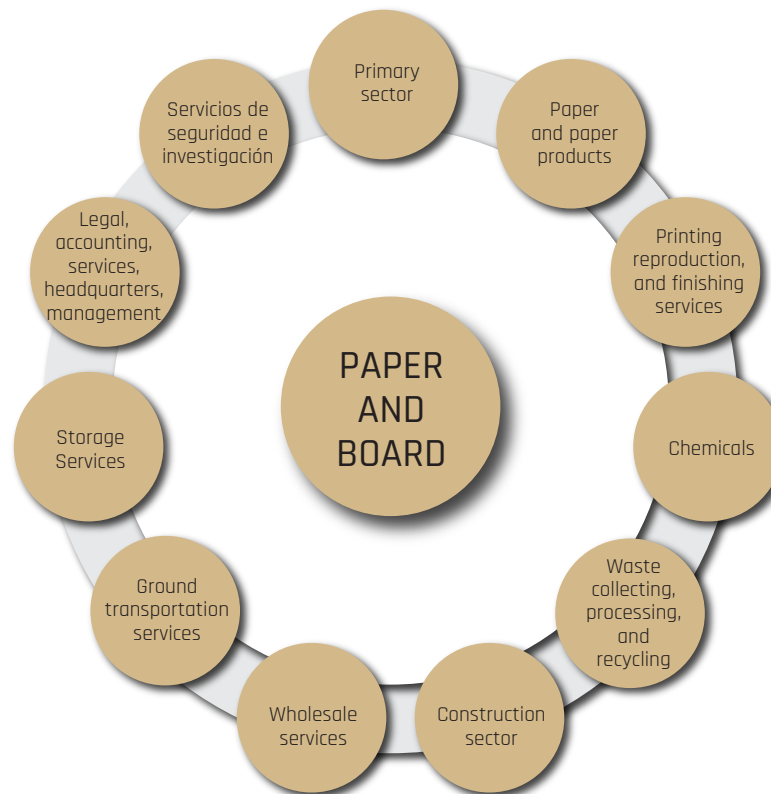
FIGURE 2. INDIRECT PRODUCTION AND EMPLOYMENT OF THE VALUE CHAIN OF PAPER AND BOARD

Indirect production	Percentage (%)	Indirect employment	Percentage (%)
Primary sector	1.7%	Primary sector	4.8%
Industrial sector	62.3%	Industrial sector	37.2%
Construction sector	2.7%	Construction sector	2.9%
Service sector	33.3%	Service sector	55.1%
Total indirect effects	100%	Total indirect effects	100%



Source: own development and CEPREDE

FIGURE 3. MANY ACTIVITIES ARE INTERRELATED IN THE VALUE CHAIN



Source: own development and CEPREDE

TABLE 1. THE VALUE CHAIN AMPLIFIES ITS EFFECTS IN MULTIPLE ACTIVITIES
of activities affected by indirect effects

Branches of activity	Production (% of total)	Employment (% of total)
Pro. from agriculture, livestock and hunting, and related services	0.4%	1.1%
Forestry and related services	1.3%	3.7%
Paper and paper products	24.5%	12.2%
Printing and reproduction services of recorded media	3.5%	4.0%
Chemical products	5.1%	2.1%
Rubber and plastic products	1.8%	2.4%
Metal products, except machinery and equipment	2.0%	3.3%
Machinery and equipment not included in other items	1.7%	2.7%
Repair and installation services of machinery and equipment	2.3%	1.3%
Electric power, gas, steam and air conditioning	9.0%	0.7%
Sewer services; waste collection, treatment and disposal services; utilization services; sanitation services and other waste management services	3.1%	2.5%
Constructions and construction works	2.7%	2.9%
Wholesale trade and trade intermediation services, except motor vehicles, motorcycles and mopeds	4.7%	7.6%
Ground transportation services, including pipelines	3.9%	5.5%
Storage services and transport auxiliaries	3.8%	3.8%
Financial services, except insurance and pension funds	2.1%	1.7%
Legal and accounting services; business headquarters services; business management consulting services	2.5%	5.5%
Architectural and engineering technical services; technical testing and analysis services	1.7%	2.5%
Security and investigation services; services for buildings and landscaping; administrative, office and other business support services	2.5%	9.6%
Other activities	21.5%	23.8%
TOTAL	100%	100%

Source: Input output table (TIO), INE. Own development and CEPREDE.

4. Quantification of the number of companies, employees and business figures

- The use of alternative and complementary sources of information allows a broader sectoral detail than the usual one.
- Various official statistics have been considered, capable of responding to a realistic definition of the value chain of paper and board.
- The executives and experts participating in the study have allowed to improve the identification of the productive units that make up the value chain, providing lists of companies and relative weights of their overall activity assignable to it.
- More than 33,000 companies operate in the value chain, and about 17,400 do so by generating paid employment, according to the Central Business Directory.
- A total of 8,434 companies have been analyzed and incorporated into the study, representing 48.5% of the

companies identified by the official sources as potential activities of the value chain

- 82.0% of the direct employment generated is stable, with a clear predominance of technical training, a qualification that represents 72.8%.
- Both features affect the salary component of expenditures, which represent more than 28%. In addition, the costs associated with R & D occupy a significant position in its cost structure.

The selection of the sample used responds to two criteria. The first is established in accordance with the National Classification of Economic Activities (NACE-2009) and the second responds to the real knowledge provided by a broad cluster of experts, able to identify a substantial number of companies whose registry reference activity may or may not correspond to the official codes initially considered.

In other words, both criteria have been combined, so that for the sample selection, a processing of the official information of the commercial

registry of those companies with a code of activity, main or secondary, corresponding to the 17, 18, 38, 53 and 58 NACEs, differentiated to 4 digits, has been carried out, adding to this initial sample a list of companies that, since not assigned to these codes, have been identified as product units that are part of the value chain of paper and board by the experts, either fully or partially, whenever the proportion of their real activity associated with the analyzed conglomerate was available.

The support provided by the experts' in-depth knowledge of the sector has allowed a thorough filtering of the sample, also resulting in some exclusions due to its lack of integration in the business cluster it defines. The value chain proposal, especially those relating to the treatment of hazardous waste and other non-hazardous waste and the publishing of video games and other computer programs.

Various official information sources have been used, but the companies' Commercial Registry has been key to determine the economic assessment of the

sector, through their Income Statements and Balance Sheets.

Together with these, the Structural Statistics of companies: Industrial Sector and its counterpart for Services, have streamlined the comparison of results and the study of their congruence, also used together with the Central Companies Directory for the analysis of the labor market.

In addition, key nuances have been incorporated to determine the type of employment generated, as well as the breakdown of production costs, not only by expenditure items, but also by origin (national/international), adding the diversification of their order portfolios by sectors and aims, thanks to the information provided by the industry experts through the answers to the questionnaire previously designed for this purpose.

TABLE 2. COMPARATIVE SAMPLE OF COMPANIES ACCORDING TO SOURCES

Sectors	Figures from the 2015 accounting period				
	E. Industrial & E. services	DIRCE TOTAL	Without employees	With employees	Analyzed (number and %*)
NACE 17, 18, 38, 53 and 58					
17 Manufacture of paper and paper products	1,652	1,770	393	1,377	298 (21.6)
171 Manufacture of pulp, paper and paperboard	184	214	34	180	58 (32.2)
172 Manufacture of articles of paper and paperboard	1,467	1,556	359	1,197	240 (20.1)
18 Printing of reproduction of recorded media	13,479	14,042	6,285	7,757	5,756 (74.2)
181 Printing and service activities related to printing	12,340	12,797	5,397	7,400	⁽¹⁾
182 Reproduction of recorded media	1,139	1,245	888	357	⁽¹⁾
38 Collection, treatment and disposal of waste; valorization	2,581	2,952	627	2,325	277 (15.6)
381 Waste collection	1,570	1,862	499	1,363	⁽¹⁾
382 Waste treatment and disposal	513	498	88	410	⁽¹⁾
383 Valorization	498	592	40	552	⁽²⁾
53 Postal and shipping activities	6,690	7,325	4,342	2,983	1,214 (40.7)
531 Postal activities subject to universal service obligation	n,d	1	0	1	0
532 Other postal and shipping activities	n,d	7,324	4,342	2,982	1,214 (40.7)
58 Publishing	9,444	10,669	6,826	3,843	889 (25.5)
581 Books, newspapers publishing and other publishing activities	7,843	8,170	4,683	3,487	889 (25.5)
582 Computer programs publishing	1,601	2,499	2,143	356	⁽³⁾
Total companies (NACE 17,18,38,53,58)	33,846	36,758	18,473	18,285	8,434 (46.1)
COMPANIES TOTAL CHAIN VALUE	31,747	33,667	16,290	17,377	8,434 (48.5)

Source: DIRCE (INE), Encuesta Industrial (INE), Encuesta de Servicios (INE) and BORME.

⁽¹⁾ % Sample/companies with employees

⁽¹⁾ Included, although not broken down as they usually combine both activities and both NACEs.

⁽²⁾ When the Associations collaborating in the investigation confirm that their business activity does correspond to the value chain, they are included, totally or partially, even though they are administratively included in this code.

⁽³⁾ Similar to the previous point but referred to the NACE

These contributions have been determinant, not only for the quantitative definition of the chain, in terms of the economic value of its activity or direct employment generated, but also for estimating the incidence of this latter on the overall Spanish economy, by allowing to define its interrelations with the rest of the activities with which it interacts within Spanish territory, which, derived from its cost structure, allow the identification of boosting processes on other industries and services and an important association with investment processes that can accommodate its innovative effort.

TABLE 3. EMPLOYMENT TYPES OF THE VALUE CHAIN. (DIRECT EFFECT 2015)

	Number	Structure
1. Number of employees	182,370	100.0
1.1. Steady	149,473	82.0
1.2. Temporary	32,897	18.0
2. Employees' qualification	182,370	100.0
2.1. Executives and technician	31,478	17.3
2.2. Operators	132,766	72.8
2.3. Admin staff	18,127	9.9

Source: BORME and Associations Recollections. Own development and CEPREDE.

TABLE 4. SUMMARY OF THE VALUE CHAIN OF PAPER AND BOARD CONGLOMERATE (DIRECT EFFECT 2015)

Economic data of the activity, in thousands of €	Accounting period 2015	Structure
Sales figures	23,093,647	
Total expenditures	21,704,883	100.0%
Net purchases of raw materials, other supplies and merchandise	10,461,173	48.2%
Salary Costs (including Social Security paid by the company)	6,089,537	28.1%
Depreciation	1,049,326	4.8%
Other Costs and Operating Expenditures, including Financial Expenditures and Taxes, in thousands of €	4,104,847	18.9%
Machinery acquisition	242,607	1.1%
Repair of machinery and equipment goods	129,904	0.6%
Electric power consumption	246,722	1.1%
Water consumption	28,621	0.1%
Fuel consumption	11,059	0.1%
Admin services	122,097	0.6%
Advertising expenditures	32,249	0.1%
Legal advice	75,953	0.3%
IT services	127,259	0.6%
Other expenditure items in R & D	491,504	2.3%
Security services	54,803	0.3%
Financial expenditures	355,273	1.6%
Taxes	300,100	1.4%

Source: BORME and Associations Recollections. Own development and CEPREDE

TABLE 5. TECHNOLOGICAL INTENSITY OF SPANISH COMPANIES.
ACCOUNTING PERIOD 2015

Percentage of expenditures on Innovative Activities of the Turnover of companies with innovative activities (%)	
Total Companies of the economy	1.74
Total Industry	1.58
- Food, beverage and tobacco (NACE 10, 11, 12)	0.92
- Board and paper (NACE 17)	1.52
- Graphic arts and reproduction (NACE 18)	4.05
- Sanitation, waste management and decontamination (NACE 37, 38, 39)	0.84
Construction	0.65
Total Services	2.00
- Commerce (NACE 45, 46, 47)	0.45
- Transport and storage (NACE 49, 50, 51, 52, 53)	1.20
- Other information and communication services (NACE 58, 59, 60, 63)	2.84

Source: Survey on companies' innovation, INE.

TABLE 5B. MAIN INDICATORS OF TECHNOLOGICAL INNOVATION BY ACTIVITY
BRANCH. ACCOUNTING PERIOD 2015

	Expenditures on innovation Total in thousands €	Expenditures on innovation Relative weight of the Value Chain in %
Total Companies	13,674,177	3.6
Total Industry	6,499,759	7.6
Manufacturing industry	6,059,205	8.1
Value Chain (estimate of business accounts)	491,504	

Source: Own development from the survey on companies' innovation, INE and R & D expenditure estimate

5. Significant ratios of the value chain activities

- Average salaries that exceed the referents of the economy by around € 2,770, getting close to € 33,400.
- With a gross surplus of around € 2,440 million, the value chain of the paper and board industry represents 0.6% of the business surpluses of the Spanish economy in 2015.
- Despite the unfavorable macroeconomic scenario, investments important enough to deal with competitiveness were discussed.
- Salary differences, negative in relation to the industry, although more intense and positive compared to the service benchmark.
- With a higher percentage of purchases than the one that defines the Spanish economy, its carry-over effect is more intense than estimated for private services.

- The intensity of capital slightly exceeds the referents of the overall economy, but marks significant distances over the whole manufacturing industry.

The average salaries for the set of activities are established around € 33,400. However, this central referent varies by about 24% between the different branches of activity. The maximum values are found in the publishing sector and the minimums correspond to the postal and shipping activities sector.

The type of dominant product in each activity determines the level of turnover reached (value of production) - both by volume of sales and by average price - and, besides, defines the type of capital and labor force, modifying the business surpluses, which range between 2.2 and 2.7 thousand million €.

Opting for technology, as a strategy to capture markets and improve competitiveness ratios, results in a high capitalization ratio, estimated at around 3.6% of its turnover figures.

TABLE 6. SIGNIFICANT RATIOS OF THE VALUE CHAIN OF PAPER AND BOARD. DIRECT EFFECTS
(AVERAGE values and ranges of variation (±))

Ratios significativos	2015	Deviation ⁽¹⁾ cross-activity	% Deviation ⁽¹⁾ cross-activity
Average salaries: Salary costs/n ^o of employees (€)	33,391	±7,989	23.9%
Added value: Production - Intermediate consumption (millions of €)	8,528	±323	3.8%
Gross business surplus: Added value - Salary costs (millions of €)	2,438	±258	10.6%
Productive efficiency: Value of purchases/Production, in %	63.07%	±15.36%	24.36%
Degree of capitalization: Investment/Production, in %	3.65%	±0.79%	21.77%

Source: Official Bulletin of the Mercantile Registry (BORME), Model T10-2015 developed by CEPREDE. Own development.

⁽¹⁾ Standard deviation of the figures relative to each one of the NACE activity branches that make up the value chain, in level and %.

TABLE 7. COMPARATIVE RATIOS OF THE VALUE CHAIN OF PAPER AND BOARD WITH KEY REFERENCES TO BE CONSIDERED BY THE ECONOMIC AGENTS. (2015)

Ratios significativos	Value chain	Economy	Manufacturing industry	Private services
Average salaries: Salary costs/n ^o of employees (€)	33,391	30,622	37,692	26,913
Added value: Production - Intermediate consumption (millions of €)	8,528	979,874	139,300	536,728
Gross business surplus: Added value - Salary costs (millions of €)	2,438	449,136	66,901	263,980
Productive efficiency: Value of purchases/Production, in %	63.1%	51.5%	74.8%	41.2%
Degree of capitalization: Investment/Production, in %	3.65%	3.60%	2.31%	4.43%

Source: INE, model T10-2015 developed by CEPREDE. Own development.

The heterogeneity of the characteristics of employment in the manufacturing industry and private services – including a mix of low-skilled workers and highly trained technicians and operators, clearly in different proportions – justify the significant disparities detected in of average salaries. In terms of the value chain, we can observe that it maintains the positive sign of the difference in relation to the overall economy and services, even though its levels are below the average of the manufacturing industry, around € 4,300, exceeding the service benchmark by around € 6,500.

The need for raw materials and supplies in the chain is estimated to be stronger than what is acknowledged for the overall Spanish economy and, with this, the carry-over effect that it represents on global economic growth is necessarily more intense than that of the tertiary sector, although other industrial activities are prone to the development of indirect impacts of even greater consideration.

6. Direct impacts of the activities around the companies that generate paper and board products

- The value chain refers to the cross- sectorial relation to and from other activities, distinguishing between direct, indirect and induced effects generated in the overall Spanish economy.
- The analysis carried out allows the identification of the main magnitudes that make up the business cluster of paper and board, in terms of creation of employment, investment, turnover, generation of income and contribution to State income, called Direct effects.
- Once the chain has been defined, identifying the different productive branches that make it up, the effects that its activity generates on the whole economy can be assessed by acting as requestors of goods and services, including those of capital, which are identified as Indirect effects.
- Meeting this demand for job creation in the supplying branches (again requestors of productive factors to other activities). In this circular process, the implicit generation of income will act as a stimulating factor of consumption, and this again will act as a driver of the activity, originating the Induced effects.
- A realistic assessment of the contributions of an activity or value chain must take into account the three accumulated effects and, thereby, identify the carry-over and leverage effects that they generate on the overall economy.
- The TIO-2015-CEPREDE provides detailed information on the value of purchases and investments for the different branches of activity.
- The turnover of the conglomerate paper-board-graphic arts-postal activities-publishing represents 2.1% of Spanish GDP in 2015 and generates 1% of employment.
- Its productive activity contributes to the

economic growth of the country, by incorporating more than 12,000 million € in concept of purchases and investment.
compras e inversión.

When mentioning the value chain, reference is made to the cross-sectorial relation to and from other activities, to the direct, indirect and induced effects on the whole Spanish economy, in terms of job creation, investment, business volume, generation of income or contribution to the income of the State.

To do this, the study must start with the assessment of the integrated activities in the value chain considering their magnitudes as well as the ones directly generated (presented in the previous section), and based on these, define the quantification of the impact vector that allows estimating the value of the rest of the impacts or effects that it might generate on the whole economy. In other words, once the total values directly generated by the value chain (paper and board) are determined, the volume of

purchases of goods and services that are necessary to carry out said production must be determined, differentiating the ones acquired in the national territory (domestic demand) and the ones acquired abroad.

This differentiation helps isolating the economic effects of the activities on the domestic economy and the international scale, since its incidence goes beyond its borders.

In addition, it has been considered appropriate to add the effects that, in terms of investment, that is, capitalization, generates this activity. In this respect, it has been necessary to determinate this magnitude, based on the figures provided by the balance sheets in terms of plant and equipment and depreciations provided by the profit and loss accounts.

The methodological process is based on the processing of the Input-Output Symmetric Tables (TSIO), a tool that is ideal for the development of this type of sectoral interconnection analysis, also defined as "analysis of impacts".

However, the sectoral differentiation contemplated by the latest available TSIOs, developed by the National Institute of Statistics, does not allow to descend to the level of disaggregation of activities proposed, a limitation adding to the fact that they refer to the 2010 accounting period.

Given these restrictions, CEPREDE has estimated, developed and implemented specific TSIOs for this study, which are consistent with the national aggregates for which information is available for the year 2015, using the information provided by the official TSIO of 2010, of the registered accounts of a vast number of companies, as they have already been exposed, and of the valuable contribution on distribution of purchases and sales provided by the leading associations of this project.

The TSIO-2015-CEPREDE allows to obtain detailed information regarding the value of purchases and their origin (domestic, imported from the rest of Spain and from the Rest of the World) for the different

branches of activity, and to estimate the investment made by type of good.

With these information flows, an estimate for each of the activities involved and for its aggregate, the turnover levels, the employment generated, the average salary, its cost structure or its contribution to the country's fiscal balance was made.

In 2015, companies operating in the sectorial aggregate that defines the value chain of paper and board, incorporated in the sample analyzed, reached higher turnover than 23,000 million €, were able to generate more than 182,000 jobs positions and to bring a total of € 3,529 million to the State budgets.

Purchases and investments made to meet these production levels amount to € 15,408 million, a turnover that becomes a reality in the accounts of the Spanish economy nuanced or reduced by the demands of goods and services made to companies located outside the country.

FIGURE 4. VALUE CHAIN OF PAPER AND BOARD. WHAT ARE THE ECONOMIC EFFECTS?

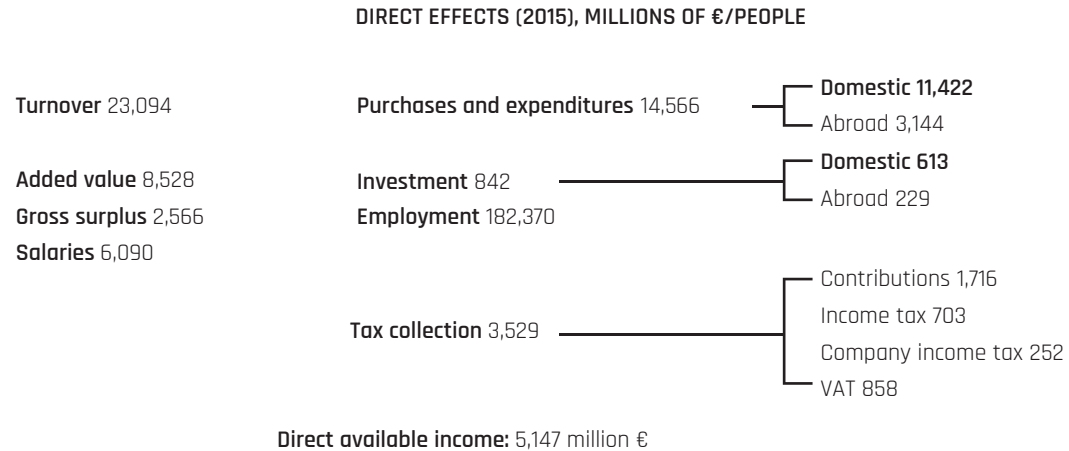
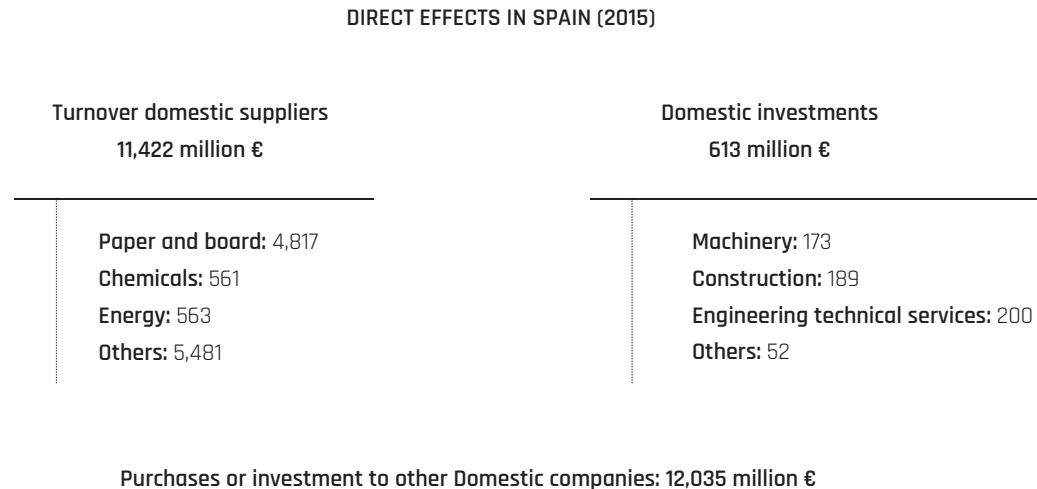


FIGURE 5. VALUE CHAIN OF PAPER AND BOARD, WHAT ARE THE ECONOMIC EFFECTS?



7. Indirect and induced impacts that complete the global impact

- Purchases and investments of the main activity imply a turnover of the suppliers, who expand the investments and reach a higher number of purchases and investments to other companies.
- In their role as suppliers, they will also intervene in the generation of employment and income, outlining some results that eventually impact the consumption.
- In this way, the growth of supply becomes a driver of demand, in what are defined as induced effects.
- More than € 5,800 million circulate through the economy due to the effects derived from its activity, in terms of salaries, which transform into an available income estimated at € 4,850 million.
- In 2015, the propensity to save of Spanish families is set at 8.6% and, consequently, the rents available for consumption derived from

the induced effects of the value chain amount to € 4,433 million.

- In terms of indirect income, the paper and board cluster brings 3.611 million to the system.
- The effects of this expansion have an impact on the labor market, generating more 19,500 jobs and an associated income of € 633 million, as well as on the operating surpluses that improve the ratio of business liquidity and the public sector that 407 million € to its fiscal balance.

The indirect and induced impacts refer to the positive impacts generated by purchases and investments made by the target activity on the economy as a whole.

These purchases and investments of the main activity involve a turnover of the suppliers, giving them the capacity and need to expand investments and a higher figure of purchases and investments to other companies. At the same time, they generate employment, leading to an

increase in purchasing capacity that has an impact on domestic demand in its consumption component.

In fact, a complete assessment of the contribution made by a branch of activity or a set of productive branches to the economy as a whole would be incomplete if these interrelations or carry-over effects were not considered, generally expressed in terms of production, added value and employment⁽¹⁾, if the consequences generated by indirect effects in terms of income are not addressed.

This study provides an additional perspective, analyzing the generation of salary income and business surpluses, from which greater availability of disposable income is derived, once the propensity to save and the tax charges associated to income and employment have been deducted.

Such an extension of purchasing power allows to link the indirect effects with the induced ones, which are just the response, in terms of consumption, to the increase in disposable income that is incorporated into the system as

the culmination of the chain effects originated by the advances of production.

The investment processes undertaken and the demand for productive inputs - even more intensively - generate employment (more than 167,000 employees) and the new income associated, as well as the surplus profits provided by the growth of the activity, a modification that favors the growth of demand by raising disposable income, that is, the capacity to buy and save once the income allocated to the payment of taxes has been deducted.

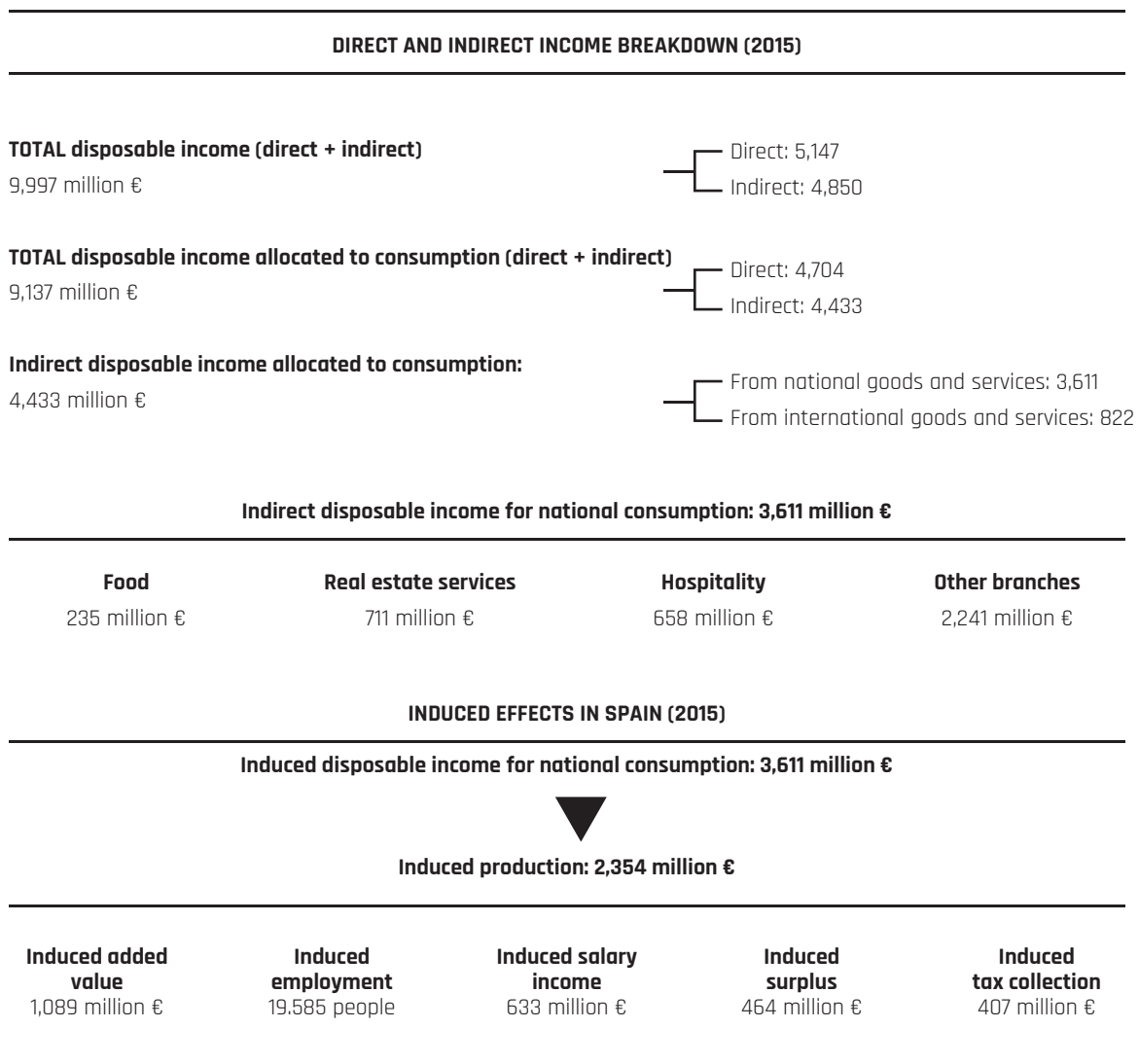
Part of this income will go to savings, and the implicit assumption to differentiate this proportion is obtained from the information provided by the National Accounts published by the National Institute of Statistics in the accounts that are presented disaggregated by institutional sectors. To sum up, for the 2015 accounting period, the proportion of the Spanish households' income allocated for consumption is 91.4%.

¹ 1 Details on this section are included in the methodological annex.

FIGURE 6. VALUE CHAIN OF PAPER AND BOARD

PURCHASES AND INVESTMENT TO OTHER DOMESTIC COMPANIES: 12,035 MILLION €	
Turnover domestic suppliers 11,422 million de €	Domestic investments 613 million de €
Indirect production: 23,023 million €	
Per purchases 21,842	Per investment 1,181
Indirect added value: 8,761 million €	
8,270	492
Indirect employment: 167,081 people	
156,194	10,887
Indirect salary income: 5,813 million €	
5,429	384
Indirect gross surpluses: 3,025 million €	
Indirect fiscal effects: 3,488 million €	
Social contributions: 1,638 Corporate income tax: 297	Income tax 671 VAT 882
Indirect disposable income: 4,850 million €	
Indirect household saving: 417 million €	
Indirect disposable income allocated to consumption: 4,433 million €	

FIGURE 7. VALUE CHAIN OF PAPER AND BOARD. WHAT ARE THE ECONOMIC EFFECTS?



8. More than a value chain? Tool for adaptation and socio-economic transformation

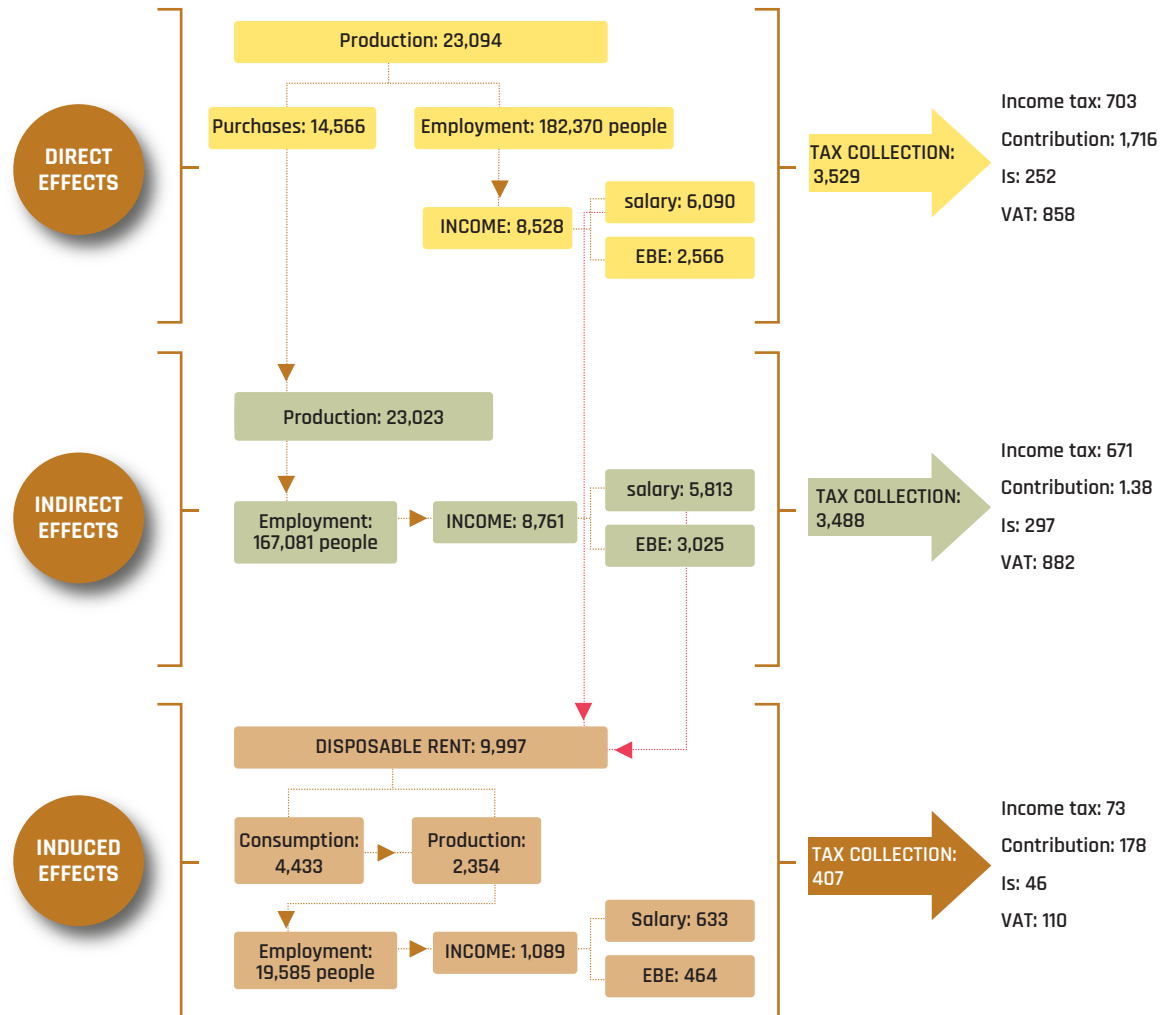
- The needs of input generate a value of purchases of 2.5 million € for every million € of turnover in the overall economy.
- In the paper-board cluster, for every million euros of turnover, 2.1 million € and 16 jobs in the whole Spanish economy, 8 more than its ability to create direct employment
- The value chain includes 18.5% of manufacturing employment, producing 8.8%, and contributes 1.8% of the total Public Administration revenue.
- External demand represents 25% of its total sales, and around 17.7 of its companies with more than 10 employees applied technological innovation processes in 2015.

- According to the Technological Innovation Survey, carried out by the INE, percentage of the turnover related to new and improved products exceeds 18% in recycling and is close to 13% in paper and board.

The global contribution of the value chain integrates direct, indirect and induced contributions, and results in a highly positive assessment, both for its economic effects (carry-over effect on production, employment, income and fiscal balance) as well as the significant boost to innovation that they convey through their focus on new technologies and sustainability.

As shown in table 8, for each million euros contributed by this cluster, 2.2 million euros are generated in the circuit of national added value (wealth) and 5.7 million euros in global turnover (value of production), and for every million of turnover, the economy produces 2.1 million. It is also worth noting the multiplier effect of the value chain on the labor market as a whole.

FIGURE 8. ANALYSIS SCHEME OF THE VALUE CHAIN, in millions of €



To be more accurate, for every million euros of direct Added Value generated, the cluster maintains a total of 43.3 jobs in the overall Spanish and bring more than twice the amount than they do with their direct contributions to the state coffers, although its multiplier effect is calculated in a more modest impulse, around 0.9.

Therefore, the magnitude of the value chain, considering the synergies that incorporate the economy as a whole, highlights the significant carry-over effect of these activities and, fundamentally, the undervaluation of their actions, in economic and fiscal matters, when this effect is not considered.

The strong competition that the new technological supports have represented for this sectorial aggregate, the difficulties of action due to the crisis context, its potential for growth and an excessive business atomization have been combined in the exercise of 2015.

The official figures available for the branches of activity that define the cluster of paper and board, although they do not address additional effects to the direct ones, reveal a scenario of clear recession, which could have been overcome with investment initiatives, cost reductions and external opening. They reflect average annual decreases in activity that in the last five years exceed 2.4%, leaving their mark on the evolution of salaries and surpluses, with cuts around 2.1 and 3.6% respectively. However, the external contribution to their income accounts has been gaining ground, thanks to improvements in productivity and competitiveness through their innovative actions.

TABLE 8. VALUE CHAIN OF PAPER AND BOARD: MULTIPLIER EFFECT⁽¹⁾

WHAT ARE THE ECONOMIC EFFECTS?					
	Total GAV	Total intermediate consumption	Total production	Total employment	Total collection
DIRECT GAV	18,378 M€	26,107 M€	48,471 M€	369,036 person	7,424 M€
8,528 M€	2.2 ⁽¹⁾	2.5 ⁽¹⁾	5.7 ⁽¹⁾	43.3 ⁽¹⁾	0.9 ⁽¹⁾

Source: CEPREDE

FIGURE 9. GLOBAL VALUE CHAIN OF PAPER AND BOARD

WHAT ARE THE ECONOMIC EFFECTS?				
EFFECTOS	DIRECT	INDIRECT	INDUCED	TOTAL
ACTIVITY (in million €)				
Production	23,094	23,023	2,354	48,471
Added value	8,528	8,761	1,089	18,378
Employment (nº people)	182,370	167,081	19,585	369,036
Salary income	6,090	5,813	633	12,536
Gross surpluses	2,566	3,025	464	6,055
TAXES (in million €)				
VAT	858	882	110	1,850
Income tax	703	671	73	1,447
Contributions	1,716	1,638	178	3,532
Corporate income	252	297	46	595
Total collection	3,529	3,488	407	7,424

TABLE 9. GLOBAL VALUE CHAIN OF PAPER AND BOARD (2015)

	Chain total	Economy total		Industry total	
	Level	Level	Chain weight ⁽¹⁾	Level	Chain weight ⁽¹⁾
Production	48,471	2,021,792	2.4% (1.1%)	553,403	8.8% (4.2%)
Added value	18,378	979,874	1.9% (0.9%)	139,300	13.2% (6.1%)
Employment (thousands of people)	369	18,521	2.0% (1.0%)	1,997	18.5% (9.1%)
Salary income	12,536	517,773	2.4% (1.2%)	72,260	17.3% (8.4%)
Surpluses	6,055	449,136	1.3% (0.6%)	66,901	9.1% (3.8%)
Tax collection	7,424	423,050	1.8% (0.8%)	---	---

(1) The figures in parentheses include the exclusive weight of the direct effect, that is, of the activities developed by the companies that make up the sector without considering the chain-linked effects that they generate in the economic system as a whole.

9. Conclusions

This report has attempted to respond to the request from the business field, represented by eight business associations and a business group, so that a study capable of undertaking two independent goals, although intrinsically connected, could be carried out from an objective and independent perspective and applying the most appropriate methodology.

The first of them, focused on the suitable definition of the value chain generated around the paper and board industries, had to be addressed to undertake the second, which answers the need to obtain an assessment of the socio-economic impact of said chain on the overall Spanish economy.

We hope that this study has managed to cover both purposes, although there is no doubt that its development has allowed the generation of tangible results that give a comprehensive and integrated vision of all the activities that, in one way or another, are part of a vertical integration process of a wide number of fully

interconnected branches of activity that, in addition, maintain broad connections with the rest of the economy and that encompass the primary sector (reforestation), the industry (energy, chemicals, machinery ...) and services (transportation, commerce ...).

In fact, the first of the conclusions drawn from this study is that it is not only necessary, but also appropriate to go deeper into the set of the activities that make up the value chain and, consequently, to obtain a realistic assessment of its wide dimension.

This aspect and those associated with the assessment of the impact generated by its productive activity in the overall economy has been reported in the previous pages and, therefore, this section gathers the main conclusions derived from the study in a structured manner.

- **The value chain is integrated by diverse and heterogeneous productive sectors**, although they all are generators of goods that make up vertically integrated production processes.

To be more accurate, the sectors of paper (NACE 17); graphic arts (NACE 18), printing, reproduction and finishing services; waste collection, treatment and disposal (NACE 38); postal and shipping activities (NACE 53); and publishing of books, newspapers and other publishing activities (NACE 58) have been considered.

- **It occupies a major economic role in the industrial structure.** The fact of acting as suppliers of the different stages of transformation, from its origins - as raw material - to its transformation - as final goods - gives it an important role.

- **These activities are very exposed to national and international competition** and, therefore, processes of innovation of processes and products are presented as a guarantee of survival.

- **Its commitment to sustainability has conceptually and genuinely transformed its production processes** incorporating among its goals the improvement of efficiency and the care for the environment, hence the recycling activity being one of its

main focus in the past years, as well as reforestation support.

- **The use of different official information sources has allowed the development of an analysis of congruence.** The definition of the dimension of the value chain has been approached through the official information available for use. The analysis and conclusions provided by several European and international studies have been added to this casuistry, which have allowed a precise identification of the outline, mostly accepted, in the definition of this value chain.

- **The integration of the opinion of sectoral experts has added realism to the assessment of the dimension of the value chain.** Interviews have been carried out with professionals of the sector, which has helped establish and compare the dimension of this value chain.

- **The income statements and the balance sheets available in the Official Bulletin of the Mercantile Registry (BORME) add authenticity to the study.** A vast array of companies have been analyzed, adding several that in said

registry were integrated to the NACE activities considered as components the value chain, to the ones identified by the experts. Finally, from all this information, a detailed processing of the industry's reality has been carried out.

- **It is a productive conglomerate with a high level of atomization.** Considering the official figures provided by the Central Companies Directory (DIRCE), the chain consists of 33,557 identified companies and more than 48% of these are business facilities that do not incorporate salaried employees.

- **The analysis was carried out on a sample of 8,434 companies, located and analyzed in the BORME.** Said sample represents 48.5% of the total of the business population that includes salaried staff (17,377 companies), giving it a sufficient range of representation.

- **The direct employment generated by the value chain is estimated at 182,370 workers for the whole sample.** The figures provided by the National Accounting refer us to a magnitude of 339,097 employees, although this

magnitude includes segments not included in the value chain, since it does not fall to the 4-digit level and considers the total number of companies and not only those that include salaried employees, two criteria which have been applied to this study.

- **82% of the direct employment generated is stable.** The analysis of the type of employment helps determining that the stability of employment is a characteristic feature of this sectoral aggregate, together with a high predominance of workers with technical training, a qualification that represents 72.8%.

- **In its cost structure, salaries represent 28%.** Of the total operating expenditures and as a result of the structure of its labor market, salaries amount 28%, estimated in € 6,090 million. In fact, average wages exceed the average referents of the economy by around € 2,770, almost reaching € 33,400.

- **The costs attributed to its purchases of raw materials, other supplies and merchandise represent the majority.** The figures provided by

the profit and loss accounts determine that 48.2% of operating expenditures answer the needs of productive inputs, with those associated to R & D occupying a prominent position in its structure of productive costs.

- **The value chain generates direct business surpluses close to 2,440 million €.** Of this figure, which represents 0.6% of the surpluses of the Spanish economy, the 252 million euros which, in terms of corporate taxes, reflect the revenue figures of the Public Administrations, are derived.

- Despite being immersed in an unfavorable macroeconomic scenario, **the companies that make up the value chain discussed investments that represented 3.6% of the value of their production.** The aggregate balance of the value chain contributes to the assessment of the plant and equipment of the companies, a part that, together with the assessment of the depreciations, allows to establish levels of investment of around 842 million euros in 2015, an amount significant enough to allow them to face competitiveness.

- **The direct turnover of the conglomerate exceeds 23,000 million €.** This figure represents 2.1% of Spain's GDP in 2015, more than the Added Value generated jointly by the economies of Cantabria and La Rioja. This has been achieved by generating demands to other sectors and developing investments estimated at € 14,566 million, a figure that triples the GVA assessment of the R & D sector of the overall economy in 2015.

- **The internationalization of the sector has followed a growing trajectory.** The geographical diversification of the destination of its production towards international areas is established at 25% of the value of its sales. Moreover, this diversification does not only affects its client portfolio but also its supplier lists.

- **The penetration of physical goods and international capital goods reduces the indirect effects generated by the value chain on the overall Spanish economy.** Since not all purchases or investments are made in a domestic context, the impact of their actions as a

requestor to the rest of the economy must be established in internal terms, reducing the magnitude of its direct interconnection with the rest of the economy to € 12,035 million.

- **The value of the purchases and investments made by the main activity justifies the turnover and employment of the sectors that act as their suppliers,** and the Input-Output methodology helps assessing the scope of these transactions (indirect effects), adding the effect they provide to the consumption of income generation associated with indirect employment. In this way, the growth of supply becomes a driver of demand in what are defined as induced effects.

- **The value chain generates more than 167,000 jobs indirectly,** adding around € 5,800 million in salaries to the whole economy. It also provides surpluses of around 3,000 million € and of both factors, labor and capital, the State seizes its corresponding share based on the average tax rates, which, together with the VAT, amount to around 3,490 million € in terms of indirect tax effects.

- **Indirect salary income provides the Spanish economy with an available income of 4,850 million euros.** Of this, 91.4% is allocated to consumption, totalizing € 4,433 million (the remaining 8.6% goes to savings) but diversified into goods and services acquired and/or produced within and outside the country, estimating an incorporation of income of € 3,611 million in the national context. Such magnitude, of a similar order to that of the total remuneration of salaried workers in the metallurgical sector, will once again act as a driver of activity, employment as well as salary, business and public income, grouped under the induced impact concept.

- **A realistic assessment of the value chain requires incorporating all three effects jointly** and, in these terms, the analysis determines that its total production represents 8.8% of the Spanish manufacturing industry, provides 18, 5% of its employment and contributes 1.8% of the country's fiscal balance.

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- INE: Cuentas económicas. Marco Input-Output
- INE: Directorio Central de Empresas (DIRCE)
- INE: Encuesta de Innovación Tecnológica de las empresas.
- INE: Encuesta de Población Activa
- INE: Estadística Estructural de empresas: Sector Industrial
- INE: Estadística Estructural de empresas: Servicios
- Memorias anuales publicadas por las empresas. Memorias de las Asociaciones del sector.

11. Interviews with executives and experts from the industry. Acknowledgement for their collaboration

Associations	Professionals
AFCO, Spanish Association of Corrugated Cardboard Containers and Packaging Manufacturers	D. Ignacio Carro, <i>General manager</i> D. Juan Antonio Mendicote, <i>Technical director</i> Dña. Patricia Vallejo-Nágera, <i>Director of Institutional Relations</i>
ASPACK, Spanish Association of Manufacturers of Packaging and Transformed Cardboard	D. Pablo Serrano, <i>General secretary</i>
ASPAPEL, Spanish Association of Pulp and Paper Manufacturers	D. Carlos Reinoso, <i>Director general</i> D. Javier Gutiérrez, <i>Statistics manager</i>
FGEE, Spanish Association of Publishers Guilds	D. Antonio María Ávila Álvarez, <i>Executive director</i> Dña. Pilar Ruiz Sánchez
LA BOLSA DE PAPEL, Iberian Association of Manufacturers of Paper Bags	D. Ángel Dapena Herrero, <i>Executive director</i>
MESA DE LA NUEVA RECUPERACIÓN, Platform for Recovering Paper and Carboard Companies in Spain	Dña. Rosa Mañas, <i>Manager</i>
NEOBIS, Graphic Communication Association	D. Jesús Alarcón Fernández, <i>General secretary</i>
REPACAR, Spanish Recyclers Paper and Board Association	D. Manuel Domínguez, <i>General manager</i> Dña. Gloria Lázaro Abad, <i>Technical department</i>
Empresas	Profesionales
GRUPO CORREOS	D. Enrique Cervera Garbayo, <i>Communication Management</i>
PRINTEOS	D. Ignacio Reiris Rico, <i>President</i> Dña. Aurelia Junco Ruiz, <i>International Financial Controller</i> D. José Luis Alcalde, <i>Group Financial Direct</i>

12. Detailed annex of the structure of suppliers and customers of economic activities

The following data tables contain the structure of purchases and sales, that is, of suppliers and customers, of the value chain. As in the rest of the report and the research, the consolidated figures of the activities represented in the wide value chain system of paper and board are incorporated.

Although the definition, to make it shorter, has two key words related to the industrial activity that it integrates, besides the manufacture of paper pulp, this chain also contains the manufacture of non-integrated paper and paper and board from recycled paper, together with the manufacture of corrugated paper and board, the manufacture of paper and board containers and packaging, the production of paper bags, the provision printing, reproduction and

finishing services, the publishing of books, the commercialization of the publishers, postal and parcel services, recycling of paper and board, and reforestation.

The accounting period used as a base for the study 2015, since it was the one with the most complete information at the beginning of the development of the research, mainly from its profit and loss accounts and its balance sheets collected in the Official Bulletin of the Commercial Registry (BORME).

This information has been the point of reference to determine the size of the value chain and, consequently, the one that has contributed to determine the direct impact of this latter, with which the exercise of estimate of its overall effects on the overall economy is initiated.

Thus, the impact analysis carried out starts from the consideration of the amounts of purchases and investments made by the companies that make up the sample, a total of 8,434, which have been extracted from the economic

accounts of the companies, previously referred to, either in their entirety or by applying percentages on their global figures when the company contemplates more than one activity including one that cannot be incorporated into the value chain. These rectifications have been carried out taking into account the opinions of business experts who participated in this study.

The Input-Output methodology has been applied to them, being necessary to develop an ad hoc symmetric table (TSIO-CEPREDE) in advance to carry out this study, updated to the year 2015 (the latest available official TSIOs refer to the year 2010), in which the information provided by sectorial experts has been incorporated in terms of distribution of purchases and diversification of clients by branch of activity/type of products and geographic scope.

These tables provide the productive structure of each one of the activities with which the value chain has been defined, namely 24 branches,

three less than those included in the National Classification of Activities disaggregated by four digits, as already indicated, and in this annex, they are presented in an aggregate form, although their incorporation into the study has been carried out in an individualized manner.

TABLE 9.A. STRUCTURE OF SUPPLIERS (PURCHASES)

ACTIVITY SECTOR, 2015	Suppliers (% of total purchases)	
	Domestic	International
Total	81.6%	18.4%
Prod of forestry and logging, and services related to them	0.42%	0.07%
Extractive industries	0.23%	0.03%
Food, beverages and tobacco	0.25%	0.02%
Textile, leather and footwear	0.16%	0.03%
Wood and cork industry	3.12%	0.09%
Paper industry	28.80%	14.16%
Graphic arts and reproduction of recorded media	3.18%	0.15%
Cakeries and oil refining	0.09%	0.01%
Chemical industry	5.42%	0.67%
Manufacture of pharmaceutical products	0.07%	0.01%
Manufacture of rubber and plastic products	1.47%	0.15%
Manufacture of other non-metallic minerals prod.	0.03%	0.00%
Metallurgy, iron, steel prod. and ferroalloys	0.23%	0.03%
Manufacture of metal products, except machinery and equipment	0.87%	0.02%
Manufacture of computer, electronic and optical products	1.02%	0.04%
Manufacture of electrical material	0.27%	0.00%
Manufacture of machinery and equipment n.c.o.p.	3.20%	0.59%
Manufacture of motor vehicles, trailers and semi-trailers	1.25%	0.00%
Manufacture of other transport material	0.10%	0.00%
Manufacture of furniture, other manufacturing industries	0.17%	0.03%
Repair and installation of machinery and equipment	2.30%	0.17%
Supply of electric power, gas, steam and air conditioned	4.37%	0.00%
Water collection, treatment and distribution	0.42%	0.00%
Sanitation activities, waste management and decontamination	6.27%	1.87%
Construction	0.39%	0.02%
Sale and repair of motor vehicles and motorcycles	0.36%	0.00%
Wholesale trade and trade intermediaries	2.26%	0.03%
Retail trade	0.38%	0.00%
Ground transport and pipeline transport	3.52%	0.02%
Maritime and inland waterway transport	0.04%	0.00%
Air Transport	0.01%	0.00%
Storage and activities related to transport	1.34%	0.01%
Postal and shipping activities	0.48%	0.00%
Hospitality	0.07%	0.00%

TABLE 9.B. STRUCTURE OF SUPPLIERS (SALES)

ACTIVITY SECTOR, 2015	Suppliers (% of total purchases)	
	Domestic	International
Publishing	0.06%	0.01%
Telecommunications	0.06%	0.00%
Programming, consulting and other related activities with IT; information services	0.92%	0.01%
Financial services, except insurance and pension funds	1.12%	0.01%
Insurance, reinsurance and pension funds, except compulsory social security	0.64%	0.00%
Auxiliary act. to financial services and to insurance	0.27%	0.00%
Real estate activities	0.16%	0.00%
Legal and accounting activities; activities from headquarters; business management consultancy activities	1.96%	0.01%
Architecture and engineering technical services; Tests and technical analysis	0.61%	0.00%
Investigation and development	0.05%	0.00%
Advertising and market surveys	0.42%	0.00%
Other professional, scientific and Techniques activities; veterinary activities	0.07%	0.00%
Rental activities	0.48%	0.00%
Activities related to employment	0.05%	0.00%
Travel agencies, tour operators, booking services and related activities with the latter	0.01%	0.00%
Security and investigation activities; services to buildings and gardening activities; office admin activities and other activities auxiliary to companies	0.37%	0.03%
Public administration and defense; social security	0.48%	0.06%
Education	0.28%	0.00%
Health activities	0.06%	0.02%
Sports, recreational and entertainment activities	0.03%	0.01%
Associative activities	0.02%	0.00%
Repair of computers, personal effects and household items	0.73%	0.00%
Other personal activities	0.23%	0.00%

Source: TSI0-2015 CEPREDE.

TABLE 10.A. ESTRUCTURA DE CLIENTES (VENTAS)

ACTIVITY SECTOR, 2015	Clients (% of total sales)	
	Domestic	International
Demand from companies		
Products of agriculture, livestock and hunting, and related services	5.57%	2.94%
Products of forestry and logging, and related services	0.00%	2.29%
Fish and other fishing prod.,...	1.04%	0.34%
Extractive industries	0.09%	0.03%
Food, beverages and tobacco	1.41%	0.42%
Textile, leather and footwear	11.81%	7.46%
Wood and cork industry	3.70%	2.13%
Paper industry	7.30%	1.68%
Graphic arts and reproduction of recorded media	1.82%	0.59%
Cokeries and oil refining	1.48%	0.04%
Chemical industry	0.41%	0.07%
Manufacture of pharmaceutical products	0.79%	0.06%
Manufacture of rubber and plastic products	0.87%	0.28%
Manufacture of other non-metallic minerals prod.	0.41%	0.05%
Metallurgy, iron, steel prod. and ferroalloys	1.79%	0.03%
Manufacture of metal products, except machinery and equipment	0.56%	0.07%
Manufacture of computer, electronic and optical products	0.36%	0.01%
Manufacture of electrical material	0.32%	0.03%
Manufacture of machinery and equipment n.c.o.p.	0.33%	0.07%
Fab. of motor vehicles, trailers and semi-trailers	0.10%	0.00%
Manufacture of other transport material	0.62%	0.03%
Manufacture of furniture, other manufacturing industries	0.10%	0.01%
Repair and installation of machinery and equipment	0.17%	0.00%
Supply of electric power, gas, steam and air conditioned	1.02%	0.00%
Water collection, treatment and distribution, Sanitation activities, waste management and decontamination	2.74%	0.16%
Construction	1.17%	0.08%
Sale and repair of motor vehicles and motorcycles	2.15%	0.10%
Wholesale trade and trade intermediaries	1.64%	0.86%
Retail trade	0.20%	0.01%
Ground transport and pipeline	0.25%	0.00%
Maritime and inland waterway transport	0.50%	0.00%
Air Transport	0.33%	0.00%
Storage and activities related to transport	0.93%	0.01%
Postal and shipping activities	0.65%	0.00%

TABLE 10.B. ESTRUCTURA DE CLIENTES (VENTAS)

ACTIVITY SECTOR, 2015	Clients (% of total sales)	
	Domestic	International
Demand from companies		
Publishing	1.55%	0.27%
Cinema, sound recording and music editing activities radio and tv programming activities	0.55%	0.02%
Telecommunications	1.12%	0.00%
Programming, consulting and other activities related to IT; Information services	0.75%	0.00%
Financial services, except insurance and pension funds	0.37%	0.02%
Insurance, reinsurance and pension funds, except mandatory social security	0.10%	0.00%
Auxiliary act. to financial services and insurance	0.07%	0.01%
Real estate activities	0.32%	0.50%
Legal and accounting activities; activities of headquarters; business management consulting activities	0.93%	0.01%
Architecture and engineering technical services; Tests and technical analysis	2.53%	0.05%
Investigation and development	0.11%	0.01%
Advertising and market surveys	0.35%	0.03%
Other professional, scientific and technical activities; veterinary activities	0.57%	0.02%
Rental activities	0.28%	0.00%
Activities related to employment	0.01%	0.00%
Travel agencies, tour operators, booking services activities...	2.27%	0.00%
Security and investigation act.; to buildings and gardening activities; office admin act. and other activities auxiliary to companies	1.73%	0.02%
Public administration and defense; social security	1.20%	0.03%
Education	0.35%	0.04%
Health activities	0.38%	0.05%
Social service activities	0.02%	0.01%
Creation, artistic and entertainment activities; libraries, archives, museums and other activities	0.85%	0.01%
Sports, recreational and entertainment activities	0.03%	0.03%
Associative activities	0.20%	0.01%
Repair of computers, personal effects and articles for domestic use	0.00%	0.00%
Other personal activities	0.04%	0.00%
Households activities like employers of housekeepers or as producers of goods and services for personal use	0.00%	0.00%
TOTAL demand from companies	70.59%	3.01%

TABLE 10.C. STRUCTURE OF CLIENTS (SALES)

ACTIVITY SECTOR, 2015	Clients (% of total sales)	
	Domestic	International
Demand for final consumption		
Demand for final products made by families	1.57%	0.36%
Demand for final products made by the AA.PP.	0.02%	0.00%
Demand for final products made by external requestors	0.00%	24.45%
Total demand for products for final consumption	1.59%	24.81%
DISTRIBUTION SUMMARY		
Pro memoria:		
TTotal demand made by companies	70.59%	3.01%
total demand of products for final consumption	1.59%	24.81%
TOTAL CLIENTS (Domestic/International)	72.18%	27.82%
TOTAL CLIENTS	100%	

Source: TS10-2015 CEPREDE.

13. Methodological annex. The analysis of value chains

The study focuses on the 2015 accounting period, bounded by the availability of official information available in the instrument that is the main and most usual process of analysis: the methodology based on the Input-Output Matrices that has become one of the most widespread tools in the world.

To be more accurate, for the analysis of impacts, in addition to the transactions directly generated by the activity (production, purchases, investments, salary income, tax revenues, etc.), the overall economic system must be considered.

In this way, the results of an activity extend beyond its direct contribution to the production increase, the consequent generation of capital income and remuneration of work incorporated in said activity or its direct contribution to the public budgets in connection with the collection that would be obtained by all public administrations as a result of this economic activity.

In this context, in estimating the economic effects generated by an activity, the multiplying effects that it originates must be considered and, for this, the classical approach based on the implicit activity multipliers in the Input-Output Tables has been proved as a fully valid instrument, by allowing to assess the level of total activity generated in an economic system from an initial impact, in our case, the purchases made by the sectoral aggregate or value chain previously defined to the rest of the productive system and the demand of investment made to develop its activity.

In short, this procedure consists of the estimation and assessment of the chain of production and income generation generated in the economic system from an initial impact: the so-called **Impact Vector**.

In the study, the volume of production, purchases of goods and services, employment, both salary and non-salary income and taxes that the developments of their activity generate define what is called **direct impact**.

Its quantification is the result of adding the figures relative to the set of companies that define the value chain, involving different economic sectors of industrial and tertiary character, from a classical perspective in which an **activity, sector, business conglomerate or cluster is exclusively identified with the internal assessments they generate.**

In the developed study, the **direct impact of the value chain** is based on the identification of the sectors or branches of activity that comprise it, a process carried out based on the definition established by the National Classification of Activities (NACE) that, on an international scale, operates to achieve area comparisons superior to domestic ones, ensuring the homogeneity of the incorporated branches of activity.

This classification considers different levels of disaggregation, with a 4 digits differentiation as a maximum.

In this case, we considered the necessity to use these maximums to incorporate the highest possible level of detail and, additionally, supported by other international experiences, it was agreed that the branches

of the chain would be identified with the NACE codes 17, 18, 38, 53 and 58, with their respective disaggregations, as contemplated in the table at the end of this methodological annex.

This identification implies the starting point for the creation of a database in which the fundamental magnitudes that, as much from the business scope as from a macroeconomic perspective were available, are incorporated for the active Spanish whose turnover corresponds to any of these activities.

From a business perspective, the Income Statements and Balance Sheets deposited in the Commercial Registry by the companies have participated in the process, initially considering those related to the 2010, 2015 and 2016 accounting periods. However, the significant disappearance of companies (closures, temporary cessation of activity, extinctions...) incorporated strong divergences in the sample considering the 2010 and 2015 periods and, for 2016, a good part of these registries were pending at the initial moment of the study. This is the reason why the study has

finally been developed exclusively for the 2015 accounting period, giving up the study of time profile or comparative dynamics.

The number of identified companies, once eliminated those that did not present accounts or had not registered any activity, amounts to 8,434, integrating into this sample a significant number of cases in which the information provided by the experts – generally speaking, and at least the name of the company and/or its NIF - identified them as an integral part of the value chain, although their official registries were classified outside the previously established NACE codes. It has been observed that this mainly happens in the wholesale trade sector and trade intermediaries, except motor vehicles and motorcycles (NACE 46).

On the other hand, the amounts originated by other activities differing from those associated with the value chain have been deducted from the official business magnitudes, thanks to the information provided by the experts regarding the weight of the activity associated with the cluster of paper and board over

the total global business and employment figures of the companies that carry out their activity in a diversified manner, that is, acting as generators of goods and services that exceed the value chain and, therefore, that require to be corrected to be part of this latter, but in the strict magnitude with which they participate.

Therefore, the database does not only contain the information of the active companies placed in the identified NACE codes by the official registries, but also of those that are known to be closely related to the value chain and to what extent.

Additionally, information provided by executives and experts has been provided through a survey designed for the collection of information, an tool that has covered four goals:

- 1- Define the structure of their client portfolio by geographical area and type of target client.

- 2.- Identify the activity branches that act as suppliers to the value chain, that is, the structure of raw material consumptions and provision by offeror sector and geographical area.

3.- Compare the information provided by the companies in the questionnaires with the official figures included in their balance sheets and income statements and, where appropriate, apply the percentage of their activity attributable to the value chain to their global magnitudes.

4.- Incorporate an analysis of the type of direct employment generated, considering the contractual characteristics (steady versus temporary) and qualification (executives and technicians, operators and admin staff).

Taking this casuistry into account, the database contemplates economic information provided by the companies through the questionnaires (compared with the registries) and the official figures of the registries, as a whole or recalculated, as required.

The main items and concepts extracted from the Commercial Registries and used in the study are the following:

- Company name
- NIF code
- NACE primary code 2009
- NACE secondary code(s) 2009

- Plant and equipment 2014 and 2015
- Number of employees
- Operating income
- Net amount sales figures
- Consumption of goods and materials
- Exploitation result
- Financial expenditures
- Taxes
- Result of the accounting period
- Staff expenditures
- Provisions for depreciation of plant and equipment

Based on this information, the aggregate valuation of the sector is calculated, that is, the creation of a registry that considers key magnitudes directly generated by the sector and including sales figures, operating expenditures, differentiated between raw materials, supplies and goods and salaries, depreciations, taxes, which are directly extractable from the information processing from the Commercial Registries. The cost distribution between the different producing branches of the products demanded and the destination of their production are estimated from the figures provided by the questionnaires, applying the average structure of customers and suppliers known as factor of

distribution of the magnitudes of the companies of which only information collected from the Commercial Registries is available, and therefore not directly available.

However, the **value chain acting as a customer**, that is, from the demands of goods and services to other economic sectors, **contributes to the generation of income**, employment and turnover (production) in the whole economy and, therefore, linked to the different investment and expenditure items that it originates internally. These items, integrated into the direct assessment of the value chain, are considered as **vectors of impact**, although always considering that their demands might be covered on a domestic scale, but also on an international scale.

Therefore, given that the purchases of physical or of capital goods of an international nature are not associated to the internal development of the sectoral cluster, the development of the analysis focuses on the national framework, that is, excluding the proportion of demands to other economies, i.e. international purchases, from

the figures of the impact vector.

Based on this assessment, the process is initiated to materialize the effects of the investments required for the development of its activity and, in general, the different inputs or productive factors demanded to generate its production in the overall economy.

Thus, direct national providers of goods - whether capital or of any other nature - will need to acquire other goods and services (intermediate consumption) to the rest of the productive system -which is again valued in domestic terms, that is, excluding the demands made abroad -, which, in turn, will demand other goods and services to their own suppliers in accordance with the productive structure of the analyzed system, to finally end up generating new incomes and demanding new employment.

This set of income and employment is usual called **indirect effect**.

Additionally, and with a general character, the impact analysis includes a third level of effects, called **Induced Effects**. These include the impact derived from all the income generated in the previous stages. Thus, in the induced effects, the **effect of the**

final consumption derived from all the salary income generated, as well as the **tax collection** obtained by the set of public administrations when applying the different tax figures to the total activity and generated revenue are usually incorporated.

To do this, a model corresponding to the following expression has been defined:

$$\{x\} = (I - A_i)^{-1} \{d\}$$

known as identity of Leontief or Demand Model associated with the TIO. Where:

$\{x\}$ is the column vector of total production by sectors

$\{d\}$ is a vector column of final demand by sectors. In this case, the vector "d" is an impact vector that determines the indirect effects, as detailed below.

$(I - A_i)^{-1}$ is the so-called Leontief inverse matrix, where I is square matrix identity whose order is defined by the number of branches of activities incorporated and A_i the matrix of interior technical coefficients " a_{ij} " that provide information on the number of factors used for the sector's production, which have been acquired within the national territory (sub-index i)

$$a_{ij} = \frac{X_{ij}}{X_j}$$

thus, $X_{ij} = a_{ij} X_j$ that is the that is the consumption of products or inputs that the branch j makes of the branch i is equal to the consumption per unit of product for the total of the production made, generating a system of simultaneous equations of the type:

$$X_1 = a_{11} X_1 + a_{12} X_2 + \dots + a_{1n} X_n + D_1$$

$$X_2 = a_{21} X_1 + a_{22} X_2 + \dots + a_{2n} X_n + D_2$$

$$X_3 = a_{31} X_1 + a_{32} X_2 + \dots + a_{3n} X_n + D_3$$

$$\dots\dots\dots$$

$$X_n = a_{n1} X_1 + a_{n2} X_2 + \dots + a_{nn} X_n + D_n$$

The most noteworthy hypothesis included in this model is centered on the retention in time of the technical coefficients and, therefore, of Leontief's inverse matrix. This assumption seems very restrictive, although it is not more restrictive than the hypothesis formulated in the causal modeling of the structural permanence of the estimators, given that the technical coefficients determine the structure of production technique that does not undergo significant changes in a timely manner but progressively throughout the period, and as a result of technological improvements.

This model was created in order to measure the effects of an alteration of the final demand (or some of its components) of one or several sectors on their respective productions, therefore considering that the technology incorporated in the production processes is maintained over time. Its key element lies in the Inverse Matrix $(I - A)^{-1}$, also called interdependency matrix, since its elements provide detailed information about the degree of

interdependence of system components. ponentes del sistema.

Each element of the inverse matrix of technical coefficients α_{ij} represents the amount by which the total output of the i -th branch must vary if the final demand of the k -th branch increases by one unit. In other words, any element of Leontief's inverse matrix provides information on the total productive effort that a sector must make to face a variation in the final demand of each of the other sectors.

In this matrix, the elements of the main diagonal α_{ii} will be greater than the unit since they reflect the direct effect of the increase in demand on the production of its own sector, plus the effects induced by additional needs of other sectors.

Therefore, the main diagonal is configured as a first approximation to the degree of interdependence of each sector and measures the total productive effort a sector must make to face the increase of one unit of its final demand, an indicator called **internal effect**.

However, this model has been shown as an effective tool to determine the effects generated by an activity on the overall economy, modifying in the proposed general expression the vector "d" defined as final demand by the demand made to other sectors that is, intermediate demand or intermediate consumption, together with the investment vector, a component that defines the purchases of capital goods made to carry out its activity to the producing branches of this latter.

In this way, the applied model is defined as:

$$\{x\} = (I-A_j)^{-1} \{dI + Inv\} \text{ or:}$$

$$\{x = \{x Di + x Inv\} = (I-A_j)^{-1} \{dI\} + (I-A_j)^{-1} \{Inv\}$$

dI corresponding to the intermediate demand (purchases of goods and services made by the branch {j} which in this case is identified as the value chain) and **Inv**, a vector that incorporates the investment by product type and, therefore, associated to producing branches of such products made by the value chain.

In sum, **dI + Inv** are the

impact vectors with which the carry-over capacity of the value chain of paper and board on the overall economy is assessed, in terms of activities quantified in the vector {x}, that is, in the value of the production that generates the demands made by the analyzed value chain for each branch of activity.

This growth in global activity results on the generation of income (salaries and non-salaries), jobs, as well as new income in terms of tax collection, differentiated by types of tax, namely income tax and Social Contributions, due to the increase in income generated by the generation of indirect employment attributed to the purchases and investments made to the rest of the system and the corporate as a consequence of the generation of indirect non-salary income (operating surpluses), adding the VAT from the income allocated to consumption.

The transformation from the growth of activity to income is carried out by applying the so-called Value Added coefficients, defined for each branch of activity as:

Coef. VA_j = 1 - (Value of purchases made to sector j / Value of production of sector j)

Since the production value is defined as the sum of Intermediate Consumption (purchases) + Value Added, so that:

$$(\{xDi\} + \{xInv\}) * \text{Coef. VA}_j = \{x\} *$$

Coef. VA_j = Indirect added value for intermediate demand and for the investment made by the value chain (**indirect AV divided by branches**).

Similarly, the growth of the activity triggers employment needs that are quantified through the so-called employment coefficients, defined as:

Employment Coef_j = (Employed from sector j / Value of production of sector j) and, with them, indirect employment created by the value chain is estimated, applying $(\{xDi\} + \{xInv\}) * \text{Employment Coef}_j = \{x\} * \text{Employment Coef}_j =$ Indirect Employment due to intermediate demand and the investment made by the value chain (**indirect employment differentiated by branches**).

Once the average salary of each branch of activity is known,

indirect employment is transformed into indirect salary income by applying the following correspondence dencia:

Indirect Employment_j * Average salary_j =
= Indirect salary income differentiated by branches.

In order to obtain indirect non-salary income, the net tax associated with indirect production must be identified. To do so, the identification of the average rate of the net taxes linked to production supported by each of the branches of activity is again used, and applying

Average rate net taxes_j * {x} = Indirect net taxes due to intermediate demand and the investment made by the value chain (**indirect net taxes differentiated by branches of activity**)

And from them, the Business Surpluses are deducted by applying the following identity:

Added Value Indirect_o - Indirect salary income - Net Indirect Taxes = **indirect Gross Operating Surplus differentiated by branch.**

Indirect and indirect employment contributions represent additional flows to public budgets in terms of income tax, contributions and corporate taxes that can be estimated by applying the following ratios:

Average rate of contributions

* Indirect salary income_j =
Indirect Social security collection

Average income tax rate *

Indirect salary income_j =
Indirect income tax collection

Average corporate rate *

Indirect surplus_j = **Indirect corporate collection**

Average VAT rate * Indirect

Added Value_j = **indirect VAT collection**

Finally, the aggregation of all the branches in each of these concepts leads to the assessment of the direct effects attributed to the value chain of paper and board.

With this progression of results, the incidence of the value chain on the overall economy could be considered as settled, but both direct and induced employment have undoubtedly generated income that boosts savings and consumption, once the tax have

been deducted. This new effect is agglomerated under the name of Induced Effects.

For its assessment, the tax burdens related to personal and corporate income must be deducted from the salaries and indirect business surpluses generated by the value chain, as these figures levy said incomes, resulting in the concept of indirect disposable income which will be allocated to advances of consumption and savings capacity.

Therefore, by applying the average savings rate of the Spanish economy to the indirect disposable income, indirect disposable income allocated to consumption is obtained:

Indirect disposable income for consumption = Indirect disposable income * (1-Savings Rate)

Now, the purchasing decisions of the individuals are based on their spending priorities. Therefore, it is necessary to define, on the one hand, the proportion of this income allocated to the consumption of products generated in the domestic

market and abroad, that is, the propensity to consume imported goods and services and, on the other hand, the type of goods consumed, that is, the distribution of expenses by type of goods, in order to identify the activity branches affected and to what extent by the indirect income generated by the value chain.

For this purpose, the distribution of private consumption by type of goods (assigned to the sectors that generate them) is used, after deducting purchases from abroad, an information provided by the TIOs in the so-called coefficients of distribution that meet the following expression

Domestic consumption of branch j / total consumption of branch j = % of households purchases of domestic origin j

Applying these percentages to the level of indirect disposable income allocated to consumption, the distribution of the indirect consumption generated by the value chain is obtained, a new impact vector that will be subjected to the same processing as the one used for the calculation of the

indirect effects, in order to know the induced effects in terms of activity (turnover) and derived from this, of employment, income and tax burdens, that is the following calculation:

{x Induced by consumption} = (I-Ai) -1 {Indirect consumption}

{x Induced by consumption} * Coef. AV_j = induced AV differentiated by branches.

{x Induced by consumption} * Coef. Employment_j = Induced employment differentiated by branches.

Induced Employment_j * Average salaries_j = Induced salary income differentiated by branch.

Average rate net taxes_j * {x Induced by consumption} = Net taxes differentiated by branch of activity

Induced Added Value_j - Induced salary income - Net induced taxes_j = Induced gross operating surplus differentiated by branches.

Contributions average rate * Induced salary income_j = Induced social security collection

Income tax average rate * Induced salary income_j = Induced income tax collection

Corporate average rate * Induced surplus_j = Induced corporate collection_j

Average VAT rate * Induced
Value Added_j = Induced VAT
collection_j
{x Inducida por consumo} *

Again, the aggregation of all the branches in each of these concepts leads to the assessment of the induced effects attributed to the value chain of paper and board.

Consequently, the study considers the direct, indirect and induced effects of the denominated value chain of paper and board. Even though it has already been emphasized, it must be remembered that this denomination comprises the effects of a total of 27 activities, selected according to the previous study developed to determine the vertical integration of the latter, under the supervision and support of a set of institutions that, ultimately, have been the drivers of this analysis. To be more accurate, the chain consists of the following:

17.- PAPER INDUSTRY

- 171.- Manufacture of pulp, paper and paperboard
 - 1711.- Manufacture of pulp
 - 1712.- Manufacture of paper and board
- 172.- Manufacture of paper and board items
 - 1721.- Manufacture of corrugated paper and paperboard and of containers of paper and paperboard
 - 1722.- Manufacture of household and sanitary goods and of toilet requisites
 - 1723.- Manufacture of paper stationery
 - 1724.- Manufacture of wallpaper
 - 1729.- Manufacture of other articles of paper and paperboard

38.- WASTE COLLECTION, TREATMENT AND ELIMINATION; VALORIZATION

- 381.- Waste collection
 - 3811.- Collection of non-hazardous waste
 - 3812.- Collection of hazardous waste
- 382.- Waste treatment and elimination
 - 3821.- Treatment and elimination of non-hazardous waste
 - 3822.- Treatment and elimination of hazardous waste
- 383.- Valorization
 - 3831.- Separation and classification of materials
 - 3832.- Valorization of materials already classified

18.- GRAPHIC ARTS AND REPRODUCTION. RECORDED MEDIA

- 181.- Graphic arts and related services
 - 1811.- Graphic arts and related services
 - 1812.- Other printing and graphic arts activities
 - 1813.- Prepress services and media preparation
 - 1814.- Binding and related services
- 182.- Reproduction of recorded media
 - 1820.- Reproduction of recorded media

53.- POSTAL AND SHIPPING ACTIVITIES

- 531.- Postal activities subject to universal service obligation
 - 5310.- Postal activities subject to universal service obligation
- 532.- Other postal and shipping activities
 - 5320.- Other postal and shipping activities

58.- PUBLISHING

- 581.- Publishing of books, newspapers and other publishing activities
 - 5811.- Books publishing
 - 5812.- Directories and postal address guides publishing
 - 5813.- Newspapers publishing
 - 5814.- Magazines publishing
 - 5819.- Other publishing activities
 - 582.- Computer programs publishing
 - 5821.- Video games publishing
 - 5829.- Publishing of other computer programs
-



Cartón ondulado, todo encaja



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Fabricantes de Envases, Embalajes
y Transformados de Cartón



Naturalmente, papel

Asociación Española
de Fabricantes de
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- ASPACK, Spanish Association of Manufacturers of Packaging and Transformed Cardboard • <http://www.aspack.es>
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- FGEE, Spanish Association of Publishers Guilds • <http://federacioneditores.org>
- LA BOLSA DE PAPEL, Iberian Association of Manufacturers of Paper Bags • <http://labolsadepapel.com>
- MESA DE LA NUEVA RECUPERACIÓN, Platform for Recovering Paper and Carboard Companies in Spain • <http://www.aspapel.es>
- NEOBIS, Graphic Communication Association • <http://www.neobis.es>
- REPACAR, Spanish Recyclers Paper and Board Association • <http://www.repacar.org>