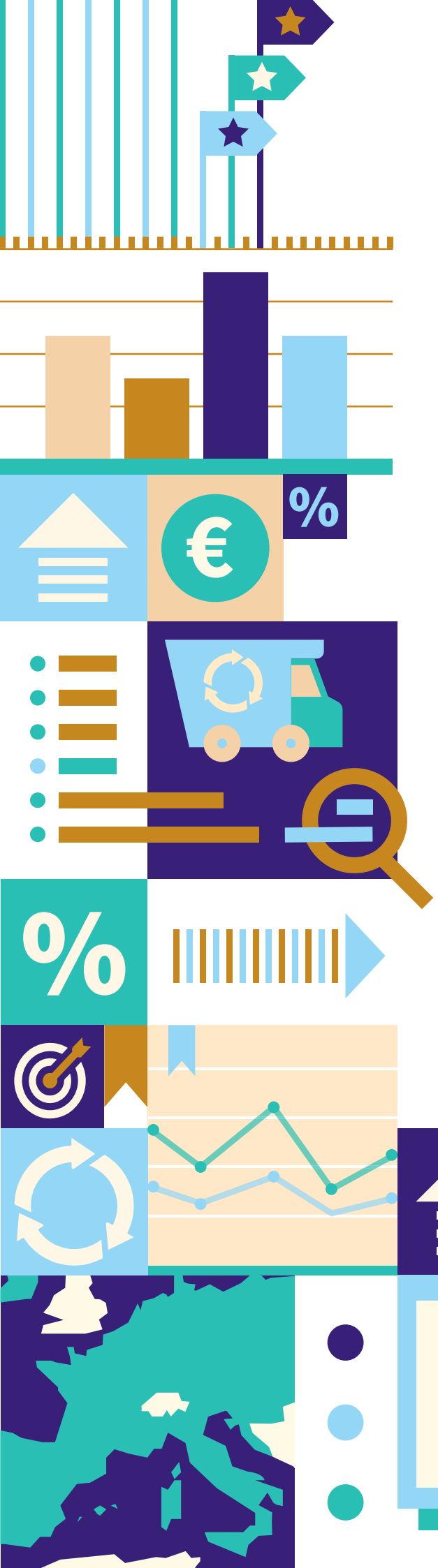


SCREENING THE EFFICIENCY OF PACKAGING WASTE IN EUROPE

Study conducted by

Università Bocconi
GREEN
Centre for Geography, Resources, Environment, Energy and Networks

Wuppertal Institut
für Klima, Umwelt, Energie GmbH

on behalf of

CONAI

May 2022

INTRODUCTION

The *"Shared Responsibility principle"* among operators was introduced for the first time in 1994 by European Parliament and Council Directive 94/62/EC on packaging and packaging waste. Its scope was initially restricted only to the packaging's end of life.

After 14 years, a new principle known as ***"Extended Producer Responsibility" (EPR)***, firstly introduced by Directive 2008/98/EC on waste. In 2018, through the amending Directive 2018/851, the EPR principle became the main measure used by Member States to ensure that packaging producers bear the financial and / or operational responsibility of packaging, from its design to its final disposal.

Finally, the Packaging and Packaging Waste Directive revision 2018/852/CE introduced a new obligation for EU Member States, which are now required to establish a specific EPR scheme for packaging by 2025, generally through organisations (financed by the producers and/or users of packaging themselves) that, on behalf of their members, take responsibility for it. These organizations are known as ***Producer Responsibility Organisations (PRO)***.

Following years of implementation, European countries have developed several different packaging waste management models, each one with its own specificities.

The aim of the research **"Screening the efficiency of packaging waste in Europe"**, promoted by **CONAI** and supported by **EXPRA** (Extended Producer Responsibility Alliance), is the definition and **assessment of the performances of activities run by PROs** within the different European EPR schemes, in light of economic efficiency and recycling effectiveness, with **a focus of CONAI positioning**.

The **first assessment study** related to such topic was commissioned by CONAI to **Bocconi University GREEN** (Centre for Geography, Resources, Environment, Energy and Networks) and **Wuppertal Institut for Climate, Environment, Energy**.

This research has been conducted by relying on the **available data collected via two ad hoc surveys and desk research**, until years **2018 /2019**. A period of time where some competing PROs were not yet set up as well related clearing house.

METHODOLOGY

The research has been conducted through **an econometric analysis** coupled with a regression model and an EPR schemes assessment. The EPR schemes assessment included the study of 25 Member States and 21 PROs, CONAI included, based on **two Key Performance Indicators** (KPI): **economic efficiency** and **recycling effectiveness**.

According to this approach, the research is developed as follows: the first section assesses the selected PROs **according to the key performance indicators** previously mentioned; the second section tests **the impact of EPR schemes on each country's performance** through a **regression model**, taking into account three variables, as to say the organization's scheme, the national waste management and the macroeconomic environment.

Furthermore, the research aims to **evaluate the adoption of FEE modulation mechanism** and its **coherence towards environmental targets** of packaging management.

TAXONOMY AND DEFINITION OBSERVED IN THE STUDY

Within the study, **countries' EPR schemes and the corresponding PROs** have been assessed according to clusters, in order to simplify their analysis. Countries' EPR schemes can be distinguished between Competitive and Non-Competitive, while the PROs can be either Profit and Not for Profit or Single or Multiple.

For example, France's PRO CITEO is a **Single**, **Non for Profit** organisation in charge of more than **90% of a Non Competitive EPR scheme share**. On the other hand, Spain's PROs ECOEMBES and ECOVIDRIO are **Multiple, Non for Profit** and active in a **Non Competitive EPR scheme**. Finally, Germany's PRO Der Grune Punkt (DGP) is a Multiple **Profit** active in a **Competitive EPR scheme**.

TRANSPARENCY AND OPEN DATA

In Europe there is a total of 44 PROs which operate in different packaging EPR schemes. In 2021, they were invited to take part in **a survey to assess transparency and open data**, but only 28 PROs decided to provide their feedback.

TABLE 1: SOURCES AVAILABILITY DETAILS

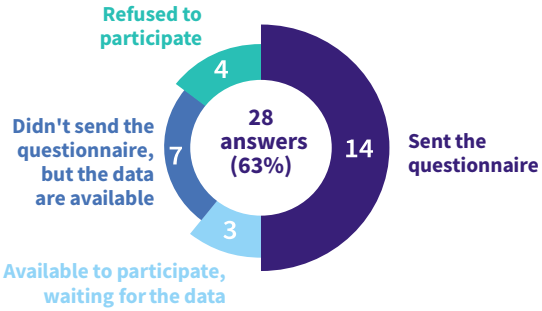
COUNTRY	PROs	PROFIT / NON PROFIT	OPERATIONAL RESULTS	FEE	FINANCIAL REPORT	DETAILED COST-REVENUES
Austria	ARAPLUS	NON PROFIT	✓	✓	✓	✗
Belgium	Fost-PLUS	NON PROFIT	✓	✓	✓	✗
Belgium	VALIPAC	NON PROFIT	✓	✓	✓	✗
Bosnia and Herzegovina	EKOPAK	NON PROFIT	✓	✓	✗	✗
Bulgaria	ECOPACK	NON PROFIT	✓	✓	◪	✗
Croatia	EKO-OZRA*	NON PROFIT	◪	✓	✓	✗
Cyprus	GREEN DOT	NON PROFIT	✓	✓	✗	✗
Czech Republic	EKO	NON PROFIT	✓	✓	✓	✓
Estonia	ETO	NON PROFIT	✓	✓	✓	✓
Finland	RINKI	NON PROFIT	✓	✓	✓	✗
France	CITEO	NON PROFIT	✓	✓	✓	✓
France	ADELPHE	NON PROFIT	✓	✗	✓	✗
Germany	Der Grüne Punkt	PROFIT	✗	✓	◪	✗
Greece	HERRCO	NON PROFIT	✓	✓	✓	◪
Hungary	OKO*	NON PROFIT	✓	✓	◪	✗
Iceland	Icelandic Recycling Fund	NON PROFIT	✗	✓	✗	✗
Ireland	REPAK LTD	NON PROFIT	◪	✓	✗	✗
Italy	CONAI	NON PROFIT	✓	✓	✓	✓
Latvia	JSC LATVIJAS ZAĻAIS PUNKTS	NON PROFIT	✗	✓	✓	✗
Lithuania	VŠĮ ŽALIASIS TAŠKAS	NON PROFIT	✓	✓	✓	✗
Luxemburg	VALORLUX	NON PROFIT	✓	✓	◪	◪
Macedonia	PAKOMAK	NON PROFIT	✓	✓	✓	◪
Malta	GREENPAK	NON PROFIT	✓	✓	✗	✗
Netherland	AFVALFONDS VERPAKKINGEN	NON PROFIT	✓	✓	◪	✗
Norway	GP	NON PROFIT	✓	✓	✓	✗
Poland	REKOPOL	PROFIT	✓	✓	✓	✗
Portugal	PONTO VERDE Portugal	NON PROFIT	✓	✓	◪	✗
Romania	ECO-ROM	NON PROFIT	✓	✓	✓	◪
Serbia	SEKOPAK	NON PROFIT	✗	✓	✓	✗
Slovakia	ENVI-PAK	NON PROFIT	✓	✗	✓	✗
Slovenia	SLOPAK	NON PROFIT	✓	✓	✓	◪
Spain	ECOVIDRIO	NON PROFIT	✓	✓	✓	✗
Spain	ECOEMBES	NON PROFIT	✓	✓	✓	✗
Sweden	FTI	NON PROFIT	✓	✓	✓	✗
UK	VALPAK	PROFIT	✓	✓	✓	◪
Germany	BellandVision GmbH	PROFIT	✗	✗	✗	✗
Germany	INTERSEROH Dienstleistungs GmbH	PROFIT	✗	✗	✗	✗
Germany	Landbell AG für Rückhol-Systeme	PROFIT	✗	✗	✗	✗
Germany	NOVENTIZ Dual GmbH	PROFIT	✗	✗	✗	✗
Germany	PreZero Dual GmbH	PROFIT	✗	✗	✗	✗
Germany	Reclay Systems GmbH	PROFIT	✗	✗	✗	✗
Germany	Veolia Umweltservice Dual GmbH	PROFIT	✗	✗	✗	✗
Germany	Zentek GmbH & Co. KG	PROFIT	✗	✗	✗	✗
Turkey	ÇEVKO Environmental Protection and Packaging Waste Recovery and Recycling Foundation	NON PROFIT	✗	✗	✗	✗

LEGEND: ✗ no ◪ partial ✓ yes

* Not yet PROs, but "Tax Compliant Services Company" to support producers.

Among them, **71% declared they allow open data of operational results, 51% publish financial statements and 20% provide cost and revenue reporting details**.

GRAPH 1 : PRO FEEDBACK RATE OF SURVEY 2021



Although several PROs declared their commitment to share openly their data, it is relevant that other PROs decided instead to not share operational and cost/revenue results, **arguing the need to maintain confidentiality and avoid harming competition**. Interestingly, PROs which are members of **EXPRA** seem to be the ones which share the most information (16 on 28 survey feedback). The key common charachteristic is that they are owned by obliged industry and work on a **not-for-profit** basis.

In addition, the research highlighted **difficulties** in finding documents containing the mentioned data and, in some cases, the information was available only in the country's language. Moreover, from the literature emerged a **non-harmonized** reporting system, often **not in line** with **law provisions** (Decision 2005/270/EC). **CONAI** results **as one of the few PROs which makes available detailed information** and public reports on its activities.

More transparency and availability of data from the whole sector would strongly improve the economic assessment of the EPR schemes, that could in turn advantage them all thanks to information sharing and learning.

PRO ASSESSMENT

ECONOMIC EFFICIENCY

(normalised cost indicator)

AND RECYCLING EFFECTIVENESS

(normalised recycling rate indicator)

The econometric analysis processed information on system costs (FEE's per tonnes of packaging released for consumption vs. tonnes of packaging recycled) and **recycling rates** (amount of material recycled vs. released for consumption) in relation to the different PROs' characteristics.

Within this framework, **two key performance indicators** (KPI) have been applied using a value scale from **0 to 1**: an **Economic Efficiency indicator** (normalised cost indicator) **and a Recycling Effectiveness indicator** (normalised recycling rate indicator).

All assessed **PRO**s are showed in the following **4-quadrant chart**, which aims to outline the relationship between **Efficiency** and **Effectiveness**.

The first quadrant chart (top left) shows PROs with high economic efficiency value (**less expensive**) and low recycling effectiveness (**less recycling rate**).

The second quadrant chart (bottom left) shows PROs with low economic efficiency value (**more expensive**) and low recycling effectiveness (**less recycling rate**).

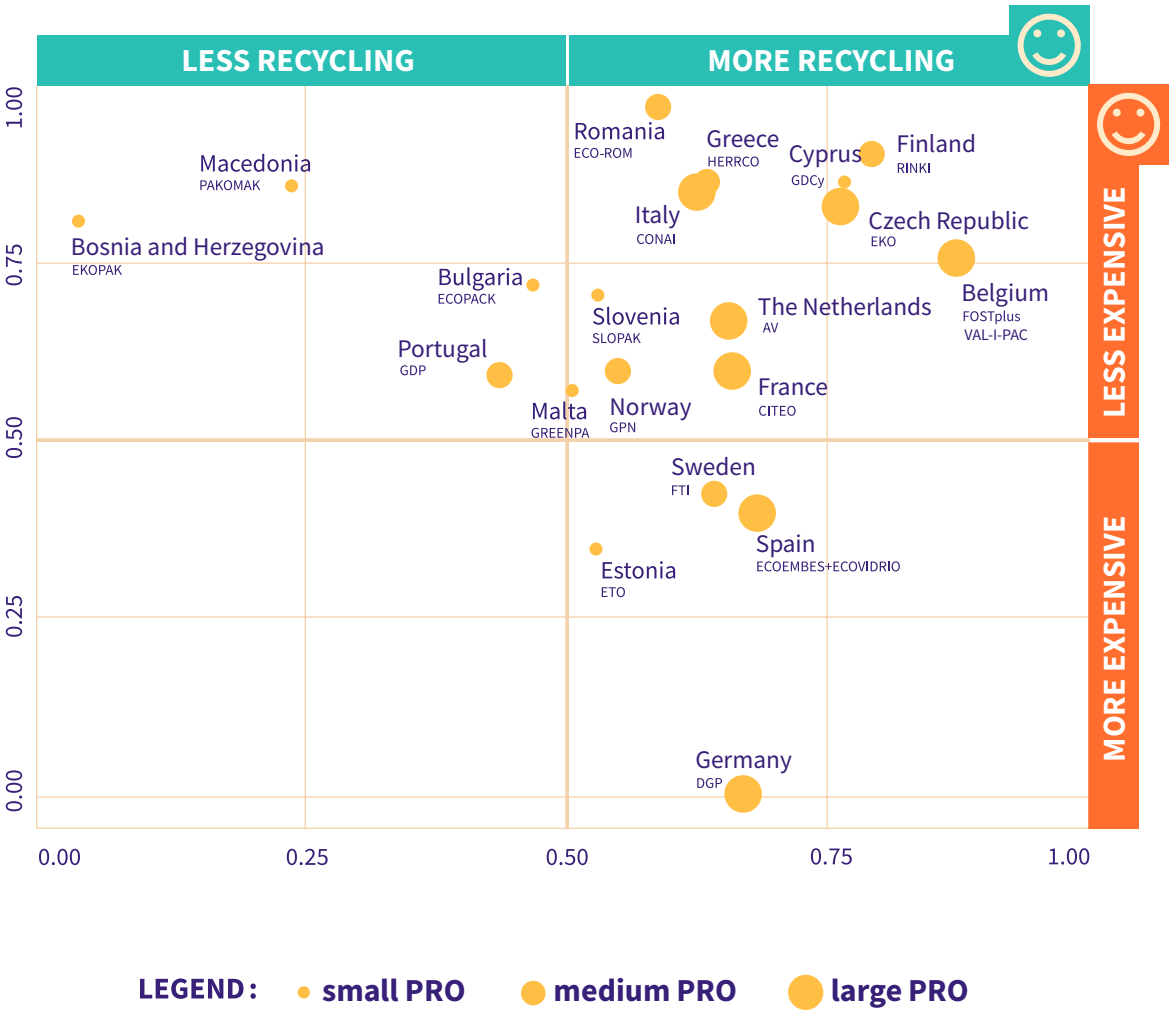
The third quadrant chart (bottom right) shows PROs with low economic efficiency value (more expensive) but high recycling effectiveness (**more recycling rate**).

The fourth quadrant chart (top right) shows PROs with high economic efficiency value (**less expensive**) and high recycling effectiveness (**more recycling rate**).

The most expensive PROs tend to have an economic efficiency value closer to "**0**", while the PROs that recycle the most tend to have a recycling effectiveness value closer to "**1**". Moreover, in the fourth quadrant of **Graph 2** is possible to observe the PROs that achieve more recycling results at a lower cost, which notably include CONAI.

A first general consideration to be drawn from this analysis is that the size of the PROs, meaning the amount of inhabitants they manage to cover, is **independent** from their efficiency and effectiveness.

GRAPH 2 : ALL PACKAGING MATERIAL AVERAGE OF EU PROS PERFORMANCES FOR ECONOMIC EFFICIENCY AND RECYCLING EFFECTIVENESS INDICATORS

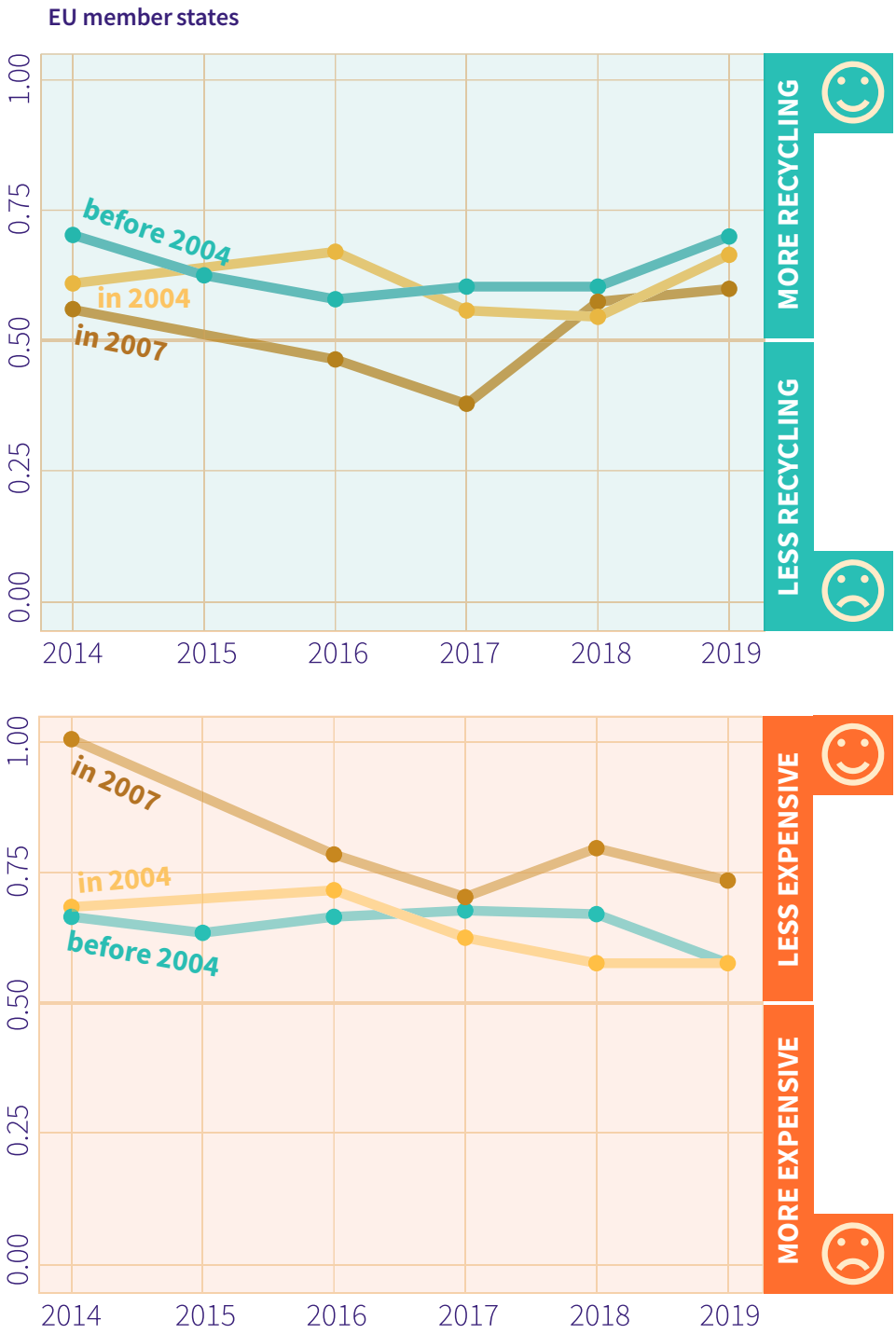


LEGEND : **small PRO** **medium PRO** **large PRO**

A **second cluster** assessment in terms of **economic efficiency and recycling effectiveness** takes into analysis the PROs of countries bearing in mind the **differences** between the more **recently established** systems and the consolidated ones (EU entry before 2004, in 2004, and after 2007).

The results highlight how PROs operating in **newer Member States** have a **higher** economic efficiency (**lower costs**) but, on average, also have a **lower** recycling effectiveness (**lower recycling rate**) compared to consolidated systems.

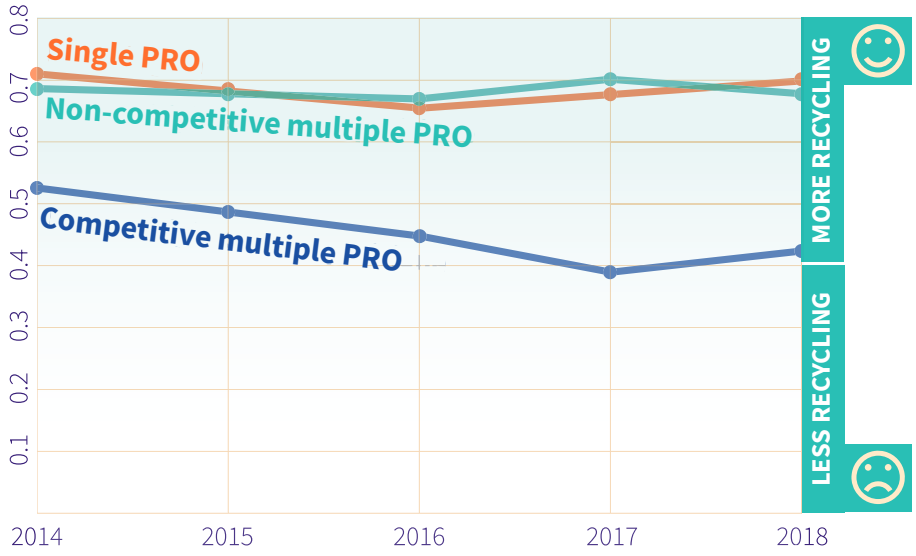
GRAPH 3 : PRO PERFORMANCES (ECONOMIC EFFICIENCY AND RECYCLING EFFECTIVENESS) FROM 2014 TO 2019 OF COUNTRIES ACCORDING EU ENTRY YEAR (PRE 2004; 2004; POST 2007)



On another note, when considering the characteristics of each PRO and creating clusters between Single and Multiple ones, and between the ones which are active in a competitive and non-competitive EPR scheme, the two KPI highlight that:

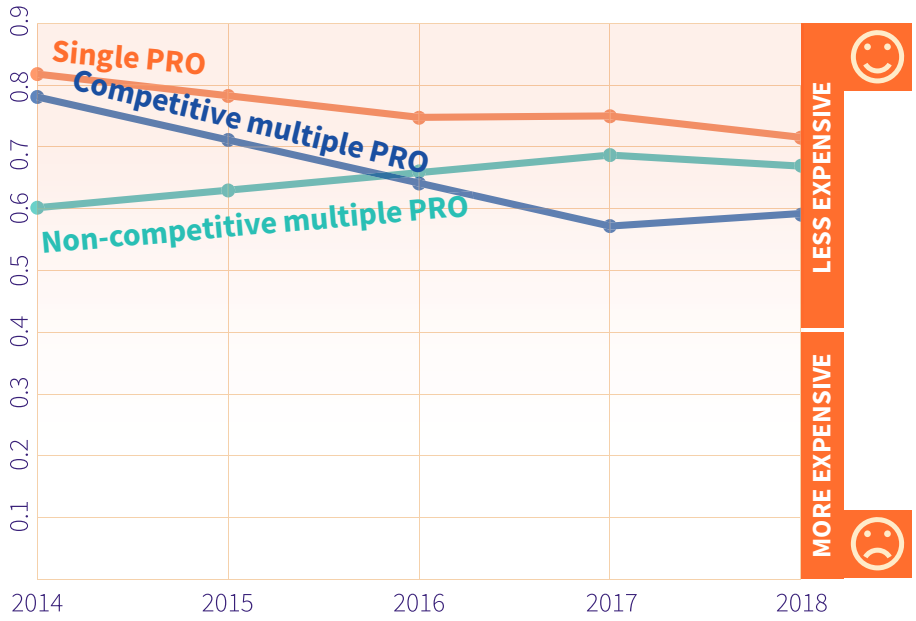
1) **Single PROs** active in **Non-competitive EPR Schemes** are **more effective** over time (time frame 2014 - 2018), and therefore have **higher recycling rates**;

GRAPH 4 : ASSESSMENT RECYCLING EFFECTIVNESS AVERAGE OF PRO SINGLE/MULTIPLE ACTIVE IN A EPR SCHEME COMPETITIVE OR NON- COMPETITIVE



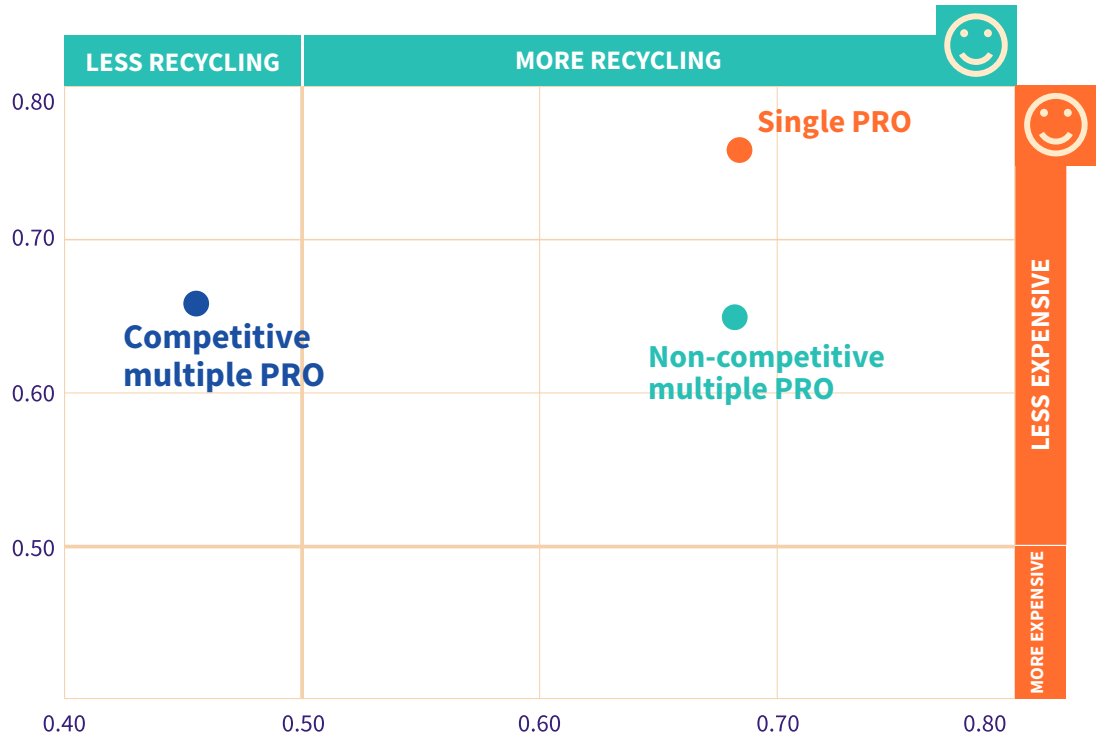
2) **Single PROs** active in **Non-competitive EPR Schemes** are **more efficient over time** (time frame 2014 - 2018), and therefore **less expensive**.

GRAPH 5 : ASSESSMENT ECONOMIC EFFICIENCY AVERAGE OF PRO SINGLE/MULTIPLE ACTIVE IN A EPR SCHEME COMPETITIVE OR NON- COMPETITIVE



In conclusion, the PROs' assessment through the two KPIs of recycling effectiveness and economic efficiency highlights how Single PROs active in a Non-competitive EPR schemes are generally more efficient and effective.

GRAPH 6 : ASSESSMENT OF ECONOMIC EFFICIENCY AND RECYCLING EFFECTIVENESS AVERAGE OF PRO SINGLE/MULTIPLE ACTIVE IN A EPR SCHEME COMPETITIVE OR NON- COMPETITIVE

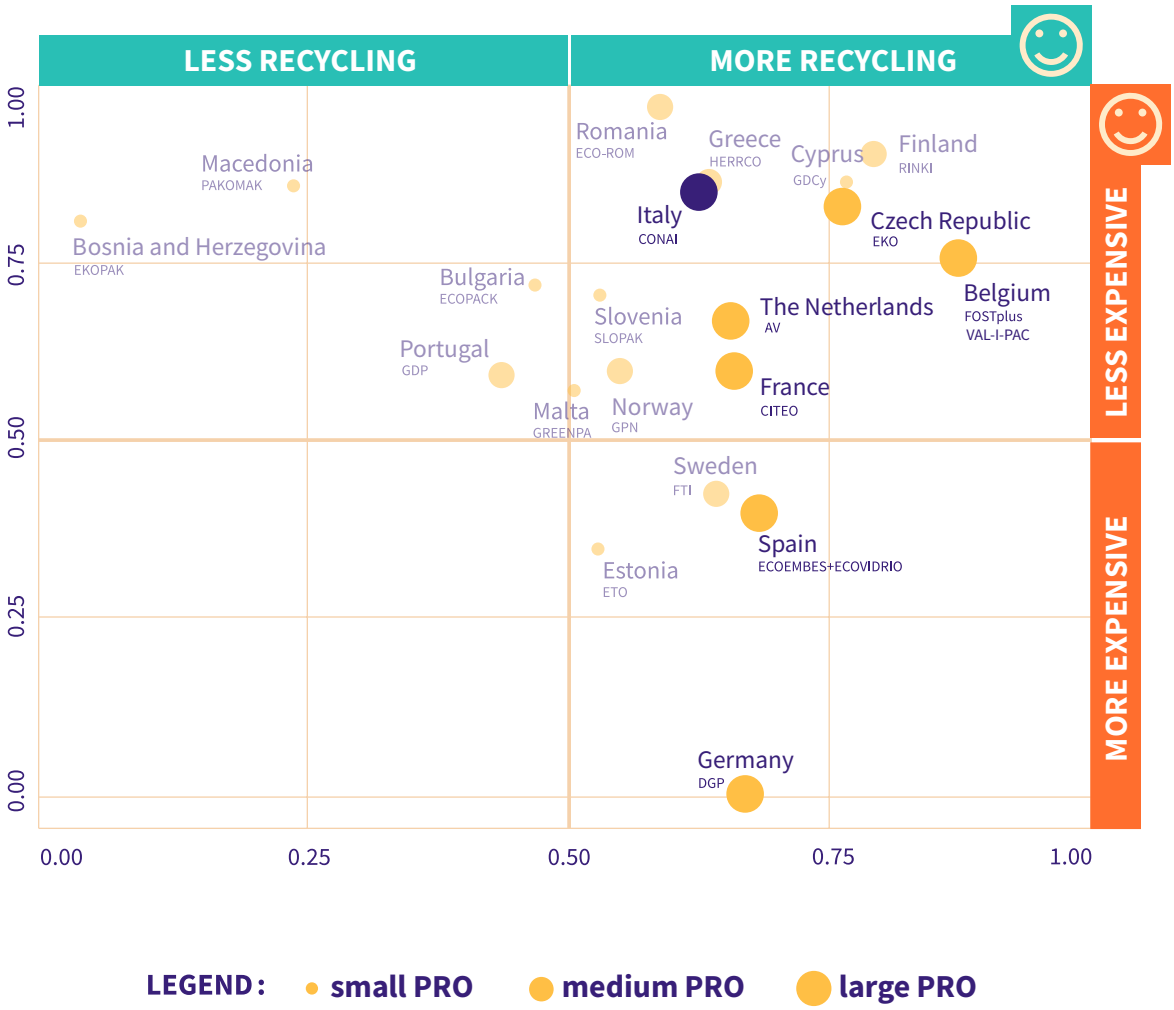


Another level of analysis concerns the waste streams of the PROs analysed, distinguishing between those which handle household, industrial and commercial packaging waste from those which only handle the household stream. Within this cluster, it was observed that **PROs handling only the household stream** have on average **higher unit costs** than PROs who also handle commercial and industrial packaging waste.

WHERE DOES CONAI STAND?

When compared with PROs of the most populated European countries (over 10 million inhabitant served), CONAI results **more efficient**, being less expensive than PROs in Spain, Czech Republic, the Netherlands, Belgium, France and Germany.

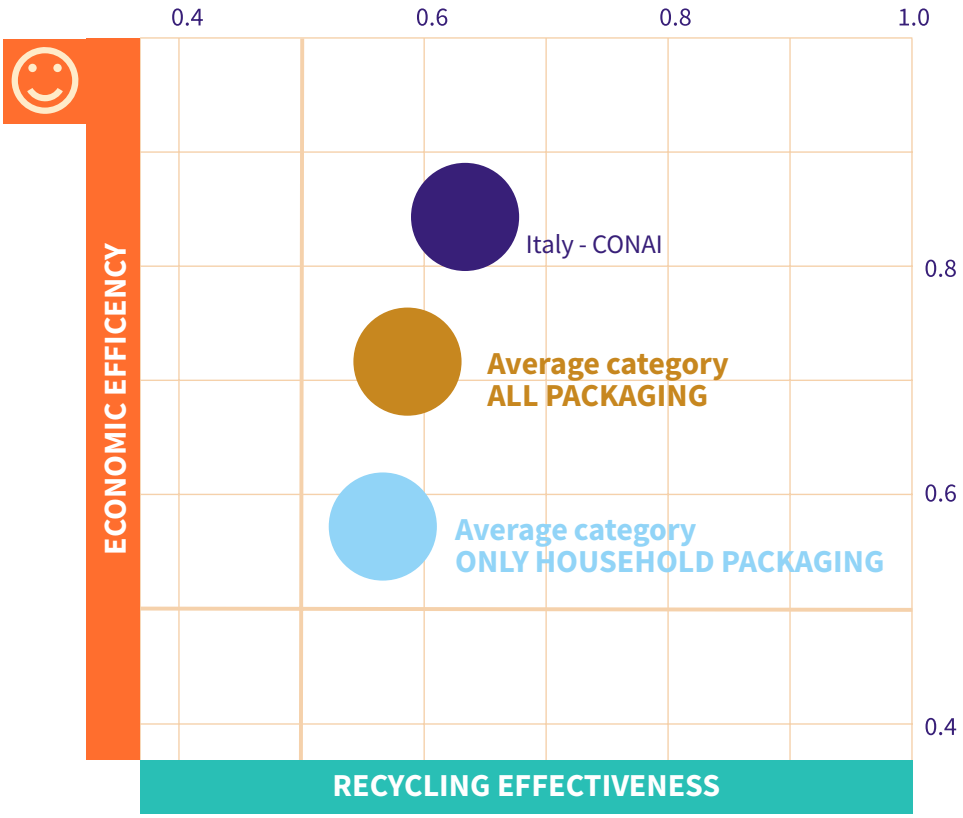
GRAPH 7 : MOST POPULOUS EU PROS PERFORMANCE AVERAGE OF ALL PACKAGING MATERIALS (ECONOMIC EFFICIENCY AND RECYCLING EFFECTIVENESS INDICATOR)



LEGEND : small PRO · medium PRO · large PRO

In the context of PROs handling household, industrial and commercial packaging waste, CONAI results more efficient compared to the average European PRO operating in that system.

GRAPH 8 : PERFORMANCES (ECONOMIC EFFICIENCY AND RECYCLING EFFECTIVENESS) ON HOUSEHOLD PACKAGING RESPONSIBILITY VS HOUSEHOLD AND COMMERCIAL & INDUSTRIAL

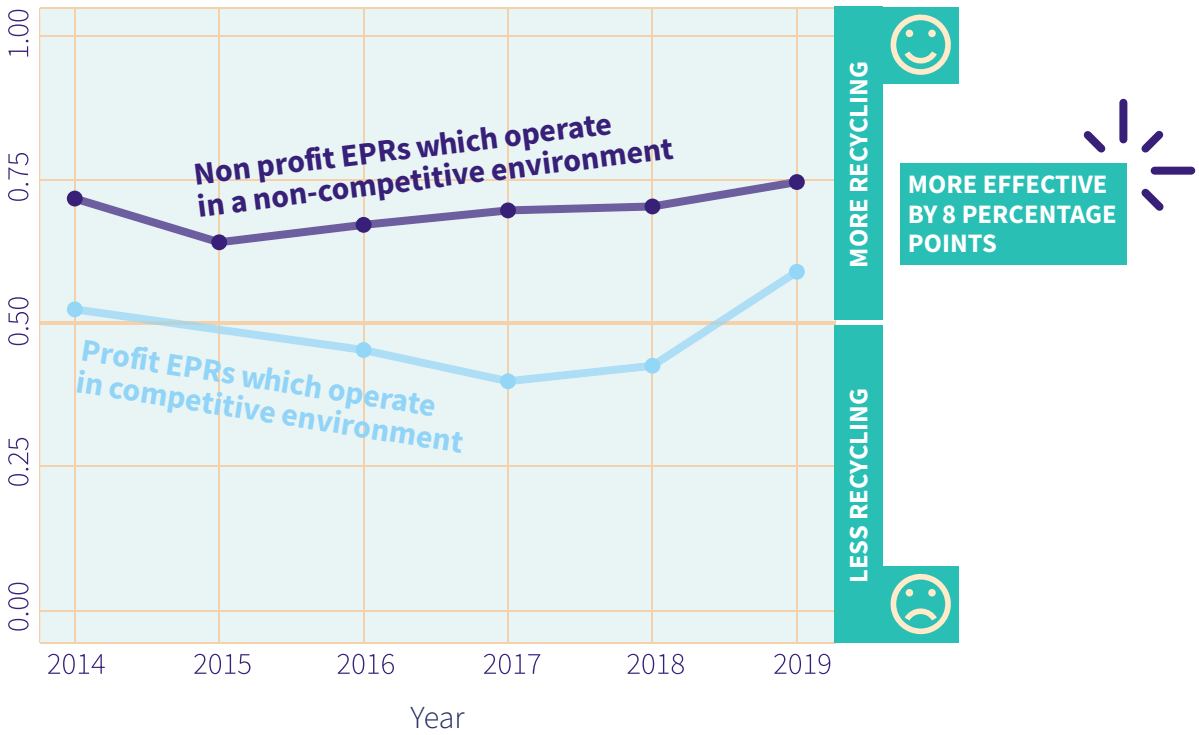


COUNTRIES' ASSESSMENT: ECONOMIC EFFICIENCY AND RECYCLING EFFECTIVENESS IN THE REGRESSION MODEL

In order to **identify the efficiency and effectiveness** – through **country-related** variables such as national waste management, socio-demographic environment and other institutional factors – **an econometric analysis was carried out at Country/EPR** scheme level with a **regression model**.

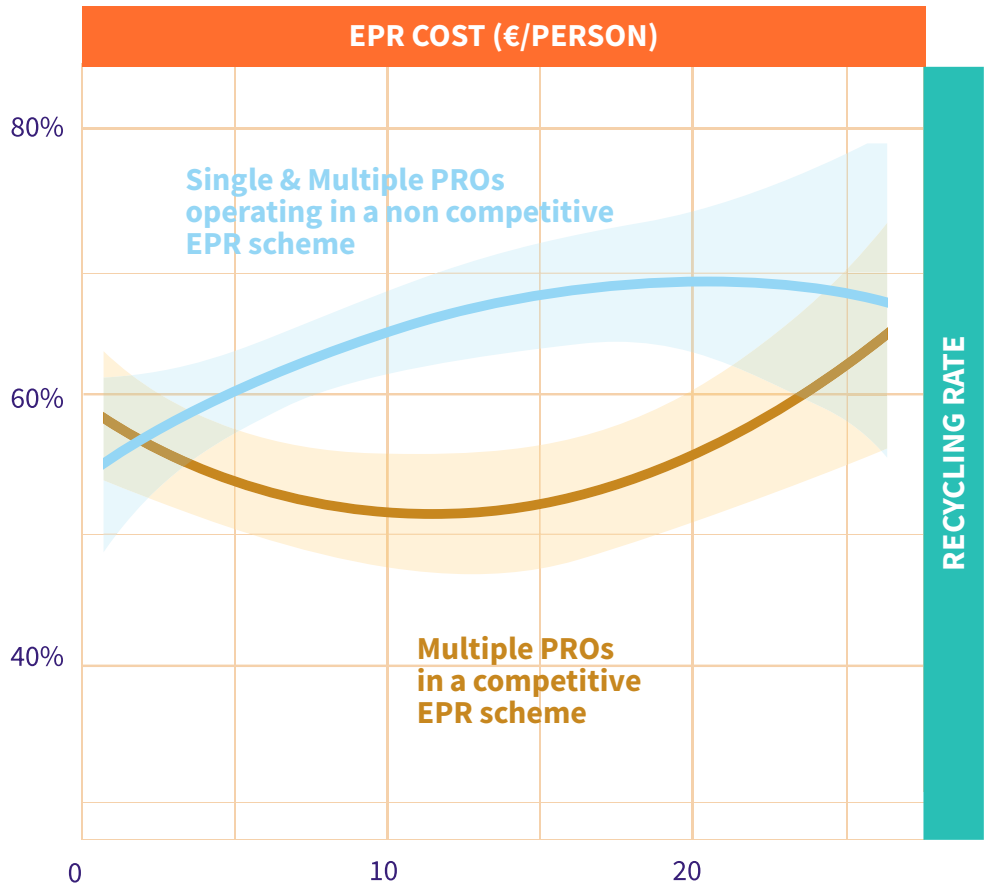
By grouping the analysed PROs according to whether they are part of an EPR Scheme of a **Profit** nature in a **Competitive** environment, or of a **Non-profit** nature in a Non-competitive environment, in relation to **recycling efficiency** performance, it can be seen that the latter achieve, on average and ceteris paribus, a **recycling rate of total packaging that is 8 percentage points higher** than systems operating in Competitive environments.

GRAPH 9 : RECYCLING EFFECTIVENESS BETWEEN NON PROFIT EPR SCHEMES IN A NON-COMPETITIVE ENVIRONMENT AND PROFIT EPR SCHEMES IN A COMPETITIVE ENVIRONMENT FROM 2014 TO 2019



Analysing the performance with respect to the cost of the EPR regime and its recycling capacity, it was observed that when **Single and Multiple PROs operate in a Non-competitive EPR scheme, they result to be more efficient and effective than Multiple PROs operating in Competitive EPR schemes**.

GRAPH 10 : PRO'S PERFORMANCES IN NON-COMPETITIVE AND COMPETITIVE EPR SCHEMES IN RESPECT TO THE EPR COST AND RECYCLING RATE



OPERATIONAL RESPONSIBILITY OF COLLECTION

In the different European Countries, the operational responsibility for collection may be performed by:

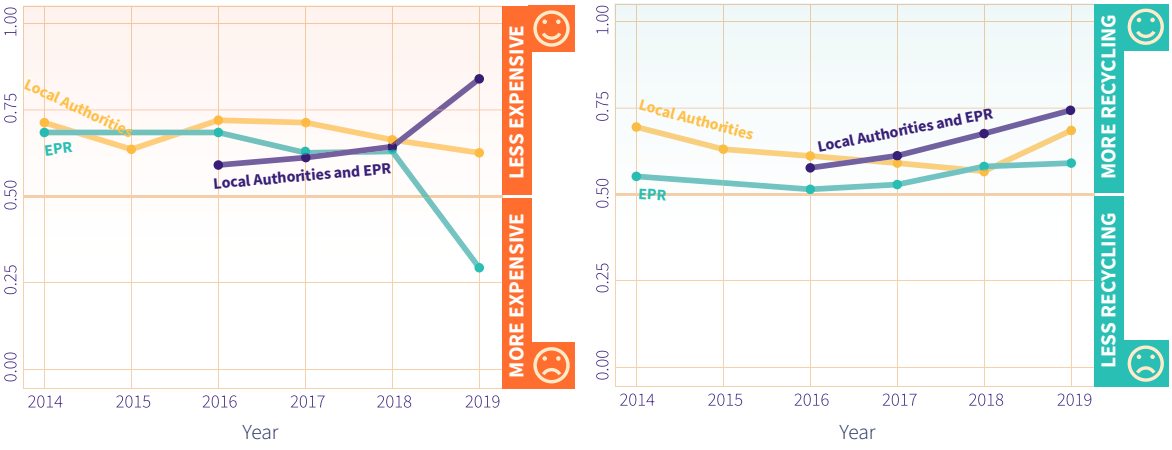
- **Local Authorities**, like in Italy, were local authorities manage with the separate collection of household domestic waste;

- **PROs**, like in Austria, Poland and Sweden, where the organisations manage the collection of packaging waste;

- **Dual system**, like in Bulgaria, Greece and Germany, where both channels operate within the same system.

EPR Schemes in which the operational responsibility for the collection of household packaging also falls on the Local Authorities (L.A.) are on average more efficient and therefore less expensive in respect to systems which rely only on the PRO.

GRAPH 11 : ECONOMIC EFFICIENCY AND RECYCLING EFFECTIVENESS PERFORMANCE ON THE OPERATIONAL RESPONSIBILITY OF THE COLLECTION FROM 2014 TO 2019



EPR SCHEMES FINANCING: ECO-MODULATION'S CRITERIA

Through a second ad-hoc survey, just the 27% of the mapped PROs replied to the questionnaire on the **factors influencing** the packaging material **fees** managed: **the modulations of the EPR contributions/tariffs** are based mainly on **qualitative and operational** criteria, rather than on the recyclability of materials or the share of recycled materials used in the production (the latter are adopted in 20%-30% of cases).

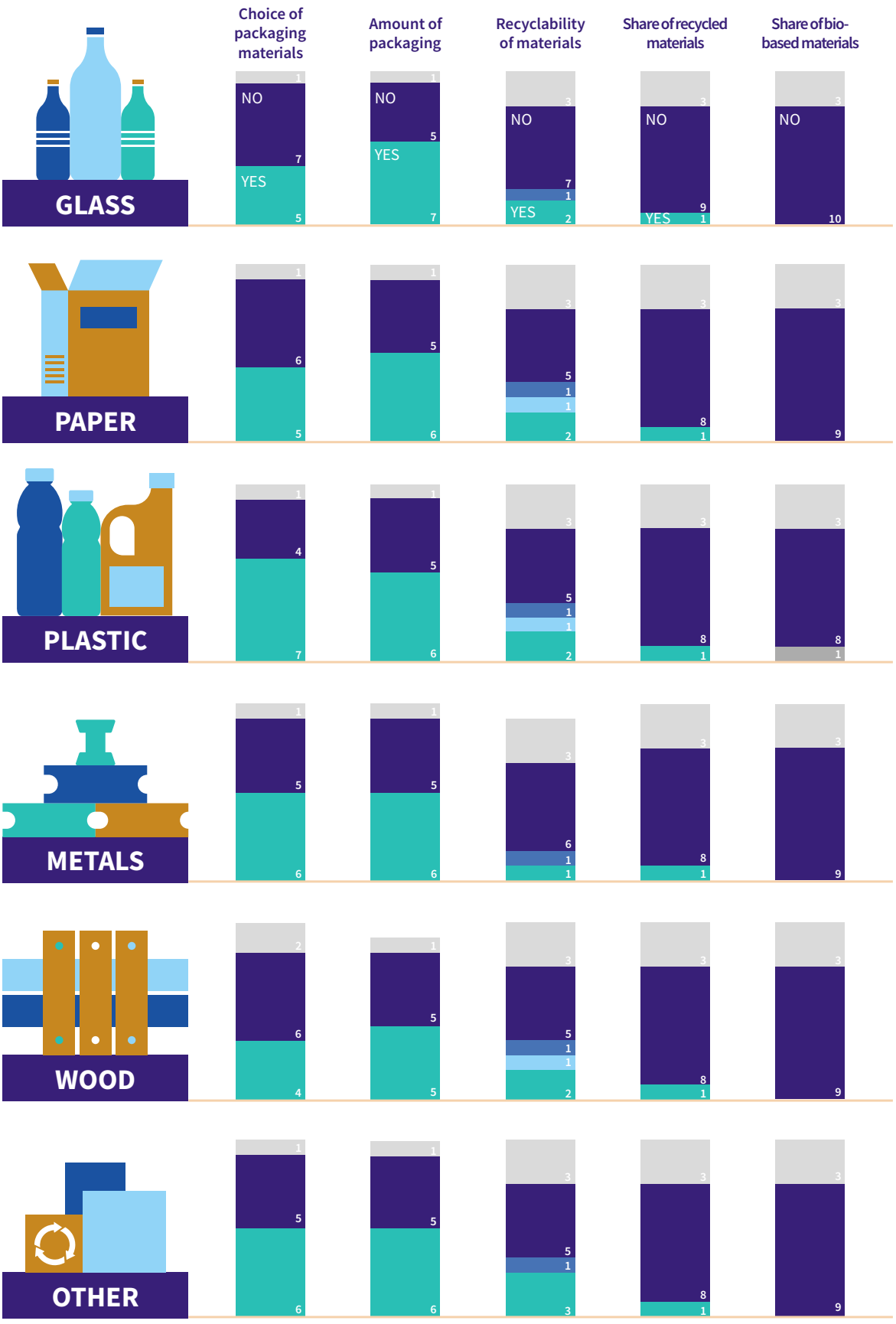
On the contrary, **CONAI** is one of the few PROs at EU level that builds its eco-modulations not only on material **cost** criteria, but also on its **recyclability**. It has done so from **2018** for **plastic** packaging and from **2019** for **paper** packaging.

As of 2021, other countries followed CONAI's example by building their eco-modulation on recyclability, namely the **Netherlands, France, Belgium and Germany**.

On the other hand, some other systems do not intend to adopt similar practices, but only modulate their fees in such a way as to cover the operating costs; in some cases, the reasons behind this approach regard legal consequences concerns.

TABLE 2 : FACTORS AFFECTING PACKAGING MATERIAL FEES (PART 1)

Do the following factors influence the fees for packaging material put on the market?

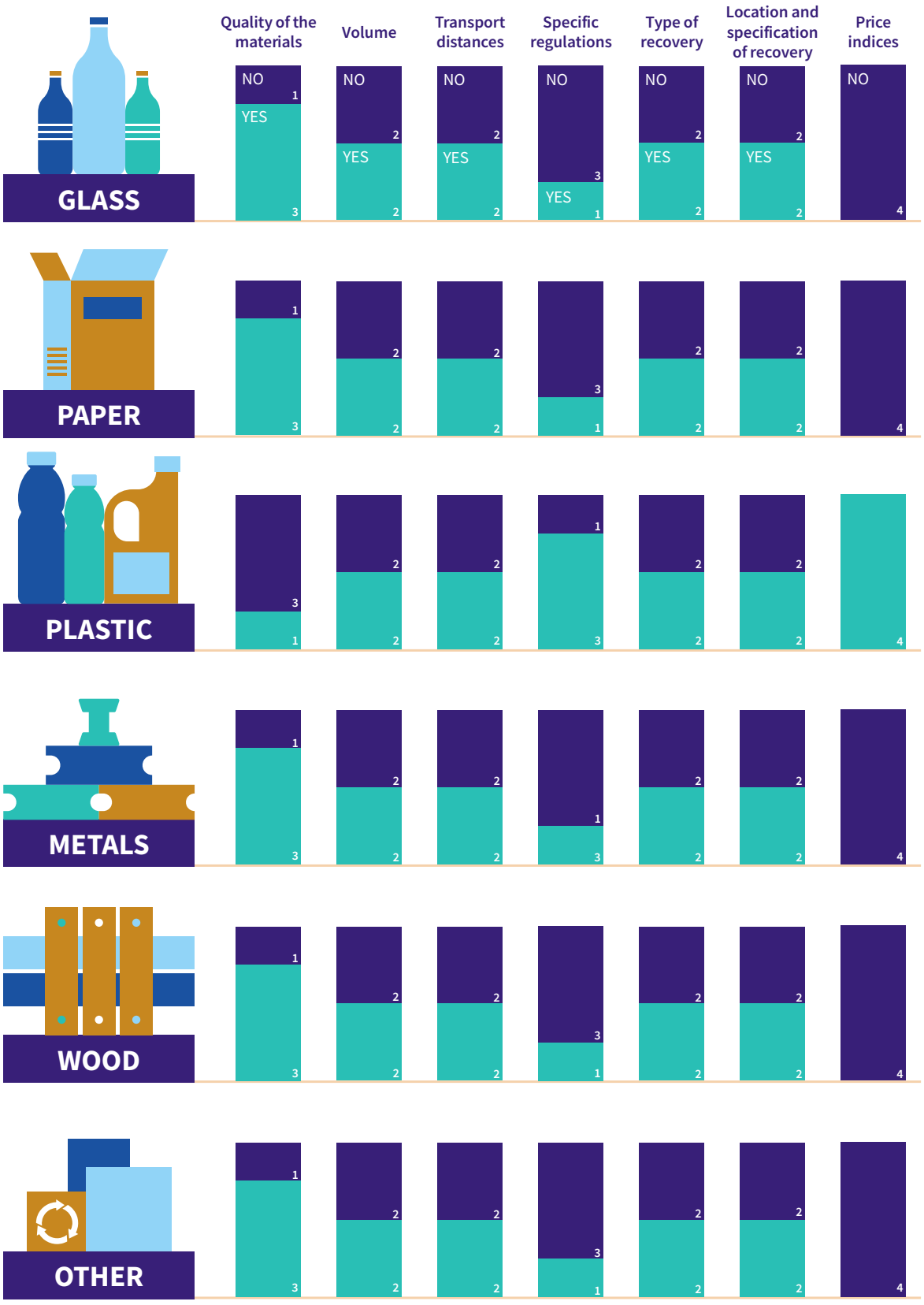


LEGEND: yes · partly · not yet · no · not specified

Reference numbers to registered answers.

According to stakeholders' opinions expressed in a survey, additional factors that may affect the fees for packaging materials are linked to the quality of the material, which is particularly relevant in determining the price, with an advantage in terms of circularity.

TABLE 3 : FACTORS AFFECTING PACKAGING MATERIAL FEES (PART 2)



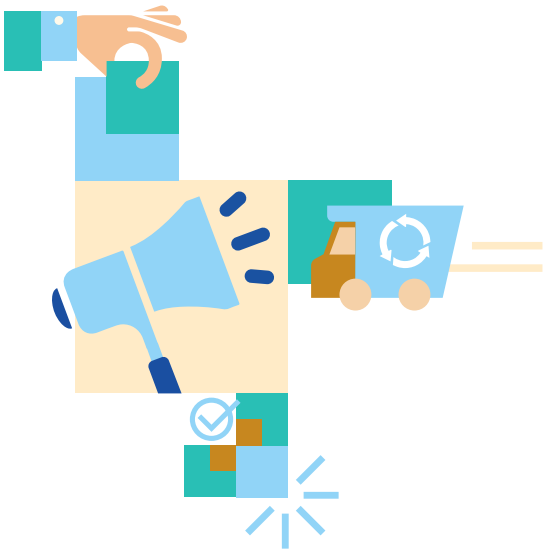
CONCLUSIONS OF THE EUROPEAN STUDY

Through this quantitative and qualitative analysis conducted at European level, three fundamental conclusions emerge:

1) PROs' **recycling effectiveness is not necessarily** associated with **higher** EPR systems' **cost**.

2) **Single** PROs in a **Non-competitive EPR scheme** have respectively **higher recycling rates and lower costs**.

3) In a **Competitive EPR scheme** with **Multiple PROs**, the presence of **central coordination** could be a solution to guarantee competition and homogeneity in a context with different PROs in the same market.



In particular, Non-competitive EPR Schemes characterized by Single PROs can benefit from the presence of a single body that deals with the responsibilities on behalf of the producers of goods, ensuring the collection, transport and treatment of end-of-life packaging waste with the following advantages:

a) more homogeneous territorial's distribution of collections;

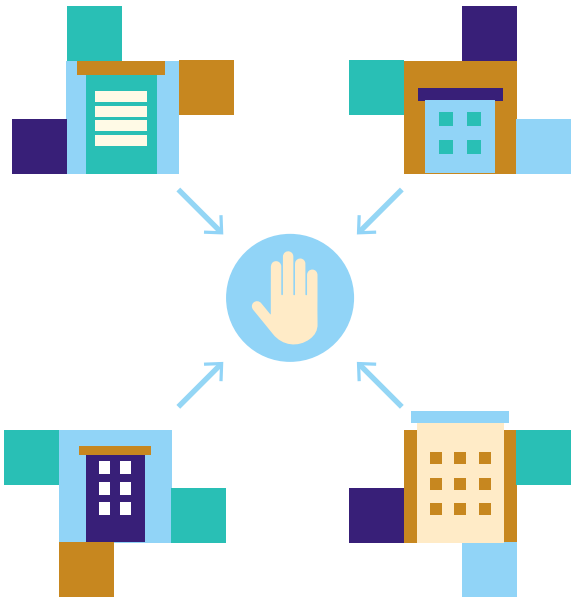
b) reduction of administrative burdens and costs of control and monitoring;

c) more effective communication between producers, authorities and all the actors in the supply chain;

d) logistic and process cost's optimization through economies of scale;

e) the avoidance of opportunistic and off-market behaviour (the so-called "Cherry-picking").

It is important to highlight how a certain type of entry barriers, typical of Non-competitive systems, are carefully evaluated and how an effective monitoring is useful and appropriate after the launch of the system in order to minimize the possibility of opportunistic behaviour.



Università Bocconi
GREEN
Centre for Geography, Resources, Environment, Energy and Networks

GREEN – Research center of Bocconi University

The Centre for Research in Geography, Resources, Environment, Energy and Networks (GREEN) was established as a result of the merger between CERTeT and IEFEC. Bocconi GREEN aims to conduct and promote research projects at the intersection of the spatial of socio-economic phenomena and of climate change, transportation, environmental policy and energy markets.

Wuppertal Institut
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Wuppertal institute for Climate, Environment, Energy

The Wuppertal Institute is as a leading international think tank for impact and application-oriented sustainability research. The focus of its work is the design of transformation processes towards a climate-friendly and resource-light world.

CONAI

CONAI (Consorzio Nazionale Imballaggi)

CONAI is a private non-profit consortium in Italy, the measure by which packaging producers and users ensure that they achieve the recycling and recovery target of packaging waste provided for by law. For more than 20 years, CONAI has served as an effective system for the recovery, recycling and valorisation of steel, aluminium, paper, wood, plastic, bioplastic and glass packaging materials.

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