BARRIERS TO CIRCULAR ECONOMY IN EUROPEAN SMES

JOSE GARCÍA-QUEVEDO (UNIVERSITY OF BARCELONA, CHAIR OF ENERGY SUSTAINABILITY, IEB)

ELISENDA JOVÉ-LLOPIS (UNIVERSITY OF BARCELONA, CHAIR OF ENERGY SUSTAINABILITY, IEB)

ESTER MARTÍNEZ-ROS (CARLOS III UNIVERSITY OF MADRID (UC3M))

42ND IAEE INTERNATIONAL CONFERENCE
MAY-JUNE 2019

UNIVERSITAT DE BARCELONA

CHAIR OF ENERGY SUSTAINABILITY
IEB Institut d'Economia de Barcelona · UNIVERSITAT DE BARCELONA · Funseam

recerCaixa

*The research leading to these results has received funding from RecerCaixa.

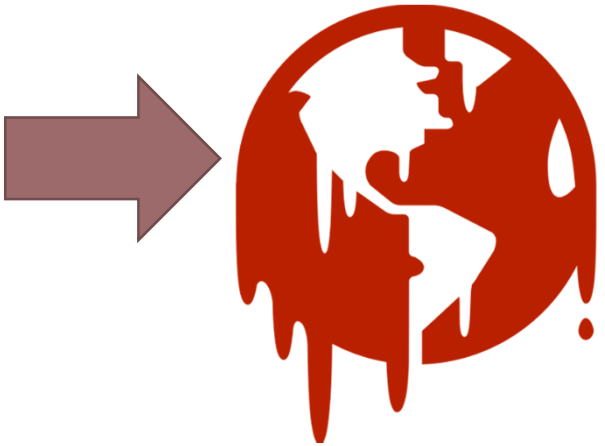
MOTIVATION

Radical transformation

- Rise of world population
  - 3 billion new middle class consumers would enter the global economy (2030)

- Consumption natural resources faster than refill

- Greenhouse emissions keep increasing



Unsustainable

Paradigm shift

Circular Economy

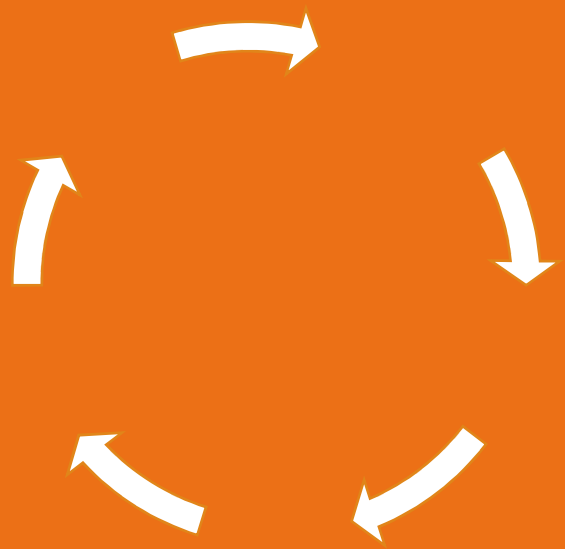
LINEAR ECONOMY

TAKE

MAKE

DISPOSE

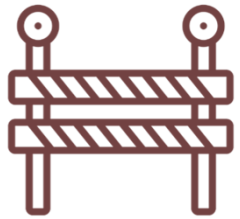
CIRCULAR ECONOMY



"Economic system where products and services are traded in closed loops or cycles"

AIM OF THE STUDY

- What stops European firms from getting involved in CE activities?



Originality of the paper:

- Scarce evidence in the European context
- Earlier studies based on case study methodologies

- Explore a large sample of SMEs as they are the economic backbone of the European Union (10,098 firms)
- Employ a rigorous econometric methodology
- Engagement but also the intensity of doing CE and the type of CE activities
- Distinguish between two main barriers to CE: deterring and revealing barriers

LITERATURE

✓Approaches from traditional **Innovation literature** (Blanchard et al. 2013; Hyytinen and Toivanen, 2005; Mohnen et al. 2008; Mohnen and Röller, 2005; Segarra-Blasco et al. 2008; Marin et al. 2014; Ghisetti et al. 2015)

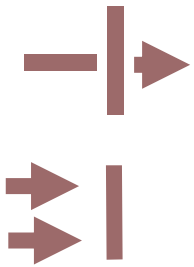
1) the factors affecting perceptions of the importance of barriers
2) the impact of obstacles on the propensity to innovate

✓Followed the taxonomy of factors hampering innovation activities proposed in the OECD Oslo Manual (OECD, 2005): cost, knowledge, market and institutional factors

✓D'Este et al. (2012) underline the necessity to distinguish the deterring from hampering barriers.

Revealing: reflect the degree of difficulty of CE activities and the learning experience of such processes

Deterring: those that are considered to be insurmountable



RESEARCH QUESTIONS

✓More recently, some analyses have focused specifically on the barriers affecting Environmental Innovations (Marin et al. 2014; Ghisetti et al. 2016)

✓CE context are still missing: theoretical framework or case studies (Govindan and Hasanagic (2018); Rizos et al. (2015, 2016), Ormazabal et al. (2018))

✓Most SMEs in the case studies mention as a main barriers:

- ❖ lack of support from their supply and demand network
- ❖ lack of capital" as barriers

1. *Which deterring or revealed barriers do SMEs perceive when undertaking CE activities?*
2. *Does the number of CE activities matter in how SMEs perceive barriers?*
3. *Does the type of CE activities matter in how SMEs perceive barriers?*

DATABASE

The analysis is based on firm level data from the **Flash Eurobarometer Survey 441** on "European SMEs and the Circular Economy"

Advantages: extensive survey specific to exploring SMEs' activities in relation to the CE as well as its main barriers

Drawback: cross sectional database

The final sample includes 10,098 European SMEs firms:

- ✓ Exclude from the analysis those firms that do not undertake CE activities or do not plan to do so and do not experience any barrier to CE (4%)
- ✓ Discard observations with missing values

EU28

2016

Manufacturing
Retail
Services
Mining, energy, water, construction

CE & KEY QUESTION

Has your company undertaken any of the following activities in the last 3 years?

Options:

- Re-plan of the way water is used to minimise usage and maximise re-usage
- Use of renewable energy
- Re-plan energy usage to minimise consumption
- Minimise waste by recycling or reusing waste or selling it to another company
- Redesign products and services to minimise the use of materials or use recycled materials

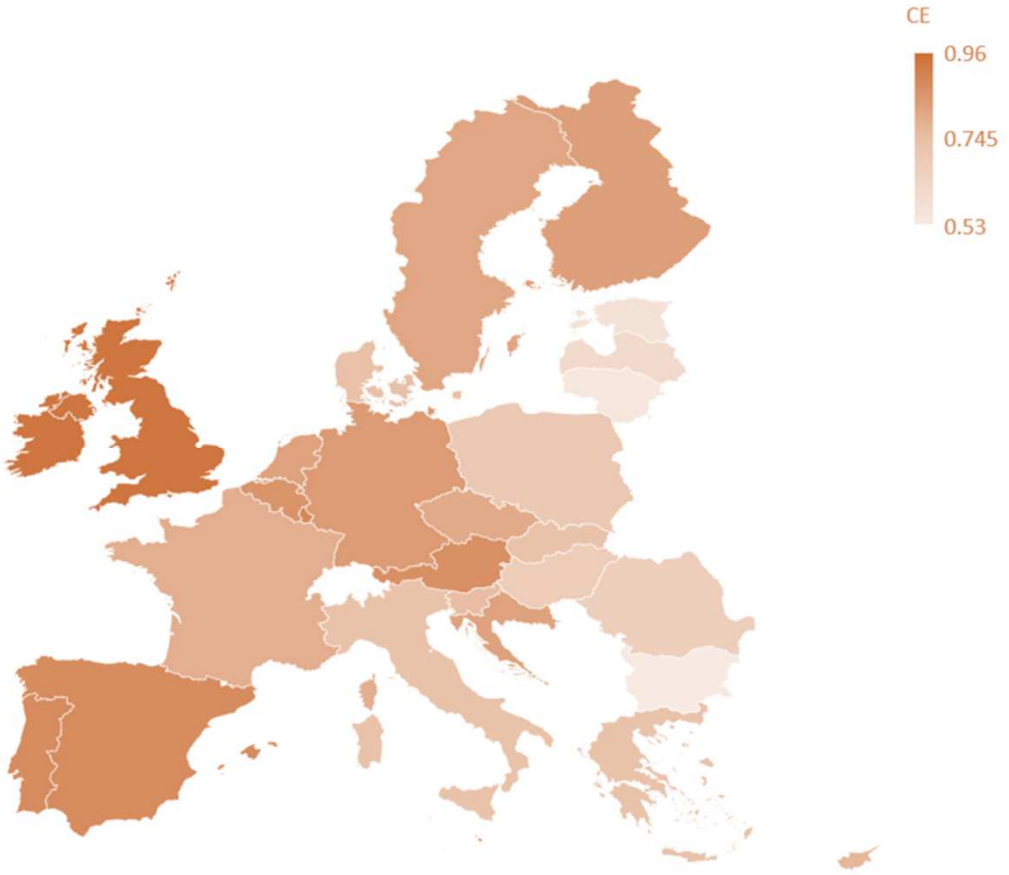


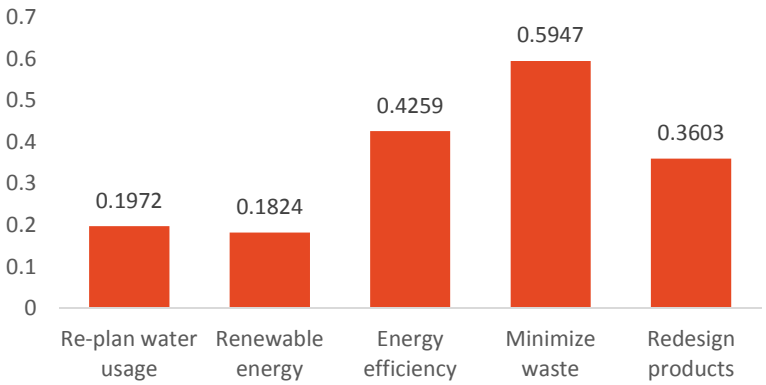
Figure 1. Map of CE activities across European Countries

DESCRIPTIVE STATISTICS

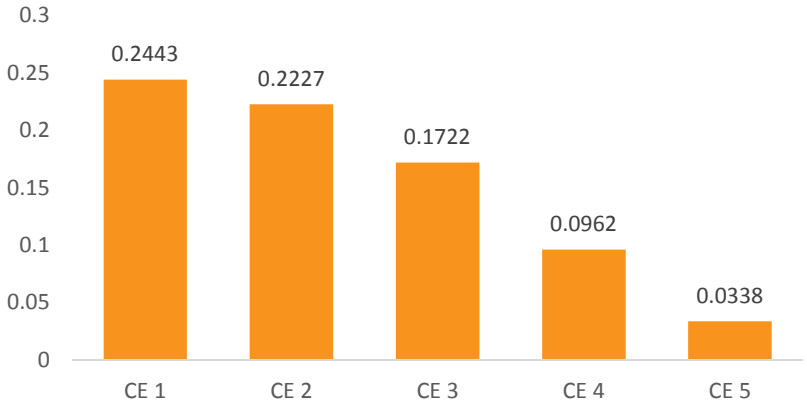
77%

of European SMEs are undertaking some CE activity

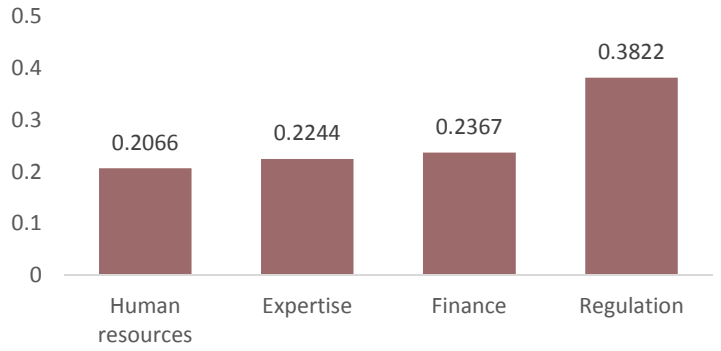
Types of CE



Number of CE



Barriers CE



EMPIRICAL STRATEGY

To consider the possible complementarity between the four barriers to CE we estimate a **multivariate probit model**.

The main specification can be summarized as follow:

$$Barriers_{ij} = \alpha_i + \beta_i CE_{ij} + \delta_i Controls_{ij} + \varepsilon_i \quad \text{(Eq. 1)}$$

Dependent variables (0/1)

- Lack of human resources
- Lack of expertise
- Complex administrative and cost meeting regulation
- Difficulties in finance

Independent variables (0/1)

CE: engagement in some Circular Economy activity

Types :

- Re-Plant water usage
- Renewable energy
- Energy efficiency
- Minimize waste
- Redesigning products

Intensity (from 0 to 5)

Control variables

- Size
- Young
- R&D (%)
- B2C
- Little information CE
- Sector & country dummies

RESULTS

Table 1. Baseline: Barriers hampering CE. Multivariate probit results

	Human resources	Expertise	Regulation	Finance
Circular economy	0.187*	-0.0857	0.451***	0.0401
	(0.0857)	(0.0609)	(0.0631)	(0.0531)
Size	0.0135	0.00300	0.0231*	-0.0444**
	(0.0121)	(0.00948)	(0.0116)	(0.0164)
Young	0.121**	0.0399	-0.0122	0.142***
	(0.0374)	(0.0439)	(0.0387)	(0.0319)
R&D	0.537***	0.345*	0.491***	0.546***
	(0.129)	(0.160)	(0.129)	(0.137)
High turnover	0.125***	0.164***	0.121***	0.0572
	(0.0378)	(0.0430)	(0.0343)	(0.0379)
B2C	0.267***	0.190**	0.253***	0.430***
	(0.0567)	(0.0674)	(0.0641)	(0.0574)
B2C*CE	-0.216**	-0.166*	-0.213**	-0.335***
	(0.0775)	(0.0766)	(0.0791)	(0.0670)
Little information CE	0.270***	0.284***	0.426***	0.525***
	(0.0258)	(0.0291)	(0.0384)	(0.0442)
Sector: ref. Industry				
Manufacturing	-0.0227	-0.0868	-0.106	-0.123*
	(0.0576)	(0.0538)	(0.0614)	(0.0532)
Retail	-0.215***	-0.146**	-0.263***	-0.301***
	(0.0524)	(0.0499)	(0.0569)	(0.0433)
Services	-0.150***	-0.161***	-0.284***	-0.248***
	(0.0426)	(0.0429)	(0.0550)	(0.0459)
Constant	-0.685***	-0.362***	-0.0863	-0.509***
	(0.0718)	(0.0622)	(0.0707)	(0.0705)
Observations		10098		

RESULTS

Table 2. Number of CE activities and barriers. Multivariate probit results

	Human resources	Expertise	Regulation	Finance
CE (1)	0.0739	**-0.177****	**0.231*****	-0.117
	(0.0919)	(0.0566)	(0.0632)	(0.0599)
CE (2)	**0.236***	-0.0266	**0.476*****	0.104
	(0.0936)	(0.0816)	(0.0799)	(0.0554)
CE (3)	**0.249****	0.00230	**0.620*****	**0.144***
	(0.0842)	(0.0625)	(0.0716)	(0.0650)
CE (4)	**0.299****	-0.0865	**0.720*****	**0.149***
	(0.108)	(0.0808)	(0.0790)	(0.0696)
CE (5)	**0.258****	-0.122	**0.814*****	**0.204***
	(0.0951)	(0.0755)	(0.0906)	(0.0986)

- All firms, regardless of the number of CE activities that they are engaged in, consider regulation barrier to be highly important
- High barriers (regulation, human resources & finance) and strong commitment to CE activities → Revealing effect: these firms benefit from a learning process (as an indicator of how successful the firm is at overcoming them)
- Lack of expertise to implement CE activities deters firms from engaging in them

RESULTS

Table 3. Types of CE and Barriers. Multivariate probit results

	Human resources	Expertise	Regulation	Finance
Water	**0.118*****	0.0320	**0.196*****	**0.152*****
	(0.0331)	(0.0310)	(0.0387)	(0.0407)
Renewable	-0.00233	0.00117	**0.192*****	0.0457
	(0.0406)	(0.0354)	(0.0404)	(0.0517)
Energy eff.	0.0311	**-0.0667***	**0.118*****	0.00485
	(0.0364)	(0.0337)	(0.0349)	(0.0310)
Waste	-0.00897	-0.0511	**0.145*****	-0.0332
	(0.0430)	(0.0345)	(0.0299)	(0.0406)
Redesign	**0.180*****	**0.113*****	**0.223*****	**0.145*****
	(0.0331)	(0.0322)	(0.0306)	(0.0305)

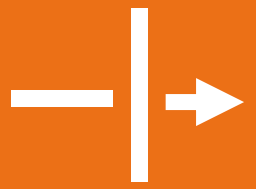
- The relationship between being engaged in a specific CE activity and the perception of barriers differs substantially across CE activities
- Importance of the regulations and the administrative and legal procedures: this obstacle is significant for the five CE activities
- Firms undertaking a disruptive innovation redesigning goods and services to minimize the use of materials are more likely to assess all four barriers as important

DISCUSSION & IMPLICATIONS

European SMEs innovating in the area of CE face several challenges and experience different types of barriers

- Regulation obstacles
- Lack of human resources

→ revealing barriers



- Lack of expertise

→ deterring barrier

There is a need to distinguish between different CE activities since the perception of barriers differs substantially across different CE activities:

- disruptive innovation **redesigning goods and services to minimize the use of materials** are more likely to assess all four barriers as important, on the other hand activities such as **minimising wa**ste face only one obstacle -regulation-

The transition towards a CE implies a complex of administrative and legal procedures stemming from environmental legislation that frequently requires excessive financial and time resources, especially for SMEs. These call for a less strict and simpler legislative framework as a pre-requisite for moving towards CE.