TESIS DE LA UNIVERSIDAD DE ZARAGOZA

2019

25

Inés Suárez Perales

From Environmental Proactivity to circular Economy. Analysis of Characteristics, Drivers and Barries of Firm's Advanced Environmental Strategies

Departamento

Dirección y Organización de Empresas

Director/es

RIVERA TORRES, PILAR
GARCÉS AYERBE, CONCEPCIÓN

ISSN 2254-7606

Prensas de la Universidad
Universidad Zaragoza

ISSN 2254-7606

Universidad Zaragoza
1542

Tesis Doctoral

FROM ENVIRONMENTAL PROACTIVITY TO CIRCULAR ECONOMY. ANALYSIS OF CHARACTERISTICS, DRIVERS AND BARRIES OF FIRM'S ADVANCED ENVIRONMENTAL STRATEGIES

Autor

Inés Suárez Perales

Director/es

RIVERA TORRES, PILAR
GARCÉS AYERBE, CONCEPCIÓN

UNIVERSIDAD DE ZARAGOZA

Dirección y Organización de Empresas

2018

Universidad Zaragoza
1542

Tesis Doctoral

From Environmental Proactivity to Circular Economy. Analysis of Characteristics, Drivers and Barriers of Firm's Advanced Environmental Strategies.

Autora

Inés Suárez Perales

Directoras

Dra. Concepción Garcés Ayerbe
Dra. Pilar Rivera Torres

Facultad de Economía y Empresa

2018

Nunca veo lo que se ha hecho; solo veo lo que queda por hacer.

(Marie Curie)

AGRADECIMIENTOS

Con estas primeras líneas me gustaría expresar mis agradecimientos a todas aquellas personas que han hecho posible la realización de esta tesis doctoral y sin las cuales, resultaría impensable haber llegado hasta aquí.

Me gustaría, en primer lugar, dar las gracias a mis directoras. Ellas, que me han enseñado con paciencia lo bueno y lo malo de esta profesión. Que me han dedicado un tiempo que muchas veces no tenían. Que han confiado en mí. Que me han enseñado que no siempre se consiguen las cosas a la primera, pero a base de trabajo y buen hacer, salen. Que me han aconsejado no solo en temas profesionales, sino en los del día a día. Que me han llenado de optimismo cuando yo ya lo había perdido. Gracias a vosotras he superado grandes obstáculos, he aprendido a focalizar mis fuerzas en hacer de algo que "podría salir" en algo grande, algo por lo que merece la pena seguir luchando. Sois un referente a seguir, dentro y fuera de la Universidad. Conchi y Pili, habéis sido unas *mamis* para mí. No podía haber tenido mejores mentoras. Gracias por haberme guiado en este proyecto, que espero sea el primero de muchos.

Este trabajo también ha sido posible gracias a mis compañeros del Departamento de Dirección y Organización de Empresas y al Grupo de Investigación CREVALOR. Quiero agradecer a la Montpellier Business School, y en especial a Dante I. Leyva, por haberme dado la oportunidad de trabajar con él y alegrar mis días grises con risas y canciones. Agradecer también a mis compañeros de la Sala 0, a todos los que han pasado por allí. Por último, gracias a compañeros y amigos que habéis pasado o estáis pasando por el proceso de la tesis, que con vuestros consejos y ayuda habéis hecho que la mía sea un poquito más fácil. Gracias por haberme "salvado la vida" en alguna que otra ocasión. Habéis sido un gran apoyo.

Quiero también agradecer, por supuesto, a mi familia. Ellos han sufrido esta tesis con mucha paciencia. Mis padres en primer lugar, han aguantado mis conversaciones monotemáticas, mis idas y venidas, mis retiros buscando soledad, y siempre han esperado con una sonrisa e ilusión a que volviera para seguir apoyándome en esta carrera de fondo. A mi tata Carmen, que siempre guardaba el consejo apropiado para cada problema, y un abrazo para los momentos de tensión. Mi hermana Eva, Iván y mi yaya Lola, de los que he aprendido el poder que tiene la familia. A mis dos sobrinos, quienes han llenado de ilusión toda mi vida con su inocencia. Un agradecimiento especial a esa *pequeña gran revolución* que me ha vuelto loca desde que llegó. Parece mentira que con casi tres años me hagas reír, pensar y plantearme tantas cosas como lo haces. El próximo paso será cambiar ese ¿por qué? en ¿por qué no?

Por último, a todas mis amigas, que en los últimos años han visto como cada vez me escondía más en casa, trabajaba los fines de semana y no siempre entendían por qué. Gracias por hacerme reír, por organizar planes a todas horas, por sacarme de casa casi de la oreja y hacer que luego no quisiera volver a casa. Gracias por todas las celebraciones que han sido, y serán.

Gracias a todos, gracias de corazón.

FINANCIACIÓN

Esta tesis doctoral se ha llevado a cabo gracias a la financiación de las siguientes entidades:

- Grupo de Investigación CREVALOR
- Ministerio de Economía y Competitividad. Subprograma Estatal de Formación y Fondo Social Europeo: ECO2013-48496-C4-3-R/ BES-2014-069987
- Fundación Bancaria Ibercaja, Fundación CAI y Universidad de Zaragoza – Ayudas Estancias de Investigación (CH3/18)

ÍNDICE DE CONTENIDOS

RESUMEN

En las últimas décadas, el interés por el impacto medioambiental de la actividad empresarial ha quedado reflejado en la literatura académica. Dentro de estos estudios, se diferencian dos grandes bloques de literatura: Por un lado, un bloque literario trata de analizar cuáles son los factores que impulsan a las empresas a emprender prácticas o medidas medioambientales; por otro lado, las investigaciones analizan cuáles son las consecuencias de dicha implantación. La presente tesis doctoral se enmarca dentro del primer bloque literario, teniendo como objetivo general profundizar en el análisis del efecto que tienen los factores internos y externos a la empresa sobre la implantación de estas estrategias medioambientales avanzadas.

Siguiendo la evolución de la literatura de gestión medioambiental, en el capítulo 2 de la presente investigación se analiza la proactividad medioambiental como una cualidad de la estrategia medioambiental. Este término, acuñado en la literatura en la década de los 90, hace referencia a acciones, iniciativas y prácticas voluntarias de carácter preventivo, que implican iniciativas que van más allá de las contenidas en la regulación medioambiental y que tienen por objetivo la reducción del impacto medioambiental. Determinados estudios aseguran que la actitud estratégica de la empresa o la reacción de la empresa ante estímulos del mercado o el entorno puede determinar la implantación de una estrategia medioambiental proactiva. El estudio de la actitud proactiva o proactividad estratégica conlleva considerar la innovación como uno de sus elementos fundamentales, por lo que en el primer capítulo de esta tesis doctoral se analiza el efecto que el liderazgo en la estrategia de innovación tiene sobre la implementación de una estrategia medioambiental proactiva en la empresa.

Continuando con el estudio de los factores internos de la empresa, en el tercer capítulo de esta tesis doctoral se profundiza en el estudio de los factores que componen el concepto de proactividad estratégica, analizando su efecto sobre la estrategia medioambiental proactiva o avanzada. En concreto, se analiza el efecto que la actuación en mercados abiertos, competitivos e internacionales tiene sobre la implantación de una estrategia medioambiental avanzada, obteniendo resultados que sugieren que aquellas empresas presentes en mercados más internacionalizados (más proactivas en su estrategia de internacionalización) se adaptan con mayor facilidad a las prácticas, políticas y estándares medioambientales más exigentes, lo que les permite desarrollar una estrategia medioambiental avanzada en todos los mercados en los que está presente.

En el cuarto capítulo se profundiza en el análisis de la eco-innovación, término que surgió en la literatura en la década de los 2000 para hacer referencia al diseño de productos, cambios en los procesos, así como políticas organizativas y de comercialización orientados hacia un desarrollo sostenible. En este capítulo se analiza en primer lugar los mecanismos a través de los cuales las empresas integran las preferencias y necesidades de los distintos grupos de interés dentro de la estrategia medioambiental. Siendo esta capacidad de integración un proceso gradual, que cuenta con mecanismos de baja implicación (como la comunicación) y con mecanismos de alta implicación (como la cooperación), en esta investigación se analiza el efecto que esta capacidad de integración de las preferencias de los grupos de interés tiene sobre la acumulación de capital eco-innovador en la empresa.

En el último estudio de esta tesis doctoral, motivado por el paquete de medidas adoptadas por la Comisión Europea en 2015, se analiza cuál es la situación de las pymes europeas en relación a la implantación de medidas de economía circular. El cambio de paradigma que acompaña a la economía

circular supone la introducción de los ciclos de la naturaleza dentro del funcionamiento organizativo, tratando de reemplazar el concepto “fin de vida” por las denominadas 4 erres: reducir, reutilizar, reciclar y recuperar. En el quinto capítulo encontramos evidencia de que introducir la economía circular en la empresa requiere un proceso de implantación gradual, que adopta medidas de control en las fases iniciales y de prevención en las fases avanzadas. De igual forma, encontramos evidencia de que existen diferencias significativas entre las barreras que encuentran las empresas que sí han llevado a cabo algún tipo de medidas de economía circular, frente a las barreras que encuentran aquellas empresas que no han llevado a cabo ninguna medida. Esto sugiere que la implantación de medidas de economía circular en el tejido industrial debe ir acompañada de esfuerzos por parte de las instituciones, tanto de regulación como de información.

En definitiva, la presente tesis doctoral trata de aportar conocimiento teórico y empírico a la literatura de gestión medioambiental mediante el estudio en profundidad de las características que acompañan a las estrategias medioambientales avanzadas más relevantes en la literatura – estrategia medioambiental proactiva; estrategia eco-innovadora; estrategia para la economía circular – así como los factores que potencian estas estrategias, es decir, aquellos que influyen en que éstas puedan considerarse como avanzadas.

ABSTRACT

The academic literature has shown an interest in the environmental impact of business activities in recent decades. These studies can be divided into two main blocks: one analyses the factors encouraging firms to undertake environmental practices or measures and the other researches the consequences of implementing them. This doctoral thesis is part of the first block and its overall objective is to further analyse how firms' implementation of these advanced environmental strategies is affected by internal and external factors.

Following the development of the environmental management literature, environmental proactivity is analysed in the second chapter of this research as a feature of environmental strategy. This term, coined in the literature in the 1990s, refers to preventive actions, initiatives and voluntary practices that surpass those in environmental regulations and whose objective is to reduce environmental impacts. Some studies state that a firm's strategic attitude or reaction to market or context stimuli can determine whether a proactive environmental strategy is implemented or not. Since studying proactive attitudes or strategic proactivity involves considering innovation as one of their essential attributes, we analyse how innovation strategy leadership affects the implementation of a proactive environmental strategy in firms in the second chapter of this doctoral thesis.

Continuing with the study of a firm's internal factors, those forming the concept of strategic proactivity are further studied in the third chapter, focusing on how they affect proactive or advanced environmental strategy. Specifically, we analyse how action in open, competitive and international markets affects the implementation of an advanced environmental strategy, with the results suggesting that firms present in more internationalised markets (more proactive in their internationalisation strategy) find it easier

to adapt to more demanding environmental practices, policies and standards. This enables them to pursue an advanced environmental strategy in all the markets where they are present.

The fourth chapter explores the analysis of eco-innovation, a term that appeared in the literature in the 2000s to refer to product design, process changes and organisation and marketing policies related to sustainable development. This chapter begins with an analysis of the mechanisms firms use to integrate stakeholders' preferences and needs in their environmental strategy. As this integration capability is a gradual process, and includes low involvement mechanisms (such as communication) and high involvement mechanisms (such as cooperation), this research analyses how this capability to integrate stakeholders' preferences affects the accumulation of eco-innovation capital in firms.

In the last study in this doctoral thesis, motivated by the package of measures the European Commission adopted in 2015, the situation of European SMEs is analysed in relation to the implementation of circular economy measures. The change in paradigm accompanying the circular economy involves introducing natural cycles into organisational operation and trying to replace the end-of-life concept with the so-called 4Rs: reduce, reuse, recycle and recover. In the fifth chapter, we find evidence that introducing the circular economy in firms requires a gradual implementation process that adopts control measures in the initial phases and prevention measures in the advanced phases. Similarly, we have found evidence of significant differences between barriers encountered by firms that have implemented some kind of circular economy measures compared with those encountered by firms that have not implemented any. This suggests that implementing circular economy measures in industry should be accompanied by institutions providing regulations and information.

In short, this doctoral thesis contributes theoretical and empirical knowledge to the environmental management literature by means of an in-depth study of the characteristics accompanying the most relevant advanced environmental strategies in the literature—proactive environmental strategy, eco-innovation strategy, circular-economy strategy—and factors that promote them, in other words, which have a bearing on them being considered advanced.

1. INTRODUCCIÓN

1.1. APROXIMACIÓN AL TEMA DE ESTUDIO

El modelo económico actual de producción y consumo tiene repercusiones nefastas para el medio ambiente. Desde la Revolución Industrial, momento en el que se establece la producción en masa y se comienzan a utilizar fuentes de energía que sustituyen al vapor, como la electricidad o el petróleo, las consecuencias sobre el medio natural se han vuelto considerables. La globalización, las nuevas tecnologías, la innovación, y la creencia en la disponibilidad ilimitada de recursos naturales, han hecho que en los últimos años las consecuencias o externalidades negativas tomen importancia a nivel global:

1984, Bhopal (India): Una fuga de gas tóxico provoca una niebla mortal que causa 18.500 muertos. 1986, Chernóbil (Ucrania): Una explosión expulsa al medio ambiente 200 toneladas de material nuclear matando de forma inmediata a 50 personas y a 300.000 animales, dejando el territorio cercano a la planta nuclear inhabitable. 1989, costa de Alaska (Estados Unidos): El naufragio del Exxon Valdez vierte más de 40 millones de litros de petróleo que se expanden sobre más de 2.000 kilómetros de costa.

En el territorio español, no son menos las externalidades negativas sobre el medio ambiente derivadas de una mala gestión humana: 6 millones de m^3 de lodos de alta toxicidad y aguas ácidas se vierten en los alrededores del Espacio Natural de Doñana en 1998 por la ruptura de una balsa en la que se almacenaban residuos tóxicos en Aznalcóllar (Sevilla). 77.000 toneladas de petróleo vertido en las costas gallegas tras el hundimiento del Prestige en 2002. 750 hectáreas del Parque Nacional de Garajanay en la Isla de la Gomera (Canarias) arden en 2012.

Todas estas catástrofes medioambientales ponen de manifiesto una mala gestión económica de los recursos y permiten cuestionar el sistema productivo, económico y de consumo. En la literaria económica queda reflejada la preocupación por las consecuencias devastadoras de la industria sobre el medio ambiente desde los años 80, momento en que se cuestiona la creencia de que los recursos naturales son ilimitados y gratuitos, para tratar de encontrar un equilibrio entre el desarrollo económico y el desarrollo sostenible. De esta manera surge un discurso enfocado a dirigir la actividad empresarial hacia satisfacer las necesidades presentes sin comprometer la capacidad de satisfacer las necesidades de generaciones futuras. Así, mientras el crecimiento económico sigue siendo necesario para alcanzar las necesidades sociales y económicas del aumento de la población, las restricciones medioambientales de recursos se introducen como un factor estratégico a largo plazo, necesario para evaluar las necesidades ecológicas y económicas. Este hecho se ve reflejado en la literatura, al introducir términos como economía medioambiental (Norgaard, 1985); relaciones ambientales-organizativas (Burton y Obel, 1986); o economía global sostenible (Marien, 1989).

Es en los años 90 cuando comienzan a surgir teorías organizativas enfocadas a la gestión sostenible de recursos, cuando las empresas comienzan a dar importancia a la reducción del uso de recursos y la minimización del impacto medioambiental, cambiando de esta manera sus formas de gestión y producción. Es entonces cuando en la literatura de gestión se empiezan a cuestionar por qué las empresas escogen ser medioambientalmente sostenibles, y cuáles son las consecuencias de estas decisiones. Surgen entonces los grandes clásicos de la gestión medioambiental, como la visión natural basada en los recursos (Hart, 1995), la performance ambiental bajo la perspectiva de recursos (Russo y Fouts,

1997) o la estrategia corporativa medioambiental proactiva (Sharma y Vredenburg, 1998). El término de proactividad medioambiental o estrategia medioambiental proactiva comienza a tener peso en la literatura, haciendo generalmente referencia a aquellas acciones, iniciativas y prácticas voluntarias de carácter preventivo, que implican iniciativas no contenidas en la regulación medioambiental. Es decir, los estudios de la estrategia medioambiental proactiva se centran en la profundidad de las acciones medioambientales de la empresa, basadas en la prevención (frente al control), la voluntariedad (frente a la obligación) y la anticipación (frente a la reacción). Algunos autores describen las estrategias medioambientales como un proceso de fases progresivas, un camino lineal que siguen las organizaciones para desarrollar su estrategia medioambiental, que abarca desde las posiciones más reactivas, hasta alcanzar la posición más proactiva en materia medioambiental (Hunt y Auster, 1990; Roome, 1992; Winsemius y Guntram, 1992). Un ejemplo de este proceso es el propuesto por Roome (1992), quien argumenta que existirán estrategias de carácter medioambiental que abarcarán desde el no cumplimiento de la ley, por falta de recursos y capacidades o por la baja importancia que los directivos dan a los problemas de carácter medioambiental; pasando por la estrategia de cumplimiento, que se limita a realizar únicamente las acciones requeridas por la ley; hasta la estrategia de liderazgo medioambiental, o de proactividad medioambiental, que consiste en implementar más prácticas medioambientales de las exigidas por la ley, así como de las generalmente implantadas por empresas del mismo sector industrial. Es decir, las empresas proactivas en su estrategia medioambiental son aquellas que toman posiciones de liderazgo con respecto a sus competidores y a la legislación vigente.

En este punto resulta de vital importancia hacer referencia al término *proactividad*, que se utiliza en esta tesis doctoral para hablar tanto de la estrategia medioambiental, como de otros procesos y estrategias llevadas a cabo por la empresa. En la literatura de gestión se hace referencia al concepto de proactividad como una capacidad de la empresa para adoptar posiciones de liderazgo. Algunos autores la asocian con participar en movimientos audaces por delante de sus competidores (Dai et al., 2014), asumir riesgos y tomar la iniciativa (Ciravegna et al., 2014) y en general a la medida en que las empresas tratan de conducir en lugar de seguir a los competidores (Ozdemirci, 2011). En definitiva, la proactividad, aplicada a cualquier concepto (medioambiental, estratégica, innovadora, etc…) pasa por tener el control para hacer que las cosas pasen en vez de observar las cosas pasar (Parker et al., 2010).

Debido a su naturaleza, las prácticas medioambientales están muy ligadas a la estrategia de innovación en la empresa, debido a la necesidad de adopción de ideas, comportamientos, sistemas o políticas a lo largo de toda la cadena de valor. Es de suponer que, para poder implantar una estrategia medioambiental, las empresas deben implantar cambios, ser flexibles y tener capacidad de reacción. Es por esta relación entre la estrategia medioambiental y la innovación que en la primera década del siglo XXI, surge y se comienza a dar importancia al término de eco-innovación. La eco-innovación o innovación medioambiental puede ser entendida como una estrategia que permite a la empresa la creación de valor, así como adquirir, nutrir y mantener una ventaja competitiva teniendo como objetivos clave la minimización del uso de recursos y la reducción del impacto medioambiental (Kemp y Pearson, 2007; Del-Río et al., 2015; Lee y Min, 2015; Costantini et al., 2017; Ghissetti y Quatraro; 2017). Pese a que en la literatura se tiende a realizar un cambio en el término utilizado, dejando atrás el concepto de

proactividad medioambiental, la implantación de objetivos medioambientales en el diseño de productos, cambios en los procesos, así como en las políticas organizativas y de comercialización siguen el camino hacia el objetivo del desarrollo sostenible con la utilización del término de eco-innovación. Pese a que al hablar del concepto de eco-innovación se pierde la característica de liderazgo que contenía el concepto de la proactividad medioambiental, la innovación medioambiental o eco-innovación no pierde la esencia de la implantación de prácticas y objetivos medioambientales en la empresa, basados éstos en la prevención y la voluntariedad. Además, los estudios académicos dan importancia a la implantación de una estrategia eco-innovadora de forma holística y global en la empresa, que irá muy ligada al conocimiento, al "aprender haciendo" y a la experiencia de la empresa (Ghisetti et al., 2015).

Siguiendo con la referencia de las estrategias medioambientales que motiven los objetivos sostenibles, que respeten el medio ambiente y que favorezcan al mismo tiempo el desarrollo económico, el crecimiento empresarial y la creación de valor, recientemente ha surgido el concepto de economía circular. Potenciado por la Comisión Europea con un paquete de medidas adoptadas en diciembre de 2015 (EC, 2015), la economía circular se basa en la introducción de los ciclos de la naturaleza dentro del funcionamiento organizativo, atrasando y acercando los flujos de materiales y energía entre ellos (Geissdoerfer et al., 2017; Kirchherr et al., 2017). La economía circular trata de reemplazar el concepto de "fin de vida" (*end-of-life* en inglés) con las denominadas 4 erres: reducir, reutilizar, reciclar y recuperar. La clave del paso de una economía lineal, en la que los recursos naturales se convierten en residuos a través de la producción es, no solo reducir esta producción de desechos, sino que estos sirvan como materias primas para otras empresas o industrias. A diferencia de los conceptos

anteriores de proactividad medioambiental y eco-innovación, la economía circular no se basa únicamente en la implantación de una estrategia en la empresa de carácter sostenible, sino en un cambio de paradigma a todos los niveles, para la regulación, la industria y la sociedad.

Como bien se ha visto, pese a que en la literatura académica ha existido un cambio en los términos utilizados, el objetivo común del desarrollo sostenible ha quedado plasmado en cada uno de estos conceptos. Para abordar el objetivo general de la presente tesis doctoral, que pasa por analizar de forma específica y con detalle las estrategias medioambientales eficientes y avanzadas, así como los distintos factores que las motivan, se ha seguido el mismo patrón de conceptos que en la literatura. Es decir, se ha comenzado estudiando la estrategia medioambiental proactiva –capítulos 2 y 3-, pasando por la estrategia eco-innovadora –capítulo 4- para terminar con la nueva apuesta, tanto a nivel académico como político y regulador que es la economía circular –capítulo 5-. Por último, en el capítulo 6 se presentan las conclusiones generales de la tesis doctoral. A continuación, en el siguiente apartado, se presentan los principales objetivos de cada uno de los capítulos que componen esta tesis doctoral, estableciendo una pregunta de investigación para cada uno de ellos.

1.2. PREGUNTAS DE INVESTIGACIÓN Y ESTRUCTURA DE LA TESIS DOCTORAL

Como se ha hecho referencia en las páginas anteriores, el análisis de la implantación de objetivos y prácticas medioambientales en la empresa, además de los motivos que llevan a éstas a su implantación, resulta de vital interés para la literatura centrada en la gestión medioambiental, para los reguladores y para las propias empresas. Es con esta motivación que el principal objetivo de la presente tesis doctoral radica en analizar las estrategias de carácter medioambiental, los factores que hacen que éstas sean

eficientes y avanzadas y que permitan reducir el uso de recursos, fomentando de esta manera una actividad industrial limpia y sostenible. Para ello, la presente tesis doctoral se ha dividido en cuatro estudios en los que se analizan distintos factores que pueden resultar facilitadores para el desarrollo de estrategias medioambientales avanzadas.

Como pregunta de investigación inicial, se plantea la siguiente cuestión: en relación a los factores internos de la empresa, *¿qué características necesita tener o adquirir una empresa para poder implantar una estrategia medioambiental avanzada o proactiva de forma eficiente y efectiva?*

Las características internas a la empresa han sido ampliamente estudiadas en la literatura de gestión medioambiental, como factores determinantes en la implantación de estrategias medioambientales avanzadas o proactivas. Así lo demuestran diferentes trabajos del tamaño de la empresa que encuentran una influencia en la estrategia medioambiental (Min & Galle, 2001), la motivación o actitud del gestor ante temas o problemas medioambientales (Hunt y Auster, 1990; Berry y Rondinelli, 1998) o la actitud estratégica o reacción de la empresa a estímulos del mercado o el entorno (Azzone et al., 1997). En relación a esta última, existen diferentes actitudes estratégicas que la empresa puede tener ante posibles contingencias. Aragón-Correa (1998), basado en las tres dimensiones estratégicas de Miles y Snow (1978) –empresarial, ingeniería y administrativa –desarrolla una serie de perfiles estratégicos que abarcan desde las posiciones más reactivas hasta las más proactivas en su estrategia. El perfil empresarial más reactivo o defensivo pasa por concentrar las mejoras en la dimensión de ingeniería, actuando principalmente sobre la eficiencia de sus procesos. Estas empresas tienen un perfil conservador frente a los cambios y actúan sobre entornos estables y en general, solo

invertirán en nueva tecnología si están convencidas de sus beneficios potenciales. En el extremo opuesto al perfil reactivo se sitúan las empresas prospectoras o proactivas en su estrategia, caracterizadas por desarrollar nuevos productos, buscar nuevos mercados y maneras de competir, invertir en tecnología flexible que les permite responder a los cambios bruscos del mercado con el objetivo de situarse en una posición de liderazgo, y que eligen estructuras y procesos organizativos que reducen la incertidumbre y permiten la innovación. Teniendo en cuenta la descripción de la capacidad de proactividad estratégica, y las actitudes que a ella se asocian, resulta evidente vincular la actitud más proactiva o prospectora con la capacidad innovadora de la empresa.

Generalmente, la innovación ha sido considerada como la actitud idónea para la adaptación y gestión de los cambios en el entorno, pues las empresas más innovadoras tienen mayor capacidad de adaptación al disponer de estructuras más flexibles, mayor intercambio de información y menor grado de aversión al riesgo (Hofmann et al., 2012). Algunos de los factores que se asocian a las empresas innovadoras son la adopción de nuevas tecnologías, la adquisición de licencias de tecnología extranjera, el número de nuevos productos y patentes o la inversión en I+D. Todas estas características hacen que la innovación pueda considerarse como un factor inherente a la proactividad estratégica, como elemento facilitador de la implantación de medidas medioambientales en la empresa. En este punto, se plantea la siguiente pregunta de investigación:

¿Afecta la innovación, como indicador de la proactividad estratégica, a la estrategia medioambiental de las empresas?

Es aquí donde se enmarca el primer estudio de la presente tesis doctoral contenido en el capítulo 2, en el estudio de cómo afectan las acciones innovadoras proactivas (por encima de las acciones generalmente

adoptadas por las empresas del sector) en la implantación de una estrategia medioambiental avanzada.

Siguiendo con el estudio de aquellos factores que facilitan la implantación de una estrategia medioambiental avanzada, y en concreto, la actitud o habilidad de la empresa denominada como proactividad estratégica, resulta importante analizar qué otros factores componen esta actitud y cómo afectan a las medidas y objetivos medioambientales de la empresa. Teniendo en cuenta la globalización actual de los mercados y las nuevas tecnologías, son muchas las empresas que han decidido en los últimos años abrir sus negocios a otros mercados, tratando de ampliar su cuota de mercado saliendo a otros países. Este hecho, que requiere de flexibilidad y adaptación al entorno, supone otro elemento diferenciador de lo que anteriormente se ha definido como proactividad estratégica. La actuación en mercados abiertos, competitivos e internacionales puede suponer un traspaso de conocimiento debido a la experiencia, así como un ajuste de las prácticas institucionalizadas. Sin embargo, el efecto de esta diversificación internacional sobre la estrategia medioambiental de la empresa no resulta tan evidente: algunos autores hacen referencia a que aquellas empresas internacionalizadas se ubicarán en aquellos mercados donde la regulación medioambiental sea menos restrictiva, lo que resultará en un mayor impacto de degradación medioambiental (Kennelly y Lewis, 2002; González-Benito y González-Benito, 2006). Esta postura apoya la idea de que la globalización promueve un comportamiento agresivo en cuanto al medio ambiente se refiere, en el que las organizaciones adoptarán posturas cómodas, ubicándose en aquellos puntos geográficos en los que la regulación medioambiental sea menos restrictiva y la presión de los grupos de interés sea mínima (King y Lenox, 2000). Por otro lado, existe una corriente literaria que apuesta por que aquellas empresas con presencia global desarrollarán ciertas prácticas,

políticas y estándares medioambientales ajustados a las políticas más exigentes, lo que les permitirá adaptar sus estándares medioambientales más avanzados a todos los mercados en los que esté presente, desarrollando una estrategia medioambiental avanzada (Porter y Van der Linde, 1995; Drezner, 2000; Aguilera-Caracuel et al., 2012). Debido a esta discordancia en la literatura, la segunda pregunta de investigación que se plantea en la presente tesis doctoral y a la que se le trata de dar respuesta en el tercer capítulo es la siguiente:

¿Es la internacionalización empresarial, como indicador de la proactividad estratégica, un factor impulsor de una estrategia medioambiental avanzada?

A lo largo de estas líneas se ha hecho referencia a características o factores internos a la empresa que pueden facilitar o potenciar la implantación de estrategias medioambientales avanzadas. Sin embargo, existen factores externos que, aunque gestionables por la empresa, son incontrolables y pueden tener repercusión sobre las decisiones medioambientales de la organización. Uno de estos factores es la presión de los grupos de interés, es decir, las preferencias, exigencias y necesidades de los stakeholders. En la literatura de gestión medioambiental se le ha dado importancia al estudio de este factor, y a las consecuencias que estas preferencias y exigencias tenía sobre las decisiones medioambientales de la empresa. De hecho, diversos trabajos ofrecen evidencia empírica de que la percepción por parte de los managers de la presión de los grupos de interés es un factor impulsor de estrategias medioambientales proactivas (Christmann, 2004; Sharma y Henriques, 2005; Murillo-Luna et al., 2008; Ferrón-Vilchez et al., 2017; Valero-Gil et al., 2017). Sin embargo, se ha dedicado un esfuerzo menor al conocimiento de los mecanismos mediante los cuales las empresas tienen en cuenta esta presión que ejercen los grupos

de interés, es decir, los mecanismos sobre los que se construye la llamada capacidad de integración de los grupos de interés. Esta capacidad fue definida por Sharma y Vredenburg (1998, pg 735) como la *habilidad para establecer relaciones de colaboración basadas en la confianza con una amplia variedad de grupos de interés*.

Dentro de esta capacidad para integrar las preferencias de los grupos de interés dentro de los objetivos y acciones estratégicas de la empresa, existen varios trabajos que distinguen entre mecanismos de baja implicación –como la comunicación- y mecanismos de alta implicación -como la cooperación- (Green y Hunton-Clarke, 2003; Plaza-Úbeda et al., 2010). En este sentido, son escasos los estudios académicos de carácter empírico que tratan de analizar cuáles son los efectos que los distintos mecanismos de integración de las preferencias de los grupos de interés tienen sobre la estrategia medioambiental de la empresa. Por ello, como tercer estudio de esta tesis doctoral se pretende contestar a la siguiente pregunta de investigación:

¿Cómo afectan los distintos mecanismos de integración de las preferencias de los grupos de interés a la estrategia medioambiental de la empresa?

El análisis de esta pregunta de investigación se encuentra recogida en el capítulo cuarto de esta tesis doctoral.

Junto con la presión de los grupos de interés, la regulación medioambiental ha sido otro de los factores externos a la empresa que empuja a ésta a implantar objetivos y prácticas de carácter medioambiental. De hecho, las políticas medioambientales fijarán la conducta medioambiental que como mínimo debe cumplir la empresa, en función de la localización o del sector de actividad de la misma. En este sentido, la

Comisión Europea viene alertando tanto a las organizaciones como a la sociedad en general, sobre la importante misión de iniciar un cambio de modelo económico hacia uno más sostenible (EC, 2015), siendo la economía circular un punto de referencia para el cambio de modelo de producción. El modelo industrial actual, denominado como lineal, se basa en la fabricación de bienes a partir de recursos, que son desechados como residuos cuando llegan al final de su vida útil (Fundación Ellen Macarthur, EMAF, 2013). Frente a este modelo, la economía circular podría definirse como un cambio de paradigma que trata de integrar la actividad económica con la sostenibilidad, reemplazando el concepto de "fin de vida" por las cuatro erres –reducir, reutilizar, reciclar, recuperar – en los procesos de producción y consumo y que trata de atrasar, cerrar y estrechar los flujos de material y energía (Geissdoerfer et al., 2017; Kirchherr et al., 2017; Prieto-Sandoval et al., 2018). En definitiva, esto significa convertir los bienes que están al final de su vida útil en recursos para otros, minimizando de esta manera los residuos y, a fin de cuentas, reemplazando producción por suficiencia (Stahel, 2016; Gregson et al., 2015). Pese a que se apuesta por el cambio de un modelo lineal a un modelo circular, y que en la literatura académica se está analizando el concepto y la viabilidad de este cambio, las preguntas que deben plantearse a este respecto son:

¿Es posible este cambio? ¿En qué punto se encuentran las empresas europeas?

La situación de las empresas europeas en relación a la implantación de un modelo de economía circular, así como las oportunidades de este modelo y las principales barreras que encuentran las empresas son cuestiones que se abordarán en el quinto y último capítulo de esta tesis doctoral.

1.3. MARCO TEÓRICO

De la misma manera que resulta de vital importancia hacer referencia a los diferentes conceptos que se van a encontrar a lo largo de la presente tesis doctoral, es especialmente importante integrar los estudios que conforman esta tesis doctoral en el marco teórico correspondiente. A continuación, se exponen las teorías, perspectivas y visiones teóricas utilizadas a lo largo de esta tesis doctoral.

En primer lugar, se debe hacer referencia a la Teoría de recursos y capacidades (Barney, 1991; Teece et al., 1997). Como punto de partida, esta teoría entiende el concepto de recursos como aquellos factores tangibles e intangibles que la organización controla y que, por tanto, están disponibles para poder llevar a cabo su estrategia (Barney, 1991). Esta teoría constituye un punto de partida clave para entender el comportamiento estratégico empresarial y se basa en la premisa de que la empresa puede ganar ventaja competitiva sostenible en el tiempo si sus recursos son a) valiosos, en el sentido de que permiten explotar oportunidades y/o neutralizar amenazas; b) ser poco comunes entre los competidores actuales y potenciales; c) ser difícilmente imitables; y d) no tener equivalentes estratégicos sustituibles. La perspectiva estática de la empresa que ofrecía esta teoría fue completada por el enfoque de las capacidades dinámicas (Teece, 1997), introduciendo el dinamismo del entorno como factor esencial en la búsqueda de una ventaja competitiva. Con el enfoque de las capacidades dinámicas se hace referencia a que la empresa no solo necesita acumular recursos para poder alcanzar una ventaja competitiva sostenible, sino que será necesario contar con un grado de reacción para adaptar, integrar y reconfigurar sus capacidades internas ante la incertidumbre de un entorno cambiante. Desde esta perspectiva, la estrategia medioambiental se analiza como una capacidad que tiene la empresa de implantar cambios en todo el proceso productivo con el objetivo

de reducir su impacto medioambiental, que podrá tener como resultado una mejora en la eficiencia, reducción en los costes de producción, mejora de la calidad, incluso aumento del prestigio de la empresa. De esta forma, la empresa podrá ganar una ventaja competitiva con respecto a sus competidores si implementa una estrategia medioambiental basada en la voluntariedad, que implica ir más allá de las exigencias de la regulación medioambiental, así como de las acciones generalmente adoptadas en su sector de actividad, y en la prevención, lo que le permitirá tener un margen de reacción a los cambios en el entorno.

En definitiva, la teoría de recursos y capacidades integra la perspectiva interna (organizativa) y la externa (entorno) en el desarrollo de una estrategia medioambiental que permita la obtención de una ventaja competitiva sostenible en el tiempo. Sin embargo, y pese a su aceptación en la literatura organizativa, algunos autores encontraron deficiencias en este enfoque. El que más atañe a la presente tesis doctoral es el relativo a las restricciones del entorno natural: los recursos son limitados. Teniendo esta restricción en cuenta, Hart (1995) desarrolla una perspectiva natural de recursos y capacidades en la que engloba tres estrategias interconectadas: a) Prevención de la contaminación; b) Diseño de producto; c) Desarrollo sostenible. Con esta visión, los recursos y capacidades de la empresa serán muy útiles para la obtención de una ventaja competitiva, teniendo en cuenta las restricciones del entorno natural, y generando a su vez actividades sostenibles que permiten reducir el riesgo y el impacto medioambiental de la organización.

Frente a la perspectiva que argumenta que la empresa lleva a cabo una estrategia medioambiental avanzada debido al desarrollo o la adquisición de recursos y capacidades de carácter internos, existe otra visión literaria que hace referencia a que la causa de este comportamiento medioambiental será debido a la presión de distintas instituciones externas a la empresa. En este

sentido, la Teoría Institucional (Di Maggio y Powell, 1983; Meyer y Rowan, 1977) observa el diseño de la organización, no como un proceso racional, sino como un efecto de las presiones externas e internas, y propone que aquellas organizaciones que estén sometidas a presiones similares, se parecerán unas a otras con el tiempo debido a tres motivos: a) Como respuesta a las fuerzas coercitivas del entorno, que se traduce en cierta estandarización; b) A medida que las organizaciones se enfrentan a situaciones de incertidumbre, tienden a imitar a otras organizaciones que se hayan enfrentado a situaciones similares; c) Conforme las organizaciones desarrollan redes de trabajo, éstas tienden a aplicar normas compartidas y comunes.

Muy ligada a la Teoría Institucional se encuentra la Teoría de los grupos de interés o de los stakeholders (Freeman, 1994), la cual afirma que las empresas no deben satisfacer únicamente las necesidades de los accionistas, sino las de una amplia gama de actores del mercado, que pueden verse afectados por, o afectar a, los resultados de la misma, y sin los cuales la organización dejaría de existir. Esta teoría se formula alrededor de dos preguntas esenciales: a) ¿Cuál es el propósito de la empresa?; y b) ¿Qué responsabilidad tiene la organización con respecto a los grupos de interés? Estas dos preguntas empujan a la empresa a darle a la creación de valor un sentido compartido con todos los grupos de interés, y a articular relaciones con distintos grupos de interés con el objetivo de cumplir su propósito inicial (Freeman et al., 2004). En este sentido, las empresas tratarán de establecer relaciones con los distintos grupos de interés a través de las cuales se creará valor para la organización y para los stakeholders. Desde este enfoque, las empresas implementan actividades, objetivos y prácticas de carácter medioambiental como respuesta a presiones de distintas instituciones como el gobierno, la sociedad, los grupos de presión, y el público en general. Los

distintos grados de implicación medioambiental se deberán pues al mero cumplimiento de estas presiones, obteniendo como resultado una actitud medioambiental reactiva, o a la anticipación de estas presiones por parte de la empresa, resultando en una estrategia medioambiental más avanzada o proactiva.

La última perspectiva teórica que se utiliza en la presente tesis doctoral es la ecología industrial que, desde su enfoque de gestión, estudia los flujos de materiales en un sistema industrial y pretende crear procesos basados en ciclos cerrados en los que los desechos pueden volver a utilizarse como inputs. (EMAF, 2013; Lieder y Rashid, 2016). De esta manera, la ecología industrial pretende transformar los residuos en nuevos productos, siguiendo los ciclos de la Naturaleza, eliminando así la noción de que los desechos son inservibles. Esta perspectiva, bajo la que se enmarca la economía circular, se centra tanto en la organización, tratando de crear procesos de producción eficientes y limpios, así como en empresas, dentro y fuera del sector industrial de actividad, que podrán alcanzar sinergias a través de las ventajas de la proximidad geográfica y redes de colaboración.

1.4. FUENTES DE INFORMACIÓN

Para la realización de la presente tesis doctoral se ha completado la revisión y discusión de la literatura del área con una metodología de acuerdo a los objetivos propuestos y preguntas de investigación planteadas. Para ello, se han utilizado bases de datos secundarias: Para los capítulos 2, 3 y 4 de la tesis doctoral se han utilizado datos procedentes del Panel de Innovación Tecnológica (PITEC). Esta base de datos recoge información sobre la situación y la evolución de las empresas innovadoras en España, y es el resultado de un esfuerzo conjunto entre el Instituto Nacional de Estadística (INE), la Fundación Española para la Ciencia y la Tecnología (FECYT) y la Fundación Cotec, además de contar con el asesoramiento de un grupo de

expertos de distintas universidades. El PITEC, que se basa en la "Encuesta sobre Innovación Tecnológica de las Empresas", recoge datos sobre la actividad innovadora de una muestra representativa de empresas españolas desde el año 2003. Debido a que la encuesta ha sufrido modificaciones a lo largo de los años, no fue hasta el año 2008 cuando se incorporó a la misma información sobre objetivos medioambientales a la hora de llevar a cabo actividades de innovación. Por ello, en la presente tesis doctoral se han utilizado los datos a partir de dicho año hasta el último año disponible, que actualmente es 2014. Esta base de datos ha permitido estudiar la implantación de estrategias medioambientales, así como los factores que afectan a dicha implantación, en una muestra representativa de empresas españolas de forma longitudinal.

Para el quinto y último capítulo, en el que se analizan las medidas de economía circular implantadas en las empresas europeas, se utiliza la base de datos "European SMEs and the Circular Economy", que está basada en la encuesta de Eurobarómetro Flash número 441. Este tipo de encuestas tienen como principal objetivo analizar y sintetizar la opinión pública en determinados temas relacionados con la Unión Europea. La encuesta 441 fue llevada a cabo a petición de la Comisión Europea a raíz del paquete de medidas adoptadas en diciembre de 2015 (EC, 2015). Por tanto, con el objetivo de conocer las actividades de economía circular en las pequeñas y medianas empresas (PYMES, SMEs por sus siglas en inglés), la encuesta se llevó a cabo de forma telefónica en abril de 2016 entre los 28 países de la Unión Europea. El resultado de esta encuesta permite obtener información de las actividades relacionadas con la economía circular en países europeos, así como las principales barreras a estas actividades.

1.5. BIBLIOGRAFÍA

Aguilera-Caracuel, J., Hurtado-Torres, N.E., Aragón-Correa, J.A. 2012. Does international experience help firms to be green? A knowledge-based view of how international experience and organisational learning influence proactive environmental strategies. International Business Review, 21(5), 847-861.

Aragón-Correa, J.A. 1998. Strategic proactivity and firm approach to the natural environment. Academy of management Journal, 41(5), 556-567.

Azzone, G., Brophy, M., Noci, G., Welford, R., Young, W. 1997). A stakeholders' view of environmental reporting. Long range planning, 30(5), 699-709.

Barney, J., 1991. Firm Resources and Sustained Competitive Advantage. Journal of Management, 17 (1), 99-120.

Berry, M.A. Rondinelli, D.A. 1998. Proactive corporate environmental management: A new industrial revolution. Academy of Management Perspectives, 12(2), 38-50.

Burton, R.M., Obel, B. 1986. Environmental organizational relations: The effects of deregulation. Technovation, 5(1-3), 23-34.

Christmann, P. 2004. Multinational companies and the natural environment: Determinants of global environmental policy. Academy of Management Journal, 47(5), 747-760.

Ciravegna, L., Majano, S.B., Zhan, G. 2014. The inception of internationalization of small and medium enterprises: The role of activeness and networks. Journal of Business Research, 67(6), 1081-1089.

Costantini, V., Crespi, F., Marin, G., Paglialunga, E. 2017. Eco-innovation, sustainable supply chains and environmental performance in European industries1. Journal of cleaner production, 155, 141-154.

Dai, L., Maksimov, V., Gilbert, B.A., Fernhaber, S.A. 2014. Entrepreneurial orientation and international scope: The differential roles of innovativeness, proactiveness, and risk-taking. Journal of Business Venturing, 29, 511-524.

Del Río, P., Carrillo-Hermosilla, J., Könnölä, T., Bleda, M. 2015. Resources, capabilities and competences for eco-innovation. Technological and Economic Development of Economy.

Di Maggio, P., Powell, W.W. 1983. The iron cage revisited: Collective rationality and institutional isomorphism in organizational fields. American sociological review, 48(2), 147-160.

Drezner, D. W. (2000). Bottom feeders. Foreign policy, 64-70.

Ellen Macarthur Foundation (EMAF), 2013. Towards a Circular Economy. Business rationale for an accelerated transition.

European Commission (EC), 2015. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Closing the loop – An EU action plan for the Circular Economy. Brussels, 2.12.2015.

Ferrón-Vilchez, V., Darnall, N., Aragón-Correa, J.A. 2017. Stakeholder influences on the design of firms' environmental practices. Journal of Cleaner Production, 142, 3370-3381.

Freeman, R.E. 1994. The politics of stakeholder theory: Some future directions. Business ethics quarterly, 409-421.

Freeman, R.E., Wicks, AC., Parmar, B. 2004. Stakeholder theory and "the corporate objective revisited". Organization science, 15(3), 364-369.

Geissdoerfer, M., Savaget, P., Bocken, N.M.P., Jan-Hultink, E., 2017. The Circular Economy – A new sustainability paradigm? Journal of Cleaner Production, 143, 757-768.

Ghisetti, C., Marzucchi, A., Montresor, S. 2015. The open eco-innovation mode. An empirical investigation of eleven European countries. Research Policy, 44(5), 1080-1093.

Ghisetti, C., Quatraro, F. 2017. Green technologies and environmental productivity: a cross-sectoral analysis of direct and indirect effects in Italian regions. Ecological Economics, 132, 1-13.

González‐Benito, J., González‐Benito, Ó. 2006. A review of determinant factors of environmental proactivity. Business Strategy and the Environment, 15(2), 87-102.

Green, A.O., Hunton‐Clarke, L. 2003. A typology of stakeholder participation for company environmental decision‐making. Business strategy and the environment, 12(5), 292-299.

Gregson, N., Crang, M., Fuller, S., Holmes, H., 2015. Interrogating the Circular Economy: The Moral Economy of Resource Recovery in the EU.

Hart, S.L. 1995. A Natural-Resource-Based view of the Firm. Academy of Management Review, 20 (4), 986-1014.

Hofmann, K.H., Theyel, G., Wood, C.H. 2012. Identifying firm capabilities as drivers of environmental management and sustainability practices–evidence from small and medium‐sized manufacturers. Business Strategy and the Environment, 21(8), 530-545.

Hunt, C.B., Auster, E.R. 1990. Proactive environmental management: avoiding the toxic trap. MIT Sloan Management Review,31(2), 7.

Kemp, R., Pearson, P. 2007. Final report MEI project about measuring eco-innovation. UM Merit, Maastricht,10.

Kennelly, J.J., Lewis, E.E. 2002. Degree of internationalization and corporate environmental performance: Is there a link? International Journal of Management, 19(3), 478.

King, A.A., Lenox, M.J. 2000. Industry self-regulation without sanctions: The chemical industry's responsible care program. Academy of Management Journal, 43(4), 698-716.

Kirchherr, J., Piscicelli, L., Bour, R., Kostense-Smit, E., Muller, J., Huibrechtse-Truijens, A., Hekkert, M., 2018. Barriers to the Circular Economy: Evidence from the European Union (EU). Ecological Economics, 150, 264-272.

Lee, K.H., Min, B. 2015. Green R&D for eco-innovation and its impact on carbon emissions and firm performance. Journal of Cleaner Production, 108, 534-542.

Lieder, M., Rashid, A. 2016. Towards circular economy implementation: a comprehensive review in context of manufacturing industry. Journal of Cleaner Production 115, 36-51.

Marien, M. (1989). Driving forces and barriers to a sustainable global economy. Futures, 21(6), 563-570.

Meyer, J. W., Rowan, B. 1977. Institutionalized organizations: Formal structure as myth and ceremony. American journal of sociology, 83(2), 340-363.

Miles, R.E., Snow, C.C., Meyer, A.D., Coleman Jr, H.J. 1978. Organizational strategy, structure, and process. Academy of management review, 3(3), 546-562.

Min, H., Galle W.P. 2001. Green purchasing practices of US firms. International. Journal of Operations and Production Management, 21(9), 1222-1238.

Norgaard, R.B. 1985. Environmental economics: an evolutionary critique and a plea for pluralism. Journal of Environmental Economics and Management, Dec, 12 (4).

Özdemirci, A. 2011. Corporate entrepreneurship and strategy process: A performance based research on Istanbul market. Procedia-Social and Behavioral Sciences, 24, 611-626.

Parker, S.K., Bindl, U.K., Strauss, K. 2010. Making things happen: A model of proactive motivation. Journal of management, 36(4), 827-856.

Plaza-Úbeda, J.A., Burgos-Jiménez, J., Carmona-Moreno, E. 2010. Measuring stakeholder integration: knowledge, interaction and adaptational behavior dimensions. Journal of Business Ethics, 93(3), 419-442.

Porter, M.E., Van der Linde, C. 1995. Toward a new conception of the environment-competitiveness relationship. Journal of economic perspectives, 9(4), 97-118.

Prieto-Sandoval, V., Jaca, C., Ormazabal, M., 2018. Towards a consensus on the circular economy. Journal of Cleaner Production, 179, 605-615.

Roome, N. 1992. Developing environmental management strategies. Business Strategy and the Environment, 1(1), 11-24.

Russo, M.V., Fouts, P.A. 1997. A resource-based perspective on corporate environmental performance and profitability. Academy of management Journal, 40(3), 534-559.

Sharma, S., Vredenburg, H. 1998. Proactive corporate environmental strategy and the development of competitively valuable organizational capabilities. Strategic Management Journal, 19(8), 729-753.

Sharma, S., Henriques, I. 2005. Stakeholder influences on sustainability practices in the Canadian forest products industry. Strategic Management Journal, 26(2), 159-180.

Stahel, W.R., 2016. Circular Economy. Nature. 6-9. https://doi.org/10.1038/531435a.

Teece, D.J., Pisano, G., Shuen, A., 1997. Dynamic Capabilities and Strategic Management. Strategic Management Journal, 18(7), 509-533.

Valero-Gil, J., Rivera-Torres, P., Garcés-Ayerbe, C. 2017. How Is Environmental Proactivity Accomplished? Drivers and Barriers in Firms' Pro-Environmental Change Process. Sustainability, 9(8), 1327.

Winsemius, P., Guntram, U. 1992. Responding to the environmental challenge. Business Horizons, 35(2), 12-21.

2. INNOVATION AS A MEASURE OF STRATEGIC PROACTIVITY. EFFECT ON ENVIRONMENTAL STRATEGY[1]

ABSTRACT

In environmental management literature it is widely accepted that an innovative attitude is a driver of an environmental strategy. In this study we define proactivity as firm's feature to go beyond competitors and we analyse the relationship between innovation and environmental proactivity. In particular, we analyse the effect of innovation proactivity on environmental proactivity using panel data for the period 2008-2013. Results show that those firms with an innovative proactive strategy are more capable to reach also proactive positions in their environmental strategy. We can conclude that an appropriate development of innovation capabilities allows firms to leverage resources and accumulate experiences and know-how. This will allow reaching proactive positions in environmental strategy.

KEYWORDS

Environmental proactivity; Innovation capability; Innovation proactivity.

[1] This is an original version of a paper published in Universia Business Review. Citation for the published publication: Suárez-Perales, I., Rivera-Torres, P., Garces-Ayerbe, C. 2018. Consequences of innovative proactivity in environmental management. Universia Business Review, (57), 56-91.

2.1. INTRODUCTION

The degradation of the environment by industrial globalisation has attracted greater interest in environmental factors in the last few years, and concepts such as green economy or sustainable development have been seen of interest for business growth. Organisations have had to change their forms of management and production, giving greater importance to reducing the use of resources and minimising environmental impact. This has led to the search and implantation of environmental strategies, the diversity of which comprises from reactive positions, merely complying with legislation, to more advanced, or proactive, attitudes.

Although the concept of environmental proactivity has been defined in different ways in management literature, there is some consensus regarding the characteristics required for a company's environmental strategy to be classified as proactive. One of them is activities aimed at preventing pollution (Aragón-Correa, 1998), tending towards reducing the use of materials and process innovation (Hart, 1995). Another feature often associated is the extent to which environmental measures are applied in a company (Sharma & Vredenburg, 1998), defined as degree of environmental response. If *depth* and *prevention* are often considered in the definition of environmental proactivity, the most repeated terms found in the literature are possibly *voluntary nature* and *anticipation*. Several authors insist that environmental proactivity requires anticipation of environmental legislation and stakeholder demands (Murillo-Luna et al., 2008). Proactivity in environmental matters required anticipation and preparation for future changes in laws and social trends, and changes in operations, processes and products that enable firms to be ready for future legislative and social changes (Aragón-Correa & Sharma, 2003). In sum, environmental proactivity requires the anticipation of the environmental needs of

stakeholders (Garcés-Ayerbe et al, 2012) and not only improving on legally required practices but also on those applied by competitors (Sharma & Vredenburg, 1998; Suárez-Perales et al., 2017).

To attain this status, firms have to be able to accumulate know-how about needs and trends in environmental protection, not only of governments and law-makers but also of different stakeholders, in society, on the market, in the industry, in technological centres and in the organisation itself. The need for information about these groups and the skills required to promptly respond to their requirements means that environmental proactivity is closely related to a firm's general strategy, particularly in relation to innovation.

Although there are numerous studies of the development of strategic capabilities such as innovation (Jacobides & Winter, 2005) and environmental proactivity (Aragón-Correa & Sharma, 2003) separately, others analyse them as two supplementary capabilities (Christmann, 2000; Ozusaglam, 2012). Like these authors, this study sees innovation as a factor that facilitates environmental proactivity. Seeing general innovation and environmental proactivity as complementary assumes that the two capabilities improve each other's performance, adding interest to their joint application[2]. Justifying environmental proactivity as a factor that facilitates innovation is therefore equally possible. The objectives of this research, however, lead to study environmental proactivity as a consequence, and not as a determining factor, of innovation.

[2] One example of this is the implantation of general innovations to improve production efficiency, which have environmental effects such as a reduction in the resources used in the production process. A general innovation strategy can produce specific environmental results. This can also occur in the opposite direction a change in starting materials to reduce emissions can result in an innovative improvement in quality.

Some authors have analysed the effect of strategic proactivity on environmental strategy, focusing only on how some specific aspects of a firm's strategy, such as ongoing innovation (Sharma et al., 2007), a shared vision (Aragón-Correa et al., 2008) or international experience (Aguilera-Caracuel et al., 2012) affect environmental performance. There are, however, many as yet unanswered questions. There is little empirical evidence, variable measurement is not fully developed and there is little knowledge of which aspects of strategic proactivity most favour environmental proactivity. This study aims to learn more about how a specific aspect of strategic activity, related to innovation, affects a firm's environmental strategy. We use a data panel to study the effect of innovative proactivity on environmental strategy. Environmental management literature concludes that the implantation of innovative measures in a firm is associated to the study of the entire production cycle, enabling detected inefficiencies to be corrected, reducing production costs and thus reducing the firm's environmental impact (Hofmann et al., 2012). This study attempts to learn more in this regard in relation to dynamic capabilities, analysing how the development of a proactive innovative attitude, characterised by greater innovation practices than are usual in the sector, affects environmental strategy. The paper is structured as follows: the next section reviews prior literature on the topic and presents the subject to be analysed. The third section contains the empirical analysis, describing our sources of information, the construction of variables and the methodology, ending with the results of the model. The final section contains our conclusions.

2.2. INNOVATION AS A FACTOR THAT FOSTERS ENVIRONMENTAL PROACTIVITY

2.2.1. The Dynamic Capabilities Approach

The dynamic capabilities approach has been recurrent in the last few years for the study of the development or acquisition of capabilities that facilitate the implantation of an environmental strategy in the firm (Aragón-Correa & Sharma, 2003). Teece (2007) defines dynamic capabilities as 'capabilities of the firm, difficult to imitate, necessary to adapt to changing environment and new technological opportunities. They also include the firm's ability to configure the setting in which it operates, develop new products and processes and design and implement viable business models'. This dynamic capabilities approach is part of the resource-based perspective, emphasising the firm's need to adapt, integrate and reconfigure its functional capabilities, resources and competencies to adapt to the demands of a changing environment (Del-Río et al., 2015). Dynamic capabilities, therefore, are internal to the firm and cannot be isolated from their context, as they arise as a result of external stimuli. Dynamic capabilities facilitate the adaptation of firms operating in settings that are dynamic, changing and difficult to predict, and are therefore fundamental for maintaining competitive advantage. According to this approach, innovation can be seen as a skill developed by the firm that enables it to adapt to a changing and dynamic scenario.

Innovation has generally been considered the ideal attitude for adaptation to and the management of changes in the setting, as innovative firms are more able to adapt with their more flexible structures, greater information-sharing culture, and less aversion to risk (Hofmann et al., 2012). Some of the factors most regularly associated to innovative firms are the use of new technology, the acquisition of foreign technology licenses, the number of new products and patents, or investment in R&D (Manu & Sriram, 1996). All these characteristics of innovation lead it to be considered a capability that fosters the use of advanced environmental measures.

Innovative firms accumulate information and know-how about their stakeholders and are technologically prepared to promptly adapt to their new environmental demands. Furthermore, this know-how enables them to reduce the risk-aversion associated to new technologies, including green ones. Some authors have studied innovation as a promoter of environmental strategy. Christmann (2000), for example, shows that the implantation of pollution prevention technologies in a firm requires the ability to innovate and make changes to the production process in order to be successful. Haverkamp et al., (2010) obtained empirical evidence that innovative firms are more likely to adopt environmental measures. They found that innovative firms were more interested in ecological product design, their managers were more committed to the environment and they had a greater perception of environmental opportunities on the market. Hofmann et al., (2012) also concluded that firms that use advanced technologies were leaders in environmental practices, and that the most innovative were the greenest.

This literature review shows that innovation can be analysed as a capability that a firm develops as the result of external stimuli out of its control, and that at the same time it favours the implantation of advanced environmental practices. In dynamic settings, different external factors force the firm to reconfigure and reorganise its resources and know-how and to implant innovations that enable it to generate a more flexible response to a changing setting (Winter, 2003). The generation of know-how and the management of changes in production process associated to innovation also facilitate the development of other, supplementary capabilities, such as environmental proactivity (Garcés-Ayerbe & Cañón-de-Francia, 2017). The introduction of innovations, therefore, fosters the development of capabilities thanks to the use of synergies that foster the implantation of a proactive environmental strategy.

2.2.2. Effect of Innovative Proactivity on Environmental Proactivity

The environmental management literature has referred to strategic proactivity as a significant positive factor when determining, implanting or applying a proactive environmental strategy in an organisation (Aragón-Correa, 1998; Carrascosa-López et al., 2012). Aragón-Correa (1998) describes strategically proactive firms as those that develop new products, markets and ways of competing; they invest in flexible technology that enables them to respond to sudden market changes in order to attain a leadership position, and they choose organisational structures and processes that reduce uncertainty and enable innovation. The results of this study show a significant, positive relationship between strategic proactivity and the development of environmental management, considered by the authors as a possible new way to obtain competitive advantage. Sharma et al., (2007) identify the concept of strategic proactivity as a capability that forms part of the organisation's routines and processes, designed to maintain a position of leadership by managing the setting, including competitors' strategies. These authors also found a positive relationship between these organisational capabilities and the development of a proactive environmental strategy. Aragón-Correa et al., (2008) analyse the impact of strategic proactivity, together with other capabilities, on the implantation of a proactive environmental strategy in small and medium-sized Spanish firms. They show that certain strategic capabilities, such as the founder's vision, flexibility in stakeholder management or an entrepreneurial trend enhance and have a positive impact on the implantation of an environmental strategy.

Some authors have only focused on type of innovative attitude, with importance given to the type of innovation strategy and how it affects environmental strategy. Sharma et al., (2007) refer to ongoing innovation as

the capability to create, improve, reconfigure and redesign existing products, services, processes and business models, showing that said capability affects environmental strategy. Haverkamp et al., (2010) also conclude that proactive innovation favours environmental strategy. They show that firms that dynamically seek new strategic positions through ongoing innovation in order to beat competitors (that is, proactively) obtain better results in their environmental strategy. Others, such as Garcés-Ayerbe & Cañón-de-Francia, (2017), show that environmental proactivity favours economic performance much more clearly when the firm is also proactive in innovation. Their results suggest that environmental proactivity is more profitable for firms that are proactive in innovation, as there are complementarities between the two dynamic capabilities.

According to the literature review, it can be assumed that different innovation strategy profiles give rise to more or less proactive environmental strategies. The generation of know-how, learning and organisational changes that accompany innovation also enable the development of other supplementary capabilities and skills such as the implementation of a proactive environmental strategy. Firms that proactively implant innovations will be able to use what they learn for the development of other skills. In other words, a proactive profile in innovation will favour a similar profile in environmental measures, among others. It can therefore be assumed that, if innovation is voluntary and has more ambitious objectives than innovation in competitors (proactively), the firm's environmental strategy will also be proactive. The following question is thus considered:

Does innovative proactivity foster environmental proactivity?

2.3. METHODOLOGY

In order to analyse this question, we used the "Survey of technological innovation in firms"[3], known as the Technological Innovation Panel (*Panel de Innovación Tecnológica* - PITEC). The period used is 2008 - 2013[4], and we only consider innovative firms in the manufacturing sectors, firms that implanted at least one of the following innovations in the period: a) Product innovation (products or services) in the period t to t-2; b) Process innovation in the period t to t-2; c) Technological innovation activities ongoing or abandoned in the period t to t-2. The sample, therefore, consists of a panel of 27,267 observations and 4,546 firms of different sizes in 23 industrial sub-sectors, according to Spanish classification code CNAE-2009.

The variables used in the study were designed based on the "Survey of innovation in firms". Considering the regular practices of competitors in the sub-sector in which the firm operates, the study variables related to environmental proactivity and innovative proactivity were constructed. Following is how these two concepts are measured[5].

Environmental proactivity: the firm's innovation could aim at different objectives, and the survey asks it to classify their importance. Three objectives related to the firm's environmental proactivity were used to measure this concept: a) Less material used per unit produced; b) Less energy used per unit produced; c) Less environmental impact. Each of these objectives is valued at 0-3, where 0 is "insignificant/not used" and 3 is "great importance". As the proactivity concept implies that the firm attempts to go beyond regular practices in the sector, with each of these three objectives we

[3] See (http://icono.fecyt.es/PITEC)
[4] Some of the significant questions for the study were significantly amended in 2008.
[5] For further detail, see Appendix I and II: "Construction of variables".

constructed a dummy variable the value of which is 1 if the firm sees these objectives as more important than average in the sector, and 0 otherwise. The sum of these three dummy variables thus gradually expresses environmental proactivity (0-3).

Innovative proactivity: the construction of the variable is based on the product between the number of innovations implanted in the firm throughout the production cycle and total expenditure in innovation. We first consider the possible implantation of four types of innovation: a) product, b) process, c) organisation, or d) marketing. Each of these possible implantations is measured with a dummy variable the value of which is 1 if the innovation was implanted, and 0 otherwise; the sum gives rise to a 0-4 variable scale, where 0 means that the firm did not implant any innovation and 4 that all four types of innovation were implanted. In order to consider proactivity, a dummy variable is constructed based on innovation effort. Net turnover is divided by total expenditure on innovation[6], thus considering the firm's size. Sectoral mean values are used to construct a dummy variable the value of which is 1 if innovation effort is above average for the sub-sector, and 0 otherwise. The two variables (the sum of implanted types of innovation on the one hand, and proactivity in innovation expenditure on the other) are then multiplied, resulting on a variable on a scale of 0-4, considering firms that are proactive in innovation relative to their sub-sector and diversity in the type of innovations implanted.

[6] Total innovation expenditure includes: a) in-house R&D; b) Acquisition of R&D; c) Acquisition of machinery, equipment, advanced hardware or software and buildings intended for the production of new or significantly improved products or processes; d) Acquisition of know-how for innovation; e) Training for innovation activities; f) Introduction of innovations on the market; g) Design, other production and/or distribution preparatory work.

Tables 1 and 2 help to better explain the variables; the first shows the descriptive statistics of the sample and the second shows the distribution by sub-sector for both environmental and innovative proactivity. In general, the mean values of each sub-sector are very low. Indeed, the global mean value of innovative proactivity is 0.437 (on a scale from 0 to 4), while the figure for environmental proactivity is slightly higher at 1.142 (on a scale from 0 to 3). A large percentage of the firms in the sample present the lowest values for both variables. Graph 1 shows a representation of the mean values for each sub-sector. The X-axis shows environmental proactivity and the Y-axis innovative proactivity. The cuts between the axes are the global mean values of the two variables. So, the first quadrant contains all the sectors for which the mean value for the 6 years of the study is above the global average for both variables, while the third contains the sectors with values beneath the global average.

INSERT TABLE 1 ABOUT HERE

The most innovatively proactive sectors are related to transport (motor vehicles, transport equipment, including aeronautic and space construction) or to the manufacture of computing equipment (computer, electronic and optic products, electric material and equipment and other machinery and equipment) or the textile industry. Regarding the innovative proactivity variable, values other than zero correspond to firms that invested more than average in their sectors in innovation. Therefore, the most technology-intensive sectors have a lower percentage of proactive firms (such as computer products), because attaining a leadership position can be a complex strategic challenge. In this respect, note the low values of the chemical and pharmaceutical industries. The metal, rubber and plastic sectors are leaders in environmental proactivity. However, despite their low values in terms of

innovation, the chemical and pharmaceutical industries have above average values in environmental proactivity. The sub-sectors with the lowest mean values in environmental proactivity are apparel and repair and installation of machinery and equipment. In the first quadrant, we see aeronautical and space construction, motor vehicles and other transport equipment. The sub-sectors with a high technological component (pharmaceuticals, computing, electronic and optic products, and aeronautical and space construction), which have higher values in innovative proactivity, also present the highest values in environmental proactivity, showing that there could be a relationship between innovative and environmental proactivity. The existence of such a relationship is verified with panel data econometrics. The advantage of this methodology is that it enables the detection and correction of specific firm effects not entered in the model. The Breusch-Pagan and Hausman statistical tests enable us to analyse the type of effects found in the model[7].

INSERT TABLE 2 ABOUT HERE

INSERT FIGURE 1 ABOUT HERE

As Table 3 shows, the estimated coefficient is positive and significant, so it can be concluded that innovative proactivity does indeed have a positive impact on environmental proactivity. This results how that, when the innovation strategy is proactive, seeking improvements throughout the production cycle (implanting innovative measures in product, process, organisation and marketing), above and beyond the usual in the sector, the

[7] Specific effects can be fixed or random, depending whether they are correlated with the model's explanatory variables or not. Detection of whether they are of one kind or another is important for choosing the types of estimator to be used.

environmental strategy is more likely to also be proactive. These results can be justified if we consider the synergies to be expected by firms when environmental land innovative proactivity are both implemented together (Hofmann et al., 2012).

INSERT TABLE 3 ABOUT HERE

Not in vain have some authors, such as Christmann, (2000) and Garcés-Ayerbe & Cañón-de-Francia, (2017), described these two dynamic capabilities as complementary. The more proactive that a firm is in innovation, the greater its know-how regarding stakeholder demands related to technological and operating possibilities, and the risks associated to change, so the firm is more likely to progress in its environmental strategy through eco-innovations aimed at reducing the use of materials and energy and, in general, environmental impact.

The use of know-how in innovation complements environmental measures in a firm, so a positive association between the two can be expected. The results obtained by Chrismann, (2000) help to justify this association. She explains that the implantation of a successful environmental strategy, a firm requires a series of innovation capabilities and changes made to its production process. The results of this research are also consistent with those obtained by Sharma et al., (2007), who show that innovation capability enables firms to make changes to their production process that have a positive impact on their environmental strategy. The results obtained suggest that firms that attempt to innovate in order to attain a leading position in their sub-sectors, tend to more than comply with legal provisions in their environmental strategy, and exceed the regular practices in their sectors. Therefore, following Haverkamp et al., (2010), it can be concluded that firms

that proactively seek new strategic innovation positions obtain better results in their environmental strategy.

2.4. CONCLUSIONS

This study considers the relationship between two strategies described by previous literature as complementary, innovation and environmental protection. It is studied considering degree of proactivity, considering whether related effort is above the average in the sector. This is precisely one of this study's contributions. Indeed, although the positive impact of innovation on environmental strategy had been previously studied in the literature, this study considered the relationship in terms of proactivity in both innovation and environmental matters.

The comparison of innovative and environmental proactivity in different sub-sectors shows that there are different business performance patters in different sub-sectors. Each sector is affected by related legislation, which varies according to the activity in question, and also regular practices. It was found that sectors with greater technological requirements have very low innovative proactivity values, suggesting that high-tech firms have to make great efforts to implant a proactive strategy, due to the high levels implanted in the sector. It is therefore important to compare firms in the same sector, as otherwise the results could be biased.

The results obtained are of interest for general and environmental managers. Proactivity in innovation promotes the application of green practices and activities in firms. This proactive strategy or attitude enables firms to make use of know-how, which could lead to a competitive advantage. Environmental proactivity enables firms to anticipate legislation, minimise costs by correct resource management and attain greater social and political acceptance. A firm's reputation will also improve and attract more

"green" consumers. It can also have an impact on policy-makers, who must consider that increasing business innovation and reducing environmental impact can be fundamental for guaranteeing a country's growth and employment. The repercussions of excessive or insufficient environmental legislation can have serious consequences for business activity. It can be extremely complicated to apply a proactive strategy if legislation is excessive. It could lead firms to limit their environmental strategies to compliance with legal provisions, minimising incentives to act proactively in environmental matters. The same occurs if legislation is insufficient. Firms would not need to spend more on innovation, as it would be easy to stand out. With correctly adapted environmental legislation, firms can benefit from the use of less resources, less waste generation, greater efficiency, better productivity or greater competitiveness.

Although prior literature showed a positive relationship between innovation and environmental management, this study confirms such as relationship with the proactivity aspect, which could have repercussion for academics. A proactive attitude involves extra effort for firms, enabling them to make the most of market opportunities, taking the initiative and acting in an opportunistic manner. One limitation of the study could be that it does not refer to the possibility of this relationship working in two directions (Tsai & Liao, 2017). Although the study considers environmental proactivity as a result, and not a cause, of innovative proactivity, the relationship could well work both ways, considering feedback between the two capabilities that is not considered in this analysis.

In this respect, a future line of research could be the analysis of innovative and environmental proactivity according to the technological intensity of a particular sector. The results could lead to conclusions

regarding the practices regularly followed by sectors and the impact of proactivity when such practices are intensive. Likewise, the effect of strategic alliances on proactive innovation and environmental strategies could also be studied.

This study shows that a proactive attitude in innovation fosters the application of a proactive environmental strategy. It is important to highlight that these strategic decisions can help the economy to become more efficient and environmentally-friendly. Furthermore, the optimisation of production process and management methods could promote employment in the growing "green sector", open new markets and benefit consumers with more sustainable products.

2.5. REFERENCES

Aguilera-Caracuel, J., Hurtado-Torres, N.E., Aragón-Correa, J.A. (2012). "Does international experience help firms to be green? A knowledge-based view of how international experience and organizational learning influence proactive environmental strategies". International Business Review, 21, 847-861.

Aragón-Correa, J.A. (1998). "Strategic Proactivity and Firms A roach to the Natural Environment". Academy of Management Journal, 41(5), 556-567.

Aragón-Correa, J.A., Sharma, S. (2003). "A Contingent Resource-Based view of Proactive Corporate Environmental Strategy". Academy of Management Review, 28 (1), 71-88.

Aragón-Correa, J.A., Hurtado-Torres, N., Sharma, S., García-Morales, V.J. (2008). "Environmental strategy and performance in small firms: A resource-based perspective". Journal of Environmental Management, 86, 88–103.

Carrascosa-López, C., Segarra-Oña, M.V., Peiró-Signes, A., Segura-García-del-Río, B. (2012). "Does It Pay to Be "Greener" than Legislation? An Empirical Study of Spanish Tile Industry". Journal of Sustainable Development, Vol. 5(5), 567.

Christmann, P. (2000). "Effects of "best practices" of environmental management on cost advantage: The role of complementary assets". Academy of Management journal, 43(4), 663-680.

Del Río, P., Carrillo-Hermosilla, J., Könnölä, T., Bleda, M. (2015). "Resources, capabilities and competences for eco-innovation". Technological and Economic Development of Economy. DOI: 10.3846/20294913.2015.1070301

Garcés-Ayerbe, C., Cañón-de-Francia, Joaquín. (2017). "The Relevance of Complementarities in the Study of the Economic Consequences of Environmental Proactivity: analysis of the Moderating Effect of Innovation Efforts". Ecological Economics, 142, 21-30.

Garcés-Ayerbe, C., Rivera-Torres, P., Murillo-Luna, J.L. (2012). "Stakeholder Pressure and Environmental Proactivity Moderating Effect of Competitive Advantage Expectations". Management Decision. 50 (2), 189-206.

Hart, S.L. (1995). "A Natural-Resource-Based view of the Firm". Academy of Management Review. 20(4), 986-1014.

Haverkamp, D-J., Bremmers, H., Omta, O. (2010). "Stimulating environmental management performance: Towards a contingency approach". Environmental Management Performance, 112 (11), 1237-1251.

Hofmann, K.H., Theyel, G., Wood, C.H. (2012). "Identifying Firm Capabilities as Drivers of Environmental Management and Sustainability Practices – Evidence from Small and Medium-Sized Manufacturers". Business Strategy and the Environment. 21, 530-545.

Jacobides, M.J., Winter S.G. (2005). "The Co-Evolution of Capabilities and Transaction Costs: Explaining the Institutional Structure of Production". 26, 395-413.

Manu, F. A., Sriram, V. (1996). "Innovation, Marketing Strategy, Environment, and Performance". Journal of Business Research, 35, 79-91.

Murillo-Luna, J.L., Garcés-Ayerbe, C., Rivera-Torres, P. (2008). "Why Do Patterns of Environmental Response Differ? A Stakeholders' Pressure A roach". Strategic Management Journal, 29, 1225-1240.

Ozusaglam, S. (2012). "Environmental innovation: a concise review of the literature". Vie & sciences de l'entreprise, 2, 15-38.

Sharma, S., Aragón-Correa, J.A., Rueda-Manzanares, A. (2007). "The Contingent Influence of Organizational Capabilities on Proactive Environmental Strategy in the Service Sector: An Analysis of North American and European Ski Resorts". Canadian Journal of Administrative Sciences, 24, 268-283.

Sharma, S., Vredenburg, H. (1998). "Proactive Corporate Environmental Strategy and the Development of Competitively Valuable Organizational Capabilities", Strategic Management Journal. 19, 729-753.

Suárez-Perales, I., Garcés-Ayerbe, C., Rivera-Torres, P., Suárez-Gálvez, C. (2017). "Is Strategic Proactivity a Driver of an Environmental Strategy? Effects of Innovation and Internationalization Leadership", Sustainability. 9, 1870-1883.

Teece, D. J. (2007). "Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance", Strategic Management Journal. 28(13), 1319-1350.

Tsai, K-H., Liao Y-C. (2017). "Sustainability Strategy and Eco-Innovation: a Moderation Model", Business Strategy and the Environment. 26, 426-437.

Winter, S. G. (2003). "Understanding dynamic capabilities". Strategic management journal, 24(10), 991-995.

2.6. APPENDIX I: CONSTRUCTION OF VARIABLES (A)

SURVEY ON TECHNOLOGICAL INNOVATION IN FIRMS	**VALUES**
ENVIRONMENTAL PROACTIVITY	
1. Information obtained from PITEC:	
Objectives of technological innovation: *Your firm's innovative activity could be aimed at different objectives. Please show the degree of importance of the following objectives.*	
Less material per produced unit	(1;4)[(1)]
Less energy per produced unit	(1;4)[(1)]
Less environmental impact	(1;4)[(1)]
2. Recoding:	
The scales of the three variables are recoded:	
Less material per produced unit	(0;3)[(2)]
Less energy per produced unit	(0;3)[(2)]
Less environmental impact	(0;3)[(2)]
3. Construction of three "proactivity" variables:	
The mean values of each sub-sector for the three variables (three environmental objectives) are calculated. Based on these values, three dummy variables are constructed, which have a value of 1 if the firm places more importance than average for the sub-sector, and 0 if it places less than average importance:	
Less material per produced unit	(0;1)
Less energy per produced unit	(0;1)
Less environmental impact	(0;1)
4. Construction of ENVIRONMENTAL PROACTIVITY variable:	**(0;3)**
The endogenous "environmental proactivity" variable is constructed by the sum of the three dummy variables in the previous step. The value of these dummy variables was 1 if the firm places more importance on a specific environmental objective than the average value for its sub.-sector. Therefore, the "environmental proactivity" variable constructed by the sum of the three dummy variables will have a value of 0 if the firm did not place more importance to an environmental objective than the average for the sub-sector, and 3 if the firm placed more than average importance on the three environmental objectives. The values imply the following:	
The firm places more than average importance on the 3 environmental objectives	**3**
The firm places more than average importance on 2 environmental objectives	**2**
The firm places more than average importance on 1 environmental objective	**1**
The firm does not place more than average importance on any environmental objective	**0**

2.7. APPENDIX I: CONSTRUCTION OF VARIABLES (B)

SURVEY ON TECHNOLOGICAL INNOVATION IN FIRMS	**VALUES**
INNOVATIVE PROACTIVITY	
1. Information obtained from PITEC: *Did your firm introduce innovation related to…*	
A) Product	**(0;1)(*)**
…Goods?	
…Services?	
B) Process	**(0;1)(*)**
…Significantly improved or new manufacturing or production methods?	
…Significantly improved or new logistic systems or delivery or distribution methods for your starting materials, goods or services?	
...Significantly improved or new support activities for your processes, such as maintenance, computing, purchasing or accounting operations?	
C) Organisation	**(0;1)(*)**
…New business practices in the organisation of work or firm procedures?	
…New work place organisation methods at your firm in order to better distribute responsibilities and decision-making?	
…New management methods for external relations with other firms or public institutions?	
D) Marketing	**(0;1)(*)**
…Significant changes in product design or the packaging of goods or services?	
…New product promotion techniques or channels?	
…New methods for positioning the product on the market or in sales channels?	
…New good or service price establishment methods?	
2. Construction of "Sum of innovations" variable:	**(0;4)**
By adding the four previous dichotomic variables, we obtain a variable the value of which is 0 if no type of innovation has been implemented and 4 if the firm implanted innovations in product, process, organisation and marketing.	
3. Construction of "proactivity" variable:	**(0;1)**
In this case, whether a firm is proactive in innovation is determined with total expenditure (investment) on innovation. Following are the steps followed for the variable's construction:	
A) Total innovation expenditure/turnover	

Considering innovation investment relative to turnover considers the size of the firm.

B) Calculation of sub-sector mean

The mean value of this figure (total innovation expenditure/turnover) is calculated for each sub-sector of the study sample, thus controlling sector and considering industry-specific effects.

C) ***Construction of "innovation proactivity" dummy variable***

A dummy variable is constructed from the sub-s-sector means in the previous step, the value of which is 1 if innovation expenditure (relative to turnover, step A) is above average for the sub-sector and 0 if it is below average.

4. Construction of INNOVATIVE PROACTIVITY variable: (0;4)

The "innovative proactivity" variable is constructed from the sum of innovations and proactivity in innovation expenditure (steps 2 and 3). This product considers the number of innovations implanted by the firm (step 2), only if its innovation expenditure is above average for the sub-sector (step 3).

2.8. APPENDIX II: TABLES.

Table 2.1: Descriptive Statistics

	Mean	SD	Min	Max	1[8]	2
Environmental proactivity	1.142	1.248	0	3	1	
Innovative proactivity	0.437	1.025	0	4	0.211	1

[8] Correlations

Table 2.2. Sample's Distribution

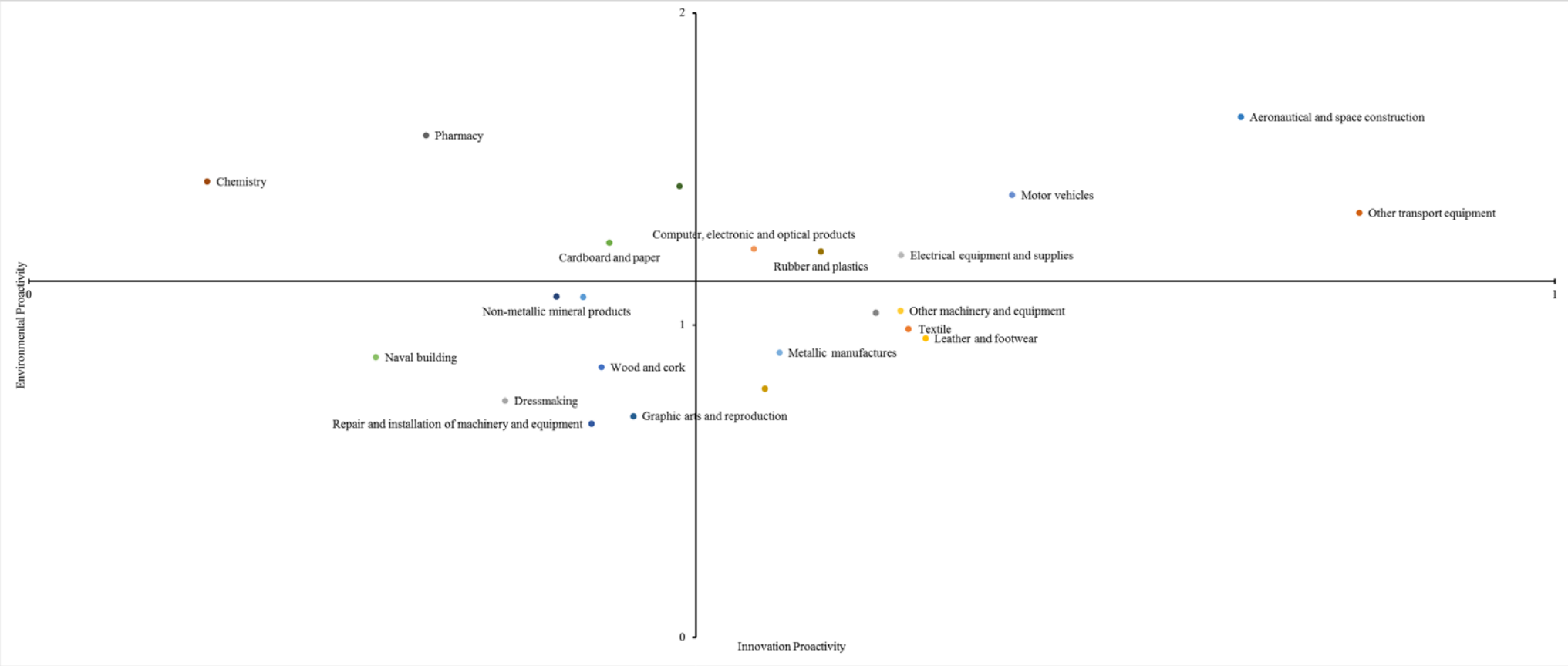
	CNAE-2009	Innovative Proactivity							Environmental Proactivity[9]					
		0	1	2	3	4	Total	Mean	0	1	2	3	Total	Mean
Food. beverages and tobacco	10. 11. 12	83.61%	7.42%	2.18%	2.60%	4.18%	**3802**	0.363	49.90%	13.90%	13.59%	22.61%	**3834**	1.089
Textile	13	72.81%	10.75%	7.06%	4.74%	4.64%	**949**	**0.576**	50.94%	16.77%	14.88%	17.40%	**954**	0.987
Dressmaking	14	81.46%	9.27%	6.10%	2.93%	0.24%	**410**	0.312	67.39%	5.56%	10.87%	16.18%	**414**	0.758
Leather and footwear	15	74.09%	12.04%	2.55%	3.65%	7.66%	**274**	**0.588**	57.45%	11.35%	9.22%	21.99%	**282**	0.957
Wood and cork	16	81.10%	8.14%	5.51%	2.62%	2.62%	**381**	0.375	55.99%	16.67%	12.24%	15.10%	**384**	0.865
Cardboard and paper	17	81.51%	8.44%	4.13%	2.33%	3.59%	**557**	0.381	48.76%	8.87%	9.57%	32.80%	**564**	**1.264**
Graphic arts and reproduction	18	81.12%	8.62%	3.03%	3.96%	3.26%	**429**	0.396	67.13%	9.49%	8.80%	14.58%	**432**	0.708
Chemistry	20	95.13%	1.66%	0.83%	1.14%	1.24%	**2898**	0.117	31.88%	21.66%	15.13%	31.33%	**2927**	**1.459**
Pharmacy	21	88.87%	3.80%	2.75%	1.57%	3.01%	**764**	0.260	28.26%	20.31%	13.93%	37.50%	**768**	**1.607**
Rubber and plastics	22	76.40%	9.22%	5.16%	4.50%	4.72%	**1801**	**0.519**	46.30%	12.58%	12.42%	28.70%	**1812**	**1.235**
Non-metallic mineral products	23	83.86%	7.93%	1.83%	2.51%	3.86%	**1475**	0.346	51.45%	11.97%	12.58%	24.01%	**1487**	1.091
Metallurgy	24	76.76%	12.64%	3.96%	4.47%	2.17%	**783**	0.427	37.53%	13.36%	16.16%	32.95%	**786**	**1.445**
Metallic manufactures	25	77.83%	7.96%	5.58%	4.44%	4.19%	**2815**	**0.492**	57.84%	12.44%	10.33%	19.39%	**2837**	0.913
Computer. electronic and optical products	26	81.17%	6.06%	2.48%	4.67%	5.62%	**1370**	**0.475**	41.39%	18.45%	14.60%	25.56%	**1377**	**1.243**
Electrical equipment and supplies	27	75.02%	9.11%	4.94%	5.54%	5.39%	**1317**	**0.572**	44.94%	14.51%	13.76%	26.79%	**1344**	**1.224**
Other machinery and equipment	28	73.80%	10.01%	6.43%	4.77%	4.98%	**3435**	**0.571**	50.61%	15.49%	12.60%	21.30%	**3460**	1.046
Motor vehicles	29	72.35%	8.99%	6.14%	6.91%	5.61%	**1302**	**0.644**	37.14%	14.84%	17.35%	30.67%	**1314**	**1.416**
Naval building	301	90.24%	3.25%	1.63%	3.25%	1.63%	**123**	0.228	49.21%	25.40%	11.90%	13.49%	**126**	0.897
Aeronautical and space construction	303	72.90%	2.80%	7.48%	5.61%	11.21%	**107**	**0.794**	27.78%	14.81%	20.37%	37.04%	**108**	**1.667**
Other transport equipment	30[10]	63.46%	9.62%	10.90%	8.33%	7.69%	**156**	**0.872**	37.18%	14.10%	24.36%	24.36%	**156**	**1.359**
Furniture	31	75.77%	10.38%	2.82%	4.62%	6.41%	**780**	**0.555**	53.44%	11.83%	12.09%	22.65%	**786**	1.039
Other manufacturing activities	32	81.82%	4.11%	4.55%	3.08%	6.45%	**682**	**0.482**	59.42%	15.80%	10.58%	14.20%	**690**	0.796
Repair and installation of machinery and equipment	33	81.80%	6.86%	6.38%	2.60%	2.36%	**423**	0.369	61.41%	18.82%	9.65%	10.12%	**425**	0.685

[9] These are the values for the simple composed by 27.267 observations for a total of 4.546 firms in the period 2008-2013.
[10] 301 and 303 not included.

Table 2.3: Estimated parameters

	Coeff.	Standard error	p-value
Constant	1.110	0.004	0.000***
Innovative proactivity	0.096	0.009	0.000***
Breusch-Pagan test (χ^2) (OLS vs random effects):	23,718.83		0.000***
Hausman test (χ^2) (Random vs fixed effects):	197.71		0.000***

2.9. APPENDIX III: FIGURES. Figure 1. Sample's Distribution



3. IS STRATEGIC PROACTIVITY A DRIVER OF AN ENVIRONMENTAL STRATEGY? EFFECTS OF INNOVATION AND INTERNATIONALIZATION[11]

ABSTRACT

The paper aims to clarify the relationship between strategic proactivity and environmental proactivity. We measure strategic proactivity through innovation, with two variables related to the firm's entire production cycle: R&D expenditure and patents. But we also consider two more strategic proactivity indicators: innovation proactivity and internationalisation proactivity. Our objective is to analyse the impact of each of these four aspects on environmental proactivity. Empirical evidence shows that firms with a greater innovation effort throughout the production cycle than the average for their sectors also attain more advanced positions (proactivity) in environmental matters and those firms that operate on different markets adapt to the most demanding environmental legislation, placing them in a position of environmental leadership.

KEYWORDS

Internationalisation; Strategic proactivity; Innovation proactivity; Ordered probit model.

[11] This is an original version of a paper published in Sustainability. Citation for the published publication: Suarez-Perales, I., Garcés-Ayerbe, C., Rivera-Torres, P., Suarez-Galvez, C. 2017. Is Strategic Proactivity a Driver of an Environmental Strategy? Effects of Innovation and Internationalization Leadership. Sustainability, (10), 1870.

3.1. INTRODUCTION

The study of internal business factors that facilitate the implantation of environmental practices and objectives has focused the interest of business management literature in the last twenty years. The academic studies involved highlight the impact of factors such as firm size (Min & Galle, 2001; Alvarez et al., 2001; Murillo-Luna et al., 2011), managerial attitudes (Hunt & Auster, 1990; Berry & Rondinelli, 1998; Sharma, 2000; Banerjee, 2001), employee motivation and qualification (Murillo-Luna et al., 2011; Vidal-Salazar et al., 2012), high-involvement work practices (Martínez del Río et al., 2012), innovation (Haverkamp et al., 2010) or internationalisation (Aguilera-Caracuel et al., 2012).

Indeed, some authors believe that an appropriate combination of these internal factors in a firm's business strategy is necessary to attain advanced or proactive positions in environmental matters. In this respect, Aragón-Correa, (1998) argued and confirmed with empirical evidence that environmental strategy is in line with a firm's business strategy. The author established that environmental proactivity is determined by a firm's strategic proactivity, defined as the firm's tendency to initiate voluntary changes in their strategic policies, routines and organisational processes instead of reacting to events in the environment. The results obtained from a sample of 105 Spanish firms showed that firms with proactive business strategies (prospector firms) are more likely to adopt proactive environmental strategies. Sharma et al., (2007), in a sample of 134 North American and European ski resorts, find that strategic proactivity and continuous innovation capabilities are associated with proactive environmental strategies. In a sample of 100 Dutch firms in the food and drink industry, Haverkamp et al., (2010) obtain empirical evidence that different company's profiles are connected with specific drivers and barriers for environmental

proactivity. The results obtained by these authors show that prospector companies are more proactive with respect to environmental capability. However, there are still many unknowns in the relationship between these two complex concepts: strategic proactivity and environmental proactivity. There is little empirical evidence, the measurement of these variables is little developed, and information about the aspects of strategic proactivity that most favour environmental proactivity is very imprecise.

In this paper, we refer to the contributions of authors such as Sharma & Vredenburg, (1998), Murillo-Luna et al., (2008) or Aragón-Correa et al., (2013) to define proactive environmental strategy as a series of objectives, actions, practices and resources aimed at reducing environmental impact, including a degree of voluntariness and prevention, which go beyond regulatory demands and the actions usually taken by firms in the same sector. Our objective, then, is to analyse whether strategic proactivity is a driving factor of such advanced environmental strategy (environmental proactivity).

One of the strategic proactivity indicators most commonly used in empirical literature is innovation, approached through different variables such as R&D investment, number of new products, number of patents, acquisition of new technology or number of employed scientists. We measure strategic proactivity through innovation, with two variables related to the firm's entire production cycle: R&D expenditure and patents. But we also consider two more strategic proactivity indicators: innovation proactivity and internationalisation proactivity. Our objective is to analyse the impact of each of these four aspects on environmental proactivity. The effect of innovative attitude on environmental proactivity has been widely confirmed in the literature, concluding that the implantation of innovative measures is associated to a study of the entire production cycle, leading to a correction of inefficiencies, together with a reduction in production costs and

environmental impact (Hofmann et al., 2012). The effect of internationalisation has been less studied. This variable's inclusion as a strategic proactivity indicator and the analysis of its effect on environmental proactivity represents one of this paper's contributions to research on the topic. According to authors such as González-Benito & González-Benito, (2008), we defend the hypothesis that firms that operate on international markets acquire know-how through the experience, and that their environmental strategy will be adapted to institutionalised practices in the countries with the most demanding legislation. The sign of the effect of internationalisation on environmental proactivity, however, is still subject to debate in the literature. More empirical research on the topic is required to determine whether internationalisation can be classified as an environmental proactivity driver or not.

Another of this study's original contribution to the literature that analyses the relationship between strategic and environmental proactivity is the measurement of proactivity variables. We design three variables (innovation proactivity, internationalization proactivity and environmental proactivity), considering that proactive behaviour (in innovation, internationalisation or environmental management) requires willingness, above and beyond the action usually taken by firms in the same sector. This aspect is considered in the design of three of the variables, referenced to the mean values attained in the sector when determining whether a firm is proactive or not.

Finally, this study differs from previous papers on the topic in that it uses a panel of firms, the dimension of which enables the use of panel data methodology to correct firm-specific aspects in the study of environmental proactivity. The correction of the impact of firm-specific effects such as managerial capability, know-how, organisational culture and other aspects

not considered by explanatory variables is particularly important in an analysis of a firm's business strategy. The correction of these effects adds value to the results obtained in this study.

The following two sections review the literature that analyses the relationship between innovation or internationalisation and environmental proactivity, defining our hypotheses. The fourth section defined the design of the empirical study, specifies the hypothesis-testing model and presents the results of the estimation. The fifth section contains the study's conclusions.

3.2. THEORETICAL FRAMEWORK

3.2.1. Innovation as an Environmental Proactivity Driver

As early as in 1991, Michael Porter argued that business pollution is due to an inefficient use of resources, referring to the need for environmental legislation as a way of encouraging innovation in firms. Such innovation would be associated to the implantation of environmental practices and objectives that would improve productivity, reducing costs and increasing competitiveness.

In general, innovation has been considered the ideal attitude for the adaptation and management of changes in the setting (Manu & Sriram, 1996). This is so because of the characteristics of innovative firms, which tend to implant proactive strategies, have flexible organisational structures that enable fluid internal communications and tend to run risks and withstand greater stakeholder pressure (Hofmann et al., 2012). Several authors have tried to identify behavioural patterns relative to business innovation strategy (Freeman, 1974; Miles & Snow, 1978). Some of the factors most commonly associated to innovative firms are the use of new technologies, number of new products and patents, R&D investment or number of employed

engineers or scientists (Manu & Sriram, 1996). Lederman, (2010), for instance, identifies innovative firms as those that invest in R&D and are willing to acquire foreign technology licenses. All these characteristics, typical of a strategic attitude to innovation and risk-taking, can be drivers of advanced environmental measures. Some authors have tried to show this relationship; Haverkamp et al., (2010) obtained empirical evidence that firms that attempt to move dynamically towards new strategic positions through continuous innovation were more likely to adopt environmental measures. Firstly, such firms were more interested in ecological product design; secondly, their executives were more committed to the environment and, thirdly, they had a clearer perception of environmental opportunities on the market. Along the same lines, González-Benito & González-Benito (2003) determined that firms that are proactive in production, defined as interested in adopting new practices in the production area, were more likely to voluntarily (proactively) implement environmental practices.

Other authors have defined continuous innovation as an organisational capability obtained through a learning process in the search for new routines and combinations of resources (Rueda-Manzanares, 2005), and through the improvement, reconfiguration and re-design of products, services, processes and business models, or the creation of new ones (Sharma et al., 2007). Hofmann et al., (2012) also interpreted the use of advanced technology and product innovation as specific capabilities that facilitate the adoption of environmental practices. These authors obtained empirical evidence that the use of advanced technology helps firms to become leaders in the use of environmental practices, and that the most innovative firms are those that have more environmental initiatives, although they were unable to determine the causality direction in this relationship. In a study of the service sector, Sharma et al., (2007) also found a positive relationship between the

organisational capabilities of strategic proactivity and continuous innovation and the development of a proactive environmental strategy, with the impact of said capabilities increasing in the presence of uncertainty.

Therefore, an innovative firm, defined as one that follows a proactive strategy regarding innovation (tending to voluntarily initiate innovation activities) can be expected to also be proactive in environmental matters, going beyond the usual environmental practises in their sectors of interest. Our first working hypothesis is:

H1: More innovative firms are more likely to be proactive in their environmental strategies.

3.2.2. Internationalisation as an Environmental Proactivity Driver

International diversification has not been considered much in the literature that analyses advanced environmental strategy drivers. However, operations on open, competitive and international markets, which foster innovation, efficiency and the creation of wealth, is favourable to the development of environmental aspects (Bansal, 2005). According to Hitt et al., (1994, p. 298), '*International diversification may be defined as expanding across country borders into geographic locations (e.g. markets) that are new to the firm*'. Despite the little interest found in the literature for analysing its impact on environmental management, there appear to be contradictory opinions. On the one hand, there are arguments that determine that internationalised firms are established at points where environmental legislation is less strict, resulting in a greater environmental impact (Kennelly & Lewis, 2002; González-Benito & González-Benito, 2006). This position supports the idea that globalisation promotes aggressive business

behaviour as far as the environment is concerned (King & Lenox, 2002). According to this idea, internationalised firms will adopt convenient positions, operating wherever legislation is less demanding and there is minimal stakeholder pressure. However, others believe that firms with a global presence will develop environmental practices, policies and standards adapted to the most demanding legislation (Porter & Van der Linde, 1995; Drezner, 2000). This perspective depends on the idea that firms operating on different markets will learn more know-how (Hitt et al. 1997). Internationalisation fosters the development of some organisational capabilities due to greater resource availability and diversity, which could foster the development of an advanced environmental strategy (Aguilera-Caracuel et al., 2012).

Kennelly & Lewis (2002) conducted a pioneer study in this respect. They studied the relationship between degree of internationalisation and corporate environmental performance in a sample of 138 firms, obtaining results pointing to a positive relationship. Christmann & Taylor (2001) show a "self-regulation" attitude among internationalised firms, defining this concept as the implantation of environmental standards or environmental management systems that go beyond legal requirements. Their study obtains results that show that multinational firms have a positive effect on environmental performance and the likelihood of adopting the ISO 14.000 standard. The authors defend the idea that multinational corporations transfer advanced environmental technology to their subsidiaries, together with environmental management systems that meet the regulatory demands of the strictest countries, showing that globalisation increases institutional (and client) pressure for firms to go beyond local environmental standards. Aguilera-Caracuel et al., (2012) show how firms can benefit from the internationalisation process by acquiring advanced environmental

capabilities that foster a proactive environmental strategy. A hierarchical regression analysis shows how presence on different markets enables firms to be in contact with different stakeholders, which leads to the generation of environmental resources and capabilities. They also find that international experience favours the acquisition of environmental skills. All this, they argue, materialises in the firm's internal management, strengthening product and process innovation, internal flexibility and the ability to adapt to new changes.

Despite the little attention paid in the literature to internationalisation as a driver of proactive environmental strategies, the impact of international presence on the development of organisational capabilities is enough to justify a more in-depth study. We therefore contemplate the idea that internationalisation fosters certain organisational capabilities, taking firms to positions of sectoral leadership in the development of advanced environmental practices, objectives and activities. This is our second hypothesis:

H2: The most international firms are more likely to be proactive in their environmental strategies.

3.3. METHODOLOGY

In this section, after describing the sample, the design of the variables and the analytical method, we specify the model to test the hypotheses and present the results of the estimation.

3.3.1. Sample

This study made use of the "Technological innovation in business survey"[12] conducted by *Instituto Nacional de Estadística*, and sponsored by *Fundación Española para la Ciencia y Tecnología* (FECYT) and *Fundación para la Innovación Tecnológica* (COTEC). This survey generates a panel database, known as *Panel de Innovación Tecnológica* (PITEC) [13], constructed from *Directorio Central de Empresas* (DIRCE). The data have been available since 2003, and the last available year is 2013.

The study uses data from 2008-2013, as some of the survey questions that are relevant for our research were modified in 2008. The sample consists of a non-balanced panel of firms, with different numbers of firms in each of the six years considered, giving rise to a data pool with 41,710 observations from 8,922 firms[14]. The sample contains firms of different sizes, measured by number of employees, and covers 18 sectors according to CNAE-2009 classification.

3.2.2. Variables design

Three proactivity variables were designed to measure the voluntary nature of environmental management, innovation and internationalisation, considering regular practice in the sector concerned. Following is a description of each of these variables.

Environmental proactivity: This variable considers the importance given by firms to four proposed environmental goals: "use less materials per produced unit", "use less energy per produced unit", "reduce environmental

[12] Available at http://icono.fecyt.es/PITEC.

[13] The PITEC is the database of reference in Spain because of numerous advantages, such as easy access, comparability with the statistics of other OECD countries, the panel structure, etc… (Naider, 2012, Alarcón & Sánchez, 2014). Fariñas et al., (2008) also highlight its usefulness for determining the impact of innovations in firms and their evolution, identifying different innovation strategies.

[14] The original data set was a data pool with 60,612 observations from 10,982 firms.

impact", "meet environmental, health or safety requirements". This information is first used to design four variables with whole values in the (0,3) range, depending on whether the importance given to the proposed environmental goal is "irrelevant", "low", "medium" or "high", respectively. Secondly, these four variables are used to construct four dummy variables that have a value of 1 when the importance granted by the firm to a specific environmental goal is above average for the sector, and 0 otherwise. Finally, the environmental proactivity ordinal variable is constructed as the sum of the four dummy variables. This variable takes on whole values in the (0,4) range.

Innovation proactivity: Four dummy variables are first designed; they take on a value of 1 when the firm has implanted measures to improve its products, processes, internal organisation or marketing system, respectively, in the last two years. Secondly, the sum variable is constructed as the sum of the four dummy variables and takes on whole values in the (0,4) range. Finally, the innovation proactivity dummy variable has a value of 1 when a firm's innovative activity of above average for the sector, and 0 otherwise.

Internationalisation proactivity: A qualitative variable is first designed, with whole values in the (1,4) range, depending on whether the markets on which the firm operates are "local", "national", "European" or "global", respectively. This qualitative variable is then used to construct the internationalisation proactivity dummy variable, which has a value of 1 when the firm operates in a larger than average geographic area in its sector, and 0 otherwise.

As well as these proactivity variables that denote the voluntary nature of the considered aspects, the specific model also includes some of what have traditionally been used as proxy variables of firms' innovative, and hence strategic, proactivity:

Expenditure in R&D: it expresses whether the firm has internal expenditure in R&D and is designed as a dummy variable with a value of 1 when the firm presents R&D expenditure in the annual period considered, and 0 otherwise.

Patents: it is a dummy variable with a value of 1 if the firm has applied for a patent o protect its technological inventions or innovations in the last two years, and 0 otherwise.

Finally, two control variables have been considered in the model's specification in order to correct the effects of firm size and age on environmental proactivity. These two variables are measured, respectively, through the number of employees Napierian logarithm and firm age Napierian logarithm. The descriptive statistics of the variables are shown on Table 1 and the correlation matrix on Table 2.

Table 3.1. Descriptive statistics of the variables

Dependent variable		**Independent variables**[15]			
Environmental proactivity		**Innovation Proactivity**			
0= No proactive	31.88%	1=Yes			49.45%
1= Low proactive	11.10%	**Internationalization Proactivity**			
2= Medium-Low proactive	17.85%	1=Yes			56.08%
3= Medium-High Proactive	11.54%	**Expenditures in R&D**			
4= High proactive	27.62%	1=Yes			43.36%
		Patents			
		1=Yes			9.12%
		Age	26.79 (20.16)*		
		Size	318.18 (1531.49)*		

Table 3.2. Correlation matrix

	Innovation Proactivity	***Expenditures in R&D***	***Patents***	***Interna. Proactivity***	Log(Age)	Log(Size)
Innovation Proactivity	1.000					
Expenditures in R&D	0.159	1.000				
Patents	0.110	0.209	1.000			
Internationalization Proactivity	0.099	0.182	0.129	1.000		
Log(Age)	0.047	-0.008	0.000	0.147	1.000	
Log(Size)	0.179	0.045	0.078	0.180	0.354	1.000

All correlations are significant at 1%.

[15] Mean and standard deviation (between brackets)

3.2.3. Methodology

The objective is to analyse firms' environmental proactivity (Y_{it}); this is a qualitative ordered variable, as explained in previous section, and then we used an ordered probit model with panel data:

$$Y_{it}^{*} = \beta' X_{it} + \upsilon_i + \varepsilon_{it} \qquad [1]$$

where Y_{it}^{*} is a latent measure of environmental proactivity; X_{it} is a vector of factors that influence the firms' proactivity; β is a vector of parameters to be estimated; υ_i is the unobserved characteristics (managerial capability, etc., which are not included among the regressors but are likely to affect firms' environmental proactivity) and ε_{it} is the error term and is assumed to have standard normal distribution. As we cannot observe Y_{it}^{*}, we can only observe the categories of responses as follows:

$$Y_{it} = \begin{cases} 0 & if \quad -\infty < Y_{it}^{*} < \mu_1 \\ 1 & if \quad \mu_1 < Y_{it}^{*} < \mu_2 \\ 2 & if \quad \mu_2 < Y_{it}^{*} < \mu_3 \\ 3 & if \quad \mu_3 < Y_{it}^{*} < \mu_4 \\ 4 & if \quad \mu_4 < Y_{it}^{*} < \infty \end{cases}$$

The maximum likelihood technique that provides consistent and asymptotic estimators can be used to jointly estimate the vector of parameters β and thresholds μ. Thresholds μ indicates an array of normal distribution related to the definite values of the explanatory variables. Parameters β denote the influence of variation in response variables on the principal scale. According to Greene, (2011), the positive sign of parameter β implies greater environmental proactivity as the value of the related variable increases.

This model is estimated using a random-effects panel ordered probit, which takes unobserved effects into account and requires that firm-specific unobserved effects be uncorrelated with the regressors, and, using a fixed-effects panel ordered probit, that it allows the regressors and the firm-specific effect of the error term to be correlated.

3.2.4. Specification of the model

We now turn to a more formal analysis by introducing the regressions for the likelihood of environmental proactivity. The variables are selected according to data availability and to the theoretical arguments on the determinants of the endogenous variable. We estimate the reduced form model for the equation [1].

3.4. RESULTS

The results of equation [1] are presented in Table 3. Table 3 shows the two different alternatives previously discussed. According to Hausman's test, the most appropriate is the fixed effects model.

Note that the variables related to firm innovation support hypothesis 1. The estimated coefficients of the two variables that consider whether the firm was innovative, R&D expenditure and Patents, are positive and significant. These coefficients show that the likelihood of high environmental proactivity values is greater in innovative than in non-innovative firms. This is so both when comparing firms that invest in R&D and those that do not and when comparing firms with and without patents. These results prevent us from rejecting the hypothesis that most innovative firms are more likely to have a proactive environmental strategy.

Regarding the Innovation proactivity variable, the estimated coefficient is positive and significant. This result provides additional empirical evidence for not rejecting hypothesis 1. The estimate coefficient shows that the likelihood of a proactive environmental strategy is greater in firms that innovate more than usual in their sectors in processes, product, organisational and/or marketing system.

The estimated coefficient of the Internationalization proactivity variable is positive and significant. This result supports hypothesis 2 and shows that firm who operate on international markets to a greater than usual extent in their sectors, are more likely to present greater degrees of proactivity in their environmental strategies.

Regarding the control variables, the significance of the estimated coefficients of the Log(Age) and Log(Size) variables shows that both firm age and size affect the likelihood of a firm's environmental strategy being proactive. The results show that there is a positive relationship between environmental proactivity and size and a negative one with respect to firms' age.

3.5. DISCUSSION AND CONCLUSIONS

This study analyses how strategic proactivity affects environmental proactivity. According to the previous literature, strategic proactivity can be interpreted as a combination of internal factors that characterise a firm's business strategy as that of an innovative firm. This study's conclusions support the prevailing idea that firms' environmental strategy is in line with their business strategy; in other words, proactive firms are more likely to be environmentally advanced.

One of the characteristics most commonly associated to proactive business strategies is innovation. The results of this study show that firms who invest in R&D and patent their innovations achieve more advanced positions in their environmental strategies. The empirical evidence obtained about hypothesis 1 supports the theory, already accepted in the seminal paper by Porter (1991) that innovation generates better environmental performance.

The results are also consistent with the previous literature that concludes that there is a positive relationship between innovative and environmental proactivity (Sharma et al., 2007; Hoffmann et al., 2012). The empirical evidence shows that firms with a greater innovation effort throughout the production cycle (product, process, organisation and marketing) than the average for their sectors also attain more advanced positions (proactivity) in environmental matters. In other words, innovation proactivity is another driver of environmental strategy. This suggests that innovative firms have more flexible organisational structures and more technological know-how, and are more likely to run risks. These firms, characterised as proactive in their strategies, have a more appropriate attitude for the implementation of advanced environmental strategies.

Another characteristic associated to strategic proactivity in firms is the tendency to extend markets across local and national borders. This study shows that firms' more than average presence on different geographical markets for the same sector favours environmental proactivity. The results obtained suggest that firms that operate on different markets adapt to the most demanding environmental legislation, placing them in a position of environmental leadership in their respective sectors. These results are consistent with those obtained by authors such as Christmann & Taylor, (2001), Kennelly & Lewis, (2002) or Aguilera-Caracuel et al., (2011), and lead us to support the idea that operating on an international scale facilitates the ability to adopt environmental strategies above and beyond those of competitors. This could be explained by the fact that globalised firms obtain different know-how through its transfer between subsidiaries, and are more likely to make better use of resources and capabilities, becoming better at adapting to external circumstances.

The results obtained regarding hypotheses 1 and 2 show that firms with more proactive business strategies are more proactive in environmental matters, confirming the conclusions reached in the same geographic context by Aragón-Correa (1998) and for other regions by Sharma et al., (2007) or Haverkamp et al., (2010).

The conclusions obtained show that a proactive strategic attitude, either in innovation or internationalisation, is often also accompanied by a proactive attitude to environmental matters. This suggests that firms configure their strategies through consistent combinations of resources and capabilities, with a common bond between their general and environmental strategies.

The consideration of age and size as control variables enables us to reach further conclusions. In the case of age, the negative sign shows that

young firms are very likely to implant environmental measures, but this likelihood diminishes over time. Pereira & Vence, (2012) provide arguments that justify this negative relationship. Following Rehfeld et al., (2007), they maintain that, in a young firm, any new strategy implantation or decision (including environmental strategy) can be considered an improvement. They therefore consider that the relationship between age and environmental proactivity has a U shape. The curve moves downwards until the firm reaches a mature age after developing know-how and internal routines in order to survive. From that point on, age will represent an improvement in environmental practices, and the curve becomes U-shaped.

As for size, the results show that the larger the firm, the greater the likelihood that it will be environmentally proactive. These results are consistent with previous studies (Alvárez et al., 2001; Rave et al., 2011; Aragón-Correa, 1998; Buysse and Verbeke, 2003). This positive relationship is explained by the greater resource availability in large firms (Aragón-Correa, 1998). Del-Río, (2009) associated environmental proactivity with larger size due to the economic ability to make investments in internal organisation and human resources, or the possibility of having a specific R&D department. In conclusion, the empirical evidence shows the likelihood of firms being proactive in their environmental strategies is greater in young than in more mature firms. Secondly, the larger the firm, the greater likelihood said.

All the results shown in this work could be a great help for managers of big and small and medium-sized enterprises (SMEs). The development of a proactive environmental strategy not only result in a better environmental performance because of the reduction of environmental impact but also in a competitive advantage. This positive relationship between the implementation of environmental objectives, practices and resources and the

acquisition of competitive advantage has been broadly accepted in the literature. Since Hart, (1995) proposed the Natural Resource Based View of the firm, lots of authors have contributed with empirical evidence to this assertion (Berry & Rondinelli, 1998; Christmann, 2000; Aragón-Correa & Sharma, 2003; Hofmann et al., 2012). Definitely, the inclusion of environmental actions in the firm is a helpful way of improving the financial results by reducing costs and gaining competitive advantage.

3.6. REFERENCES

Aguilera-Caracue,l J., Escudero-Torres, M.A., Hurtado-Torres, N.E., Vidal-Salazar, M.D. 2011. La Influencia de la Diversificación y Experiencia Internacional en la Estrategia Medioambiental Proactiva de las Empresas, Investigaciones Europeas de Dirección y Economía de la Empresa 17(1), 75-91.

Aguilera-Caracuel, J., Hurtado-Torres, N.E., Aragón-Correa, J.A. 2012. Does international experience help firms to be green? A knowledge-based view of how international experience and organizational learning influence proactive environmental strategies, International Business Review 21, 847-861.

Alarcón, S., Sánchez, M. 2014. Cómo Innovan y Qué Resultados de Innovación Consiguen Las Empresas Agrarias Y Alimentarias Españolas, Cuadernos de Estudio Agroalimentarios Septiembre, 63-82.

Álvarez, M.J, Burgos, J., Céspedes, J.J. 2001. An analysis of environmental management, organizational context and performance of Spanish hotels, Omega 29, 457-471.

Aragón-Correa, J.A. 1998. Strategic Proactivity and Firms Approach to the Natural Environment, Academy of Management Journal 41(5), 556-567.

Aragón-Correa, J.A., Sharma, S. 2003. A Contingent Resource-Based view of Proactive Corporate Environmental Strategy, Academy of Management Review 28 (1), 71-88.

Aragón-Correa, J.A., Martín-Tapia, I., Hurtado-Torres, N.E. 2013. Proactive Environmental Strategies and Employee Inclusion: The Positive Effects of Information Sharing and Promoting Collaboration and the Influence of Uncertainty, Organization and Environment 26(2), 139-161.

Bansal, P. 2005. Evolving Sustainably: A Longitudinal Study of Corporate Sustainable Development, Strategic Management Journal 26, 197-218.

Banerjee, S.B. 2001. Managerial perceptions of corporate environmentalism: interpretations form industry and strategic implications for organizations, Journal of Management Studies 38(4), 489-513.

Berry, M.A., Rondinelli, D.A. 1998. Proactive Corporate Environmental Management: A New Industrial Revolution, The Academy of Management Executive May 12 (2), 38.

Christmann, P. 2000. Effects of "Best Practices" of Environmental Management on Cost Advantage: The Role of Complementary Assets, Academy of Management Journal August 43(4).

Christmann, P., Taylor G. 2001. Globalization and the Environment: Determinants of Firm Self-Regulation in China, Journal of International Business Studies 32(3), 439.

Del Río, P. G. 2009. The empirical analysis of the determinants for environmental technological change: A research agenda, Ecological Economics 68, 861-878.

Drezner, D. 2000. Bottom Feeders. Foreign Policy 121, 64-73.

Fariñas, J. C. Huergo, E. Jaumandreu, J., López, A. 2008. Informe PITEC 2008: La innovación en la empresa española, Fundación Española para la Ciencia y la Tecnología (FECYT), Madrid.

Freeman, C. 1974. The economics of innovation. Manchester: Penguin.

González-Benito, J., González-Benito, Ó. 2003. La proactividad medioambiental como una consecuencia de la proactividad productiva de la empresa. Paper presented at XIII ACEDE National Conference Proceedings, Salamanca.

González-Benito, J., González-Benito, Ó. 2006. A review of Determinant Factors of Environmental Proactivity, Business Strategy and the Environment 15, 87-102.

González-Benito, J., González-Benito, Ó. 2008. Determinantes de la proactividad medioambiental en la función logística: un análisis empírico, Cuadernos de Estudios Empresariales 18: 51-71.

Kennelly, J.J., Lewis, E.E. 2002. Degree of Internationalization and Corporate Environmental Performance: Is there a Link? International Journal of Management 19(3), 478.

Haverkamp, D-J, Bremmers, H., Omta O. 2010. Stimulating environmental management performance: Towards a contingency approach, Environmental Management Performance 112 (11), 1237-1251.

Hitt, M.A., Hoskisson, R.E., Ireland R.D. 1994. A Mid-Range Theory of the Interactive Effects of International and Product Diversification on Innovation and Performance. Journal of Management 20 (2), 197-326.

Hitt, M.A., Hoskisson, R.E., Kim, H. 1997. International Diversification: Effects on Innovation and Firm Performance in Product-Diversified Firm, Academy of Management Journal 40(4), 767.

Hofmann, K.H., Theyel, G., Wood, C.H. 2012. Identifying Firm Capabilities as Drivers of Environmental Management and Sustainability Practices – Evidence from Small and Medium-Sized Manufacturers, Business Strategy and the Environment 21, 530-545.

Hunt, C.B., Auster, E.R. 1990. Proactive environmental management: avoiding the toxic trap, Sloan Management Review 31(2), 7–18.

Kennelly, J.J., Lewis, E.E. 2002. Degree of Internationalization and Corporate Environmental Performance: Is there a Link?, International Journal of Management 19(3), 478.

King, A., Lenox, M. 2002. Exploring the Locus of Profitable Pollution Reduction, Management Science 48(2), 289.

Lederman, D. 2010. An international multilevel analysis of product innovation, Journal of International Business Studies 41, 606-619.

Manu, F.A., Sriram, V. 1996. Innovation, Marketing Strategy, Environment, and Performance, Journal of Business Research 35, 79-91.

Miles, R.E., Snow, C.C. 1978. Organizational Strategy, Structure and Process. New York, Mc Graw-Hill.

Martínez-del-Río, J., Céspedes-Lorente, J., Carmona-Moreno, E. 2012. High-Involvement Work Practices and Environmental Capabilities: How Hiwps Create Environmentally Based Sustainable Competitive

Advantages, Human Resource Management November–December 51(6) 827–850.

Min H., Galle, W.P. 2001. Green purchasing practices of US firms. International Journal of Operations and Production Management 21 (9), 1222-1238.

Murillo-Luna, J.L., Garcés-Ayerbe, C., Rivera-Torres, P. 2008. Why Do Patterns of Environmental Response Differ? A Stakeholders' Pressure Approach, Strategic Management Journal 29, 1225-1240.

Murillo-Luna, J.L., Garcés-Ayerbe, C., Rivera-Torres, P. 2011. Barriers to the adoption of proactive environmental strategies, Journal of Cleaner Production 19, 1417-1425.

Naider. 2012. Estudio sobre los efectos de la I+D en los resultados empresariales para España. Fundación Española para la Ciencia y la Tecnología, (FECYT), Madrid.

Porter, M.E. 1991. Towards a dynamic Theory of strategy, Strategic Management Journal 12(S2), 95-117.

Porter, M.E., Van der Linde, C. 1995. Toward a new conception of the environment-competitiveness relationship, Journal of Economic Perspectives Fall, 97-118.

Rehfeld, K-M. Rennings, K., Ziegler, A. 2007. Integrated product policy and environmental product innovations: An empirical analysis, Ecological Economics 61: 91-100.

Rueda-Manzanares, A. 2005. Stakeholders, Entorno y Gestión Medioambiental en la Empresa: La moderación del Entorno sobre la Relación entre la Integración de los Stakeholders y las Estrategias Medioambientales. Doctoral Thesis. Granada's University. Business Organization Department.

Sharma, S. 2000. Managerial Interpretations and Organizational Context as Predictors of Corporate Choice of Environmental Strategy, Academy of Management Journal August. 43 (4), 681.

Sharma, S., Aragón-Correa, J.A., Rueda-Manzanares, A. 2007. The Contingent Influence of Organizational Capabilities on Proactive

Environmental Strategy in the Service Sector: An Analysis of North American and European Ski Resorts, Canadian Journal of Administrative Sciences 24: 268-283.

Sharma, S., Vredenburg, H. 1998. Proactive Corporate Environmental Strategy and the Development of Competitively Valuable Organizational Capabilities, Strategic Management Journal 19, 729-753.

Vidal-Salazar, M.D., Cordón-Pozo, E., Ferrón-Vilchez, V. 2012. Human Resource Management and Developing Proactive Environmental Strategies: The Influence of Environmental Training and Organizational Learning, Human Resource Management 51(6), 905-934.

3.7. APPENDIX I: TABLES

Table 3.1. Estimated parameters

	Fixed Effects Panel Data			Random Effects Panel Data		
	Coef.	**Std. error**		**Coef.**	**Std. error**	
Innovation Proactivity	0.418	(0.020)	***	0.472	(0.018)	***
Expenditures in R&D	0.699	(0.023)	***	0.775	(0.019)	***
Patents	0.134	(0.031)	***	0.207	(0.026)	***
Internationalization Proactivity	0.113	(0.027)	***	0.095	(0.021)	***
Log(Age)	-0.134	(0.060)	**	0.004	(0.022)	
Log(Size)	0.175	(0.023)	***	0.101	(0.009)	***
Hausman Test	88.98	***				
Obs.	41,710					
Log pseudolikelihood	-41,321.4			-53,896.8		

4. DOES THE DEGREE OF STAKEHOLDERS' INTEGRATION AFFECTS THE FIRM'S ECO-INNOVATION STRATEGY? ANALYSIS OF THE DIFFERENT EFFECTS OF COMMUNICATION AND COOPERATION

ABSTRACT

The objective of this study is to analyse how communication and cooperation -as measures of stakeholders' integration capability- affect the development of technological environmental capital. Literature on environmental innovation, sustainable development and strategic management is examined in order to propose that stakeholders' integration could have a positive effect on environmental strategy, and this effect would be greater if stakeholders' preferences are totally integrated in firms' strategic decisions. With this aim we analyse this effect with a mediation model, controlling by activity sector and firms size. Results suggest that firms acquire stakeholders' environmental information through a communication process but the effect on eco-innovation intensity is greater when stakeholders' preferences are integrated through cooperation techniques. Results also show that the degree of stakeholders' integration in the decision making process is crucial for the development of an advanced eco-innovative strategy.

KEYWORDS

Communication; Cooperation; Eco-Innovation Intensity; Stakeholders' Integration; Knowledge accumulation.

4.1. INTRODUCTION

In the last few years, the pressing need to design new production and consumption systems compatible with sustainable development principles has conditioned decision-making in both public and private organisations, while remaining the focal point of the scientific discourse in numerous areas of knowledge. In such areas related to business management, the eco-innovation concept was coined by authors such as Fussler & James, (1996) to refer to *the process of developing new products, processes or services which provide customer and business value but significantly decrease environmental impact.* Some years later authors such as Klemmer et al., (1999) or Rennings, (2000) extended this definition arguing that eco-innovation could be developed and enforced by relevant actor (firms, politicians, associations, private households). This concept, which can be of a technological, organisational, social or institutional nature, shows that even small gestures aimed at reducing environmental impact can be classified as eco-innovation. More recently Kemp & Pearson, (2007) defined eco-innovation according to the Oslo Manual (OECD, 2005) definition of innovation[16], defining eco-innovation as a *the production, assimilation or exploitation of a product, production process, service or management or business method that is novel to the organization (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resources use (including energy use) compared to relevant alternatives*. This definition brings to light that any significant novelty implemented in the organization with the objective of reducing environmental impact could be considered as eco-innovation.

[16] Innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practice.

Although there is a somewhat more radical interpretation of the eco-innovation concept, which focuses on invention in the sense of obtaining tangible results from new ideas and their application (Carrillo-Hermosilla et al., 2010), this study uses the term eco-innovation in the sense proposed by Kemp & Pearson (2007).

According to current management literature, the implantation of such eco-innovative practices can be interpreted as a response to stakeholders' environmental requirements and preferences (Yarahmadi & Higgings, 2012). Indeed, together with environmental regulation, stakeholder pressure is one of the factors that most determines firms' environmental strategy (Sharma & Henriques, 2005; Horbach, 2008; Murillo-Luna et al., 2008; Ferrón-Vilchez et al., 2017; Valero-Gil et al., 2017). Different studies provide empirical evidence showing that managers' perception of this pressure is a factor that promotes proactive environmental strategies, based on technological and organizational measures aimed at prevention, innovation, eco-design, comprehensiveness, visibility and communication, which more than exceed regulatory requirements (Christmann 2004; Sharma & Henriques, 2005; Murillo-Luna et al., 2008; Ferrón-Vilchez et al., 2017; Valero-Gil et al., 2017). The conditions that affect the relationship between stakeholder pressure and the adoption of proactive environmental practices have also been widely studied in the literature. Garcés-Ayerbe et al., (2012) or Valero-Gil et al., (2017), for example, find that managers' expectations of obtaining competitive advantages positively moderate response to stakeholders, while Delgado-Ceballos et al., (2012) find that stakeholder influence is more effective the greater the presence of internal barriers, such as unfavourable attitudes, lack of environmental awareness or training and expertise among workers and directors. Sharma et al., (2007), on the other hand, find that stakeholder influence is more positive in case of uncertainty

in the general business environment, and Rueda-Manzanares et al., (2008) add the negative impact of complexity in business environment. Darnall et al., (2010) show the moderating effect of firm size and Delmas & Toffel (2004) that of a series of firm characteristics other than size, such as organizational structure, degree of internationalization or competitive status.

As shown in the above studies, the literature that analyses how environmental pressure from stakeholders leads to the application of specific environmental measures has given rise to vast theoretical and empirical knowledge of moderating variables. Academics, however, have focused less on identifying the mechanisms through which firms consider stakeholder pressure, which are the mechanisms on which so-called "stakeholder integration capacity" is generated. Hart (1995) suggests that product stewardship entails integrating the voice of external stakeholders' perspectives into product design and development processes so that pollution prevention in the firm can be achieved. Based on this concept, Sharma & Vrenderburg (1998, page 735) define stakeholder integration capacity as "the ability to establish trust-based collaborative relationships with a wide variety of stakeholders". Based on the study of specific cases, the authors find that measures taken by firms to reduce environmental impact include the integration of know-how acquired from stakeholders, transmission of this know-how within the organisation, maintaining this know-how active and obtaining feedback. Plaza-Ubeda et al., (2010) study the opinions of the CEOs in a sample of firms to identify the attributes that managers associated to stakeholder integration capacity. They conclude that the Stakeholder Integration construct comprises three dimensions: knowledge of stakeholders, interactions with stakeholders and adaptation of firm behaviour to stakeholders' demands. Our study considers these three dimensions, as we analyse whether knowledge of and interaction with

stakeholders have an impact on degree of eco-innovation. The objective is to study how communication and cooperation with stakeholders affect the development of technological capital based on eco-innovation. The aim is to analyse whether a firm's cumulative technological environmental capital is the result of a process of adaptation of firm behaviour to stakeholders.

Prior literature justifies a positive relationship between the organisational capability of stakeholder integration and the development of proactive environmental strategies and technological eco-innovation, supported with empirical evidence (Plaza-Úbeda et al., 2009; Delgado-Ceballos et al., 2012; Agudo-Valiente et al., 2015; Ryszko, 2016; Cunico et al., 2017). It also establishes types of stakeholder participation for company environmental decision-making, distinguishing between low (such as communication) and high involvement mechanisms (such as cooperation) (Green & Hunton-Clarke, 2003). The different effects of communication and cooperation mechanisms in eco-innovation, however, have not yet been studied in the literature. We aim to shed light on this aspect.

The paper is structured as follows: the following two sections include a literature review about how "stakeholder integration" affects degree of eco-innovation in firms; the fourth section presents the empirical study, followed by the discussion and conclusions.

4.2. THE EFFECT OF STAKEHOLDER INTEGRATION CAPACITY ON ECO-INNOVATION

Eco-innovation is a recent concept, and there is not yet a globally accepted definition in management academics; moreover, discovering a definition that encompasses all the characteristics of this concept is not an easy task. Since Fussler & James (1996) definition as those innovations in product and process which improve the environmental results of the firm while providing value to the consumer and the firm, many authors have tried

to provide information and details related to this concept. Klemmer et al., (1999) in the "Innovation effects of environmental policy instruments" report, requested by the German Ministry of Research and Technology (BMBF) indicate that eco-innovation comprises all measures of relevant actors (firms, politicians, unions, associations, churches, private households) which a) develop new ideas, behaviour, products and processes, apply or introduce them and b) contributes to a reduction of environmental burdens or to ecologically specified sustainability targets. Kemp & Pearson (2007) suggest in their eco-innovation definition, detailed previously, that eco-innovation could be applied to any pro-environmental changes implemented, which is new to the firm, and not necessarily to the market. This definition shows that eco-innovative practices aimed at reducing environmental impact can be implemented throughout the life cycle, acquired elsewhere or internally developed. Later, the OECD (2009) report on sustainable manufacturing and eco-innovation, enlarges this definition by adding that the environmental results of eco-innovative practices can be intentional or not. In other words, practices for economic, organisational, market or other purposes that also generate better environmental outcomes are also eco-innovative[17].

According to this broad interpretation, the application of eco-innovative measures could aim at different purposes, such as improving production efficiency, approaching new markets, accessing financial resources or integrating the view of clients, suppliers and other key agents in

[17] Some authors, however, tend to be more radical when it comes to determining the conditions in which practices can be classified as eco-innovative. These authors, for example, refer to a process of change that consists of the invention of the idea and its application, the results of which can be measured with green patents (Arundel & Kemp, 2009; Carrillo-Hermosilla et al., 2010; Oltra et al., 2010). This definition of the eco-innovation concept is more limited in relation to our research, as it only contemplates the idea of internal development of environmental ideas and projects, but not their acquisition elsewhere.

the firm. Therefore, firms must design their eco-innovation strategies considering their dynamic setting, and adapt measures to both legal requirements and stakeholders' environmental demands and preferences. A firm's capacity to adapt to different stakeholder demands is "stakeholder integration capacity" and was highlighted by Hart (1995) in his Natural Resource-Based View. In his study, Hart claims that the optimal design of a pollution prevention strategy requires reducing environmental impact in all the steps in the value chain. Therefore, what he calls the "voice of environment" (the perspective of external stakeholders) has to be part of product design and process development.

Based on the above, capacity for stakeholder integration in environmental matters could be defined as the ability of corporations to make active communications and to establish trust-based collaborative relationships with their stakeholders with regards to environmental issues and behave in line with the interests of their stakeholders (Sharma & Vredenburg, 1998; Salem et al., 2016).

Considering that good stakeholder management requires a firm's strategic objectives to be in line with stakeholder goals (Plaza-Úbeda et al., 2009), stakeholder integration capacity involves considering stakeholders' concerns, objectives and preferences when establishing the firm's objectives when solving environmental problems. Thus, the organisation can evaluate stakeholder requirements when implanting an eco-innovative strategy, while generating relevant know-how when generating other capabilities (Delgado-Ceballos et al., 2012).

This relationship between eco-innovation strategy and stakeholder integration capacity has been studied primarily from two theoretical perspectives: Institutional Theory and the Resource Based View. Institutional Theory, according to authors such as Di Maggio and Powell

(1983) or Meyer and Rowan (1977), among others, claims that institutions such as the government, pressure groups and the general public bring pressure to bear for organisations to rationalise their businesses, strategic practices and outcomes. From this approach, stakeholder integration in environmental innovation strategy responds to objectives such as compliance with regulations and obtaining legitimacy or credibility from stakeholders. Due to this rationalisation and stakeholder pressure, and in a search for social legitimacy, organisations seek feedback, partnership or association with these stakeholders, in order to respond to their requirements and expectations (Yarahmadi & Higgins, 2012). This could explain why some of the firms in an industry voluntarily adopt environmental practices that go above and beyond legislation (Plaza-Úbeda et al., 2009). Therefore, as mentioned by Jennings & Zandbergen (1995), firms that interact with the same stakeholder groups can be expected to have similar environmental management practices (Delmas & Toffel, 2004).

On the other hand, the Resource Based View also explains how stakeholder integration affects the design of a firm's eco-innovation strategy. This perspective is based on the premise that the firm can gain a sustainable competitive advantage if its resources and capabilities are valuable, non-substitutable, rare and not imitable by their competitors (Barney, 1991). From this viewpoint, certain alliances with partners or other market agents can lead to both parties benefitting from access to heterogeneous resources that can be essential to apply an environmental innovation strategy, besides reducing the costs of these resources (Yarahmadi & Higgins, 2012). On the other hand, stakeholder integration can be seen as a capacity constructed from the coordination of several intangible assets (such as know-how, for example), so the complexity involved in completing and coordinating the integration process makes it a strategic capacity that is difficult to imitate

(Plaza-Úbeda et al., 2010). Also important in this respect is the capacity to generate information and know-how in a reciprocal manner, sharing both environmental risks and learning. This interaction continues between the organisation and different stakeholders, and the mutual feedback enables the creation of a continuous environmental innovation capacity that can give rise to a sustainable competitive advantage (Sharma & Vrendenburg, 1998) and enables the firm to continue to improve in relation to different stakeholder preferences.

Both these theories enable us to assume that the stakeholders who are in contact with organisations will tend to have an impact on their environmental decisions, attempting to integrate their preferences and knowledge in the eco-innovation strategy. The firm will design its environmental strategy, based on its knowledge of the particular demands and preferences of each stakeholder group, and its progress will depend on its ability to respond to these demands.

Although there is empirical evidence in the literature of the positive relationship between environmental pressure from stakeholders and environmental strategy proactivity (Henriques & Sadorsky, 1999; Buysse & Verbeke, 2003; Murillo-Luna et al., 2008, among others), we found just a few studies analysing the relationship between stakeholder integration strategy and a firm's eco-innovative intensity. Plaza-Úbeda et al., (2009) obtain results in this respect. They attempt to analyse whether managers who integrate stakeholder demands in their decision-making processes tend to more highly rate the benefits associated with the implementation of more intensive environmental protection measures. The authors show that managers who believe in the win-win scenario for environmental investment, which is perceived as profitable, are likely to make more effort to integrate stakeholder interests in their decision-making processes. Their

results suggest that the win-win environmental paradigm may extend to other stakeholder group categories and permeate the firm's overall corporate social responsibility strategy. On the other hand, Delgado-Ceballos et al., (2012) analysed the impact of internal barriers on the relationship between stakeholder integration and a proactive environmental strategy in a sample of 69 Spanish universities. Using a survey, they measure stakeholder integration capacity as the perceptions of the collaboration of each stakeholder and their skills in relation to addressing environmental issues. The results show that collaboration between an organisation and its stakeholders enables the development of proactive environmental strategies; the greater the internal barriers to environmental strategy development, the greater the importance of stakeholder integration.

The reviewed literature suggests that greater stakeholder integration capacity could led to greater eco-innovation efforts, so we contemplate the following hypothesis:

Hypothesis 1: Stakeholder integration has a positive effect on eco-innovation intensity in firms.

4.3. EFFECTS OF STAKEHOLDER COMMUNICATION AND STAKEHOLDER COOPERATION ON ECO-INNOVATION

Green & Hunton-Clarke (2003) analyse different stakeholder participation systems that enable their integration. They propose three possible participation systems according to degree of involvement in the organisation's decision-making: a) informative participation: this requires unilateral or bilateral communication with the firm, involving no more than the transmission of information. The firm generally uses this information to attempt to learn about and understand stakeholders and generate information figures; b) consultative participation: this participation refers to a higher

level of involvement between the organization and the stakeholders. Regarding this degree of participation, stakeholders are asked questions at a deeper and more exploratory level than in the first case. Then, the material generated will identify stakeholder priorities or more serious problems, to be considered when designing plans and making decisions. Stakeholders, however, will not have a direct impact or be involved in strategic decisions; c) decisional participation: this represents the greatest degree of stakeholder involvement in a firm, as they directly participate in the decision-making process. In this case, organisations may involve and interact with stakeholders from the beginning of their project or plan, showing a high degree of commitment.

Similarly, Plaza-Ubeda et al., (2010) also interpret stakeholder integration as a gradual involvement process, which starts by identifying stakeholders, continues by interacting with them and ends with adaptive behaviour by the firm. According to these authors, identification and knowledge of stakeholders is the first step for a company to determine which stakeholders it must engage. This first step in stakeholder integration only involves the acquisition of information by the firm, in order to identify different stakeholders and their preferences. Greater integration requires interaction between stakeholders and company, through reciprocal relationships with stakeholders that vary depending on intensity and frequency of communication. Finally, adaptive behaviour refers to the set of changes made in the company's behaviour with a view to meeting its stakeholders' demands. The key to this highest level of stakeholders' integration is the responsiveness idea, which implies translating stakeholders' knowledge and interaction into actions. According to the authors, this response from the firm will determine whether the attempt to integrate stakeholder preferences in business decisions is real or not.

In sum, according to previous literature, a firm can use different methods to cement their relationship with stakeholders, such as cooperation and consultation. For optimal stakeholder integration, the firm must start by learning about its stakeholders through communication, continue by interacting with them and complete the process by changing its strategy and processes in order to respond to their demands. In other words, stakeholder integration requires knowledge of their requirements and demands and cooperation with them to design an appropriate response.

Accepting that stakeholders pressure firms to establish proactive environmental protection measures (Henriques & Sadorsky, 1999; Buysse & Verbeke, 2003; Murillo-Luna et al., 2008), and accepting that stakeholder integration varies from one firm to another, we aim here to find empirical evidence showing that, as can be expected, firms that progress further in the stakeholder integration process design more intensive eco-innovation strategies.

We specifically consider that communication with stakeholders has a positive effect on eco-innovation intensity. We also consider that the greater communication with stakeholders, more will be learnt about their requirements in environmental matters, so greater the likelihood of cooperation relations for the most appropriate use of this knowledge. As stakeholders pressure firms to present environmentally respectful behaviour, more intense eco-innovation practices can be expected in firms that cooperate and thus present greater stakeholder integration.

This study therefore believes that establishing either unilateral or bilateral communication channels with stakeholders, enabling feedback, is a first step in stakeholder integration. This first step, based on communication, has a decisive impact on decision-making related to environmental strategy, and can even give rise to the establishment of cooperation for eco-innovation

projects. Lozano (2008) defines cooperation as engaging in work on monitoring and evaluation, learning from each other and sharing experience, or collaboration as the use of information to create something new, seeking divergent insight and spontaneity, jointly developing proposals, sharing information, planning joint workshops, and raising funds, among other activities. From this perspective, cooperation with stakeholders in environmental matters shows a higher degree of stakeholder integration than communication, so more intense eco-innovation efforts can be expected in the firm.

As far as we know, the relationship between stakeholder integration capacity and eco-innovative intensity, considering the effects of different degrees of integration, has hardly been studied. Salem et al., (2016), for example, consider different degrees of stakeholder integration, but with a different research objective. They study the effect of different degrees of stakeholder integration on a firm's competitiveness, measured through three constructs: profits, satisfaction and image-related aspects. The results show that the identification of stakeholders as a first step in integration does not affect any of the factors related to a firm's competitiveness. The results, however, show a positive and significant relationship with the three factors when stakeholder integration is greatest. Similarly, Cunico et al., (2017) studied the effect of technological cooperation (as the highest degree of integration) on eco-innovation strategy in cassava processing companies. Using a sample of 33 questionnaires, the authors conclude that firms do not have the necessary competencies for an efficient eco-innovation strategy alone, and require cooperation with other organisations. They do not analyse, however, the impact of communication.

Based on the above arguments, two hypotheses are contemplated to study the relationship considered in hypothesis 1.

H1A: Communication with stakeholders has a direct positive effect on eco-innovation intensity in firms.

H1B: Communication with stakeholders has an indirect positive effect on eco-innovation intensity in firms, through the mediator effect of cooperation.

4.4. EMPIRICAL STUDY

4.4.1. Sample

This study is based on information obtained from the Spanish Technological Innovation Panel (PITEC [18]) conducted by the Spanish National Statistics Institute (INE) in collaboration with the Spanish Science and Technology Foundation (FECYT) and the Foundation for Technological Innovation (COTEC). Data have been collected yearly since 2003, and the last available year is 2014. This study used data for 2014, and our sample consists of 3998 firms that belong to 18 sectors, all of which should have answered at least to two questions, regarding total innovation expenditure and environmental importance.

4.4.2. Variables design

The Communication with stakeholders, Cooperation with stakeholders and Eco-Innovation Intensity variables are calculated from the survey's questions about the firm's innovations; these data are collected and published by the National Statistics Institute (INE) for 2014. Following is a description of the endogenous and exogenous variables.

[18] The PITEC is the database of reference in Spain, due to numerous advantages, such as easy access, comparability with the statistics of other OECD countries, panel structure, etc. The data set is available free of charge at the http://icono.fecyt.es website.

Endogenous variable:

Eco-Innovation Intensity (EII): Following the methodology used by Garcés-Ayerbe & Cañón-de-Francia (2017) and Pakes & Schankerman (1984), we consider that the eco-innovation process generates intangible assets that can be cumulative, so Eco-Innovation Intensity (EII) is measured through Environmental Capital (EC) corrected for size; Environmental Capital (EC) is a direct function of the firm's environmental investment in previous periods, as well as environmental investment in the current period, and is calculated using a stock measure constructed from a formulation of depreciated sums of the Environmental Investments (EI) made in the last few and current periods, using Koyck lags:

$$EII = \frac{EC}{Size}$$

$$EC = \sum_{p=0}^{p} (1-\delta)^p * EI_{t-p}$$

where p is the number of years before the current year t in which environmental investments affected the stock of *Environmental Capital* (EC). Following the approach of Hirschey and Weygandt (1985) for R&D investments, the useful life of investments in environmental technology is considered to be five years. Therefore, following Henderson and Cockburn (1994)[19], depreciation rate δ is considered to be a constant 20% rate.

[19] There is no consensus regarding the value of the depreciation rate and the number of periods that should be used to calculate stock. Hirschey and Weygandt (1985) estimate an annual depreciation rate of 10−20%, and a useful life of investment of 5−10 years; Griliches (1984) recommends a 15% ratio and a four-year lag; Cockburn and Henderson (1994) assume a 20% depreciation rate.

To measure *Environmental Investment* (EI) we use a proxy variable based on the information provided by the PITEC database. This proxy variable is calculated as follows:

$$EI = TIE * EIMP$$

Where *Total Innovation Expenditure* (TIE) is total expenditure[20] in innovation*;* and *Environmental Importance* (EIMP) is a measure of the importance[21] that the firm gives to the innovation objective oriented to "reducing environmental impact".

Exogenous variables:

Communication with stakeholders (COMM): Communication with stakeholders is calculated from the survey question about firm innovations related to information sources for technological innovation activities. The survey specifically asks about the importance of different information sources for the firm's innovation activities in the last three periods (including the current period), where 0=Non-significant/not used; 1= Low importance; 2= Medium importance; 3= High importance[22]. The variable is calculated by the mean degree of importance of eight information sources related to different stakeholder groups: a) in the firm or business group, departments, employees, etc.; b) equipment, material, component or software suppliers; c)

[20] Total innovation expenditure includes: a) in-house R&D; b) acquisition of R&D; c) acquisition of advanced machinery, equipment, hardware or software and buildings for the production of new or significantly improves products or processes; d) acquisition of know-how for innovation; e) training for innovation activities; f) market introduction of innovations; g) design, other production and/or distribution preparations.

[21] The way to measure the importance of the "reduce environmental impact" objective from the PITEC database is as follows: 1=High importance; 2= Medium importance; 3= Low importance; 4= Not significant/not applicable. This variable was re-calculated with the following values: 1=High importance; ½= Medium importance; 1/3= Low importance; 0= Not significant/not applicable.

[22] The original values of the variable are 1=High importance; 2= Medium importance; 3= Low importance; 4= Not significant/not applicable.

clients; d) competitors or other firms involved in the same activity; e) consultants, commercial laboratories or private R&D institutes; f) universities or other higher education centres; g) public research agencies; h) technological centres. As a result, we obtain a quantitative variable with values ranging from 0 to 3.

Cooperation with stakeholders (COOP): Variables that measure cooperation with stakeholders are calculated from the information available in the firm innovation survey. It defines cooperation for innovation as active participation with other agents, companies or non-commercial organisations in innovation activities, adding that both parties do not necessarily obtain commercial benefits from this cooperation. The variable is calculated by the sum of eight dummy variables that have a value of 1 if the firm cooperated with the stakeholder in the last three periods (including the current period) and 0 otherwise. The eight stakeholder groups are as follows: a) other firms from the same group; b) equipment, material, component or software suppliers; c) private sector clients; d) public sector clients; e) competitors or other firms involved in the same activity; f) consultants, commercial laboratories or R&D institutes; g) universities or other higher education centres; h) public or private research centres. As a result, we obtain a discrete quantitative variable with values ranging from 0 to 8.

Control variables:

As the design of the endogenous variable corrects firm size effects, but not sectoral effects, the analyses are corrected through sectoral variables:

Sectoral dummies: *N-1* dummy variables are used to correct the model for sectoral effects; they have a value of 1 if the company is in the sector, and 0 otherwise, where $N = 18$ is the total number of sectors.

4.4.3. Methodology

The *Eco-Innovation Intensity* (EII) model is shown in equations 1 to 3:

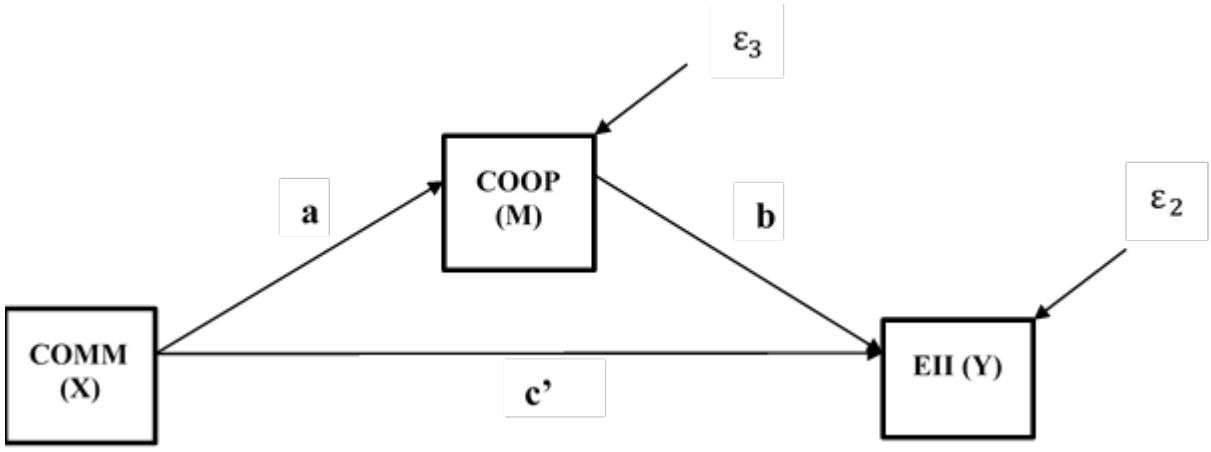
$$\mathrm{EII} = i_1 + c * \mathrm{COMM} + * \sum_{n=1}^{N-1} d_n * D_n + \varepsilon_1 \quad (1)$$

$$\mathrm{EII} = i_2 + c' * \mathrm{COMM} + b * \mathrm{COOP} + \sum_{n=1}^{N-1} d_n * D_n + \varepsilon_2 \quad (2)$$

$$\mathrm{COOP} = i_3 + a * \mathrm{COMM} + \sum_{n=1}^{N-1} d_n * D_n + \varepsilon_3 \quad (3)$$

Where EII is the dependent variable, COMM is the independent variable, and COOP is the mediator; coefficients i_1, i_2, i_3 are intercepts in each equation; and ε_1, ε_2, ε_3 are residuals. D_n are *(N-1)* dummy control variables for N=18 sector of activity. In Equation 1, coefficient c represents the total effect that COMM can have on EII. In Equation 2, coefficient c' denotes the relation between COMM and EII controlling for COOP, representing the direct effect of COMM on EII that is not intervened by COOP. Coefficient b denotes the relation between COOP and EII controlling for COMM. Finally, in Equation 3, coefficient a indicates the relation between COMM and COOP (MacKinnon, 2008). Equations 2 and 3 are represented in Figure 1.

Figure 4.1. Representation of Equations 2 and 3 of EII Model



The traditional Baron & Kenny (1986) method used Sobel's Z test as the inferential test for the indirect effect of how much X (COMM) affects Y (EII) through M (COOP). Sobel's Z test is calculated as follows:

$$\text{Sobel Z} = \frac{(ab)}{\sqrt{b^2 s_a^2 + b^2 s_b^2}}$$

Where a and b are the unstandardized coefficients from the Baron & Kenny (1986) method; s_a is the standard error estimated of a and b and s_b is the standard error estimated of b. Until about ten years ago this method was considered best practice, although it is starting to become less popular, as the Sobel test used to test the indirect effect assuming normality, and this may not always hold. Most of the alternative methods rely on bootstrapping because no assumption about normality is required. The bootstrapping method uses a resampling procedure to form sampling distribution. It involves repeatedly drawing samples from the original sample in order to create an empirical approximation of the sampling distribution of the indirect effect under study and it was used in this study to test mediation.

In testing mediation, the relationship among the variables must satisfy the following conditions (Sarkis et al., 2010): a) the independent variable must influence the dependent variable; b) the independent variable must

influence the mediator; c) the mediator must influence the dependent variable and d) the effect of the independent variable on the dependent variable must diminish after controlling for the effects of the mediator. According to Baron and Kenny, 1986, Tepper et al., 1996 and Sarkis et al., 2010, if all of these conditions are satisfied and the influence of the independent variable becomes non-significant in the presence of the mediator, the effects of the independent variable are said to be "completely" or "fully" mediated by the mediator. Otherwise, if all of the conditions are satisfied, but the influence of the independent variable remains significant in the presence of the mediator, the effects of the independent variable are said to be "partially" mediated.

4.5. RESULTS

The mediation model results are shown in Table 1. We can see the effect of the exogenous variables (communication and cooperation) on the endogenous eco-innovation intensity variable, which is positive and statistically significant. Specifically, the effect of communication with stakeholders on environmental innovation intensity is positive and significant, enabling us not to reject proposed hypothesis 1A. The table also shows that the indirect effect of communication through cooperation is also positive and statistically significant, so we do not reject hypothesis 1B. This means that communication with stakeholders has a positive effect on eco-innovation intensity; this effect will be greater if communication eventually leads to cooperation (greater stakeholder integration). Therefore, considering that stakeholder integration capacity is measured through communication, feedback and cooperation, it can be concluded that stakeholder integration has a positive effect on environmental innovation intensity, so hypothesis 1 is not rejected.

INSERT TABLE 1 ABOUT HERE

Regarding testing mediation, as is shown in Table 1, the model fulfils the four considerations proposed by Sarkis et al., (2010). The model meets the first of the conditions, where COMM is the independent variable and influences dependent variable EII. The second and third conditions are also met, as the independent COMM variable influences the COOP mediator in a positive and significant manner, and the COOP mediator variable influences the dependent variable. Also, when the mediator variable is added to the model, the influence of COMM on independent variable EII diminish, that is, the direct effect of COMM is lower than the total effect, so the fourth condition is also met. Given that all of the conditions are satisfied, but the influence of COMM remains significant in the presence of the mediator COOP, we are facing a partially mediated model.

The model is not fully mediated because communication has its own direct effect on eco-innovation intensity, in addition to the indirect effect through the mediator. This result suggests that communication is the initial part of the process of stakeholders' integration. Communication has an effect on eco-innovation intensity by itself, but it could also make the way to a greater integration through cooperation and, as a consequence, an additional positive effect on eco-innovation intensity.

4.6. CONCLUSIONS

This study analyses the effect of stakeholder integration capacity on eco-innovation intensity in firms. The results add to much previous literature that shows a positive relationship between managers' perceived environmental pressure from stakeholders and the development of advanced or proactive environmental strategies (Sharma & Henriques, 2005; Murillo-Luna et al., 2008; Ferrón-Vilchez et al., 2017; Valero-Gil et al., 2017).

This study relates to Stakeholder Theory, as it considers a firm's eco-innovation strategy to be the result of the process of adapting to stakeholders' knowledge, requirements and expectations in environmental matters. The study's results provide empirical evidence in this respect and suggest that firms instate eco-innovation activities to respond to specific stakeholder environmental interests and demands.

Consistent with the statements originally made by Hart (1995), this study concludes that firms that develop greater stakeholder integration capacity make greater efforts in eco-innovation. The results of an empirical analysis of information relating to a sample of Spanish firms provide more empirical evidence to support the results previously obtained by Plaza-Úbeda et al., (2009) whom argued that stakeholders' integration requires firm's strategic objectives to be in line with stakeholders' goals so that results –such as economic, environmental or reputation ones- could be obtained.

In the previous literature, stakeholder integration was presented by some authors as a gradual process in which the firm starts to involve stakeholders through communication and then, after learning about their demands, interacts with them through cooperation in the design of appropriate environmental responses (Green & Hunton-Clarke, 2003; Plaza-Úbeda et al., 2010). Some authors have shown how stakeholder integration capacity has a positive effect on competitiveness (Salem et al., 2016), and others that cooperation has a positive effect on technological innovation strategy but, to the best of our knowledge, none have analysed the differentiated effect of different degrees of stakeholder integration on eco-innovation intensity. The results of this study show that communication, as the first step in stakeholder integration, has a positive effect on eco-innovation strategy. This suggests that the information obtained from

communication with stakeholders is directly useful for advancing in eco-innovation strategy design. It would therefore appear to be advisable for firms that aim to be eco-innovative to enable information channels for not only informing stakeholders, but also for learning about their environmental preferences through surveys, suggestion boxes, interviews, events, fairs, etc. As Agudo-Valiente et al., (2015) suggested, the more information a firm has, the better equipped will be to make decisions and apply the tools, activities and processes that best satisfy their stakeholders. A firm is then able to accumulate knowledge that can be used to understand stakeholder preferences and take them into account when designing eco-innovation strategy.

This study has also confirmed that communication with stakeholders is a step that comes before cooperation. Its results also show that cooperation with stakeholders also supports eco-innovation strategy development. It is therefore concluded that, when firms reach the greatest degree of stakeholder integration, through cooperation, environmental innovation intensity is greater than when there is only communication. This result is consistent with what Salem et al., (2016) say about the advantages of achieving high levels of stakeholder integration, supported by empirical evidence.

By definition, cooperation involves the use of information to create something new, to jointly develop a proposal, to share information and to plan joint workshops, among other activities, so cooperation with stakeholders will steer environmental objectives towards satisfaction of their demands. It can be assumed that much more environmental technological capital can be accumulated with this degree of integration than only through communication. Cooperation with stakeholders enables a firm to integrate their preferences in its decision-making processes, such that environmental practices will be adhered to the firm's strategic objectives.

This study considers that the environmental innovation process produces intangible assets (capabilities, know-how, etc.) that can be cumulative, so eco-innovation intensity not only considers the firm's environmental investment in the study year, but also in a previous period. Due to how we measure eco-innovation intensity, the results suggest that when stakeholder integration is complete (when communication has led to cooperation), the firm learns more about environmental innovation.

From a practical point of view, results could be taken into account for managers who want to improve their environmental strategy. Integrating stakeholders' preferences into environmental objectives has to be carried out through a gradual process, where acquiring relevant environmental information through communication as a first step will develop in an accumulation of stakeholders' environmental preferences. The next step would be the use of that information to create and accumulate environmental knowledge and jointly develop an environmental strategy in line with stakeholders' preferences.

4.7. REFERENCES

Agudo-Valiente, J.M., Garcés-Ayerbe, C., Salvador-Figueras, M. 2015. Corporate social performance and stakeholder dialogue management. Corporate Social Responsibility and Environmental Management 22(1): 13-31.

Arundel, A., Kemp, R. 2009. Measuring eco-innovation.

Barney, J. 1991. Firm resources and sustained competitive advantage. Journal of management 17(1): 99-120.

Baron, R.M., Kenny, D.A. 1986. The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. Journal of personality and social psychology 51(6): 1173.

Buysse, K., Verbeke, A. 2003. Proactive environmental strategies: A stakeholder management perspective. Strategic management journal 24(5): 453-470.

Carrillo-Hermosilla, J., Del-Río, P., Könnölä, T. 2010. Diversity of eco-innovations: Reflections from selected case studies. Journal of Cleaner Production 18(10-11): 1073-1083.

Christmann, P. 2004. Multinational companies and the natural environment: Determinants of global environmental policy. Academy of Management Journal 47(5): 747-760.

Cockburn, I., Henderson, R. 1994. Racing to invest? The dynamics of competition in ethical drug discovery. Journal of Economics & Management Strategy 3(3): 481-519.

Cunico, E., Cirani, C.B.S., Lopes, E.L, Jabbour, C.J.C. 2017. Eco-innovation and technological cooperation in cassava processing companies: structural equation modeling. Revista de Administração (São Paulo), 52(1): 36-46.

Darnall, N., Henriques, I., Sadorsky, P. 2010. Adopting proactive environmental strategy: The influence of stakeholders and firm size. Journal of management studies 47(6): 1072-1094.

Delgado-Ceballos, J., Aragón-Correa, J.A., Ortiz-de-Mandojana, N., Rueda-Manzanares, A. 2012. The effect of internal barriers on the connection between stakeholder integration and proactive environmental strategies. Journal of Business Ethics 107(3): 281-293.

Delmas, M., Toffel, M.W. 2004. Stakeholders and environmental management practices: an institutional framework. Business strategy and the Environment 13(4): 209-222.

DiMaggio, P., Powell, W.W. 1983. The iron cage revisited: Collective rationality and institutional isomorphism in organizational fields. American sociological review 48(2): 147-160.

Ferrón-Vilchez, V., Darnall, N., Aragón-Correa, J.A. 2017. Stakeholder influences on the design of firms' environmental practices. Journal of cleaner production 142: 3370-3381.

Fussler, C., James P. 1996. Eco-innovation: A Breakthrough Discipline for Innovation and Sustainability. Pitman Publishing, London.

Garcés-Ayerbe, C., Rivera-Torres, P., Murillo-Luna, J.L. 2012. Stakeholder pressure and environmental proactivity: Moderating effect of competitive advantage expectations. Management Decision 50(2): 189-206.

Garcés-Ayerbe, C., Cañón-de-Francia, J. 2017. The Relevance of Complementarities in the Study of the Economic Consequences of Environmental Proactivity: Analysis of the Moderating Effect of Innovation Efforts. Ecological Economics 142: 21-30.

Green, A.O., Hunton-Clarke, L. 2003. A typology of stakeholder participation for company environmental decision-making. Business strategy and the environment 12(5): 292-299.

Griliches, Z. 1984. RD, Patents and Productivity. The University of Chicago Press, Chicago.

Hart, S.L. 1995. A natural-resource-based view of the firm. Academy of management review 20(4): 986-1014.

Henriques, I., Sadorsky, P. 1999. The relationship between environmental commitment and managerial perceptions of stakeholder importance. Academy of management Journal 42(1): 87-99.

Hirschey, M., Weygandt, J.J. 1985. Amortization policy for advertising and research and development expenditures. Journal of Accounting Research: 326-335.

Horbach, J. 2008. Determinants of environmental innovation—New evidence from German panel data sources. Research policy 37(1): 163-173.

Jennings, P.D., Zandbergen, P.A. 1995. Ecologically sustainable organizations: An institutional approach. Academy of management review 20(4): 1015-1052.

Kemp, R., Pearson, P. 2007. Final report MEI project about measuring eco-innovation. UM Merit, Maastricht, 10.

Lozano, R. 2008. Developing collaborative and sustainable organisations. Journal of Cleaner Production 16(4): 499-509.

MacKinnon, D.P. 2008. Introduction to statistical mediation analysis. Routledge.

Meyer, J.W., Rowan, B. 1977. Institutionalized organizations: Formal structure as myth and ceremony. American journal of sociology 83(2): 340-363.

Murillo-Luna, J.L., Garcés-Ayerbe, C., Rivera-Torres, P. 2008. Why do patterns of environmental response differ? A stakeholders' pressure approach. Strategic management journal 29(11): 1225-1240.

OECD. 2009a. Sustainable manufacturing and eco-innovation. Framewok, practices and measurement. Synthesis report. Paris. Available at: www.oecd.org/sti/ innovation/sustainable manufacturing.

Oltra, V., Kemp, R., De-Vries, F.P. 2010. Patents as a measure for eco-innovation. International Journal of Environmental Technology and Management 13(2): 130-148.

Pakes, A., Schankerman, M. 1984. The rate of obsolescence of patents, research gestation lags, and the private rate of return to research resources. In RD, patents, and productivity: 73-88. University of Chicago Press.

Plaza-Úbeda, J.A., de Burgos-Jiménez, J., Carmona-Moreno, E. 2010. Measuring stakeholder integration: knowledge, interaction and adaptational behavior dimensions. Journal of Business Ethics 93(3): 419-442.

Plaza-Úbeda, J.A., Burgos-Jiménez, J., Vázquez, D.A., Liston-Heyes, C. 2009. The 'win–win' paradigm and stakeholder integration. Business Strategy and the Environment 18(8): 487-499.

Rennings, K. 2000. Redefining innovation—eco-innovation research and the contribution from ecological economics. Ecological economics 32(2): 319-332.

Rueda-Manzanares, A, Aragón-Correa, J.A, Sharma, S. 2008. The influence of stakeholders on the environmental strategy of service firms: The moderating effects of complexity, uncertainty and munificence. British Journal of management 19(2): 185-203.

Ryszko, A. 2016. Interorganizational Cooperation, Knowledge Sharing, and Technological Eco-Innovation: the Role of Proactive Environmental Strategy-Empirical Evidence from Poland. Polish Journal of Environmental Studies 25(2).

Salem, M.A., Shawtari, F.A., Shamsudin, M.F., Hussain, H.I. 2016. The relation between stakeholders' integration and environmental competitiveness. Social Responsibility Journal 12(4): 755-769.

Sarkis, J., González-Torre, P., Adenso-Díaz, B. 2010. Stakeholder pressure and the adoption of environmental practices: The mediating effect of training. Journal of Operations Management 28(2): 163-176.

Sharma, S., Aragón-Correa, J.A., Rueda-Manzanares, A. 2007. The contingent influence of organizational capabilities on proactive environmental strategy in the service sector: An analysis of North American and European ski resorts. Canadian Journal of Administrative Sciences/Revue Canadienne des Sciences de l'Administration 24(4), 268-283.

Sharma, S., Henriques, I. 2005. Stakeholder influences on sustainability practices in the Canadian forest products industry. Strategic management journal 26(2): 159-180.

Sharma, S., Vredenburg, H. 1998. Proactive corporate environmental strategy and the development of competitively valuable organizational capabilities. Strategic management Journal: 729-753.

Tepper, B.J., Shafer, S.M., Meredith, J.R., Marsh, R. 1996. A clarification on conceptual and methodological issues related to the job characteristics model: A reply. Journal of Operations Management 14(4): 369-372.

Valero-Gil, J., Scarpellini, S., Garcés-Ayerbe, C., Rivera-Torres, P. 2017. Medioambiente e innovación en la empresa española: reduciendo distancias entre los académicos y la empresa. Universia Business Review: 54.

Yarahmadi, M., Higgins, P.G. 2012. Motivations towards environmental innovation: A conceptual framework for multiparty cooperation. European Journal of Innovation Management 15(4): 400-420.

4.8. APPENDIX I: TABLES

Table 4.1. Results of the Mediation Model

	COOPERATION		ENVIRONMENTAL INNOVATION INTENSITY	
DIRECT EFFECTS				
COMMUNICATION	**0.436*** **	**(0.012)**	**0.118*** **	**(0.017)**
COOPERATION			**0.118*** **	**(0.020)**
D_1	0.018*	(0.011)	-0.002***	(0.009)
D_2	0.058	(0.046)	-0.041***	(0.060)
D_3	0.094***	(0.023)	-0.044***	(0.013)
D_4	0.004	(0.014)	0.002***	(0.017)
D_5	0.097***	(0.024)	-0.039***	(0.023)
D_6	0.013*	(0.023)	-0.064***	(0.027)
D_7	0.058***	(0.018)	-0.035***	(0.017)
D_8	-0.001	(0.008)	-0.020***	(0.008)
D_9	0.078**	(0.031)	0.050***	(0.040)
D_{10}	0.040**	(0.018)	-0.048***	(0.020)
D_{11}	-0.014*	(0.008)	-0.010***	(0.005)
D_{12}	0.110***	(0.031)	0.236***	(0.043)
D_{13}	0.002	(0.013)	-0.019***	(0.019)
D_{14}	-0.006	(0.011)	0.003***	(0.014)
D_{15}	0.013	(0.019)	-0.033***	(0.020)
D_{16}	0.006	(0.006)	0.013***	(0.019)
D_{17}	0.023	(0.016)	0.012***	(0.016)
INDIRECT EFFECT				
COMMUNICATION			**0.051*** **	**(0.009)**
TOTAL EFFECTS			**0.170*** **	**(0.016)**
$\chi^2(37)=1528.791$	*$R^2=0.216$****	*(0.011)*	*$R^2=0.130$****	*(0.014)*

*Bootstrapping=10,000; Standard errors between brackets. *Significant at 10%; **Significant at 5%; ***Significant at 1%*

5. TOWARDS A CIRCULAR ECONOMY: WHERE ARE WE? OPPORTUNITIES AND BARRIERS FOR EUROPEAN SMES COMPANIES

ABSTRACT

Circular Economy is a paradigm shift attempting to replace the end-of-life concept with reducing, reusing, recycling and recovering materials and to slow down, close and narrow material and power loops. This concept is much discussed in academic literature, but limited progress has been accomplished so far regarding its empirical analysis. The objective of this work is to study circular economy practices and analyse in depth the circular economy behaviour at a micro level. We find that firms' circular economy behaviour is an ongoing process where measures are implemented gradually, starting with control measures and ending with preventive ones. We discover also that the most proactive companies in implementing circular economy measures generally come across certain common barriers such as administrative processes and a lack of human resources, while firms that have not implemented circular economy measures view financing, investment and cost–benefit barriers as the most significant. Significant efforts need to be undertaken by firms to accomplished circular economy. Also circular economy regulation should be improved to make it easier for companies to implement strategies that will make them more sustainable.

KEYWORDS

Circular Economy (CE)[23]; Barriers; Implementation typology;

23 Circular Economy

5.1. INTRODUCTION

The current linear economy is based on converting natural resources into waste via production. This traditional model, in which goods are manufactured and then discarded as waste, deteriorates the environment. Although recycling is fully developed in our society, and improving resource efficiency is encouraged, activities focused on achieving this efficiency fail to consider the finite nature of material stock (Ellen Macarthur Foundation; EMAF, 2015). Conversely, a circular economy (CE), restores any damage done during resource acquisition while ensuring not much waste is generated in the product life cycle. Even some authors such as Murray et al., (2017) state that CE may not have any net effect on the environment. This is one of the reasons why the CE is currently attracting the attention of the academic literature and institutions. The European Commission (EC) has also warned organizations and society of their important mission to pave the way for a new economic model (EC, 2017). In the EC communication titled *Closing the loop – An EU action plan for the Circular Economy* (EC, 2015), a CE was defined as 'one in which the value of products, materials and resources is maintained for as long as possible', thus minimizing waste and resource use. This is a starting point, but increasing waste prevention, reuse, recycling and recovery are fundamental actions of both the action plan and the legislative package on waste (EC, 2017).

From an academic viewpoint, the number of CE-related publications in top journals has increased rapidly since 2007, and most were published in the 2014–2016 period (Korhonen et al., 2018a). The need to clarify the concept of CE—and its goals, means and how to implement it—is incipient in the academic literature since the concept is novel (Prieto-Sandoval et al., 2018; Korhonen et al., 2018a; Korhonen et al., 2018b; Kirchherr et al., 2017; Ghisellini et al., 2016). However, it is generally accepted that the CE is a

paradigm shift attempting to integrate economic activity and environmental wellbeing (Prieto-Sandoval et al., 2018); replace the end-of-life concept with the 4Rs -reducing, reusing, recycling and recovering- in production and consumption processes (Kirchherr et al., 2017); and slow down, close and narrow material and power loops (Geissdoerfer et al., 2017; Kirchherr et al., 2017). Applied to the micro level, this means turning goods that are at the end of their service life into resources for others, thus stretching the economic life of goods and materials, closing loops and minimizing waste, that is, the CE replaces production with sufficiency (Stahel, 2016; Gregson et al., 2015).

The principal aims of implementing a CE strategy in an organization are to reduce virgin materials and waste output (Haas et al., 2015) and to protect the environment and prevent pollution (Ma et al., 2014). In other words, a CE strategy is implemented to accomplish sustainable development through increased resource efficiency. The concept of sustainable development explains environmental quality, economic development and social equity (Kirchherr et al., 2017), while protecting the environment and preventing pollution (Haas et al., 2015). Nevertheless, sustainable development refers to a 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED, 1987, p. 43). This definition underpins the assumption that resources are finite and have to be managed to sustain future generations (Murray et al., 2017).

Based on the document presented by the Ellen MacArthur Foundation (EMAF, 2015), the CE rests on three principles: a) preserving and enhancing natural capital by controlling finite stocks and balancing renewable resource flows; b) optimizing resource yields by circulating products, components and materials in use at the highest utility; c) fostering system effectiveness

by revealing and designing out negative externalities. The 4Rs the CE is based on—reduction, reuse, recycling and recovery—are extracted from these principles. The third in the list, recycling, has been implemented within the traditional linear economy system—based on extract–produce–use–dump—because many policies have promoted it (Korhonen et al., 2018a). By increasing product longevity through better manufacturing and maintenance, the replacement rate decreases, resulting in reduced resource use (Murray et al., 2017). Although recycling has been fully developed, it is still the tip of the iceberg. The CE will require changes in legislation, the way society produces and consumes innovations, while also using nature as an inspiration to respond to societal and environmental needs (Prieto-Sandoval et al., 2018).

Considering resource availability is important when talking about implementing CE activities. Large enterprises are known to have more margins to invest in new production methods and can, therefore, implement these kinds of activities. Nevertheless, as the OECD stated (OECD, 2017), 95% of companies in OECD member countries are small and medium-sized enterprises (SMEs) and, as Ormazabal et al., (2018) mentioned, 99% of companies in the EU are SMEs. That is why the study of the CE strategy should focus on this kind of firm.

The objective of this work is to study CE practices and analyse in depth CE behaviour at a micro level. The novelty of the concept, the need for a literature background focused on business management, the lack of consensus on practices associated with a CE strategy and the shortage of empirical studies analysing CE barriers are the motivation for this work. The paper is organized as follows. The following section reviews the theoretical framework that could explain the CE. The third section reviews the previous CE literature and highlights the need for further study. The fourth section

defines the empirical study and presents the results. The fifth section contains the study's conclusions.

5.2. THEORETICAL FRAMEWORK

The current industrial economy is known as a linear resource consumption model that follows a 'take-make-dispose' pattern. Following this linear model, firms in different industries use natural resources to generate products and sell them to customers, who then discards them as waste (EMAF, 2013). The traditional linear model assumes an unlimited supply of natural free of charge resources and an unlimited capacity of the environment to absorb waste and pollution (Murray et al., 2017; Cooper, 1999). Although great strides have been made in increasing resource efficiency—especially with the recycling policy—this model incorporates several waste and pollution sources along the supply chain (Murray et al., 2017; Urbinati et al., 2017). These traditional linear consumption patterns—together with the tendency for the world's population to grow and the exponential increase in the demand for raw materials, water and power—are limiting the availability of resources. As a result, we can observe the overuse of resources, the removal of natural resources from the environment and the reduction in the value of natural capital, what causes higher price levels and more volatility in many markets (EMAF, 2013; Murray et al., 2017)

A CE is a regenerative industrial system by intention and design (EMAF, 2015). The concepts of restoration or regeneration are highly important in CE because they show that the industry itself aims to repair previous damage by developing new and better systems (Murray et al., 2017). CE replaces the 'end-of-life' concept with restoration, promote the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims to eliminate waste through the superior design of materials, products, systems and business models (EMAF, 2015). As Murray et al.

(2017) argued, the CE focuses on optimizing systems rather than components, and on achieving value from redesigning manufacture and service supply systems rather than simply improving resource utilization. Keeping this in mind, and focusing on firms' circular behaviour, there are some literature approaches that could be applied to the study of the transition from a linear to a circular economy.

According to the natural resource-based view—the first step towards incorporating the challenge of the natural environment into strategic management—competitive advantage lies in the existence of internal resources and competencies that are valuable, rare and difficult to imitate, considering that (natural) resources are scarce (Barney, 1991; Hart, 1995). The scarcity of these resources makes companies look for substitute resources, which enables them to create additional value. Besides the changing environment, all this requires major internal changes and cross-functional capabilities based on tacit competencies that allow firms to adapt to new scenarios. The literature in this respect demonstrates that *developing dynamic capabilities can be viewed as a learning process that contributes to building, exploiting and transforming new knowledge to address change* (Teece et al., 1997). Dynamic capabilities are seen as a process related to companies' ability to reconfigure the source of their resources to respond more efficiently to changes and create value (Masteika & Cepinskis, 2015). This approach could be applied to the CE following the four principles of circular value creation contained in the Ellen Macarthur Foundation communication (EMAF, 2013): a) the tighter the circles are, the larger the savings should be in the embedded costs in terms of resources; b) keeping resources –such as products, components, and materials- in use longer; c) the arbitrage value creation potential is rooted in the lower marginal costs of

reusing the cascading[24] material as a substitute for virgin material inflows and their embedded costs; d) to generate maximum value, each of the above principles—requires a certain purity of material and quality of products and components. All these CE bases for value creation require the development of dynamic capabilities so that the firm can adapt to changes in the environment and benefit from the advantages of the value creation consequences of implementing CE activities. From this perspective, as Kabongo & Boiral (2017) argued, firms are likely to develop dynamic capabilities for the CE as a result of a continued learning process.

The CE could also be analysed through an industrial ecology perspective, aimed at understanding the circulation of materials and whose holistic goal is to guide the transformation of the industrial system to a sustainable one (Saavedra et al., 2018). Generally speaking, industrial ecology is the *means whereby humanity can deliberately approach and maintain sustainability, given continued economic, cultural and technological evolution* (Lieber & Rashid, 2016). Focusing on management, industrial ecology is the study of material flows through industrial systems and it aims to create closed-loop processes in which waste serves as an input, thus eliminating the notion of an undesirable by-product within and outside the industrial system (EMAF, 2013; Lieder & Rashid, 2016). Industrial ecology adopts a systemic viewpoint by developing production processes based on local ecological constraints, looking at their global impact from the outset, and attempting to shape them (EMAF, 2013). Industrial ecology could be applied at three levels (Lieder & Rashid, 2016): a) the factory or company level, where attention is paid to cleaner production; b) inter-firm

[24] Consecutive uses.

level, where collaboration and synergies are emphasized and industrial symbiosis[25] could be achieved due to geographic proximity; c) regional or global level. With the industrial ecology perspective, independent companies would create physical links to use each other's waste as resources—by exchanging power, materials, water and by-products—and to slow down use cycles to delay waste output (Murray et al., 2017; Saavedra et al., 2018). Focusing on the company level, CE activities would be implemented along the entire value chain, creating multiple closed loops that make it easy to take advantage of reusing resource waste.

5.3. PREVIOUS CIRCULAR ECONOMY STUDIES

Since the concept of the CE is still emerging, there are few studies where CE drivers and barriers are analysed, and most of them are based on reviews, merging CE literature with eco-innovation and sustainable development concepts. Some studies confirm that the CE has been promoted mainly by practitioners, the business community and policy makers, and interest in academic studies is now growing, thus making the CE a trending concept (Kirchherr et al., 2017). This may be the reason why there is currently no comprehensive and systematic analysis to understand the CE and, therefore, the emerging literature has concentrated on the limitations and characterization of the CE concept, trying to arrive at a consensus in the environmental management literature (Kirchherr et al., 2017; Korhonen et

[25] Some authors referred to industrial ecology as the 'science of sustainability' given its interdisciplinary nature. Industrial symbiosis (IS) is based on the biological analogy in nature: nutrients are cycled and power is cascaded down among the actors in the systems in a mutually beneficial manner (Deutz et al., 2017; Murray et al., 2017; Saavedra et al., 2018). These cycles are similar to the closing material loops and power flux that the CE proposes for better use of resources.

al., 2018a; Korhonen et al., 2018b; Prieto-Sandoval et al., 2018). These studies have focused on finding a generally accepted definition of the CE by analysing previous studies related to implementing this kind of activity.

Another group of studies has concentrated on developing a theoretical background essentially based on the industrial ecology perspective (Lieder and Rashid, 2016; Urbinati et al., 2017; Murray et al., 2017; Saavedra et al., 2018). One of the conclusions these papers share is that industrial ecology tools (material power and water flows from industrial symbiosis) are needed to fully support the CE. There is also a need to develop a theoretical framework based on business management since research into the CE has paid particular attention to waste generation, resource use and environmental impact, while neglecting business and economic perspectives (Lieder and Rashid, 2016). One of this study's conclusions is that companies should not prioritize either environmental or economic benefits because the ultimate objective of CE implementation strategy is achieving a fully regenerative economy and natural environment.

Empirical studies related to CE practices are scarce. In one of these works, Urbinati et al., (2017) established four different modes of adopting CE principles in firms considering the value network and customer value proposition and interface: linear, downstream circular, upstream circular, and full circular, depending on the degree of circularity. Based on the case studies of 24 firms, these authors observed that full circular companies could be either large firms with more years of activity, or new ventures created to exploit the potential of circular business models. They also pointed out the need for future empirical research to analyse CE policies and objectives and create awareness of the need for product design practices.

De-Jesus & Mendoça (2018) analysed the factors that influence implementing CE activities or policies using academic and 'grey literature'.

These authors used 40 works published in the 2006–2015 period to group CE drivers and barriers from hard to soft. They identified hard drivers and barriers with technical factors (such as the availability of technology, technical support, training, and so on) and economic factors (for example, capital requirements or transaction costs), and soft drivers and barriers with social, regulatory and institutional factors. They found that the CE is driven particularly by soft factors, and demonstrated the crucial role of institutional framing and increasing social awareness. They concluded that, even when CE practices are technically feasible, their implementation is often limited by economic and market limitations, thus underscoring the role of environmental innovation, considered an essential pathway for overcoming CE barriers.

Ranta et al., (2017) used a qualitative six-case study to examine the institutional CE drivers and barriers in China, the US and Europe. In their work, they stressed the lack of institutional support for other CE principles outside recycling, especially regulation-wise. They also found a major cultural cognitive barrier to reuse, which is the customer preference for new products, concluding that the general barrier to the CE could be the emphasis on recycling, which resonates with a lack of institutional support for reuse.

Ormazabal et al., (2018) conducted a survey study on SMEs in Navarre and the Basque Country and discovered that the most critical barriers are the lack of support from public organizations, insufficient financial resources and lack of customer interest in the environment—this idea is shared by Kirchherr et al., (2018). By conducting a factor analysis, the authors identified and named two different components for barriers in SMEs: hard barriers—lack of financial support, insufficient information management systems, lack of adequate technology, insufficient technical resources, insufficient financial resources, and lack of support from public

institutions—and human-based barriers—lack of customer interest in the environment, lack of qualified personnel in environmental management, and commitment of the organization's leaders. This work tried to shed light on CE literature by identifying the opportunities and barriers to implementing the CE in SMEs. The authors concluded that considering the activity sector while analysing CE implementation is important because some industries are more willing to implement environmental strategies in some CE cycle phases. They also point out SMEs' limited resources, short-term vision and lack of time in their everyday activities, which imply they do not see the CE as one of their priorities.

As has been demonstrated, most of the literature on the CE focuses on reviewing the concept and trying to establish a generally accepted definition and practices that characterize CE activities. Few studies have analysed the implementation of CE activities in business and the barriers companies have to overcome and, in those cases, the methodology is limited. The sample of this type of study is based on previous works, literature or samples focusing on limited geographical areas. That is why this study's objective is to analyse the status quo of the CE strategy and identify the typologies of CE activity implementation in firms. This allows us to discover which CE activities are most implemented, based on activity sector, following the recommendation of Ormazabal et al., (2018), and the barriers that have to be overcome to implement this type of practice.

5.4. EMPIRICAL STUDY

5.4.1. Sample

To reach the objective proposed in this study we used the European SMEs and the Circular Economy database, which is based on Flash Eurobarometer Survey number 441 (EC, 2016). This database takes

information from the year 2015 on CE activities implemented in companies in European countries, as well as the barriers to this CE practice. Thus, our sample consists of 10,618 companies in 28 EU countries. The sample focuses on SMEs, as shown in Table 1. More than half the sample (62.97%) is composed of microenterprises with fewer than 10 employees, and there are 1,456 cases with between 50 and 250 members of staff, representing 13.71% of the sample. It is also important to observe the sample companies' business sector because their industry can limit CE activity implementation. Based on the Statistical Classification of Economic Activities in the European Community (NACE), more than 30% of the sample belongs to retail trade and transportation. Major sectors, such as manufacturing (13.63%), construction (11.50%), and scientific and technical activities (12.82%) are also represented in the sample.

INSERT TABLE 1 ABOUT HERE

5.4.2. CE activity implementation and barriers

In Flash Eurobarometer Survey number 441 we found five different internal measures for the CE: a) re-planning of the way water is used to minimize usage and maximize re-usage; b) use of renewable energy; c) re-planning energy usage to minimize consumption; d) minimizing waste by recycling and reusing waste or selling it to another company; e) redesigning products and services to minimize the use of materials or use recycled materials. Firms were asked if they had performed any of these activities in the last three years (2013–2015). Out of the 10,618 total answers, 7,843 said they had implemented or were implementing at least one of the CE measures—we call these companies in-going firms—while 2,775 said they had not implemented any CE activities—no-going firms. The survey first asked in-going firms about the issues they had encountered when

undertaking CE activities. Five barriers were listed: a) lack of human resources; b) lack of expertise to implement these activities; c) complex administrative or legal procedures; d) cost of meeting regulations or standards; e) difficulties in accessing finance. No-going firms were asked about the reasons why they had not performed any CE-related activity. The possible reasons were: a) lack of human resources; b) lack of expertise to implement these activities; c) no clear idea about cost benefits or improved work processes; d) no clear idea about investment required; e) complex administrative or legal procedures; f) cost of meeting regulations or standards; g) difficulties in accessing finance. Table 2 shows that the CE activity most performed by more than 56% of in-going firms is recycling and reusing, followed by minimizing power consumption by at least 40% of the firms. In-going firms are also characterized by meeting complex legal procedures and regulation standards while implementing CE activities. No-going firms, however, stand out for financial barriers, such as no clear idea about cost benefits or the investment required (Table 2).

INSERT TABLE 2 ABOUT HERE

The information in Table 3 shows the differences between activity sectors in the in-going and no-going companies. Using a chi-square test we examined whether there are statistically significant differences in the distribution of no-going and in-going enterprises.

INSERT TABLE 3 ABOUT HERE

A high number of in-going firms work in the manufacturing, electricity, construction and accommodation and food service sectors. These activity sectors seem to be more proactive in implementing CE practices in their processes. Other sectors like transport, information and communication, and professional, scientific and technical activities stand out

for not implementing any CE practices (no-going companies). All this information is detailed in Figure 1, which shows the information contained in Tables 1, 2 and 3.

INSERT FIGURE 1 ABOUT HERE

In the right part of the figure, we can observe in-going firms for every activity sector; the darkest are those sectors with more in-going firms than expected[26]. Conversely, no-going firms are on the left side, and we have also shaded where there are more no-going firms than expected. The other activity sectors that are not shaded behave in the same manner as the mean of the entire sample. Finally, in Figure 1 we find the barriers that in-going companies found compared with no-going ones. For example, lack of human resources seems to be the same in both groups, with a low score. Nevertheless, there seem to be some differences in the perception of financing, procedure and regulation barriers. While no-going firms did not think regulations were an important barrier, with 15.24%, nearly 30% of the in-going companies stated they were the second most important obstacle to implementing CE activities. We found the same situation with complex administrative or legal procedures. It seems that in-going firms find more barriers related to regulations, standards and procedures, while no-going firms find barriers related to investment and searching for financing. Nevertheless, this is an anticipated conclusion and more research has to be conducted in this area.

5.4.3. CE behaviour for in-going firms

[26] Statistically significant differences.

With the objective of analysing CE behaviour in depth, two variables were built on the total number of CE activities and barriers: CE scope and barriers scope. Firstly, we constructed the CE scope variable using the total number of implemented CE practices. This variable is the sum of implemented CE activities, so it has a range of 1 to 5 (in-going firms should have implemented at least one CE activity). Then, for the construction of the barriers scope variable we also totalled the number of barriers to implementing CE activities, resulting in a variable range of 0 to 5. With these two variables, we used the cluster analysis technique to obtain a typology of CE behaviour. Figure 2 shows that we obtained five groups for the CE scope and barriers scope in the cluster analysis.

INSERT FIGURE 2 ABOUT HERE

There seems to be five differentiated behaviours concerning CE activity implementation, ranging from firms that do not have much CE scope and barriers scope, to those that, on average, have an integrated CE strategy and have overcome many barriers. The first group contains 577 companies that, on average, have implemented 1.49 CE activities and found 4.16 barriers. These companies find too many barriers for the small amount of CE-related activities they implement. The second group is the largest, with 4,637 companies; this seems to be the most common CE behaviour, with 1.77 CE activities implemented and 0.43 barriers on average. The third group comprises 1,315 firms; companies in this group seem to implement more CE practices (2.46 in average) and also overcome more barriers, with an average of 2.68. The fourth group seems to contain the most efficient companies for CE activity implementation; this group has 1,007 companies that, on average, have implemented 4.25 CE activities and they found fewer barriers to it (0.8). The fifth and last, the smallest group, also contains very proactive CE-implementing companies with an average of 4.29 activities, and they

found 3.76 barriers. The behaviour followed by group number four, with a high scope in implementing the CE and low barriers, seems to be the most efficient. However, in all cases, we observed that the CE behaviour seems to follow a reactive-proactive pattern.

We developed a variance analysis (ANOVA) means contrast for the five groups obtained in the cluster analysis and the CE activities and barriers to analyse this reactive-proactive pattern in depth. As shown in Table 4, there are statistically significant differences between all CE activity and barrier groups. Certain processes appeared in the different groups relating to implementing CE activities. We observed that the first CE activity implemented in companies seems to be recycling/reuse, followed by minimizing power consumption and product redesign. We also noted that groups x_4 and x_5 implemented all the CE activities above the sample's mean. These two groups differ in the barriers overcome: group four highlighted the complex administrative or legal procedures as an issue, while group number five highlighted all of them, paying special attention to the cost of meeting regulations or standards.

INSERT TABLE 4 ABOUT HERE

There seems to be a progressive process in the implementation of CE activities, due to the behaviour of the different groups. It was noted that all the groups have implemented recycling and reuse. As mentioned in the theoretical background, this practice is ingrained in society and industry. The second most implemented activity by in-going firms is related to minimizing power consumption, followed by product redesign to minimize the use of materials or use recycled material. After implementing this practice, it seems firms have reached a scale economy, where implementing one more practice is not an extra effort. We observed that groups four and five have achieved

this point, and they also rethink the way water is used and follow renewable energy practices. Not only does there appear to be a pattern from reactive to proactive behaviour in implementing CE activities, but also a progressive switch from control to prevention activities.

We also observed barrier typology. One barrier appeared in all the groups: administrative or legal procedures. This barrier is followed by the cost of meeting regulations and standards and then the lack of human resources. After coming up against and/or overcoming these three issues, firms also seem to find it difficult to access the finance and expertise needed to implement CE activities.

After demonstrating the apparent typology of CE behaviour, it is interesting to describe how each group is obtained and behaves. Table 5 shows the statistically significant differences between size, R&D investment, activity sector and country in the distribution of each CE group. Firms in group one, which stand out for implementing recycling or reuse and coming across all the CE barriers, are, on average, microenterprises with less than 5% of R&D investment. Apparently, they concentrate on manufacturing, construction, retail and transportation activities and are located in eastern European countries (Hungary, Latvia, Poland, Slovakia and Romania). Group two is characterized by a low scope in CE activities (only implementing recycling and minimizing power consumption) and low barrier scope (only administrative and legal procedures). Firms in this group are also microenterprises, but they invest a little more in R&D; they belong to the information and communication and scientific and technical sectors—which leads us to believe that the increase in R&D investment could be due to their business type—and are mostly located in Germany, Italy and Denmark. Group three, with a medium scope for CE activities and barriers, is slightly larger than the two previous groups. These companies also invest

more in R&D than those in groups one and two, almost 15% of their turnover on average, and they belong to the construction and retail sectors; French companies are predominant in this group. Finally, groups four and five stand out for implementing all the CE-related activities. Firms in these groups are larger and also invest more in R&D. Both groups find that legal procedures, regulations and human resource standards are barriers. They also share the same sectors, namely manufacturing and water supply and waste management, and country of location (Ireland). This could suggest that these sectors and this country could have more procedures or costs that hinder the implementation of CE activities.

INSERT TABLE 5 ABOUT HERE

5.5. DISCUSSION AND CONCLUSIONS

This work has found that the CE concept is novel and emerging, above all in the academic literature on management. As public and private institutions (EMAF, 2015; EC, 2017) have stated, there is now a need to change the system and stop using linear production models. The importance of SMEs in Europe highlights the need to analyse the CE in terms of these firms. Changing the system, paradigm and industrial model requires a series of small steps to gradually encourage circular production processes, thus promoting the implementation of the 4Rs.

This study has confirmed the need for a theoretical framework in environmental management literature and it has attempted to provide an overview of the CE with a focus on resources and dynamic capabilities, but without forgetting industrial ecology. These two theoretical perspectives should be used jointly to analyse the CE model as they complement each other. While the industrial ecology or science of sustainability introduces natural biological cycles into business management, turning the waste of one

process into the raw material of another, the dynamic capabilities perspective views the introduction of new circular measures as the creation of knowledge through a process of adapting to an environment that is constantly changing. When implementing CE activities in a business, the company should consider its dynamic environment, and stakeholders' movements, positions and preferences. From the perspective of dynamic capabilities, CE activity implementation is viewed as a process whereby companies develop skills that will enable them to take advantage of their efforts and attain economies of scale in introducing sustainability measures.

Our review of the literature has uncovered that the few studies on the CE analyse it from a concept perspective, seeking its taxonomy and exploring the characteristics of this type of activity. Not many studies focus on the empirical analysis of this type of strategy. In our study, we have analysed the behaviour of several companies to obtain an implementation typology of these practices. We have observed that the CE behaviour is a gradual process that starts by implementing material recycling and reuse measures. The next step is to put into practice measures to minimize power consumption and to redesign products. As a last step, the most proactive firms in implementing CE measures also rethink their water use and turn to renewable energy. We observed that CE measures are implemented gradually, starting with activities involving control measures and ending with putting preventive practices in place. These implementation profiles, ranging from the most reactive behaviour, based on introducing pollution control measures, to the most proactive with prevention measures, coincide with previous studies analysing the implementation of proactive environmental strategies in business (Murillo-Luna et al., 2008; Aragón-Correa et al., 2013; Valero-Gil et al., 2017).

Implementing CE practices could be conditioned by several factors. Our work has analysed the barriers affecting both proactive CE companies, called in-going firms, and reactive companies, called no-going firms. We discovered that in-going firms believe they have overcome different barriers to no-going firms. Firms that have not implemented CE measures view financing, investment and cost–benefit barriers as the most significant. In other words, companies that do not implement CE measures generally seem to believe that the factors that have prevented them from doing so are essentially economic.

In the cluster analysis classifying the in-going companies based on the CE measures they have implemented and the barriers they came across, we have observed five typologies whose scope differs, in both the number of CE measures and the number of barriers. After obtaining the typologies, we found that the most proactive companies in implementing CE measures generally come across certain common barriers: administrative processes, regulations and a lack of human resources to perform these practices. These results partly coincide with previous authors', such as Urbinati et al., (2017) and Ranta el al., (2017), who refer to the need for institutional support, for example policies and regulations that enable CE measures to be created and implemented in companies. They do not coincide with the results obtained by Ormazabal et al., (2018), who concluded that the lack of financial resources was one of the main CE barriers. The results also show that firms implementing the most measures are medium-sized. There also seems to be a positive relationship between the scope of CE activities and R&D investment. In view of the results, considering external factors, such as the company's business sector or country location, is also important. Regulations, standards or practices can determine how or whether businesses will implement CE measures and react to any barriers they come across.

Consequently, we can conclude that CE regulations should be improved to make it easier for companies to implement strategies that will make them more sustainable.

It is important to note that the concept of barrier should not be seen as negative. When companies overcome barriers, it implies they have acquired and accumulated knowledge and this helps them to implement practices better, have more understanding of the production process and identify possible improvements, and, therefore, create more circular, sustainable and efficient processes.

The main limitation of this work is that these are initial results. Due to the lack of data for analysis and the fact that the CE is a recent concept, the factors promoting the implementation of these practices and the effects they have on the companies performing them should be explored in more depth. As a result, we propose the factors that facilitate the CE and its impacts on firms as a future line of research.

5.6. REFERENCES

Aragón-Correa, J.A., Martín-Tapia, I., Hurtado-Torres, N.E., 2013. Proactive Environmental Strategies and Employee Inclusion: The Positive Effects of Information Sharing and Promoting Collaboration and the Influence of Uncertainty. Organization and the Environment, 26(2), 139-161.

Barney, J., 1991. Firm Resources and Sustained Competitive Advantage. Journal of Management, 17 (1), 99-120.

Cooper, T., 1999. Creating an economic infrastructure for sustainable product design. Journal of Sustainable Product Design,7– 18.

De-Jesus, A., Mendoça, S., 2018. Lost in Transition? Drivers and Barriers in the Eco-Innovation Road to the Circular Economy. Ecological Economics, 145, 75-89.

Ellen Macarthur Foundation (EMAF), 2013. Towards a Circular Economy. Business rationale for an accelerated transition.

Ellen Macarthur Foundation (EMAF), 2015. Towards the Circular Economy. Economic and business rationale for an accelerated transition.

European Commission (EC), 2015. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Closing the loop – An EU action plan for the Circular Economy. Brussels, 2.12.2015.

European Commission (EC), 2016: Flash Eurobarometer 441 (European SMEs and the Circular Economy). TNS opinion, Brussels [producer]. GESIS Data Archive, Cologne. ZA6779 Data file Version 1.0.0.

European Commission (EC), 2017. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. The role of waste-to-energy in the circular economy. Brussels, 26.1.2017.

Geissdoerfer, M., Savaget, P., Bocken, N.M.P., Jan-Hultink, E., 2017. The Circular Economy – A new sustainability paradigm? Journal of Cleaner Production, 143, 757-768.

Ghisellini, P., Cialani, C., Ulgiati, S., 2016. A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. Journal of Cleaner Production, 114, 11-32.

Gregson, N., Crang, M., Fuller, S., & Holmes, H. (2015). Interrogating the circular economy: the moral economy of resource recovery in the EU. Economy and Society, 44(2), 218-243.

Haas, W., Krausmann, F., Wiedenhofer, D., Heinz, M., 2015. How Circular is the Global Economy? An Assessment of Material Flows, Waste Production, and Recycling in the European Union and the World in 2005. Journal of Industrial Ecology, 19 (5).

Hart, S.L., 1995. A Natural-Resource-Based view of the Firm. Acad. Manage. Rev. 20 (4), 986-1014.

Kabongo, J.D., Boiral, O., 2017. Doing More with Less: Building Dynamic Capabilities for Eco-Efficiency. Business, Strategy and the Environment, 26, 956-971.

Kirchherr, J., Reike, D., Hekkert, M., 2017. Conceptualizing the circular economy. An analysis of 114 definitions. Resourcer, Conservation and Recycling, 127, 221-232.

Kirchherr, J., Piscicelli, L., Bour, R., Kostense-Smit, E., Muller, J., Huibrechtse-Truijens, A., Hekkert, M., 2018. Barriers to the Circular Economy: Evidence from the European Union (EU). Ecological Economics, 150, 264-272.

Korhonen, J., Nuur, C., Feldmann, A., Eshetu-Birkie, S., 2018. Circular economy as an essentially contested concept. Journal of Cleaner Production, 175, 544-552.

Korhonen, J., Honkasalo, A., Seppälä, J., 2018. Circular Economy: The Concept and its Limitations. Ecological Economics, 143, 37-46.

Lieder, M., Rashid, A. 2016. Towards circular economy implementation: a comprehensive review in context of manufacturing industry. Journal of Cleaner Production, 115, 36-51.

Ma, S-h., Wen, Z-g., Chen, J-N., Wen, Z-c., 2014. Mode of circular economy in China's iron and steel industry: a case study in Wu'an city. Journal of Cleaner Production, 64, 505-512.

Masteika, I., Cepinskis, J., 2015. Dynamic Capabilities in Supply Chain Management. Procedia – Social and Behavioral Sciences. 213, 830-835.

Murillo-Luna, J.L., Garcés-Ayerbe, C., Rivera-Torres, P., 2008. Why do patterns of Environmental Response differ? A Stakeholders' Pressure Approach. Strategic Management Journal, 29, 1225-1240.

Murray, A., Skene, K., Haynes, K., 2017. The Circular Economy: An Interdisciplinary Exploration of the Concept and Application in a Global Context. Journal of Business Ethics. 140, 369-380.

OECD, 2017. Enhancing the Contributions of SMEs in a Global and Digitalised Economy, 7-8.

Ormazabal, M., Prieto-Sandoval, V., Puga-Leal, R., Jaca, C., 2018. Circular Economy in Spanish SMEs: Challenges and opportunities. Journal of Cleaner Production, 185, 157-167.

Prieto-Sandoval, V., Jaca, C., Ormazabal, M., 2018. Towards a consensus on the circular economy. Journal of Cleaner Production, 179, 605-615.

Ranta, V., Aarikka-Stenroos, L., Ritala, P., Mäkinen, S.J., 2017. Exploring institutional drivers and barriers of the circular economy: A cross-regional comparison of China, the US, and Europe. Resources, Conservation and Recycling, 135, 70-82.

Saavedra, Y.M.B., Iritani, D.R., Pavan, A.L.R., Ometto, A.R., 2018. Theoretical contribution of industrial ecology to circular economy. Journal of Cleaner Production, 170, 1514-1522.

Stahel, W.R., 2016. Circular Economy. Nature. 6-9.

Teece, D.J., Pisano, G., Shuen, A., 1997. Dynamic Capabilities and Strategic Management. Strategic Management Journal, 18(7), 509-533.

Urbinati, A., Chiaroni, Davide., Chiesa, V., 2017. Towards a new taxonomy of circular economy business models. Journal of Cleaner Production, 168, 487-498.

Valero-Gil, J., Rivera-Torres, P., Garcés-Ayerbe, C., 2017. How is Environmental Proactivity Accomplished? Drivers and Barriers in Firms' Pro-Environmental Change Process. Sustainability-Basel. 9, 1327.

World Commission on Environment and Development (WCED) 1987. Our common future.

5.7. APPENDIX I: TABLES

Table 5.1. Sample's Distribution

	N	%
Size		
1-9 employees	6687	62.97
10-49 employees	2475	23.30
50-250 employees	1456	13.71
Activity Sector		
Mining and quarrying	30	0.28
Manufacturing	1448	13.63
Electricity, gas, steam and air conditioning supply	61	0.57
Water supply, sewerage, waste management and remediation	100	0.94
Construction	1222	11.50
Wholesale and retail trade, repair of motor vehicles and	3627	34.15
Transportation and storage	656	6.17
Accommodation and food service activities	757	7.12
Information and communication	483	4.54
Financial and insurance activities	348	3.27
Professional, scientific and technical activities	1362	12.82
Administrative and support service activities	524	4.93
Country		
France	401	3.8
Belgium	401	3.8
The Netherlands	403	3.8
Germany	400	3.8
Italy	400	3.8
Luxembourg	200	1.9
Denmark	402	3.8
Ireland	400	3.8
United Kingdom	400	3.8
Greece	400	3.8
Spain	400	3.8
Portugal	400	3.8
Finland	401	3.8
Sweden	400	3.8
Austria	400	3.8
Cyprus (Republic)	201	1.9
Czech Republic	400	3.8
Estonia	400	3.8
Hungary	402	3.8
Latvia	402	3.8
Lithuania	400	3.8
Malta	200	1.9
Poland	401	3.8
Slovakia	400	3.8
Slovenia	403	3.8
Bulgaria	400	3.8
Romania	401	3.8
Croatia	400	3.8
	10,618	**100**

Table 5.2. In-Going and No-Going firm's distribution

	N	%(*)
IN-GOING FIRMS (N=7,843)		
CE Activities' Implementation		
Water	1998	25.47
Renewable Energy	1850	23.59
Energy Consumption	4323	55.12
Recycle/Reuse	6052	77.16
Redesign	3652	46.56
Barriers to CE		
Lack of human resources	1677	21.38
Lack of expertise to implement these activities	1708	21.78
Complex administrative or legal procedures	2459	31.35
Cost of meeting regulations or standards	2228	28.41
Difficulties in accessing finance	1798	22.92
NO-GOING FIRMS (N=2,775)		
Barriers to CE		
Lack of human resources	423	15.24
Lack of expertise to implement these activities	576	20.76
No clear idea about cost benefits or improved work	717	25.84
No clear idea about investment required	598	21.55
Complex administrative or legal procedures	467	16.83
Cost of meeting regulations or standards	436	15.71
Difficulties in accessing finance	610	21.98

(*) $\sum \neq 100\%$; The percentage is calculated with N=7,843/2,775.

Table 5.3. Sample's Distribution. In-Going and No-Going firms

	NO-GOING			IN-GOING				TOTAL
	N	%	**Barriers Scope**	**N**	%	**CE Scope**	**Barriers Scope**	
Mining and quarrying	4	13.33	**0.50**	26	86.67	**2.10**	**1.38**	**30**
Manufacturing	249	17.20**	**1.56**	1199	82.80**	**2.01**	**1.38**	**1448**
Electricity, gas, steam and air conditioning supply	8	13.11**	**0.50**	53	86.89**	**2.52**	**1.26**	**61**
Water supply, sewerage, waste management and remediation	6	6.00**	**1.33**	94	94.00**	**2.58**	**1.69**	**100**
Construction	321	26.27	**1.72**	901	73.73	**1.72**	**1.53**	**1222**
Wholesale and retail trade, repair of motor vehicles and	922	25.42	**1.44**	2705	74.58	**1.62**	**1.20**	**3627**
Transportation and storage	265	40.40**	**1.21**	391	59.60**	**1.27**	**1.32**	**656**
Accommodation and food service activities	122	16.12**	**2.13**	635	83.88**	**2.18**	**1.49**	**757**
Information and communication	187	38.72**	**1.10**	296	61.28**	**1.21**	**1.04**	**483**
Financial and insurance activities	90	25.86	**1.22**	258	74.14	**1.68**	**0.96**	**348**
Professional, scientific and technical activities	454	33.33**	**1.04**	908	66.67**	**1.44**	**1.00**	**1362**
Administrative and support service activities	147	28.05	**1.15**	377	71.95	**1.68**	**1.06**	**524**
TOTAL	**2775**	**26.13**	**1.38**	**7843**	**73.87**	**1.68**	**1.26**	**10618**

Chi-square test. The difference between observed and expected values is statistically significant *** p-value<0.01; ** p-value<0.05; * p-value<0.1

Table 5.4. CE Behavior and Barriers

	$\bar{x}$	$\bar{x}_1$	$\bar{x}_2$	$\bar{x}_3$	$\bar{x}_4$	$\bar{x}_5$		
	100% N 7.843	**7.36%-577**	**5.912%-4.637**	**16.77%-1.315**	**12.84%-1.007**	**3.91%-307**	**ANOVA**	**Duncan Test**
CE ACTIVITIES IMPLEMENTED								
Water	**0.18**	0.13	0.13	0.26	**0.71**	**0.77**	640.80	$\bar{x}_1$=$\bar{x}_2$
Renewable Energy	**0.17**	0.07	0.14	0.20	**0.68**	**0.68**	585.26	$\bar{x}_4$=$\bar{x}_5$
Redesign	**0.34**	0.30	0.34	**0.55**	**0.91**	**0.91**	443.04	$\bar{x}_1$=$\bar{x}_2$; $\bar{x}_4$=$\bar{x}_5$
Energy Consumption	**0.40**	0.32	**0.44**	**0.61**	**0.97**	**0.96**	389.87	$\bar{x}_4$=$\bar{x}_5$
Recycle/Reuse	**0.57**	**0.66**	**0.71**	**0.82**	**0.97**	**0.97**	118.08	$\bar{x}_4$=$\bar{x}_5$
CE scope	**1.68**	1.49	1.77	2.46	4.25	4.29	3,465.75	
Lack of expertise to implement these activities	**0.21**	**0.82**	0.07	0.46	0.10	**0.63**	976.23	$\bar{x}_4$=$\bar{x}_5$
Difficulties in accessing finance	**0.22**	**0.80**	0.08	0.47	0.11	**0.74**	972.42	$\bar{x}_2$=$\bar{x}_4$
Lack of human resources	**0.21**	**0.77**	0.07	0.43	**0.12**	**0.64**	836.27	$\bar{x}_2$=$\bar{x}_4$
Cost of meeting regulations or standards	**0.28**	**0.88**	0.09	**0.63**	**0.20**	**0.88**	1368.77	$\bar{x}_1$=$\bar{x}_5$
Complex administrative or legal procedures	**0.31**	**0.90**	**0.11**	**0.69**	**0.26**	**0.86**	1280.48	$\bar{x}_1$=$\bar{x}_5$
Barriers scope	**1.26**	4.16	0.43	2.68	0.80	4.16	6,619.53	

ANOVA: Reject H_0: "$\bar{x}_1 = \bar{x}_2 = \bar{x}_3 = \bar{x}_4 = \bar{x}_5$" for p-value <0.000; and Duncan Test: Reject H_0: "$\bar{x}_i = \bar{x}_j$", for all $i \neq j$, † p−value <0.00.
In bold the CE activities and CE barriers according to the intensity and scope group where belong.

Table 5.5. In-Going Typology I

	In-Going	$\bar{x}_1$		$\bar{x}_2$		$\bar{x}_3$		$\bar{x}_4$		$\bar{x}_5$	
	73.89% 7.843	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Size											
Micro (1-9 Employees)	**59.3**	**357**	**61.872**	**2905**	**62.648**	721	54.829	504	50.050	166	54.072
Small (10-50 Employees)	**24.7**	146	25.303	1096	23.636	**358**	**27.224**	**254**	**25.223**	87	28.339
Medium (50-250 Employees)	**15.9**	74	12.825	636	13.716	236	17.947	**249**	**24.727**	**54**	**17.590**
% of R&D											
Less than 5% of turnover	**71.9**	425	76.715	**3527**	**82.119**	894	71.406	606	68.090	190	66.667
Between 5-10%	**9.0**	52	9.386	**331**	**7.707**	**167**	**13.339**	**114**	**12.809**	**39**	**13.684**
Between 10-15%	**5.3**	31	5.596	192	4.470	**86**	**6.869**	**77**	**8.652**	**27**	**9.474**
More than 15% of turnover	**6.6**	46	8.303	245	5.704	105	8.387	**93**	**10.449**	**29**	**10.175**
Activity Sector											
Mining and quarrying	**0.3**	2	0.347	14	0.302	5	0.380	4	0.397	1	0.326
Manufacturing	**15.3**	87	15.078	625	13.479	**235**	**17.871**	**191**	**18.967**	**61**	**19.870**
Electricity, gas, steam and air conditioning supply	**0.7**	1	0.173	26	0.561	8	0.608	**15**	**1.490**	3	0.977
Water supply, sewerage, waste management and remediation	**1.2**	5	0.867	36	0.776	**23**	**1.749**	**21**	**2.085**	**9**	**2.932**
Construction	**11.5**	**86**	**14.905**	477	10.287	**187**	**14.221**	103	10.228	**48**	**15.635**
Wholesale and retail trade, repair of motor vehicles and	**34.5**	212	36.742	**1704**	**36.748**	426	32.395	278	27.607	85	27.687
Transportation and storage	**5.0**	36	6.239	234	5.046	66	5.019	40	3.972	15	4.886
Accommodation and food service activities	**8.1**	54	9.359	313	6.750	105	7.985	118	11.718	**45**	**14.658**
Information and communication	**3.8**	20	3.466	**207**	**4.464**	38	2.890	26	2.582	5	1.629
Financial and insurance activities	**3.3**	9	1.560	157	3.386	45	3.422	43	4.270	4	1.303
Professional, scientific and technical activities	**11.6**	45	7.799	**609**	**13.133**	125	9.506	109	10.824	20	6.515
Administrative and support service activities	**4.8**	20	3.466	235	5.068	52	3.954	59	5.859	11	3.583

In bold Chi-square test. P-Value<0.05. The difference between observed and expected values is statistically significant. Shaded cells show the profile typology.

Table 5.6. In-Going Typology II

	In-Going	$\bar{x}_1$		$\bar{x}_2$		$\bar{x}_3$		$\bar{x}_4$		$\bar{x}_5$	
	73.89% 7.843	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Country											
France	**3.9**	**49**	**8.492**	123	2.653	**83**	**6.312**	31	3.078	**23**	**7.492**
Belgium	**4.3**	30	5.199	172	3.709	63	4.791	**58**	**5.760**	14	4.560
The Netherlands	**4.0**	17	2.946	178	3.839	65	4.943	45	4.469	11	3.583
Germany	**4.0**	11	1.906	**209**	**4.507**	43	3.270	44	4.369	10	3.257
Italy	**3.6**	21	3.640	**187**	**4.033**	40	3.042	26	2.582	10	3.257
Luxembourg	**2.2**	8	1.386	89	1.919	21	1.597	**45**	**4.469**	8	2.606
Denmark	**3.6**	5	0.867	**229**	**4.939**	20	1.521	22	2.185	3	0.977
Ireland	**4.7**	20	3.466	194	4.184	62	4.715	**66**	**6.554**	**23**	**7.492**
United Kingdom	**4.4**	17	2.946	220	4.744	43	3.270	**57**	**5.660**	12	3.909
Greece	**3.7**	20	3.466	183	3.947	37	2.814	36	3.575	11	3.583
Spain	**4.3**	27	4.679	189	4.076	60	4.563	45	4.469	20	6.515
Portugal	**4.4**	21	3.640	194	4.184	54	4.106	**64**	**6.356**	11	3.583
Finland	**4.1**	11	1.906	169	3.645	62	4.715	**64**	**6.356**	15	4.886
Sweden	**3.9**	12	2.080	192	4.141	44	3.346	43	4.270	12	3.909
Austria	**4.4**	13	2.253	192	4.141	61	4.639	**64**	**6.356**	13	4.235
Cyprus (Republic)	**1.9**	7	1.213	**106**	**2.286**	13	0.989	19	1.887	3	0.977
Czech Republic	**3.8**	22	3.813	172	3.709	**69**	**5.247**	20	1.986	13	4.235
Estonia	**2.7**	6	1.040	**160**	**3.451**	19	1.445	23	2.284	2	0.651
Hungary	**3.3**	**33**	**5.719**	128	2.760	**62**	**4.715**	24	2.383	15	4.886
Latvia	**3.0**	**36**	**6.239**	131	2.825	48	3.650	13	1.291	4	1.303
Lithuania	**2.8**	21	3.640	**148**	**3.192**	27	2.053	15	1.490	5	1.629
Malta	**2.4**	5	0.867	**127**	**2.739**	19	1.445	33	3.277	5	1.629
Poland	**3.4**	**48**	**8.319**	120	2.588	**81**	**6.160**	10	0.993	11	3.583
Slovakia	**3.5**	**29**	**5.026**	174	3.752	48	3.650	20	1.986	6	1.954
Slovenia	**3.7**	17	2.946	162	3.494	44	3.346	48	4.767	**19**	**6.189**
Bulgaria	**2.5**	17	2.946	**136**	**2.933**	33	2.510	8	0.794	4	1.303
Romania	**3.4**	**35**	**6.066**	126	2.717	55	4.183	31	3.078	16	5.212
Croatia	**4.2**	19	3.293	**227**	**4.895**	39	2.966	33	3.277	8	2.606

In bold Chi-square test. P-Value<0.05. The difference between observed and expected values is statistically significant. Shaded cells show the profile typology.

5.8. APPENDIX II: FIGURES

Figure 5.1. CE Implementation and Barriers

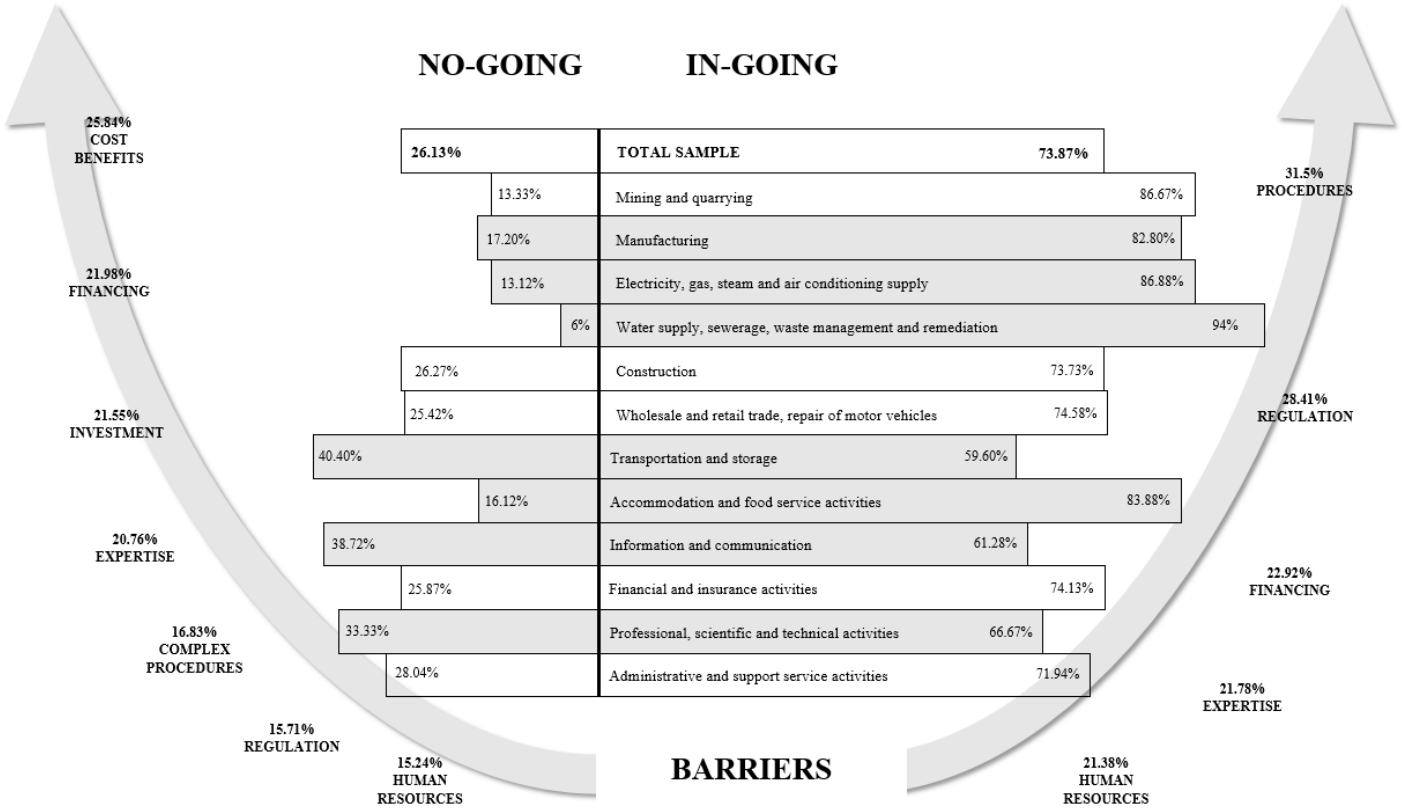
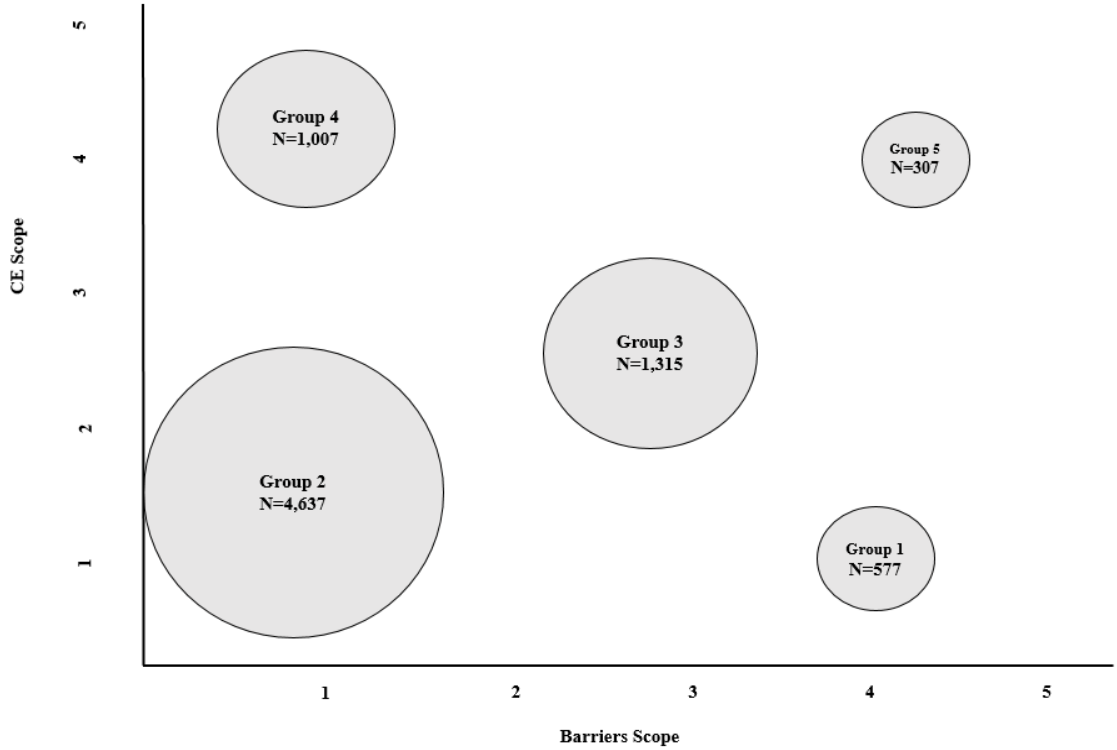


Figure 5.2. CE Scope and Barriers to CE Scope



6. CONCLUSIONS

6.1. INTRODUCTION

The need to progress towards an economic growth model that can reconcile the economy and the environment is a mainstream issue. On 28 June 2018, the World Economic Forum published a press release urging governments, companies, scientists and citizens to immediately address the problem of worldwide greenhouse gas emissions. If measures are not taken in time, climate change could become irreversible by 2020. This news in itself is already a convincing reason to study how industry can progress towards a production model focused on sustainable development.

Since the 1980s it has been apparent in the academic literature on environmental management that we need to make advances in our search for new strategies and business models that ensure organisations can attain their economic objectives while minimising their impact on the environment. In this block of the literature, the analysis focuses on key organisational factors for implementing an advanced environmental strategy that allows firms to meet their specific targets and respect the environment at the same time.

In this doctoral thesis the most relevant literature on advanced environmental strategies has been analysed. These strategies range from environmental proactivity to the circular economy and include eco-innovation strategies. We have studied the characteristics of each of these environmental strategies, focusing especially on determining which factors promote their implementation. Based on the most relevant theoretical perspectives for organisational management, we have analysed the key factors for appropriate implementation of this type of strategies, highlighting aspects that firms should have, develop or acquire in the implementation

process to properly benefit from environmental strategy. This chapter contains a synthesis of the findings and conclusions obtained in the four research areas forming this doctoral thesis. Consequently, the sixth chapter has the following structure. The second section is a discussion of the general conclusions and the most relevant theoretical implications. The third depicts the implications of the research presented herein for both management and public regulators and then continues with the study's limitations and future lines of research. The doctoral thesis ends with a final conclusion.

6.2. GENERAL CONCLUSIONS AND THEORETICAL IMPLICATIONS

The most relevant advanced environmental strategies for the environmental management literature have been studied throughout the chapters in this doctoral thesis. Chapters 2 and 3 focus on the study of proactive environmental strategies and the factors affecting their implementation. As seen in these studies, environmental proactivity is interpreted as organisational behaviour that implements environmental strategy favouring pollution prevention measures in the measures portfolio, and it is characterised by a willingness to implement these measures. These two characteristics, prevention and willingness, highlight a firm's intention to make non-required or non-compulsory changes, in other words, to surpass obligatory requirements. Other characteristics associated with this advanced environmental behaviour include how comprehensive and extensive firms' adoption of environmental measures has been, in other words, the environmental responses they have adopted have been both detailed and diverse. The research efforts presented in these two chapters focused on studying how so-called strategic proactivity affects environmental proactivity and highlighted that the former is the driving factor of the latter.

Strategic proactivity consists of a firm's advanced strategic attitude or reaction to market stimuli characterised by developing new products, seeking new markets, developing or investing in flexible technology, and so on, which enable it to respond to sudden market changes with the aim of attaining a leadership position.

In this doctoral thesis, strategic proactivity has been associated, firstly, with innovative leadership (chapter 2). The results presented in this chapter show that a proactive or leadership attitude in innovation actions encourages a proactive attitude in the firm's environmental strategy; in other words, innovative proactivity wields a positive effect over environmental proactivity. These results are justified if we consider that a leadership or proactive attitude in a company's innovation strategy involves benefiting from knowledge, learning and an accumulation of know-how that allow it to undertake environmental actions more easily than companies that adopt reactive or passive positions.

How strategic proactivity affects environmental proactivity was also studied in chapter 3 of this doctoral thesis. Continuing with the combination of characteristics underlying a proactive attitude in the strategy, the study in this chapter also focused on how business internationalisation affects an advanced environmental strategy. Further exploring the concept of *proactivity*, we analysed whether firms with a larger geographical expansion than their competitors' also have a more advanced environmental strategy. The results show that more business expansion to international markets than is usual in the sector is associated with a stronger probability of attaining high environmental proactivity levels. This finding is justified by the fact that more internationalised firms obtain more recognition, take greater advantage of the resources available in new markets and become more capable of adapting to external circumstances. Therefore, they accumulate

more knowledge and experience and benefit from this accumulated know-how to initiate more advanced environmental measures.

These results can be interpreted from a resource and capability perspective. This perspective confirms that firms must have, develop or require tangible or intangible resources that are valuable, rare, inimitable and have no strategic substitutable equivalent. From this viewpoint, environmental strategy can be understood as a heterogeneous capability that enables companies to obtain a competitive advantage if it is implemented in an advanced or proactive manner: voluntarily, based on prevention and anticipating shifts in the sector. Implementing environmental proactivity involves studying a firm's entire production cycle, giving the company an opportunity to improve its efficiency, its processes, reorganise its organisational structures, and so on. Environmental proactivity could also influence the firm's reputation and attract consumers interested in clean production or green products. All these aspects can be a source of competitive advantage for the firm. Furthermore, proactivity applied to business strategy, as defined in this doctoral thesis, may result in a heterogeneous capability for firms as, by definition, it helps them attain leadership positions. Continuing the focus on dynamic capabilities, the concept of strategic proactivity also enables firms to benefit from new business opportunities, take early action towards changes in the market due to their flexibility and obtain new technological opportunities. However, although chapters 2 and 3 of this doctoral thesis analyse the effect of strategic proactivity on environmental proactivity, both capabilities can complement each other during their implementation. In other words, a proactive attitude in business strategy favours environmental proactivity and vice versa, since both capabilities must be seen as complementary resources due to the competitive advantages obtained when they are implemented together. In

short, there is a synergic relationship between a leadership attitude in business strategy and the implementation of a proactive environmental strategy.

In the study of advanced environmental strategies, we have seen that, besides the term environmental proactivity, the term eco-innovation has often been used, especially in the last decade. Based on the definition of the concept, eco-innovation involves introducing a new aspect into the product or service, production process, or management or marketing method, which causes fewer environmental risks than the available alternatives in its life-cycle. Eco-innovation can be interpreted as any pro-environmental change in the firm and, therefore, it includes similar aspects to those considered in the term environmental proactivity.

How the capability to integrate stakeholders affects the firm's eco-innovation strategy was analysed in the fourth chapter of this doctoral thesis. The results obtained in this research show that stakeholder integration is a gradual process that enables companies to create active communication and collaboration relationships with a range of stakeholders based on trust. The findings also show that the capability to integrate stakeholders involves considering their concerns, objectives and preferences when establishing the firm's environmental objectives and that eco-innovative intangible assets are accumulated. From the perspective of resources and capabilities, stakeholder integration can also be seen as a unique capability that companies develop, one that is difficult to imitate and that may involve obtaining a competitive advantage. Stakeholder identification, communication and cooperation as integration mechanisms of stakeholders' environmental requirements, demands and preferences allow firms to adapt to these requirements, accumulate knowledge, create value for their organisation and develop skills that enable them to react to changes in these needs.

This capability to integrate stakeholders must also be seen as the firm's response to stakeholders' requirements. The stakeholder theory states that firms pursue relationships with stakeholders to create shared value for both parties. The type of stakeholder the firm focuses its attention on will depend on its strategic objectives and the value the stakeholders contribute to the organisation. Consequently, the most environmentally aware firms will tend to integrate the needs and preferences of stakeholders that pressurise them the most about these issues, and they will develop unique skills and environmental knowledge through these integration mechanisms.

The institutional theory argues that organisations design their strategy and behaviour based on the pressures they are subjected to by external institutions (the government, regulations or stakeholders). In this respect, companies will place more emphasis on integrating the preferences of target stakeholders in their environmental strategy in response to their pressure. The greater the pressure, and the more value created on the basis of these communication and cooperation relationships, the better the integration and, therefore, as seen in the fourth chapter, the higher the accumulation of eco-innovation capital in the company, in other words environmental know-how.

The fifth chapter contains an analysis of the state of the issue of one of the most promising terms in new research trends in environmental management: the circular economy. As seen above, the term 'circular' qualifies an economy seeking not to have a net effect on the environment by restoring any possible damage arising from resource extraction and pollution from production processes, and trying to replace the linear criterion of 'take, use, throw away' by the circular criterion of 'reduce, reuse, recycle and recover'. This paradigm shift at an industry level concerns implementing natural cycles in production methods to form continuous, reusable, recyclable and recoverable flows of materials and energy that can integrate

economic activity and the environment in a sustainable manner. Since they are new, environmental strategies for an economy are only beginning and an exhaustive study of the state of the issue is required. In the last study of this doctoral thesis, the circular economy was analysed from the perspective of resources, capabilities and industrial ecology. While industrial ecology introduces natural biological cycles into business management—turning the waste of one process into the raw material of another—the dynamic capability perspective views the introduction of new circular measures as the creation of knowledge through a process of adapting to a situation that is constantly changing. Given these theoretical perspectives, the fifth chapter of this doctoral thesis focuses on analysing the implementation of measures related to the circular economy in European SMEs. First, the degree of implementation of circular economy measures was analysed in these companies. The implementation pattern observed is gradual, beginning with pollution control measures and ranging up to the most advanced based on prevention. In chapter 5 we refer to firms that have performed at least one circular-economy measure as in-going organisations in contrast to those that have not implemented any measure of this kind (no-going firms) and we compared the barriers that both types have encountered to implementing circular-economy measures. Consequently, we observed that the more reactive firms, the no-going ones, refer to the lack of financing and investment as the main barriers that prevent them from implementing circular-economy measures. In other words, firms that have not integrated the circular economy in their strategy see economic factors as the main problem or barrier to implementing it. In contrast, firms that have implemented circular measures to a greater or lesser extent view administrative processes, regulation and the lack of preparation of human capital as the main barriers to implementing these measures. This difference highlights the need to inform firms of strategies based on the circular

economy and to relax bureaucratic and administrative processes to make implementing circular economy measures in firms less costly.

6.3. MANAGERIAL IMPLICATIONS

For managers, the results of this research highlight the need to voluntarily and proactively implement advanced environmental strategies. Firstly, we have argued that business strategy and implementing environmental practices and objectives complement each other. On the basis of this, we can assume that implementing strategic proactive practices (such as innovation or internationalisation) is associated with a detailed study of the entire production cycle, which will favour the implementation of advanced environmental measures in firms.

By implementing an advanced environmental strategy, the firm's negative externalities, such as air pollution due to manufacturing or water contamination, are reduced. Initially, managers may think that the cost of the environmental impact is absorbed by the firm, as shown in the study on barriers to the circular economy in the fifth chapter, in which firms that did not implement this type of measure said it was because of the costs associated with doing so. However, besides promoting care for the environment and facilitating a sustainable industrial activity, these measures make the firm improve the efficiency of its processes, decrease its use of resources and, in short, improve its bottom line.

The fourth chapter of this doctoral thesis shows how integrating stakeholders' preferences fosters an increase in accumulated environmental capital. The implications of these results for management should be related to implementing active communication channels with the stakeholders that contribute the most value to the firm. Consequently, contact with consumers,

suppliers, universities, and so on, is essential to learn stakeholders' preferences and needs and act on key aspects for both to create joint value. Furthermore, cooperation with certain stakeholders could enable firms to accumulate more environmental knowledge, for example by cooperating with universities or adapting to a supplier's high environmental standards.

Although certain industrial sectors are more likely to pollute, in these cases the intervention of public regulators is essential to foster a less damaging activity for the environment. The implications for public regulators will be discussed below.

6.4. IMPLICATIONS FOR PUBLIC REGULATORS

As mentioned above, implementing proactive measures in innovation, internationalisation and communication and cooperation with stakeholders promotes the implementation of advanced environmental strategies. However, certain activity sectors can present limitations when performing these practices. For example, in the second chapter we saw that behaviour patterns for innovation strategy and environmental strategy differ depending on the activity sector. We found that sectors with more technological requirements had very low innovation productivity values, which leads us to believe that firms in high-technology sectors should step up their efforts to implement a proactive strategy due to high levels in the activity sector. It is, therefore, important for regulators to consider each activity sector's technological level and also the usual contamination levels for every sector. In the latter case, for sectors whose contamination levels are higher due to their activity, public regulators should give an incentive to implement environmental practices in the form of tax deductions, grants or other

motivating mechanisms. After implementing these measures, stricter environmental regulations could be put in place in every sector.

The results also suggest that, despite institutional efforts to promote the implementation of a circular economy, the authorities gradually need to apply interventionist measures with instruments such as regulations or ecological taxes that promote the implementation of this type of measure. Furthermore, the economic barriers that no-going firms seem to encounter, which make them not implement any circular-economy measure, highlight that these interventionist measures might perhaps need to be based on extrinsic incentives, such as grants or tax breaks, to encourage circular behaviour in firms.

6.5. LIMITATION AND FURTHER RESEARCH

After highlighting the most relevant conclusions and implications of this research, this section refers to the main limitations of the studies forming this doctoral thesis, which could lead to future lines of research.

The main limitation arises from the use of secondary databases, which limits the items to be used and the field of study. The first future line of research that could result from this is the study of strategic proactivity using more factors than the ones we use here (proactivity in innovation and internationalisation).

Along these lines, the use of data on Spanish firms, which only encompass technological organisations, could lead to the analysis of the relationships examined herein in another sample of firms in another region as future research. The findings could highlight whether the country's

regulations or practices generally adopted by its firms have an impact on the most advanced environmental strategies.

A future line of research in stakeholder integration that could prove useful is analysing the effect of integrating stakeholders to see whether, for example, integrating the preferences of internal stakeholders has more impact than integrating the preferences of external stakeholders. It might also be interesting if this study included an in-depth interview with company managers to analyse which stakeholders they are more interested in attracting and communicating with, which could then be followed by studying how this affects the accumulation of environmental capital.

This research has focused on a block of literature that analyses factors affecting the implementation of an advanced environmental strategy. Here it would be a good idea to discover which incentives motivate firms to implement this series of measures in their organisation. By analysing this issue using classic economics as a basis, incentives that encourage firms to perform environmentally sustainable actions can be seen as extrinsic or intrinsic, in other words, aiming to obtain a tangible or intangible output that creates value for the firm (for example, improving the bottom line) or an output associated with sustainable behaviour (for example, management awareness of the deterioration of the environment and, therefore, their satisfaction in pursuing an environmental strategy). Incentives that encourage firms to follow a certain advanced environmental strategy and the outcomes of this motivation could be a future line of research.

Lastly, the circular economy is a subject that needs to be studied in depth. There is still scant literature on the circular economy and few studies have framed it in an organisational context. Consequently, more in-depth research of the implications of the circular economy and an analysis comparing industries are required.

6.6. FINAL CONCLUSION

The reason behind this doctoral thesis is a personal concern for environmental degradation, which, due to current consumer habits and production models, has resulted in climate change becoming an imminent problem with no return. This concern and also interest in finding solutions from an academic standpoint have been a constant theme throughout this doctoral thesis. This research on the most advanced environmental strategies and the factors promoting the implementation of these strategies is based on a desire to encourage responsible consumerism, respect for the environment and nature and to seek solutions to the ecological crisis that is threatening our society and, in short, our way of life. Therefore, as a final conclusion, we would like to take this opportunity to refer to a Native American proverb:

We do not inherit the Earth from our ancestors; we borrow it from our children.

7. CONCLUSIONES

7.1. INTRODUCCIÓN

La necesidad de avanzar hacia un modelo de crecimiento económico que permita la conciliación entre la economía y el medio ambiente es un hecho imperante. El pasado 28 de junio de 2018, el Foro Económico Mundial publicaba un comunicado en el que instaba a gobiernos, empresas, científicos y ciudadanos a abordar de inmediato el problema de las emisiones mundiales de gases de efecto invernadero. En caso de no tomar medidas a tiempo, el cambio climático podría resultar irreversible para el año 2020. Esta noticia en sí misma ya resulta una motivación contundente para estudiar de qué manera, el tejido industrial puede avanzar hacia un modelo de producción encaminado hacia el desarrollo sostenible.

En el caso de la literatura académica relacionada con la gestión medioambiental, ha sido desde la década de los 80 cuando se ha puesto de manifiesto la necesidad de avanzar en la búsqueda de nuevas estrategias y modelos de negocio que, además de garantizar la consecución de los objetivos económicos de la organización, permitan minimizar el impacto medioambiental. En este bloque de literatura, se han analizado cuáles son las claves organizativas para que la implantación de una estrategia medioambiental avanzada permita cumplir con los objetivos específicos de la empresa, respetando a su vez el medio ambiente.

En esta tesis doctoral se ha analizado la literatura más relevante acerca de las características de las estrategias medioambientales avanzadas, desde las estrategias de proactividad medioambiental hasta las estrategias para la economía circular, pasando por las estrategias eco-innovadoras. Se han

estudiado cuáles son las características de cada una de estas estrategias medioambientales, poniendo especial hincapié en determinar qué factores fomentan su implantación. Desde las perspectivas teóricas más relevantes para la gestión de las organizaciones, se han analizado cuáles son las claves para una adecuada implantación de este tipo de estrategias, arrojando luz sobre los factores que la empresa debe poseer, desarrollar o adquirir en el proceso de implantación para el adecuado aprovechamiento de la estrategia medioambiental. En el presente capítulo se sintetizan los resultados y conclusiones obtenidos a lo largo de los cuatro estudios de investigación que componen esta tesis doctoral. Para ello, el séptimo y último capítulo se estructura de la siguiente manera: En el segundo epígrafe se realiza una discusión de las conclusiones generales obtenidas, así como de las implicaciones teóricas más relevantes. En la tercera sección se argumentan cuáles pueden ser las implicaciones del trabajo de investigación presentado en esta tesis doctoral, tanto para la gestión como para los reguladores públicos, para pasar a las limitaciones del trabajo y las futuras líneas de investigación. Por último, se realiza una última conclusión final.

7.2. CONCLUSIONES GENERALES E IMPLICACIONES TEÓRICAS

A lo largo de los capítulos que componen esta tesis doctoral, se han estudiado las estrategias medioambientales avanzadas más relevantes para la literatura de gestión medioambiental. En primer lugar, los capítulos 2 y 3 se centran en el estudio de las estrategias de proactividad medioambiental, así como de los factores que afectan a su implantación. Como se ha visto a lo largo de estos estudios, la proactividad medioambiental se interpreta como aquella conducta organizativa por la que se implementa una estrategia medioambiental sesgada hacia las medidas de prevención de la contaminación en la cartera de medidas, que está caracterizada por la

voluntariedad en la implementación de estas medidas. Estas dos características, prevención y voluntariedad, ponen de manifiesto la intención de la empresa de realizar cambios no requeridos u obligados, es decir, que llegan más allá de los requerimientos obligatorios. Otras de las características asociadas a esta conducta medioambiental avanzada han sido la profundidad y el alcance en la adopción de medidas medioambientales en la empresa, es decir, la intensidad y la diversidad con la que se adoptan las respuestas medioambientales. Los esfuerzos de la investigación presentada en estos dos capítulos se han centrado en el estudio del efecto que la denominada proactividad estratégica tiene sobre la proactividad medioambiental, poniendo de manifiesto que la primera resulta un factor impulsor de la segunda. La proactividad estratégica consiste en aquella actitud estratégica avanzada o reacción de la empresa a estímulos del mercado que se caracteriza por desarrollar nuevos productos, buscar nuevos mercados, desarrollar o invertir en tecnología flexible, etc…que le permiten responder a cambios bruscos del mercado con el objetivo de situarse en una posición de liderazgo.

En la presente tesis doctoral, la proactividad estratégica se ha asociado en primer lugar con el liderazgo innovador (capítulo 2). Los resultados de este capítulo demuestran que una actitud proactiva o de liderazgo en las acciones de innovación fomentan una actitud proactiva en la estrategia medioambiental de la empresa; es decir, que la proactividad innovadora tiene un efecto positivo sobre la proactividad medioambiental. Estos resultados se justifican si se tiene en cuenta que la actitud de liderazgo o proactividad en la estrategia de innovación de la empresa supone un aprovechamiento de conocimientos, un aprendizaje y una acumulación de *know-how* que permiten a la empresa emprender acciones medioambientales con menor esfuerzo que aquellas empresas que toman posiciones reactivas o pasivas.

En el capítulo 3 de la tesis doctoral se ha continuado con el estudio del efecto de la proactividad estratégica sobre la proactividad medioambiental. Siguiendo con la combinación de características que componen la actitud proactiva en la estrategia, en este capítulo se ha estudiado además cuál es el efecto sobre una estrategia medioambiental avanzada de la internacionalización empresarial. Continuando con la aplicación del concepto de *proactividad*, se ha analizado si aquellas empresas que tienen una expansión geográfica mayor que la de sus competidores tienen también una estrategia medioambiental más avanzada. Los resultados demuestran que la expansión geográfica de la actividad empresarial a mercados internacionales, en mayor medida de lo que es habitual en el sector, tiene asociada una probabilidad mayor de alcanzar niveles elevados de proactividad medioambiental. La justificación de este resultado se encuentra en el hecho de que las empresas más internacionalizadas obtienen mayor conocimiento, aprovechan más los recursos disponibles en los nuevos mercados y desarrollan mayor capacidad de adaptación a las circunstancias externas. Por tanto, acumulan más conocimiento y experiencia, y aprovechan este *know-how* acumulado para emprender medidas medioambientales de forma más avanzada.

Estos resultados pueden interpretarse desde la visión de recursos y capacidades. Esta perspectiva afirma que las organizaciones, para poder alcanzar una ventaja competitiva sostenible en el tiempo, deberán poseer, desarrollar o adquirir recursos tangibles o intangibles que sean valiosos, poco comunes, inimitables y no tener equivalente estratégico sustituible. Desde este punto de vista, la estrategia medioambiental puede entenderse como una capacidad heterogénea que lleve a la empresa a obtener una ventaja competitiva si se implementa de forma avanzada o proactiva: de forma voluntaria, basada en la prevención y anticipándose a los movimientos del

entorno. La proactividad medioambiental conlleva en su implementación el estudio de todo el ciclo productivo de la empresa, por lo que llevará a la empresa a mejorar su eficiencia, a una mejora de sus procesos, a una reorganización de las estructuras organizativas, etc… Además, la proactividad medioambiental podría influir en la reputación de la empresa, así como atraer a consumidores interesados por la producción limpia o los productos verdes. Todas estas características pueden suponer una fuente de ventajas competitivas para la empresa. Por otra parte, la proactividad aplicada a la estrategia empresarial, tal y como se ha definido en la presente tesis doctoral, puede suponer para la empresa una capacidad heterogénea ya que, por definición, lleva a la empresa a alcanzar posiciones de liderazgo. Además, siguiendo el enfoque de las capacidades dinámicas, el concepto de proactividad estratégica permite a la empresa aprovechar nuevas oportunidades de negocio, actuar de forma temprana a los cambios en el mercado gracias a su flexibilidad y obtener nuevas oportunidades tecnológicas. Sin embargo, y pese a que en los capítulos 2 y 3 de esta tesis doctoral se haya analizado el efecto de la proactividad estratégica sobre la proactividad medioambiental, se debe tener en cuenta que ambas capacidades pueden ser complementarias en su implementación. Es decir, una actitud proactiva en la estrategia empresarial favorece la proactividad medioambiental y viceversa, pues ambas capacidades deben verse como recursos complementarios al obtenerse ventajas competitivas en la implementación conjunta. En definitiva, existe una relación sinérgica entre la actitud de liderazgo en la estrategia empresarial y la implantación de una estrategia medioambiental proactiva.

En el estudio de las estrategias medioambientales avanzadas, se ha visto como, además del término de proactividad medioambiental, ha sido también muy utilizado el término eco-innovación, especialmente en la última

década. Siguiendo la definición del concepto, la eco-innovación supone la implementación de una novedad en el producto o servicio, proceso productivo, o método de gestión o comercialización, que genera menores riesgos medioambientales que las alternativas disponibles a lo largo de su ciclo de vida. La eco-innovación puede interpretarse como cualquier cambio pro-ambiental en la empresa y por tanto, comprende aspectos similares a los considerados en el término de proactividad medioambiental.

En el cuarto capítulo de esta tesis doctoral se ha analizado el efecto que la capacidad de integración de los stakeholders tiene sobre la estrategia eco-innovadora de la empresa. Los resultados obtenidos de esta investigación permiten comprobar que la capacidad de integración de los stakeholders es un proceso gradual que permite a la empresa crear relaciones activas de comunicación y colaboración con distintos grupos de interés, basadas en la confianza. Además, los resultados muestran que la capacidad de integración de los stakeholders implica tener en cuenta las preocupaciones, objetivos y preferencias de los distintos grupos de interés a la hora de fijar los objetivos medioambientales de la empresa, acumulando activos intangibles de carácter eco-innovador. Desde la perspectiva de recursos y capacidades, la integración de los stakeholders puede verse también como una capacidad única que desarrolla la empresa, difícil de imitar, y que puede suponer la obtención de una ventaja competitiva. La identificación de los grupos de interés, la comunicación y la cooperación como mecanismos de integración de los requisitos, exigencias y preferencias de los stakeholders en materia medioambiental permite a la empresa adaptarse a estos requerimientos, acumulando conocimiento, creando valor para la organización y desarrollando competencias que le permiten reaccionar ante cambios en estas necesidades.

Esta capacidad de integración de los stakeholders también debe verse como una respuesta de la empresa a los requerimientos de los distintos grupos de interés. La Teoría de los stakeholders afirma que la empresa articula relaciones con distintos grupos de interés con el objetivo de crear un valor compartido para ambas partes. La empresa focalizará su atención en determinados grupos de interés en función de sus objetivos estratégicos y del valor que éstos aporten a la organización. De esta manera, las empresas más concienciadas con el cuidado del entorno natural tenderán a integrar las necesidades y preferencias de aquellos grupos de interés que más presionen en estas cuestiones, desarrollando a través de estos mecanismos de integración competencias únicas y conocimiento medioambiental.

La Teoría institucional argumenta que las organizaciones diseñan su estrategia y comportamiento en función de las presiones a las que se ve sometida por instituciones externas (el gobierno, la regulación o los stakeholders). En este sentido, las empresas tenderán a integrar en mayor medida las preferencias de los grupos de interés objetivo en su estrategia medioambiental, como respuesta a las presiones de éstos. Cuanto mayores sean éstas presiones, y cuanto mayor valor se cree a partir de estas relaciones de comunicación y cooperación, mayor será la integración y, por ende, como se ha comprobado en el capítulo cuarto, mayor será la acumulación de capital eco-innovador en la empresa, es decir, el *know-how* medioambiental.

En el quinto capítulo de esta tesis doctoral se ha analizado el estado de la cuestión de uno de los términos más prometedores en las nuevas tendencias de investigación en la gestión medioambiental: la economía circular. El término circular, como se ha visto anteriormente, califica a una economía que busca no tener efecto neto en el medio ambiente, restaurando los posibles daños derivados de la extracción de recursos y la contaminación en todo el proceso productivo, tratando de reemplazar el criterio lineal de

"tomar, usar desechar" por el criterio circular "reducir, reutilizar, reciclar y recuperar". Este cambio de paradigma a nivel industria, se basa en la implantación de los ciclos de la naturaleza en las formas de producir, donde se formen flujos de materiales y energía continuos, reutilizables, reusables, recuperables, apostando por la integración de la actividad económica y el medio ambiente de una forma sostenible. Debido a su novedad, las estrategias medioambientales para una economía se encuentran en un punto inicial, siendo necesario un estudio exhaustivo del estado de la cuestión. En el último trabajo de investigación de esta tesis doctoral, se ha analizado la economía circular desde la perspectiva de los recursos y capacidades, así como desde la visión de la ecología industrial. Mientras que la ecología industrial introduce los ciclos naturales biológicos dentro de la gestión de las organizaciones, convirtiendo los residuos de un proceso en la materia prima de otro, la perspectiva de las capacidades dinámicas ve la introducción de medidas circulares como la creación de conocimiento a través de un proceso de adaptación al entorno que está en constante cambio. Bajo estas perspectivas teóricas, el quinto capítulo de esta tesis doctoral se ha centrado en el análisis de la implantación de medidas relacionadas con la economía circular en las pymes europeas. En primer lugar, se ha analizado cuál es el grado de implantación de las medidas relacionadas con la economía circular en estas empresas, observándose que el patrón de implantación es gradual, comenzando con medidas relacionadas con el control de la polución, hasta aquellas más avanzadas, basadas en la prevención. En el capítulo 5 nos referimos a las empresas que han llevado a cabo al menos una medida de economía circular como organizaciones *in-going*, frente a las que no han llevado a cabo ninguna medida de este tipo (empresas *no-going*), y se han comparado las barreras que ambos tipos de empresas han encontrado para la implantación de medidas de economía circular. Se ha observado de esta manera, que aquellas empresas más reactivas, las *no-going*, hacen referencia

a la falta de financiación y de inversión como las principales barreras que impiden llevar a cabo medidas de economía circular. Es decir, las empresas que no han integrado la economía circular dentro de su estrategia, ven los factores económicos como el principal problema o barrera para llevarla a cabo. En el lado opuesto, aquellas empresas que sí han implementado en mayor o menor grado medidas circulares, ven los procesos administrativos, la regulación, y la falta de preparación del capital humano como las principales barreras en la implementación de estas medidas. Esta diferencia pone de manifiesto la necesidad de informar a las empresas sobre las estrategias basadas en economía circular, además de una necesaria relajación de los procesos burocráticos y administrativos, que permitan que la implantación de medidas de economía circular en la empresa sea menos costosa.

7.3. IMPLICACIONES PARA LA GESTIÓN

Para los directivos, los resultados obtenidos a lo largo de esta investigación ponen de manifiesto la necesidad de trabajar de una manera voluntaria y proactiva a la hora de implantar estrategias medioambientales avanzadas. En primer lugar, se ha argumentado la complementariedad existente entre la estrategia de negocio y la implantación de prácticas y objetivos medioambientales. De esta complementariedad se puede suponer que, la implantación de prácticas proactivas estratégicas (como son la innovación o la internacionalización) llevará asociado un estudio minucioso de todo el ciclo productivo, que favorecerá la implantación de medidas medioambientales avanzadas en la empresa.

Al implantar una estrategia medioambiental avanzada en la empresa, las externalidades negativas de la empresa, como la polución del aire derivada de la fabricación o la contaminación de las aguas se reducen. A priori, los directivos pueden pensar que el coste del impacto medioambiental

se está absorbiendo por la empresa, como se ha demostrado en el estudio de las barreras a la economía circular en el quinto capítulo, donde aquellas empresas que no implementaban medidas de este tipo aseguraban que era por los costes asociados a su puesta en marcha. Sin embargo, estas medidas, además de fomentar el cuidado del medio ambiente y facilitar una actividad industrial sostenible, hace que la misma empresa mejore la eficiencia de sus procesos, disminuya el uso de recursos y, en definitiva, mejore sus resultados.

En el cuarto capítulo de esta tesis doctoral se ha visto como una integración de las preferencias de los grupos de interés fomenta el aumento del capital acumulado en materia medioambiental. Las implicaciones para la gestión derivadas de estos resultados deben ir relacionadas con la implantación de vías de comunicación activas con aquellos grupos de interés que más valor aporten a la empresa. Por ello, el contacto con consumidores, proveedores, universidades, etc… es esencial para conocer cuáles son las preferencias y necesidades de estos grupos y actuar en los puntos clave para ambos, con el fin de crear valor conjunto. Además, una cooperación con determinados grupos de interés podrá llevar a la empresa a una mayor acumulación de conocimiento medioambiental, por ejemplo, cooperando con universidades, o adaptándose a los altos estándares medioambientales de un proveedor.

Si bien es cierto que determinados sectores industriales tienen por naturaleza una mayor capacidad de contaminación, en estos casos la intervención de los reguladores públicos es esencial para tratar de fomentar una actividad menos dañina para el medio ambiente. De las implicaciones para los reguladores públicos se hablará a continuación.

7.4. IMPLICACIONES PARA LOS REGULADORES PÚBLICOS

Como bien se ha hecho referencia, la implantación de medidas proactivas en innovación, internacionalización, así como la comunicación y la cooperación con los grupos de interés, fomentan la implantación de estrategias medioambientales avanzadas. Sin embargo, determinados sectores de actividad pueden tener limitaciones a la hora de llevar a cabo estas prácticas. Por ejemplo, en el capítulo 2 se ha comprobado que existen diferentes patrones de comportamiento en cuanto a la estrategia de innovación y la estrategia medioambiental en función del sector de actividad. Se comprobaba que, aquellos sectores con mayores necesidades tecnológicas tenían unos valores de proactividad innovadora muy bajos, lo que hace pensar que aquellas empresas que pertenecen a los sectores de alta tecnología deben realizar grandes esfuerzos para implantar una estrategia proactiva, debido a los altos niveles en el sector de actividad. Por ello, es importante que los reguladores tengan en cuenta el nivel tecnológico de cada sector de actividad, así como los niveles de contaminación habituales para cada sector. En este último caso, para aquellos sectores que por naturaleza tienen unos niveles de contaminación mayor, los reguladores públicos deben incentivar la implantación de prácticas medioambientales a través de deducciones fiscales, subvenciones u otros mecanismos motivadores. Después de la puesta en marcha de estas medidas, será posible un endurecimiento de la regulación medioambiental en cada sector.

Por otro lado, los resultados obtenidos sugieren que, a pesar de los esfuerzos institucionales por promover la implantación de una economía circular, es necesaria la aplicación de medidas intervencionistas de mano de las autoridades competentes, a través de paulatinos instrumentos como la regulación o la fijación de impuestos ecológicos que promuevan la

implantación de este tipo de medidas. Por otro lado, las barreras económicas que parecen encontrar las empresas *no-going*, lo que las lleva a no implementar ningún tipo de medida relacionada con la economía circular, ponen de manifiesto que tal vez estas medidas intervencionistas tendrían que basarse en incentivos extrínsecos, con los que las empresas se vean motivadas al comportamiento circular, como son la concesión de subvenciones o las ventajas fiscales.

7.5. LIMITACIONES Y FUTURAS LINEAS DE INVESTIGACIÓN

Después de destacar las conclusiones e implicaciones más relevantes de esta investigación, conviene hacer referencia a las principales limitaciones de los estudios que componen la tesis doctoral, lo que podrá sugerir futuras líneas de investigación.

La principal limitación de esta tesis doctoral se deriva de la utilización de bases de datos secundarias, lo que limita los ítems a utilizar y el campo de estudio de la investigación. La primera futura línea de investigación que de aquí se deriva es el estudio de la proactividad estratégica utilizando más factores que los que aquí analizamos (proactividad en innovación e internacionalización).

Siguiendo en esta línea, la utilización de datos de empresas españolas que sólo engloban a organizaciones tecnológicas, podría llevar a considerar como futura investigación el análisis de las relaciones contenidas en esta tesis doctoral en otra muestra de empresas de otra región. Los resultados podrían poner de manifiesto si, efectivamente, la regulación del país, o las prácticas generalmente adoptadas por las empresas del mismo, tienen efecto en las estrategias medioambientales más avanzadas.

En cuanto al estudio de la integración de los stakeholders, convendría como futura línea de investigación analizar el efecto de la integración de los distintos grupos de interés, viendo si, por ejemplo, la integración de las preferencias de los stakeholders internos afecta en mayor medida que los externos. Además, podría ser interesante completar este estudio con una entrevista en profundidad a los directivos de las empresas, tratando de analizar qué grupos de interés les interesa más atraer y comunicarse con ellos, para después estudiar el efecto en la acumulación de capital medioambiental.

La presente investigación se ha centrado en un bloque de literatura que analiza aquellos factores que afectan a la puesta en marcha de una estrategia medioambiental avanzada. En este punto, convendría preguntarse cuáles son los incentivos que motivan a las empresas a llevar a cabo esta serie de medidas en la organización. Analizando esta cuestión desde la Economía clásica, estos incentivos que empujan a la empresa a llevar a cabo acciones medioambientalmente sostenibles pueden verse como extrínsecos o intrínsecos, es decir, con objetivo de obtener un output tangible o intangible que cree valor para la empresa (por ejemplo, mejora de los resultados económicos) o que el output esté asociado al hecho de un comportamiento sostenible (por ejemplo, concienciación del manager con el deterioro medioambiental, y por ende, satisfacción a la hora de llevar a cabo una estrategia medioambiental). Estos incentivos que impulsan a la empresa a llevar a cabo una determinada estrategia medioambiental avanzada, así como los distintos resultados obtenidos en función de esta motivación, podrían suponer una futura línea de investigación.

Por último, cabe destacar que la economía circular es un tema que necesita estudio en profundidad. La literatura relacionada con la economía circular es todavía escasa, y muy pocas investigaciones la enmarcan dentro

de un contexto organizativo. Es por esto que un mayor estudio de las implicaciones de la economía circular, así como un análisis de comparación entre industrias, es necesario.

7.6. CONCLUSIÓN FINAL

La presente tesis doctoral ha sido motivada principalmente por la preocupación personal por la degradación del medio ambiente que, debido a los actuales hábitos de consumo y modelos productivos, han llevado a ver el cambio climático como un inminente problema sin retorno. A lo largo de esta tesis doctoral se ha tratado de plasmar la preocupación, así como el interés por la búsqueda de soluciones, desde un punto de vista académico. La presente investigación acerca de las estrategias medioambientales más avanzadas, así como los factores que fomentan la implantación de este tipo de estrategias, se sustenta en un ánimo por fomentar un consumo responsable, un respeto por el medio ambiente y la naturaleza, y una búsqueda de las soluciones a la crisis ecológica que azota nuestra sociedad y, en definitiva, nuestra forma de vivir. Por todo ello, no queremos dejar pasar la oportunidad de hacer conciencia, y como conclusión final, hacer referencia a un proverbio nativo americano:

No heredamos la tierra de nuestros ancestros, la tomamos prestada de nuestros hijos.