UNIVERSIDAD DE GRANADA

FACULTAD DE CIENCIAS ECONÓMICAS Y EMPRESARIALES

PROGRAMA DE DOCTORADO EN CIENCIAS ECONÓMICAS Y EMPRESARIALES

TESIS DOCTORAL

Elementos económicos y sociales del desarrollo sostenible de regiones comunitarias, y de un grupo de los países menos adelantados del mundo

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2020

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Editor: Universidad de Granada. Tesis Doctorales
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ISBN: 978-84-1306-651-6
URI: http://hdl.handle.net/10481/63932

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Agradecimientos

Llegado el momento de presentar el trabajo, que ha dado como resultado esta tesis doctoral, quisiera comenzar exponiendo mi agradecimiento a aquellas personas e instituciones que han contribuido a llegar a este punto. En primer lugar, agradezco a mi familia, por su incondicional apoyo, tanto en este proceso como en mi vida en general, y sin cuyo respaldo me habría sido imposible culminar este doctorado, como mi querido tío, Gerardo Alberto Mejía Pérez, y mi querido hermano, Noe Zermeño Mejía.

Agradezco igualmente a la Universidad de Granada, por la oportunidad que me ha concedido de aprender de magníficos profesionales y ser partícipe de este programa de doctorado. Igualmente agradezco a la institución en la que desarrollo mi labor, la Universidad de Guadalajara, por su apoyo y confianza. Quisiera agradecer también con todo mi aprecio y consideración a mis directores de tesis, José Antonio Rodríguez y José María Martín, el trabajo, el esfuerzo constante y la dedicación plena, que han aportado en este proyecto, así como sus consejos, guía y cariño, y al profesor Antonio Luzón, por su apoyo inestimable, su ayuda y sus ánimos en todo el proceso de elaboración de la tesis.

1.Resumen

La Tesis que se presenta bajo el título “Elementos económicos y sociales del desarrollo sostenible de regiones comunitarias y de un grupo de los países menos adelantados del mundo”, surge como reagrupación de artículos publicados por la doctoranda en cuatro revistas científicas de prestigio internacional. De estas revistas, tres quedan indexadas en el Journal Citation Reports (JCR), y una tercera en Scopus, EconLit, Catálogo Latindex y Emerging Sources Citation Index.

El conjunto de trabajos incluido en esta Tesis toma como hilo conductor la importancia de la selección de indicadores socioeconómicos para el análisis de determinadas problemáticas, con una alta repercusión en el bienestar de los ciudadanos. En concreto, se ha trabajado en diferentes niveles territoriales: regiones españolas y europeas, y países africanos. El primero de los trabajos publicados, como se expondrá a continuación, utiliza un indicador unidimensional, mientras que los tres restantes evolucionan mediante el uso de indicadores multidimensionales, más precisos en la captación de forma integral de un fenómeno complejo y dinámico.

El primer trabajo publicado, el 15 de febrero de 2018, se titula “Effects of Vacation Rental Websites on the Concentration of Tourists—Potential Environmental Impacts. An Application to the Balearic Islands in Spain”. Este artículo, contenido en la revista *International Journal of Environmental Research and Public Health*, se centra en uno de los principales sectores de actividad de la economía española, el turismo. En concreto, este trabajo aborda dos grandes problemas asociados a este sector, a saber. El primero de ellos sería la estacionalidad turística, entendida como la concentración de visitantes en determinados períodos del año. Y el segundo de los problemas estriba en la irrupción de nuevos modelos de intermediación turística, las plataformas online de alojamientos turísticos, un fenómeno escasamente regulado y cuyos impactos en la sociedad y en el sector están aún por determinar.

Este estudio mostró como principal conclusión, que los nuevos modelos de intermediación de alojamientos turísticos han agravado el problema de la estacionalidad turística, en una región que sufre el mayor nivel de estacionalidad turística de España, como las Islas Baleares. Esto ha contribuido al incremento del impacto sobre los recursos naturales y sobre las sociedades locales.

Pero además, este estudio hizo tomar conciencia sobre la importancia de trabajar con indicadores multidimensionales, capaces de reflejar un problema desde un punto de vista más completo, superando las limitaciones de trabajar con una única variable.

El segundo artículo acreditado se titula “A Spatial Analysis of the Achievements, in Terms of Regional Development, Accomplished by the Initial EU-Member Cohesion Fund Beneficiaries Using a Synthetic Indicator”. Este trabajo, publicado en la revista *Sustainability*, en abril de 2019, aborda el análisis propuesta asumiendo la mencionada perspectiva multidimensional a la que se ha hecho referencia. En concreto, se ha tomado como referencia para la agregación de información el método de la distancia de Pena Trapero, sobre el que más adelante se hablará. El objetivo de esta investigación se centró en el estudio de la cohesión económica y social en las regiones de España, Grecia, Irlanda y Portugal, en el marco de la Política Regional Comunitaria. Este objetivo habría sido imposible de abordar tomando como referencia un indicador unidimensional, por lo que mediante la metodología propuesta se compuso un indicador sintético, que refleja de forma más completa los progresos en materia de cohesión y desarrollo económico y social. Los resultados mostraron una considerable distancia entre las regiones mejor y peor posicionadas en términos, de desarrollo económico y social.

El tercer artículo publicado tiene por título “Human rights in the Horn of Africa: an index of child and maternal health”. Esta investigación se publicó en la revista *Gaceta Sanitaria*, en diciembre de 2019. Este trabajo toma igualmente como referencia metodológica el sistema de composición de indicadores multidimensionales señalado en el trabajo anterior. La investigación que aquí se propone se inserta en el marco propuesto por Naciones Unidas, dentro de la Agenda 2030 para el Desarrollo Sostenible. En particular, se persigue la creación de una medida territorial y una clasificación de salud materna e infantil en los países del Cuerno de África, siendo este uno de los objetivos establecidos en la señalada estrategia de. Una vez más, se concluye que un indicador multidimensional captura de una forma más precisa una realidad compleja, que no puede describirse o monitorizarse tomando en consideración una única variable.

Como principales resultados, se ha destacado la gran diferencia en la situación de los países analizados, aun cuando pudiera pensarse que su perfil es similar. En conjunto, Somalia y Etiopía representan casi el 70% de la población de la región conocida como el Cuerno de África, y en ellos, se describen los peores escenarios teóricos asociados al análisis propuesto.

El cuarto y último trabajo que forma esta Tesis, se titula “An Analysis of tourism sector seasonality and its relation to the economic cycle: The case of Spain”. Este artículo fue publicado en la revista *Estudios de Economía Aplicada,* en febrero de 2020. En concreto, este artículo forma parte de un número especial de esta revista centrado precisamente en el trabajo con indicadores económicos multidimensionales, “Challenges in the construction of composite indicators”. Este trabajo cierra el ciclo de esta Tesis, pues vuelve a trabajar sobre la estacionalidad turística, al igual que en el primer trabajo publicado, pero en este caso se asume una perspectiva multidimensional, que complementa a la primera publicación. En esta investigación, se ha volcado la experiencia adquirida en los estudios anteriores, en lo que respecto al tratamiento de datos mediante indicadores sintéticos. El objetivo planteado fue analizar el efecto que el punto del ciclo económico puede tener sobre la intensidad de la estacionalidad turística, lo cual resulta muy interesante para anticipar políticas públicas, que puedan contener los efectos más perniciosos de esta tendencia. El principal hallazgo de este trabajo ha sido la constatación de que los destinos más sensibles a las variaciones en el ciclo económico, en lo que respecta a los niveles de estacionalidad, son los urbanos.

Para finalizar este resumen, se toma una visión de conjunto del trabajo realizado, y se constata desde el prisma de la doctoranda, un proceso de aprendizaje y evolución como investigadora. Este aprendizaje hace referencia al proceso de abordaje de una investigación, al tratamiento de datos y a la aproximación a varios problemas socioeconómicos relacionados con el desarrollo, la cohesión y la sostenibilidad de ciertas actividades. Igualmente, de una forma modesta, se han realizado algunas contribuciones a la literatura académica sobre varios temas, que aportan uno o varios granos de arena en la amplia inmensidad de la investigación.

2. Introducción, metodología y objetivos de la tesis.

2.1. Introducción.

En las sociedades actuales se producen complejos procesos de desarrollo, algunos de los cuales conducen a situaciones poco deseables. El crecimiento económico no garantiza la mejora de la situación para los habitantes, por lo que resulta de gran importante realizar un seguimiento de las dinámicas asociadas a numerosos aspectos relacionados con estos procesos. En esta Tesis, se acota el espectro de trabajo a tres niveles: el contexto regional español, el de un grupo de países europeos considerados como más atrasados, respecto al promedio de la Unión Europea (UE), y de un grupo de países africanos, con una situación de desarrollo aún en un estadio muy incipiente. Esta heterogeneidad de ámbitos de trabajo ha sido tomada como un reto, pues en el desarrollo de esta Tesis se ha primado el trabajo con indicadores de desarrollo aplicados a diferentes problemáticas. Todo ello bajo el objetivo común de proponer metodologías adecuadas para realizar un seguimiento y diagnóstico a problemas vinculados al desarrollo y crecimiento económico.

En esta introducción se ofrece una breve visión del marco teórico que se ha desarrollado en los trabajos propuestos. Queda dividida en tres ejes: la estacionalidad turística y su papel en el desarrollo, la evolución de la política de cohesión comunitaria y el papel de los Objetivo de Desarrollo Sostenible de Naciones Unidas.

La estacionalidad turística y su papel en el desarrollo.

La estacionalidad turística se manifiesta como la alternancia de épocas de elevada actividad conocidas como momentos pico, con otras llamadas valle, en las que se produce una fuerte caída de las llegadas. En las épocas de máxima actividad, se registran como consecuencia de la gran afluencia de visitantes. Se trata de interferencias con la comunidad local, que pueden generar sentimientos de rechazo a la actividad turística (Martín, Jiménez y Molina, 2014; Koenig-Lewis y Bischoff, 2005), así como alteraciones en la calidad de vida de los autóctonos y en la propia cultura local.

Del mismo modo, en estas épocas de elevada concentración de visitantes, se pueden originar problemas medioambientales asociados a un incremento de la presión sobre los recursos naturales, interferencias con la fauna y flora local, así como crecimiento en la generación de residuos (Ioannides y Petersen, 2003; Lusseau y Higham, 2004; Cuccia y Rizzo, 2011). Por su parte, a las épocas de menor afluencia, se asocian efectos económicos derivados de la pérdida de rentabilidad de los proyectos empresariales, sub-aprovechamiento de los recursos, inestabilidad en el mercado laboral e incluso problemas para retener profesionales altamente cualificados (Adler y Adler, 2003; Terry, 2016; Ashworth y Thomas, 1999; Ball, 1988; Lundmark, 2006; Terkenli, 2005). En definitiva, la estacionalidad de la demanda representa un importante reto para el sector turístico, que puede llegar a poner en riesgo las políticas de desarrollo sostenible vinculadas a esta industria.

Como Martin et al., (2017: 1693) señalan: “un bajo grado de estacionalidad es una condición necesaria, o deseable, al menos, dado que el nivel estable de ingresos, actividad y empleo a lo largo del año, es requerido para posicionar al turismo como una alternativa real de desarrollo sostenible”. El problema de la estacionalidad turística se ha reconocido a nivel europeo. De hecho, algunos programas europeos impulsados por la Comisión Europea se centran directamente en reducir esta cuestión. La estacionalidad turística se identifica como un problema que puede impactar con intensidad en la competitividad de la actividad turística comunitaria.

Para comprender el efecto de la estacionalidad turística y sus dinámicas, resulta necesario entender las causas que derivan en las diferentes intensidades. Estas causas son complejas y diversas, y han sido objeto de atención de muchos investigadores. Puede tomarse como referencia, al igual que se hace en numerosos trabajos, la clasificación propuesta por Hylleberg (1992), quien diferencia entre tres grupos de factores: clima (temperatura, número de horas de sol); efectos del calendario (fechas de eventos religiosos, festivales); y decisiones de tiempo (vacaciones escolares, vacaciones de empresa, año fiscal, periodos contables). Estos factores pueden también ser clasificados en naturales e institucionales.

Otros factores destacados en la literatura económica son la localización del destino, (Martín et al., 2014); las propias restricciones asociadas al turismo (Higham y Hinch, 2002); la presión social o la inercia (Butler, 1994); e incluso la variación en los ingresos de los turistas y de los precios relativos (Rosello, Riera y Sausó, 2004).

El contexto de los Objetivos de Desarrollo de Naciones Unidas.

El Programa de Naciones Unidas de los Objetivos de Desarrollo Sostenible tiene su antecedente en los Objetivos de Desarrollo del Milenio (ODM). Este programa contaba con 8 objetivos que asumían compromisos en áreas tales como proporcionar educación primaria universal, detener la propagación del VIH / SIDA, reducir a la mitad la pobreza extrema, etc. Esta estrategia supone un gran cambio en la forma de aunar los esfuerzos de desarrollo, a escala nacional y mundial. Un total de 189 países aprobaron los ocho ODM (Kumar y Singh, 2013).

Entre los objetivos que señalaba este marco de actuación, se encontraban la reducción significativa en la mortalidad infantil en los menores de cinco años (ODM 4), y la reducción en la mortalidad materna (ODM 5), en relación con las tasas de 1990 (ONU, 2000). La definición de estos objetivos como prioritarios han llevado a organizaciones internacionales a impulsar un mayor nivel de ayuda al desarrollo, atención política y trabajo de investigación (Black et al. 2010; Goli y Arokiasamy, 2014). Sin embargo, el progreso hacia la fecha límite final de 2015 ha sido desigual, dentro y entre los países (ONU, 2014).

El marco de trabajo diseñado para dar continuidad al anterior, que entró en vigor a partir de 2015, se construyó pensando en reunir toda la gama de aspiraciones y necesidades humanas para garantizar una vida digna para todos (ONU 2013). En la agenda de desarrollo de Naciones Unidas post-2015, la salud es un componente central (Alleyne et al., 2013). El 1 de enero de 2016, el mundo comenzó oficialmente a implementar el plan de acción basado en los Objetivos de Desarrollo Sostenible (ODS). El objetivo tres se centra en garantizar el bienestar y la salud de todas las personas, mejorando la salud reproductiva, materna e infantil (UN, 2016).

Como indicaban numerosos autores, la salud de los niños y las mujeres debe priorizarse en la agenda de los ODM, contribuyendo a poner fin a las muertes prevenibles de madres e hijos, pues esto no es solo una obligación moral, sino un objetivo alcanzable esencial para avanzar en el desarrollo sostenible (Requejo y Bhutta, 2015).

Evolución de la política de cohesión europea.

Uno de los principios básicos, que definió la creación de las Comunidades Europeas, fue el de la solidaridad de intereses entre países. Esta idea está detrás de la política presupuestaria inicial del proceso de integración europeo (Strasser, 1978). La política de cohesión regional vivió un fuerte impulso después de la entrada de Grecia (1981) y, posteriormente, de Portugal y de España (1986) (Fernández, 2007), siendo un instrumento fundamental en la respuesta del proceso de integración a las crecientes desigualdades interregionales.

El Acta Única Europea (1987) proporcionó el ímpetu definitivo para la estrategia de solidaridad comunitaria, haciendo posible que las regiones se pudieran adaptar al proyecto comunitario (Garrido et al., 2007). Tan sólo un año más tarde, en 1988, el Consejo Europeo se comprometió a duplicar la asignación financiera de los Fondos Estructurales en el período 1988-1993, reformar sus operaciones e implementar los cuatro principios básicos de Política Regional (concentración, programación, asociación y adicionalidad) (Garrido et al., 2007).

Los recursos financieros de los Fondos Estructurales se fortalecieron, mientras que el Fondo de Cohesión se estableció en 1993 para favorecer la convergencia económica, bajo el paquete Delors II y la implementación del Tratado de Maastricht. Este nuevo fondo estaba destinado a cofinanciar proyectos de infraestructura y medio ambiente en países con un PIB per cápita de menos del 90% del promedio de la UE: España, Grecia, Irlanda y Portugal, como se detalla en Holgado et al. (2015).

El siguiente punto de inflexión data de lo que podría llamarse “la gran ampliación” de 2002, con los países de Europa Central y Oriental como protagonistas, durante el período de programación 2000-2006 (Mancha y Gallo, 2013). Finalmente, el Tratado de Lisboa, firmado el 13 de diciembre de 2007 (efectivo el 1 de diciembre de 2009), reafirmó la prioridad de reforzar la cohesión económica, social y, de una nueva manera, territorial (Comisión Europea, 2008).

El período de programación presupuestaria 2007-2013 conllevó cambios significativos en la política regional comunitaria (Comisión Europea 2007), en el marco de la estrategia renovada de Lisboa. Una de las principales novedades fue la sustitución del objetivo 1 por el objetivo de convergencia, que financia las regiones más pobres, aquellas con un PIB per cápita de menos del 75% del promedio de la UE. El objetivo de convergencia también incluyó provisionalmente regiones afectadas por el efecto estadístico, tras la ampliación al Centro y Este de Europa.

Finalmente, la Estrategia Europa 2020 establece los objetivos de la Política de Cohesión para el período 2014-2020 (Cordero, 2015). Es una estrategia de crecimiento orientada a lograr una economía integradora, inteligente y sostenible Estas tres prioridades se refuerzan para coadyuvar a la UE a generar altos niveles de empleo, cohesión social y de productividad (Comisión Europea 2013).

2.2. Metodología.

Sería redundante exponer de manera detallada en esta introducción la metodología que se ha utilizado en los artículos que integran esta Tesis, en los que se recogen no sólo la justificación metodológica, sino también la selección de los datos y las variables en los diferentes contextos. Como se ha expuesto anteriormente, el objetivo de esta Tesis se centra en la propuesta de indicadores para el análisis de problemas económicos y sociales. La línea temporal en la publicación de los trabajos que componen esta Tesis, evoluciona desde una investigación consolidada mediante un indicador simple, el Índice de Gini, a otras tres investigaciones que requieren de indicadores multidimensionales. Estos tres casos comparten una característica metodológica, el que están basados en el método de distancia propuesto por Pena en 1977, y que en la actualidad ha resurgido como base metodológica para numerosos trabajos científicos en el área de las ciencias sociales.

A continuación se esboza una breve descripción de los indicadores utilizados en los artículos realizados: el Índice de Gini, en su aplicación a la medición de la estacionalidad turística, y el DP_2, como indicador sintético propuesto para la medición de una realidad económica y social multidimensional.

El Índice de Gini aplicado a la medición de la estacionalidad turística.

El Índice de Gini (IG) (Gini, 1912), mide el grado de concentración de una variable considerando un conjunto de observaciones. En este caso, el IG mide la concentración de viajeros y pernoctaciones, tomando como referencia los 12 meses. Así pues, un valor de 0 revelaría que en todos los meses del año se reciben el mismo número de viajeros, o que se realizan el mismo número de pernoctaciones. Mientras que un valor de 1 mostraría que todos los viajeros y pernoctaciones se concentran en un único mes. El valor de este indicador muestra el rango de frecuencias acumulativas en unas observaciones, comenzando por los valores más bajos (Lundtorp, 2001).

Este indicador puede ser enunciado de la siguiente manera:

$$IG = 1 + \left(\frac{1}{n}\right) - \left(\frac{2}{(n^2.\grave{}x)}\right).(x_1 + 2x_2 + 3x_3 + \cdots . nx_{n1})$$

En esta expresión, *n* es el número de observaciones, *x* es la media de las observaciones, y $x_1 + 2x_2 + 3x_3 + \cdots . nx_{n1}$ son las observaciones individuales en orden descendente de magnitud (Weaver & Oppermann, 2000).

En la literatura sobre estacionalidad turística las metodologías aplicadas son muy diversas, y dependen de los objetivos específicos marcados. En el supuesto de la medición de la intensidad de la estacionalidad es frecuente el uso de medidas de concentración como el Índice de Gini, aunque también otras investigaciones utilizan el Coeficiente de Variación o el Índice de Theil. De entre estas opciones, el IG es la medida más empleada (Fernández-Morales, 2003; Koenig-Lewis y Bischoff, 2005; Lundtorp, 2001). Este coeficiente aporta algunas ventajas, respecto a otras alternativas, como su estabilidad (Lundtorp, 2001).

El Método de Distancia (DP_2)

Quizás, el asunto más complejo en el desarrollo de indicadores sintéticos es el tratamiento de las unidades de medidas (cómo agregar variables expresadas en diferentes unidades), y el reparto de los pesos en las diferentes variables del indicador sintético, o expresado de otra forma, cómo agregar las variables en un único indicador.

En los tres últimos artículos que se presentan en esta Tesis, se usa el Método de Distancia (DP_2), definido por Pena (1977), que ha recibido una renovada atención por académicos en diferentes campos (Ray, 2014; Somarriba y Zarzosa, 2016). Este indicador resuelve algunos problemas indicados anteriormente, como la heterogeneidad de las unidades de medida de las variables, la duplicidad de información contenida en las mismas y el impacto asociado a cada una (Somarriba y Pena, 2009).

El sistema de construcción del método DP_2 verifica una serie de propiedades, que garantizan que el peso de los indicadores parciales es determinado de un modo no arbitrario (Rodríguez, 2011; Canaviri, 2016). Además de satisfacer las condiciones de distancia en un espacio métrico (no-negatividad, competitividad y desigualdad triangular) (Pena, 1977; Somarriba y Pena, 2008), el DP_2 verifica el conjunto de propiedades exigidas para un indicador sintético. Como exponen Zarzosa y Somarriba (2013), resulta adecuado, ya que se trata de medidas ad hoc, ideadas, específicamente, para analizar distancias entre diversas situaciones.

Concretamente, el indicador sintético DP_2 cumple las siguientes propiedades (Rodríguez, Holgado y Salinas, 2012; Escobar, 2006): existencia y determinación, monotonía, singularidad, cuantificación, invariancia, homogeneidad de grado uno, exhaustividad, aditividad, transitividad, invariancia, en comparación con la referencia de base, conformidad y neutralidad (Zarzosa, 1996).

El DP_2 para la región r es definido como sigue (Pena, 1977; Zarzosa y Somarriba, 2013):

$$DP_2 = \sum_{i-1}^{n} \left\{ \left({}^{d_i}/_{\sigma_i} \right) \left(1 - R^2_{i,i-1,\ldots.1}\right) \right\}$$

Con $R_1^2 = 0$, donde $d_i = d_i(\tau^*) = |\mathcal{X}_{ri} - \mathcal{X} * i|$, que es la referencia base, *n* es el número de variables, m el número de regiones, $\mathcal{X}_{ri}$ el valor de la variable *i* en la región *r*, σ_i la desviación estándar de la variable *i*, y $R^2_{i,i-1,\dots\dots 1}$ el coeficiente de determinación en la regresión X_i sobre $X_{i-1}, X_{i-2}, \dots\dots, X_1$, que expresa la parte de varianza o variación de X_i explicada literalmente por las variables. Como resultado, si m es el número de regiones, en la matriz X de observaciones, el componente X_i reflejará la situación de la variable *i* en la región *r*.

El coeficiente de determinación $R^2_{i,i-1,\dots\dots 1}$ mide el porcentaje de varianza de cada variable explicada por la regresión lineal estimada, usando las variables anteriores $X_{i-1}, X_{i-2}, \dots\dots, X_1$ (Pena, 2009; Sánchez and Martos, 2014). Como resultado, el factor $1 - R^2_{i,i-1,\dots\dots 1}$, que Pena (1977) denomina "factor de corrección", previene la redundancia en las variables. Esto es, como $1 - R^2_{i,i-1,\dots\dots 1}$ expresa la proporción de la varianza de X_i no explicada por $X_{i-1}, X_{i-2}, \dots\dots, X_1$, la parte ya explicada por el indicador precedente es obtenida multiplicando cada indicador parcial por el correspondiente coeficiente de determinación $R^2_{i,i-1,\dots\dots 1}$ (Somarriba y Pena, 2008; Rodríguez, 2014).

Así, si tomamos como referencia una región teórica, que obtiene los peores valores para las variables de estacionalidad estudiadas, el indicador DP_2 nos ofrece las distancias desde cada región a esa región ficticia de referencia (Rodríguez, 2014; Ray, 2014). Las condiciones de peso relativo de cada variable son determinadas por un algoritmo, que alcanza convergencia y se estabiliza para verificar la condición de conformidad, con un método no aleatorio, es decir, neutro para la clasificación de variables (Pena, 2009). Dado que el DP_2 es un valor numérico, se cumple esta propiedad (Zarzosa y Somarriba, 2013).

Las variables son ajustadas en orden de entrada descendiente, de acuerdo con su correlación con el primer indicador, mientras que, simultáneamente, se elimina la información irrelevante (Somarriba y Pena, 2008). Las diferencias en la i-esima variable entre una región y la de referencia son, por lo tanto, ponderadas por el porcentaje de nueva información, que esa variable provee (Somarriba y Zarzosa, 2013).

2.3. Objetivos de la Tesis.

Los objetivos de esta Tesis subyacen en la exposición que se ha adelantado anteriormente, y pueden describirse de forma sintética en los siguientes puntos:

- Estudio de problemas concretos con referencia al desarrollo económico y social, tanto a nivel regional como nacional. Los cuatro artículos planteados hacen referencia a esta voluntad, y a partir de ellos, se espera el diseño de líneas de investigación futuras, que complementen y den coherencia, a largo plazo, a los estudios presentados.

- Realizar una propuesta de indicadores para el estudio de ciertos problemas económicos y sociales. Ante un grupo de problemas detectados, u objetos de estudio, se pretende realizar una propuesta justificada de indicadores de medida. Se espera que esta propuesta de indicadores sea asumida y continuada por la comunidad científica en el estudio de los problemas aquí trabajados.

- Continuar la reflexión sobre la importancia del uso de indicadores multidimensionales en el análisis económico y social, capaces de capturar de una forma más completa un fenómeno complejo, en comparación del resultado esperado del análisis con indicadores simples.

3. Discusión conjunta de las conclusiones de los trabajos.

La discusión sobre las conclusiones derivadas de los trabajos aportados, y que, por lo tanto, son las propias de esta Tesis, quedan divididas en dos grupos. De una lado, las imputables a cada uno de los análisis realizados. Y de otro, las referidas al trabajo con indicadores socioeconómicos. Se comenzará con un breve resumen de las conclusiones asociadas a este último aspecto.

Diversos retos económicos y sociales requieren un análisis que va más allá del seguimiento basado en un único indicador, pues, en ellos, intervienen numerosas variables, cuyo seguimiento conjunto necesita de procedimientos más avanzados. En esta Tesis, se han aplicado indicadores individuales para analizar la evolución de la estacionalidad turística, habiéndose obtenido conclusiones relevantes e interesantes. No obstante, como se ha expuesto en trabajos incluidos en esta Tesis, ciertas conclusiones pueden estar condicionadas por la variable seleccionada, en aquellos casos en los que es posible optar entre varias. Por ello, resulta más recomendable trabajar con un indicador sintético, que recoja toda la información posible de las variables representativas de un fenómeno u objeto de estudio.

La propuesta que se desarrolla en esta Tesis se ha basado en el método de la distancia P_2, cuya aplicación a la investigación en ciencias sociales se ha mostrado de gran utilidad. Este indicador, que aporta una serie de propiedades descritas anteriormente, mejora otras opciones, al asignar pesos a las variables de forma no arbitraria o eliminar la información redundante, entre otras ventajas. Con los trabajos presentados, se pretenden incrementar las evidencias sobre las bondades de esta metodología, especialmente en áreas tales como: la medición de la estacionalidad turística y el seguimiento de los objetivos de desarrollo sostenible y cohesión territorial.

Sin ánimo de repetir las conclusiones, que quedarán expuestas en los propios trabajos que conforman esta tesis, a continuación se detallan brevemente algunas de los principales resultados obtenidos a través de los análisis aplicados.

Estacionalidad turística y evolución del ciclo económico:

- La estacionalidad durante el período de menor dinamismo de la demanda turística aumentó, respecto a la de 2007, en destinos urbanos del interior, como Madrid, y en destinos costeros urbanos, como Barcelona.
- Estos datos registran una proporción mucho mayor que los enclaves rurales como Costa Verde, por ejemplo, o las zonas costeras no urbanas, como Ibiza-Formentera.
- Lo contrario ocurre en períodos de expansión económica. La proporción de destinos que mejoran su posición relativa en el ranking de estacionalidad es mucho mayor en los destinos urbanos, que en los destinos costeros no urbanos y rurales.
- Las implicaciones de este estudio pueden ser consideradas por organizaciones e instituciones públicas dedicadas al turismo en España, dentro de un marco general de fortalecimiento de la calidad, la innovación y la gestión sostenible en el sector.
- Hemos verificado que los destinos urbanos sufren el mayor aumento de la estacionalidad en los períodos de recesión, con un impacto importante en los resultados de su actividad. En situaciones de menor demanda, las políticas públicas que apoyan la modernización y promueven el turismo deberían concentrar sus esfuerzos en difundir y fomentar viajes fuera de temporada alta a destinos urbanos en España.
- Dado que estos destinos se recuperan más activamente, por analogía, las acciones públicas después de la crisis (en períodos de expansión), podrían reducir sus canales de promoción en enclaves urbanos y centrar las acciones en el resto de destinos.
- Finalmente, es importante señalar que el éxito en contener el incremento de la estacionalidad depende, en gran medida, de los flujos de turistas extranjeros. Los destinos que más se resienten en períodos de crisis (destinos urbanos) deberían ser objeto de campañas internacionales periódicas para promover el mercado turístico español.

Estacionalidad turística y nuevos modelos de intermediación de alojamientos:

- Los datos anuales sobre los flujos de visitantes concluyen que las llegadas de turistas asociadas con establecimientos regulados y alojamientos en propiedad, están perdiendo terreno, respecto a los establecimientos turísticos alquilados en línea.
- La demanda vinculada a este tipo de alojamiento se concentra más durante la temporada alta en comparación con otros establecimientos del sector, lo que aumenta la estacionalidad del turismo y la presión ejercida sobre los destinos.
- De hecho, la subida en el número de usuarios de este sistema anula las mejoras realizadas por otras modalidades, en términos de estacionalidad.
- El sector público podría limitar los lugares ofrecidos en alojamiento para alquilar durante la temporada alta, con el objeto de reducir la presión sobre los destinos y promoverlos durante la temporada del valle.
- Las caídas en la actividad durante la temporada del valle generan problemas igualmente graves, ya que obligan a la población local a buscar fuentes de ingresos alternativas a las asociadas con el turismo.
- La falta de planificación puede resultar en un incremento en el número de visitantes que se alojan en este tipo de alojamiento, así como en un aumento de la concentración de turistas y una mayor presión sobre el medio ambiente.
- Esta línea de investigación debe completarse con estudios que analicen el impacto de varias regulaciones legislativas en la planificación de alquileres turísticos.
- También es necesario conocer la forma en que la concentración de visitantes afecta al bienestar de las comunidades locales, ya que un aumento en el número de llegadas de turistas a zonas tradicionalmente residenciales puede generar muchas interferencias, incluso más en destinos que sufren de un alta estacionalidad.

Índice de salud maternal e infantil:

- El método DP_2 muestra las disparidades territoriales en el ámbito de la salud materna e infantil en el Cuerno de África, en 2017.
- Obtuvimos una diferencia de 4,56 unidades entre Djibouti y el valor de referencia. Djibouti logró un mayor nivel de salud infantil y materna, pero representa solo el 0,5% de la población total del Cuerno de África.
- En el extremo opuesto, Somalia registra valores extremadamente bajos en el conjunto de indicadores parciales. Se debe dar prioridad a las intervenciones para abordar las variables que tienen un mayor poder para explicar las diferencias en los valores relativos entre países, como la variable asociada al número de partos que son atendidos por personal de salud cualificados.
- Los diferentes valores de estas variables sugieren que el progreso en la salud materna es desigual en todo el Cuerno de África, mientras que existen menos diferencias territoriales en las variables asociadas con la salud infantil, tal y como se define en los ODS.
- En resumen, la prestación de servicios de salud necesita una gran mejora, especialmente en Somalia y Etiopía, y existe una necesidad urgente de aumentar el número de trabajadores de la salud en toda la región para reducir la mortalidad infantil y materna.
- En general, la clasificación DP_2 para estos países difiere de la establecida por el Índice de Desarrollo Humano (IDH) para países con baja desarrollo humano, en 2017.
- En este sentido, nuestro análisis tiene en cuenta una serie de variables de los ODS, algunas de las cuales no están incluidas en el IDH.

Desarrollo regional en la UE:

- Desde una perspectiva territorial, los resultados, en términos de desarrollo económico y social, muestran una distancia considerable entre las regiones mejor y peor posicionadas en la clasificación, con la Ciudad Autónoma de Ceuta en el último lugar.
- Paradójicamente, Ceuta fue designada una región de eliminación gradual en el período 2007–2013, en la Política Regional Comunitaria, de acuerdo a su PIB per cápita y, por lo tanto, no era elegible para su inclusión en el Objetivo de Convergencia 2014–2020.
- Del mismo modo, el Egeo Meridional (Grecia) ocupa un lugar bajo en la clasificación, pero está incluido en el grupo de las regiones más desarrolladas. Aunque las regiones griegas de Macedonia Occidental y Grecia central obtuvieron valores bajos para las variables analizadas, se han definido como regiones en transición en el período actual de programación comunitaria.
- Del mismo modo, dos regiones de Portugal (centro y norte) ocupan posiciones relativamente altas (superiores a la media) en la clasificación obtenida, aunque están cubiertas por el objetivo de convergencia de la Política Regional en el intervalo temporal 2014-2020.
- Las regiones más avanzadas se encuentran en el noreste de España y en las regiones de las capitales nacionales de los países, como la Comunidad de Madrid (tercera), el sur y el este de Irlanda (cuarta) y el área metropolitana de Lisboa (duodécima). En Grecia, en contraste, la región de Attica (Atenas) está en el medio de la clasificación (vigésimo primero).
- Los valores del indicador DP_2 revelan algunas disparidades generales entre las regiones analizadas en el desarrollo económico y social. Estas disparidades podrían tenerse en cuenta en la programación de la futura política regional, aumentando los esfuerzos en áreas con valores más bajos en las variables analizadas.
- Los resultados muestran que el desempleo está altamente polarizado en determinadas regiones de la Unión Europea, si bien este indicador no se utiliza como criterio en la selección de las regiones prioritarias de la solidaridad comunitaria y, por ende, para recibir financiación de los Fondos Estructurales.

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5. Anexo de trabajos publicados.

TRABAJO 1:

Artículo: Effects of Vacation Rental Websites on the Concentration of Tourists-Potential Environmental Impacts. An Application to the Balearic Islands in Spain.

Revista: International Journal of Environmental Research and Public Health (2018).

Vol 15, nº 2, pp. 347-359.

doi: 10.3390/ijerph15020347.

Factor de Impacto en el año de publicación, fuente de impacto: WOS (JCR): 2.468.

La revista International Journal of Environmental Research and Public Health ocupa el puesto 67/186 (Q2), en el Área de PUBLIC, ENVIRONMENTAL & OCCUPATIONAL HEALTH (Journal Citation Reports).

El artículo ha recibido, hasta la fecha del depósito de la Tesis, según Google Académico: 18 citas.

Effects of Vacation Rental Websites on the Concentration of Tourists—Potential Environmental Impacts. An Application to the Balearic Islands in Spain.

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Abstract

The concentration of tourists at certain times of the year can damage sensitive environments. The use of peer-to-peer vacation rental websites has increased greatly during the last decade. This system could either reduce seasonality in touristic destinations where the tourist activity takes place throughout the year at a lower price or on the contrary, it could increase the number of visitors at certain times of the year even more. This paper intends to analyze the effect that these platforms have on tourism seasonality in order to calculate if they help reduce or increase the pressure on the destinations. To do so, the Gini Index has been applied to one of the main touristic spots in Europe, the Balearic Islands in Spain. The conclusion is that this type of accommodation has aggravated the problem, generating a greater concentration of tourists and a higher pressure on the resources of the islands.

Keywords: Spain; environmental impacts; collaborative economy; peer-to-peer vacation rental websites; seasonality of tourism.

Effects of Vacation Rental Websites on the Concentration of Tourists—Potential Environmental Impacts. An Application to the Balearic Islands in Spain.

1. Introduction

Tourism is one of the main driving forces behind economic growth in several countries and world regions [1,2]. Whereas the world-leading economic powers obtain huge benefits from tourism, developing countries rely on tourism to consolidate their economic growth. As presented in the United Nations Environment Program [3], tourism, as with any other economic activity, generates both positive and negative impacts on the environment, society and economy at local, national, and global scales. There are also pros and cons relative to the environmental effects since tourism contributes to preserving environments in numerous regions. However, international organizations and academic papers have both suggested the negative impacts generated by tourism [4,5,6,7,8].

Tourism seasonality does not exist exclusively in the tourism sector, even though it is the sector where it has a stronger presence. Focusing on this sector and acknowledging that there is not a widely accepted definition, we take Butler's definition as a reference [9] "a temporal imbalance in the phenomenon of tourism, which may be expressed in terms of dimensions of such elements as numbers of visitors, expenditure of visitors, traffic on highways and other forms of transportation, employment, and admissions to attractions". Several studies have analyzed the cause of tourism seasonality, for instance, Hylleberg suggested the following set of factors: weather (e.g., temperature, hours of sunshine), calendar effects (e.g., timing of religious festivals such as Christmas, Easter, Eid or Vesak) and timing decisions (e.g., school vacations, industry vacations, tax years, accounting periods, dates for dividend and bonus payments, etc.) [10]. As discussed below, the uneven pattern of the economic activity throughout the year has many effects on tourist destinations. The environmental impacts derived from a high concentration of visitors in short periods of time are among these effects.

The collaborative economy concept, as far as tourism sector is concerned, usually refers to several activities, such as house swapping, house renting, ridesharing, voluntourism, couchsurfing, dinner hosting and similar innovations that epitomize the collaborative economy [11]. This phenomenon, also known as collaborative consumption, the sharing economy and peer-to-peer consumption, emerges as a consequence of changes recently experimented by society, economy and technology. Such changes include the possibility of accessing temporarily to certain assets, the development of transactions between producers and customers mediated online, the setting of relationships between host and local population, and new forms of interaction between consumers that allow them to share information in order to limit the possible risks [11]. In the tourism sphere, collaborative economy companies adopt both for-profit and not-for-profit structures. This has disrupted the industrial systems related to tourism around the world [12]. Supporters and opponents of the collaborative economy within tourism scope are both very numerous. The supporters defend the value that collaborative economies has since it makes it possible to exploit social and economic resources not exploited before from a sustainable and decentralized point of view [13]. On the contrary, opponents warn about the illusion of participation, crowd power and customer sovereignty [14]. This new type of tourism planning poses a challenge for both planners and policymakers in areas with a big rise in the number of tourist arrivals linked with this trend. Problems such as neighborhood nuisances, traffic, and scarcity of parking spots may be associated with this trend [15].

The growth of peer-to-peer vacation rental platforms such as Airbnb, Homelidays, and Wimdu has altered the tourism context. The studies into collaborative economy tourism accommodation platforms, which are more and more frequent in the past few years, cover issues such as marketing, profitability, public image of the destination, etc. However, there is very little bibliography on the impacts derived from tourism. Some studies highlight the impacts that are predictable, as Dredge et al. points out: “Local residents may be directly or indirectly impacted by the collaborative economy tourism accommodation sector.” As Dredge et al. [11] point out, “there are residents in neighboring houses and apartments that must deal with local impacts (e.g., noise and nuisance caused by tourist behavior, loss of community cohesion, impacts of community facilities, impacts on rental and property prices, etc.)”. In the same study, focused on Barcelona, Paris and Berlin, it is argued that the increase of the amount of

accommodation for tourists may have directly caused a rise in property prices of centrally located districts. Moreover, the rise of the collaborative economy has also coincided with housing shortages and affordability issues. Other disturbances have also been detected, such as the intensification of tourist concentration in certain spots, noise and nuisance caused by tourist behavior, loss of community cohesion, impacts of community facilities and impacts on rental and property prices, etc. Sellares et al. [16] highlights the effect this type of tourism accommodation has on the local people with regard to the increase of rental prices and a loss of quality of life. The effects that this new tourism structure has on the seasonal concentration of tourists and the consequences in destinations where seasonality is already severe have not been paid any attention yet.

This paper provides an analysis that has not been carried out up until now. It offers data on the number of tourists that take part in a collaborative economy tourism accommodation platform in environmentally sensitive destinations. Therefore, this research aims to determine whether the annual number of visitors staying in this type of accommodation improves seasonality or aggravates it. The former is backed by an increase in the amount of accommodation offered outside of the peak season and its lower price, enabling tourists to travel more times throughout the year apart from their main trip. Nevertheless, the demand linked to this type of accommodation offer could exacerbate the patterns of concentration of visitors as a consequence of the unplanned increase in the number of bed places, thus aggravating a problem that already exists. Choosing the Balearic Islands as the case study is justified for many reasons. It is one of the main touristic spots in Europe and the Spanish region with the highest seasonality level [17]. Moreover, the tourists that arrive at the islands are very sensitive when it comes to the prices and travel expenses [18], thus the effect that a more affordable accommodation offer has on the prolongation or shortening of the tourist season must be determined.

This paper begins with an exposition of the environmental risks derived from tourism seasonality and the rise in the number of tourists. Secondly, we analyze meticulously the area relative to the case study, and shows the ecological consequences that are generated by the current tourism model of the Balearic Islands. The first section is developed through an exhaustive review of the literature on tourism seasonality, tourism impacts and sustainability. In the second part, we also work keeping in mind the bibliography on tourism sustainability, especially focused on the papers applied to the Balearic Islands. In the following section, we show and justify the methodology we have chosen to complete the analysis proposed below, as well as the sources of information that give meaning to this study. Later, the main results are presented. The results show in a direct way the effect that tourism demand associated with touristic rental properties rented online has on seasonality. The last two sections, which concern conclusions and discussion, analyze the risks derived from these trends according to the results obtained. Finally, we propose future possible lines of research.

2. Risks Derived from Tourism Seasonality and Increase in the Number of Arrivals

In Spain, a country with a clear tourism profile, the rise of the seasonality level has gone hand in hand with the growth of mass tourism, linked to the so-called “sun and beach” tourism. This has caused the destinations with a larger number of visitors to become more seasonal [17], and shows a clear risk for the natural environment where tourism is developed. There are several impacts derived from seasonality. These impacts will be different depending upon the configuration of the destination due to the fact that the causes and intensity of seasonality are also linked to certain characteristics of the destination [19]. The negative tourism effects are sorted into four different categories: ecological, economic, sociocultural and labor [20]. Seasonality generates negative effects related to economic and labor impacts during the valley seasons, where arrivals are drastically reduced. While the environmental and sociocultural impacts are related to the excessive number of visitors at certain times of the year, environmental impacts concern the massive number of visitors during the peak season. Among these effects are included the congestion of rural lanes, disturbance of wildlife, physical erosion of footpaths and litter problems [21]. Tourism can generate a high pressure on the carrying capacity of some destinations due to the exhausting use of its resources

during peak seasons [22]. Butler [9] concludes that one of the main problems of seasonality is the impact derived from the pressure put on the environment due to the overcrowding and overexploitation of the natural spaces. The ideal scenery would have a homogeneously distributed activity level throughout the year so that the pressure on the resources is reduced. In destinations with a higher concentration of visitors, a resting period understood as a time for the recovery of the natural resources and a return to normality is justified [22,23,24]. This implies, therefore, that the seasonal economic and labor impacts would be increased since they are bound to a period with little activity or none at all. On top of that, little would be done to restrain the negative effect that a peak season has on the natural resources and the environment.

Tourism also produces another set of interferences on the environments where it is developed. These interferences are derived from the number of arrivals, a factor that can also intensify the effects linked to seasonality. Plenty of developed countries have followed for years the same tourism model, which consists of attracting the largest number of visitors possible during the longest period possible [25]. It is because of this that sustainable tourism models have shifted from understanding tourism not only as an economic effect to understanding it as an environmental and social effect as well [26].

This paper intends to analyze seasonality within a context of growth where the demand linked to the increase in peer-to-peer touristic rentals takes place in a collaborative marketplace. The aforementioned factors—the increase in the number of visitors and the development and use of collaborative economy platforms—are co-related. This is because the development of the collaborative economy takes place in a context in which European cities experience the impacts of years and years of pro-growth strategies, encouraged by the consolidation of low-cost mass tourism [15]. In a moment where low-cost airlines and affordable accommodations boost the tourist demand, we should pay more attention to the actual pressure put on environmental resources, which is intensified at certain times of the year. The high concentration of visitors could surpass the time of recovery of resources and wastes allocation. As pointed out by Cazarro [27], regarding the excessive use of water, “the largest kind of tourism in Spain is that of ‘sun and beach’, concentrated in arid and water-stressed regions, some of which have already needed water transfers to prevent salinization”.

3. Ecological Challenges Derived from the Pressure of Tourism in the Balearic Islands.

The Balearic Islands, located on the east shore of Spain, are one of the main tourist destinations in Europe. Their geographical situation provides them with several advantages over others. It is possible to reach the islands in less than four hours from almost any European country. Tourism prevails over the other economic sectors and accounts for the 85% of the Gross Domestic Product (GDP), thus operating profound changes that have transformed an area with a rural economy into one of the richest in Spain [18]. The islands cover an area of 5040 square kilometers and they have 1428 km of coast. This archipelago is formed by three large islands: Mallorca, Menorca, and Ibiza; and two others of smaller size: Formentera and Cabrera (much less exploited than the former).

The tourism developed on the islands is quite controversial among the local people. Although it accounts for the largest part of the islands' income, it also causes many negative impacts. Regarding the management of the environmental impacts, the large number of visitors is both a success and a challenge. In 2016, the Balearic Islands hosted a total of 18.3 million tourists, 40% more than in 2008 [28]. The islands have one of the highest tourist-per-capita ratios of the world—16:1—taking the local population into consideration. Besides the problems caused by the growth in the number of arrivals, this destination must also manage the challenge of dealing with the highest seasonality level of Spain [17]. This archipelago has devoted its tourism offer to the so-called "sun and beach tourism", and unlike other areas with a more stable climate throughout the year, the Balearic Islands depends heavily on the summer. If we take data concerning 2016 into account, it can be observed how 50% of the arrivals (more than 9 million visitors) took place during the months of June, July and August [28]. Apart from the tourism floating population, we must add up the employees of the tourism sector who arrive every summer to the islands from different places of Spain to cover the job vacancies. The number of people working as employees of the tourism sector reaches an average of 176,727 during the summer, while in the off-season, the number falls to 73,198 employees [28]. The increase in the demand and a large number of visitors result in a complex situation when trying to manage potential ecological impacts.

From an ecological perspective, managing solid waste is one of the main challenges caused by the growth of tourism [29]. Several studies have pointed out the large increase of solid waste generation as a consequence of the seasonal population in tourist areas [30,31,32,33]. Therefore, in these areas, it is especially important to collect, transport, process and finally dispose of solid waste in an environmentally sound and cost-efficient way [31]. Mateu et al. [34] argue that, according to estimations, if the tourist population grows by 1%, the solid waste generation increases by 0.282%. Moreover, this does not just happen during the stay of the tourists on the islands, but for a long time after they have left. Equally, it is estimated that each tourist produces 1.31 kg of solid waste per day, which comes close to the 1.48 kg produced by each local.

Tourism also puts a high pressure on water resources in ecosystems with already limited resources such as the Balearic Islands. Overcrowding may have severe consequences in environmentally sensitive areas, especially coastal zones and islands [35,36]. Tourism tends to have distinct seasonal variations and to be concentrated in regions that are often associated with the limited availability of water resources [37]. The success of tourism experiments in the Balearic Islands results in the overcrowding of beaches during the warm season. This causes a peak in the consumption of water resources that overlaps with the dry season. This situation implies an over-extraction and lowering of the groundwater [38]. The consequence of this over exploitation is the incapability to reach the necessary resupply rate of aquifers. Inland aquifers have lost 55 m of their total in 15 years because of the extraction, which surpasses the annual recovery rate. In an average year, the total available fresh water in Mallorca is 250,106 cubic meters. In 1990, the annual demand for water already exceeded that volume. Desalination plants were built to make up for this deficit, which has increased the volume of water available, but in exchange it has also caused a rise in its price, as well as increasing the energetic cost and pollution levels [39].

In the academic literature, there are many additional references concerning the different economic instruments proposed to internalize the costs and the environmental implications of tourism in the Balearic Islands [40,41]. Some studies have analyzed the characteristics of tourism demand, visit trends and seasonal patterns [42,43], but the effect of the peer-to-peer accommodation rental websites has not been studied yet. The results of this study will enhance the global understanding of this new system of intermediation in addition to providing conclusions focused on this region.

4. Methodology

The basic aim of this research is to determine whether the tourism demand linked to collaborative economy tourism accommodation websites increases or reduces tourism seasonality. To reach this goal, two elements are required: an appropriate measurement system of the concentration of visitors and monthly disaggregated data from each type of accommodation.

Papers of the academic literature address the issue of seasonality from different perspectives. Some of them are focused on breaking down the seasonal factors that constitute the time series, i.e., [1,44,45,46,47,48]. Other papers prefer to develop predictions or modeling [49,50,51,52,53,54,55,56,57,58]. Quantifying the levels of concentration of visitors through indexes represents one of the main lines of work regarding seasonality [43,59,60,61]. Nevertheless, there is not a widely accepted method to measure seasonality's intensity [20]. The most widespread procedures to quantify this measurement are focused on the application of indexes, such as the Gini Index (GI), the Theil Index and the Coefficient of Variation since they are able to offer a unique measurement of the concentration in one year.

The GI is the most commonly used in this type of analysis [59]. This index fulfills the Pigon-Dalton condition, whose interpretation applied to tourism seasonality implies that the transfer of the supply or demand from a month with a higher number of arrivals to another with a lower number diminishes the coefficients, or so to say, seasonality [62]. Wanhill [61] recommends the application of this methodology over other alternatives, since it takes the biases of distribution into consideration and is less influenced by extreme values. Lundtorp [60] shows that the GI is the most stable seasonality measurement system. Moreover, choosing this system to measure the

concentration of visitors in this paper is justified because in the last 30 years of academic literature, the GI has been the tool mostly used to reach this end [60,61,63,64,65]. The GI, usually applied to the number of arrivals, measures the degree of imbalance of tourism throughout the year [66]. The GI is built using the Lorenz Curve, which shows the cumulative frequency range of observations, starting off at the lowest number [60]. The Gini coefficient equals the area between the Lorenz Curve and the 45 degrees line that divides the area below the line and is expressed as follows:

$$IG = 1 + \left(\frac{1}{n}\right) - \left(\frac{2}{(n^2.\grave{}x)}\right).(x_1 + 2x_2 + 3x_3 + \cdots .nx_n)$$

In this formula, *n* is the number of months (the study is performed using monthly data), *x1, x2, x3, …, xn* represents the individual observations in descending magnitude order and *`x* is the average number of observations [67]. The maximum value of the index is 1 and it implies that the total of visitors of the year concentrates in one month, whereas the minimum value, 0, implies an equal distribution of the arrivals every month.

Once the measurement method has been defined, the second necessary element to reach the goal is locating monthly disaggregated data. We rely on data provided by the Regional Government of the Balearic Islands via tourist data yearbooks [28]. This institution provides monthly data that allows us to differentiate the many types of accommodations where tourists stay. The Regional Government releases these statistics using several sources of information. One of these methods consists of face-to-face surveys, where they ask tourists in which type of accommodation they decided to stay. Following this procedure, which takes a representative sample into consideration, we extrapolate the information relative to the tourist arrivals to the islands so that we can obtain data for each type of accommodation. Since collaborative economy online accommodation platforms are quite new, these statistics were released in 2016 for the first time. Surveys carried out in a direct way guarantee that the data obtained comprehend the entirety of the collaborative economy tourism accommodation platforms. All data used for this study have their origin in official statistics released by the Regional Government of the Balearic Islands. We have added the data necessary to build the categories with which we work and shown below.

We work with three different points in time: 2016 because it was the last year with complete and definitive data, 2008 as the year the main website, Airbnb, started its activity; and 2012 as a halfway checkpoint. The regulated tourism accommodation offer (hotels, aparthotels, pensions and camping sites) will be compared with the non-regulated offer (tourists accommodated in private properties, friends or family's properties and rental properties). In 2016, aside from the non-regulated offer, it is also possible to count with disaggregated data regarding the properties rented for touristic purposes using online platforms. Using these data, we make a comparison between the three different categories, firstly in absolute values and afterwards according to their respective GI. We propose the respective analyses of the GI referring to the number of tourists staying in regulated accommodation and its evolution, the analysis of the GI concerning the number of tourists staying in non-regulated accommodation and its evolution; the analysis of the GI regarding the number of tourists staying in touristic accommodation rented using online rental platforms and their comparison with the global GI. Thanks to these analyses, we can draw conclusions as to the effect this new type of organization of the tourism offer has on the concentration of tourist demand and the deseasonalization of destinations. Both factors determine the pressure that tourism has on the environment.

5. Results

The first thing that stands out in how tourism has evolved in the Balearic Islands is the huge increase in the number of tourists who visit the destination every year (Table 1). In 2016, the arrivals exceeded 18.3 million, 40% more than in 2008. This figure alone represents a challenge due to the ecological impact derived from the extra population that the islands must host. According to the type of accommodation chosen by each tourist, we can draw additional conclusions from the evolution of the arrivals. In 2008, the tourists staying in regulated establishments (hotels, aparthotels, pensions and camping sites) made up 73% of the total, a percentage that had decreased to 66.9% in 2016 (Table 2). In absolute terms, the number of people that stay in this type of establishment has risen to a total of 28.43%. The number of tourists accommodated in non-regulated accommodation (private properties, friends/family's properties and rental properties intermediated online or offline), went from a 27.0% of the total in 2008 to a 33.1% in 2016. Moreover, the number of tourists using this type of accommodation has

grown, in absolute terms, by 71.8% percent in the last few years, which has consolidated a trend with important repercussions for the tourism context of the Balearic Islands and the local residents. Since there are not disaggregated data for 2008 and 2012 as per type of intermediation, these data include both tourists using websites to rent properties and those using traditional methods.

Table 1. Evolution of the number of tourist arrivals to the Balearic Islands as per type of accommodation. Years 2008, 2012 and 2016.

Year	Total Number of Tourists	Tourists Accommodated in Regulated Establishments	Tourists Accommodated in Non-Regulated Establishments
2008	13,103,901	9,565,848	3,538,054
2012	15,346,663	10,589,197	4,757,465
2016	18,363,889	12,285,442	6,078,447

Source: Agency for Tourism of the Balearic Islands. Own elaboration.

Table 2. Percentage distribution of tourist arrivals to the Balearic Islands as per type of accommodation. Years 2008, 2012 and 2016.

Year	Tourists Accommodated in Regulated Establishments	Tourists Accommodated in Non-Regulated Establishments
2008	73.0%	27.0%
2012	69.0%	31.0%
2016	66.9%	33.1%

Source: Agency for Tourism of the Balearic Islands. Own elaboration.

Once the number of tourists staying in touristic rental properties and its evolution are determined, their effect on the Balearic Islands' seasonality is analyzed. The data expressed in absolute values in Table 3 show the concentration of visitors during the peak months: June, July and August. In 2016, 47.5% of the tourists accommodated in regulated establishments visited the islands in those months (hotels, aparthotels, pensions and camping sites). The number goes up to 52.9% if we take the non-regulated establishments into consideration (private properties, friends/family's properties and rental properties intermediated online or offline). The percentage of tourists accommodated in properties rented via collaborative economy tourism accommodation platforms during the months of June, July and August is 56.6%.

Therefore, these waves of tourists contribute to increasing seasonality, especially within the type of tourism that has experimented a bigger increase in absolute values, which is why the problem of overcrowding is becoming more intense.

Table 3. Monthly distribution of tourist arrivals to the Balearic Islands sorted by accommodation chosen. Years 2008, 2012 and 2016.

Year	January	February	March	April	May	June	July	August	September	October	November	December
Tourists accommodated in regulated establishments												
2016	246,917	130,729	516,686	1,039,526	1,927,474	1,713,061	2,014,975	2,117,470	1,538,135	821,721	139,193	79,555
2012	61,117	158,757	339,243	536,913	1,143,608	1,691,798	2,062,804	2,009,826	1,637,077	792,183	102,033	53,839
2008	95,099	163,881	314,237	638,952	1,175,997	1,434,831	1,814,803	1,676,477	1,272,543	738,664	160,552	79,811
Tourists accommodated in non-regulated establishments												
2016	181,054	124,155	155,081	390,133	619,641	1,046,782	1,046,782	1,126,503	652,502	483,625	132,03	120,157
2012	156,069	96,528	162,094	269,709	291,289	530,093	908,425	1,089,635	684,131	372,877	105,573	91,041
2008	132,931	94,415	132,188	274,385	327,95	342,409	528,198	738,933	481,178	293,412	103,551	88,503
Tourists accommodated in regulated and non-regulated establishments												
2016	427,971	254,885	671,767	1,429,660	2,547,115	2,759,842	3,061,756	3,243,973	2,190,637	1,305,347	271,223	199,712
Tourists accommodated in online rented properties												
2016	22,177	20,086	36,23	135,837	229,52	338,325	523,666	526,67	378,942	211,215	21,298	16,796

Source: Agency for Tourism of the Balearic Islands. Own elaboration.

The analysis provided by the GI describes how the growing number of tourists staying in properties rented through websites affects seasonality (Table 4), according to the pattern of their arrivals throughout the year. Given that the monthly data concerning the number of tourists staying in rental properties using online websites belong only to 2016, it is not possible to analyze the evolution of this kind of visitor. Looking at last year, the degree of concentration of tourists is higher in properties rented online than in any other type of accommodation. For that matter, if we compare 2008 and 2016, we can observe how the GI calculated for the number of tourists staying in regulated establishments has decreased from a value of 0.48 to 0.46. In the case of non-regulated establishments, after a slight increase of the concentration in 2012, the GI went down from a value of 0.475 to 0.444 in 2016. The latter figure shows a lower level of seasonality compared with the level that refers to the tourists who were accommodated in regulated establishments. As far as the data of regulated establishments are concerned, seasonality seems to be restrained in the Balearic Islands. The evolution of the annual distribution of tourists staying in non-regulated accommodation as a whole

contributes to reducing seasonality as well. Therefore, the factor increasing seasonality in the Balearic Islands is the annual distribution of the total number of tourists staying in touristic properties rented using a website. The growing weight of this type of accommodation has contributed, generally, to counteracting the reduction of the levels of seasonality attributed to the other forms of accommodation. The GI of the touristic rental properties (rented via online) comes to 0.55, whereas the GI related to the rest of accommodations is 0.453, which would rise to 0.482 considering the total number of tourists. Thus, the demand associated with accommodation rented through a website contributes to increasing seasonality in the Balearic Islands, belittling achievements previously accomplished. Moreover, the fact that it is the modality that has grown the most, the expected outcome is even worse. The GI related to the seasonality of the offer of regulated accommodation in Spain is given as a reference. In 2016 it was 0.18, which shows the important problem that is taking place in the Balearic Islands.

Table 4. Gini Index of the monthly tourist arrivals to the Balearic Islands. Calculated by type of accommodation. Years 2008, 2012 and 2016.

Type of Accommodation	2016	2012	2008
Tourists accommodated in regulated establishments	0.463	0.522	0.480
Tourists accommodated in non-regulated establishments	0.444	0.475	0.395
Tourists accommodated in regulated and non-regulated establishments	0.453		
Tourists accommodated in online rented properties	0.550		

Source: Agency for Tourism of the Balearic Islands. Own elaboration.

6. Discussion

The results obtained point out the urgent need to incorporate the supply variable relative to non-regulated touristic properties to processes of destination planning. It has been confirmed that the flow of tourists staying in holiday properties mediated online contribute to increasing seasonality, which is the basis of this study. Combining an increase in the level of seasonality with a large increase in the number of arrivals will undeniably intensify the pressure put on natural resources. This pressure in environmentally sensitive destinations, with water scarcity or a limited waste management results in a huge challenge for public planning. This is particularly the case

of the Balearic Islands, a region that suffers from high tourism seasonality, which is now being worsened as consequence of these new types of tourism intermediation. Previous studies show the positive benefits that tourism has on this region. We broaden the conclusions of said studies with our current analysis since it warns about the danger that these tendencies constitute for the environment.

The analysis of data and its recent evolution shows us how the concentration of tourists accommodated in regulated establishments began to reduce. This is possibly due to the development of policies of diversification within the hotel industry. These improvements are being overridden because of the effect of tourist flows associated with the offer of accommodations rented online. These properties are left out of professional proceedings that manage the offer of accommodations. Thus, they do not reach the same success in the deseasonalization of the destination. Instead, the effect is completely the opposite, just as shown in this study.

7. Conclusions

It can be objectively asserted that the modality comprised of touristic rental accommodation is now more present than before compared to other types of travel planning. The expansion of collaborative economy tourism accommodation platforms has also contributed to it. This change raises an issue in the legislative planning of several locations, which have not been modernized yet, thus excluding the real number of accommodation places from a coherent process of planning according to the carrying capacity of the destination. The growth in tourism has been facilitated by public and private policies that prioritized the increase of arrivals over other parameters, which does nothing but worsen the planning problem. The third element conditioning the impact of tourism is the concentration of visitors at certain times of the year because it increases the pressure on natural resources [68]. A high level of seasonality conditions the support of the local residents towards tourism given that the local community shapes their attitude towards tourism after having evaluated its potential benefits and negative impacts, which are intensified due to seasonality [69]. As argued by Peric et al. [70], there is a gap in the knowledge and understanding of mechanisms on how to deliver social and economic community benefits. Sustainable tourism aims to channel tourism to the advantage of all stakeholder-destination places and communities, tourists and all the associated activities and services [71].

Environmentally sensitive spots such as the Balearic Islands face the challenge of managing growing flows of tourists concentrated in a short period of time. The challenge is magnified if we take into consideration that the increasing accommodation offer eludes public planning in terms of quality conditions and number of vacancies. The pressure put on the resources is intensified due to the impact of the increasing tourist arrivals and their concentration. When it comes to the Balearic Islands, it affects directly the water consumption and the aquifers' capacity to recover, the increase of environmental pollution, waste production, etc. All of this pushes to its limits a sensitive environment that relies heavily on nature to uphold tourism.

The annual data on the flows of visitors conclude that the tourist arrivals associated with regulated establishments and owned properties are losing ground with respect to touristic establishments rented online. The demand linked to this type of accommodation becomes more concentrated during the peak season compared with other types of accommodation, which increases tourism seasonality and the pressure put on the destinations. In fact, the increase in the number of users of this system overrides the improvements made by other modalities in terms of seasonality. This being so, the public sector should limit the places offered in accommodation up for rent during the peak season to reduce pressure on the destinations while promoting them during the valley season. The plunges in activity during the valley season generate equally severe problems since they force the local population to seek alternative sources of income to those associated with tourism [72]. It is clear that the lack of planning can result in an increase in the number of visitors staying in this kind of accommodation as well as in an increase of the concentration of tourists and a higher pressure on the environment.

The limitations of this research are related to the novelty of the object of study given that intermediating touristic properties via online platforms is a recent phenomenon. Therefore, official statistics are undergoing a process of adaptation in order to include data referred to this housing system. This limits the possibility to perform evolutionary studies. The paper is also limited by the low number of regions that offer this kind of statistics, which reduce the number of comparisons possible. Other types of accommodation, such as house exchange, are left out of these statistics because they do not consider this modality on its own. Finally, we must point out how

useful it would be to count with local statistical data that allow for the understanding of the problem depending on the type of geographical area (coastal, urban or rural).

This study brings to light the necessity of the public sector to take part in planning the offer of properties intermediated via online platforms. Thus, guaranteeing a number of places suitable for the carrying capacity of the different destinations. This planning should be developed hand in hand with the hotel industry. The rapid growth of this type of accommodation has resulted in the necessity of updating the legislation as well as including these accommodations in the processes of tourism planning in order to restrain their growth. This study suggests that the planning must have two different approaches, from the point of view of space (to avoid geographic concentration clusters) and time (adjusting supply throughout the year). Many segments of the local population might also benefit economically from this type of accommodation, which puts to use social and economic resources that are underused. Moreover, it can generate new forms of social interaction that enrich both the tourists and the local population. Therefore, to achieve this goal of preserving potential benefits while assuming the necessity of limiting negative impacts, a bigger effort is required in public planning. Due to the novelty of these systems of intermediation, this effort has not been made yet.

This line of research should be completed with studies analyzing the impact of several legislative regulations on the planning of touristic rentals. It is also necessary to know the way in which the concentration of visitors affects the quality of life of local communities, since an increase in the number of tourist arrivals at traditionally residential zones can generate many interferences, even more in destinations that suffer from a high seasonality. To restrain these interferences, a mean of participation should be established so that the local residents are able to participate in public planning processes. This would lead the way for new and interesting lines of research.

Acknowledgments: The authors would like to thank the financial support provided by the Government of Spain (ECO2013-44879-R) and the Regional Government of Andalucía (SEJ-393). Thanks also to the anonymous reviewers for their valuable feedback and to the editor.

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TRABAJO 2:

Artículo: A Spatial Analysis of the Achievements, in Terms of Regional Development, Accomplished by the Initial EU-Member Cohesion Fund Beneficiaries Using a Synthetic Indicator

Revista: Sustainability (2019).

Vol 11, nº 8, pp. 2343-2359.

doi: 10.3390/ijerph15020347.

Factor de Impacto en el año de publicación, fuente de impacto: WOS (JCR): 2.592

La revista Sustainability ocupa el puesto 105/251 (Q2), en el Área de ENVIRONMENTAL STUDIES (Journal Citation Reports).

El artículo ha recibido, hasta la fecha del depósito de la Tesis, según Google Académico: 3 citas.

A Spatial Analysis of the Achievements, in Terms of Regional Development, Accomplished by the Initial EU-Member Cohesion Fund Beneficiaries Using a Synthetic Indicator

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Abstract This study proposes construction of a synthetic indicator to measure progress toward the objective of economic and social cohesion among the regions of Spain, Greece, Ireland and Portugal within the framework of European Community Regional Policy. Our aim is to integrate in a single indicator a large number of variables defined by the European Commission to monitor improvements in regional development, classified according to the objectives of the Europe 2020 Strategy to promote smart, sustainable and inclusive growth. To achieve this goal, we use the Pena distance method for the year 2013.
JEL classification: R11; R58; O18; O52.

Keywords: Spatial disparities; economic and social cohesion; economic development; European Union; Lisbon strategy; regional policy; synthetic indicator

1. Introduction

Since its creation with the Treaty of Rome, the European model of economic integration has become a model to be fulfilled as new countries are incorporated [1]. Integration is not, however, a process designed from the outset to materialize immediately or according to a single plan, rather, it must be based on concrete achievements in stages that begin by creating de facto solidarity among European Union (EU) countries [2].

Although the first antecedents of Community Regional Policy on integration are articulated in the preamble of the Treaty of Rome, which recognized the need to reduce inequalities among European countries and regions [3] and began formally in 1975 after the accession of Ireland, this policy did not reach its present dimension until decade's later [4]. The policy has thus developed from its original goal of reducing regional economic disparities, measured essentially in terms of gross domestic product (GDP) per capita of the Community territories, into a broader concept of economic and social cohesion [5].

Since the 1990s, a series of rural development aid programs (Leader Approach) has been implemented in European rural areas in order to solve the demographic, social, and economic problems that rural areas experience [6]. This road has not been easy, and EU member states must again join forces to clarify the unresolved questions about the future of the EU, especially with regards to promotion of economic and social cohesion within its territory [7]. To this end, the European Regional Policy was proposed as a strategic investment aimed at all EU regions and cities to boost economic growth and improve EU inhabitants' quality of life [8]. More specifically, the main objective of this policy is both to promote the progress of less-developed areas [9] and to provide complementary support to social groups less favoured by the integration process [10].

More recently, the Regional Policy has contributed to developing research and development and innovation (R & D & I), an EU priority since the Lisbon Strategy for growth was launched in 2000 [11]. Although conceived within the framework of this community project as the "largest solidarity operation between countries in history", the measures proposed in the Strategy are conditioned by the limited resources of the Community budget [12].

From a historical point of view, the minimal resources of Community finances relative to the GDPs of all member states have not encouraged further deepening of European integration, as evidenced as early as the MacDougall Report for a Community of nine Member States [13]. Subsequently, the Sapir Report [14] states that, due to lack of resources, the Community's budget cannot be the determining factor for economic growth and employment creation in the EU in the future. Further, the EU is committed to extensive restructuring of its expenditure items, prioritizing issues such as solidarity among territories.

We develop our study within this conceptual framework. Its goal is to construct a synthetic indicator that complements the European Commission's classification of the regions to receive more or less funding, which is based solely on the criterion of GDP per capita. Related research in this context—covering different areas, variables and/or methodologies—includes recent studies [7,10,15,16,17,18,19]. The territorial scope of analysis in our research is innovative and pioneering in that it focuses on classifying the regions of Spain, Greece, Ireland and Portugal, the original Cohesion countries. The goal pursued by creating this synthetic indicator based on a wide group of variables is being able to offer a measurement of the degree of development achieved by European regions. Said goal is coherent with the vision of the European regional policy, which considers development as something more than just economic growth. The synthetic indicator here proposed must be built by taking into consideration variables relative to the pillars of Europe's development strategy. The distance method defined by Pena (DP2) system offers a methodology that is able to aggregate the information provided by a group of variables. This methodology overcomes a number of problems that are a common characteristic of other alternative synthetic indicators. Below, the defining characteristics of this indicator will be explained in detail. However, in order to make it clearer for the reader as of now, the DP2 solves problems such as the duplicity of information provided by the variables, the aggregation of information expressed in different units and the weighting of each variable objectively. The result is a single value that gathers a great deal of information. Moreover, said value is calculated objectively and is useful to measure more comprehensively the achievements in terms of regional development. The analysis also identifies the variables that have the greatest impact on the economic and social development of the regions within the framework of the Europe 2020 Strategy for Growth.

The Cohesion Fund is an EU redistributive instrument whose main goal is to promote territorial cohesion by financing projects in the Transport and Environmental territorial development components [20]. In the period 2014–2020, the Regional Policy will be conditioned by the Europe 2020 Strategy of intelligent, sustainable and integrating growth [11]. The new proposals aim to reinforce the strategic dimension of regional policy and guarantee that the EU's investment will focus on long term objectives in matters of growth and labour, setting a series of ambitious objectives in five priority areas: employment, innovation, education, social integration and climate/energy [11]. Thus, the territorial differences of the EU might be analyzed not only by taking into consideration the per capita income level of each region, but also by using other relevant variables for the regional development [10]. To do so, we extend the approach normally used to measure regional disparities, which includes GDP per capita only [16]. For Sen [21], resources (GDP or income) only have value to the extent that they enhance human life.

2. Evolution of EU Regional Policy

Although the principle of solidarity of interests among countries expressed by R. Schuman laid the foundations of budgetary policy at the start of the European Communities, first-period implementation of this policy consisted almost exclusively of agricultural expenditure, and Community institutions had hardly any financial autonomy [22]. According to Fernández [23], Regional Policy reached maturity after the entrance of Greece (1981), and subsequently Spain and Portugal (1986), including cohesion as a key objective in the integration processing response to increasing interregional inequalities. The Single European Act (1987) provided the definitive impetus for Community solidarity strategy, making it possible for regions to adapt to the Community project, although with greater difficulty [24].

In 1988, the European Council achieved a commitment to double the financial allocation of the Structural Funds in the period 1988–1993, to reform its operations and to implement the four basic principles of Regional Policy (concentration, programming, partnership and additionality) [24]. Formally initiated in 1989, EU cohesion policy has since passed through a series of metamorphoses, while becoming the most financed EU policy and, since then, has shifted into a financial tool to promote investment for growth and jobs [25], thus becoming one of the priority policies in the EU. In this sense,

population growth should not be allowed to tax the available resources but should enable more investment to enable a level of higher real capital growth per person. What this means is that if public and private investment fail to keep pace with the population growth, each worker will become less productive, stunted at a time when creativity and innovation make essential ingredients for regional integration to progress [26].

At the same time, another important contribution is research considering a more complex approach to regional disparities based on more indicators offering complementary information [27], as this study has set in line with previous ones [10]. Natural resources, income, infrastructure, health, poverty, infant mortality, child nutrition, inequality, among others, and social cohesion combined explain the socio-economic development of a region and society [28].

Medeiros [25] proposes a new set of priorities for the EU cohesion policy revolving around territorial cohesion. They include: green economy, balanced territory, social cohesion and good governance. Thus, they revolve around closer integration of the EU territory and stronger foundations for sustainable development [29]. It is thus necessary to identify the areas in which budgetary efforts should be concentrated to increase the impact of the European Cohesion Policy on the goal of economic and social convergence of the regions [30].

The financial resources of the Structural Funds were thus strengthened and the Cohesion Fund established in 1993 to support economic convergence under the Delors II package and implementation of the Maastricht Treaty. This new fund was intended to co-finance infrastructure and environmental projects in countries with a GDP per capita of less than 90% of the EU average: Spain, Greece, Ireland and Portugal, as detailed by Holgado [31]. The role of the infrastructure is key, transportation is generally perceived as a catalyst for economic development [32].

Subsequently, the “major enlargement” of the EU with countries in Central and Eastern Europe in 2002 was a turning point in the growing role of economic and social cohesion during the 2000–2006 programming period [33]. Finally, the Lisbon Treaty, signed by the heads of state on 13 December 2007 (effective 1 December 2009), reaffirmed the priority of reinforcing economic, social and, in a new way, territorial cohesion [34].

Of the three objectives, Objective 1 covered the less-developed regions, whose GDP per capita was less than 75% of the Community average and which absorbed most of the financial resources (two thirds of the Structural Funds). Objective 2 covered the

regions that exceeded the 75% threshold. Objective 3 aimed to support the adaptation and modernization of policies and of the education, training and employment systems. The programming period 2007–2013 brought significant changes in Community Regional Policy through the Goteborg agreements [34] and the renewed Lisbon Strategy. One of the main developments was replacement of Objective 1 with the Convergence Objective, which finances the poorest regions, those with a GDP per capita of less than 75% of the EU average. The Convergence Objective also provisionally included regions affected by the statistical effect (phasing-out), that is, regions below the threshold for the EU-15 rather than the EU as extended by successive enlargements. The remaining regions were included in the new Regional Competitiveness and Employment Objective, which replaced former Objectives 2 and 3 for 2007–2013, and whose budget allocation aimed to finance promotion of innovation, entrepreneurship, protection of the environment, accessibility, adaptability and development of the labour market [35].

Finally, the Europe 2020 Strategy defines the Cohesion Policy objectives for the current period 2014–2020 [36]. It is a growth strategy aimed at achieving an intelligent, sustainable and inclusive economy. These three priorities mutually reinforce each other to help the EU and its member states generate high levels of employment, productivity and social cohesion [37]. The growth and job creation target for 2014–2020 concentrates European funds on the Convergence Objective, which covers the least-developed regions, defined as those whose GDP per capita is below 75% of the EU average. In parallel, a new category was re-established for regions no longer eligible for the Convergence Objective but whose GDP per capita did not exceed 90% of the average (termed “Regions in Transition”) in order to prevent them from being harmed by the sudden reduction in European funds.

At present, the 28 countries of the European Union are composed of a total of 276 regions, according to the Commission’s statistical classification derived from the Nomenclature of Territorial Units (NUTS) [2]. According to the GDP per capita indicator, the region with the highest value in purchasing power parity in 2014 was the UK’s Inner London, at 148,000 euros per inhabitant/year. The region with the lowest value was Severozapaden (Bulgaria), with 8200 euros per inhabitant/year.

This great disparity between two Community regions clearly justifies the need to supplement the process of economic integration and enlargement of the Union with measures to promote economic cohesion among territories. To address this need, following this introduction and explanation of the statistical method applied, our study provides a synthetic indicator of a set of variables defined by the European Commission [8,38] to measure progress in regions' economic and social cohesion. Before the paper's conclusion, we provide a measure of the most significant variables that determine this progress in order to enable prioritization of financial resources in the corresponding areas to achieve better results in the most disadvantaged regions. To achieve this goal, we use the Pena distance method for the year 2013.

3. Materials and Methods

To achieve our research goals, the distance method defined by Pena (DP2) [39] and expanded by Zarzosa [40] and Somarriba [41] is used to develop the synthetic indicator. This technique has been widely used in similar work on development, well-being and quality of life at regional and national level [18,25,42,43,44,45,46,47,48,49,50,51,52,53,54,55].

The indicator developed by this method enables comparison between the regions studied based on the information provided by a set of variables [56]. It produces a territorial ranking according to the objective to be measured—in our case, level of economic and social development achieved by European regions for the year studied, incorporating a large number of variables. This indicator has the advantage of solving a large number of problems [43]—such as aggregation of variables expressed in different measurements, arbitrary weighting and duplication of information [41,54]. To obtain synthetic indicators, Somarriba and Pena [43] compare the DP2 indicator to other methods, such as principal component analysis and data envelopment analysis (DEA).

So, DEA has some limitations. It involves subjectivity in choice of the partial indicators [43], does not fulfil the principle of uniqueness and monotony, and does not maintain the variance with changes of origin and/or scale in the units of measure [57,58]. The principal component analysis also fails to fulfil some mathematical properties, not only of uniqueness and monotony but also and especially of neutrality,

properties verified in the DP2 method [40,49]. For an exhaustive study of the DP2 indicator and its properties, see [10,16,18,39,40,41,42,46,48,50,54,55,56,59,60].

Pena [39,56] defines this indicator, for a region r, as:

$$DP_2=\sum \{(d_i/\sigma_i)(1-R^2_{i,i-1,\ldots,1})\}$$

with $R^2_1 = 0$, where $d_i = d_i\,(r*) = |x_{ri} - x*_i|$ with the baseline, which coincides with the minimum vector, and where: n is the number of variables, x_{ri} is the value of the variable i in region r, and σ_i is the standard deviation of variable i.

$R^2_{i,i-1,\ldots,1}$ is the coefficient of determination in the regression of X_i over X_{i-1}, X_{i-2}, …, X_1, which is already included. This coefficient measures the part of the variance of each variable explained by the linear regression estimated using the variables defined above [49]. The factor $(1 - R^2_{i,i\text{-}1,\ldots,1})$ is a "correction factor" [39] that avoids redundancy by eliminating from the partial indicators the information already contained in the preceding indicators [61]. The synthetic indicator thus includes only the new information for each variable [59]. The calculation of the DP2 indicator is iterative. In this process, the entry order of the variables is determined by the amount of information they provide to the measurement in question. The proposal of Pena consisted in ranking the variables hierarchically by their absolute coefficient of correlation with the synthetic indicator in descending order. This process should begin with an initial solution: the given that each variable is correlated amongst themselves. Thus, the correction factors would assume a value of 1 in each case, given that R^2i, i−1, i−2, …, 1 equals zero. The result of this process is the Frechet Index, which represents the maximum value that the DP2 indicator can take for every country. From this step onwards, the variables are ranked according to their correlation with the Frechet Indicator, from most to least correlated. Once the synthetic indicator has been calculated, the variables are ranked once again, according to their degree of correlation with it. This process continues until the indicator reaches convergence.

The DP_2 indicator fulfils the properties desirable in a synthetic indicator, as demonstrated by Zarzosa [40,47], Pena [56], Cuenca [45] and Zarzosa and Somarriba [18]. The ordering of the variables in the DP2 method corresponds to their relative importance, measured in terms of linear correlation with the final synthetic indicator. The baseline in this study coincides with the minimum vector of the year of study. The synthetic distance indicator designed to compare regions must be invariant relative to the reference base taken for each region, such that it is the same for all regions [40]. We

thus take as reference base the value of a fictitious region that would be generated by the lowest values observed for the variables used [16] and associated with study of the objectives of the Europe 2020: A strategy for smart, sustainable and inclusive growth [11] (Table 1).

Table 1 Partial Indicators of Economic and Social Cohesion according to the objectives of European Strategy 2020

OBJECTIVES EUROPE 2020 STRATEGY	DIMENSIONS	INDICATORS	DATA YEAR
SMART GROWTH	Research and Development	Research & Experimental Development expenditure as % of GDP	2013
		Patent applications to the European Patent Office per million of active population (average 3 years)	2010-2012
	Competitiveness and Business Environment	GDP in Purchasing Power Standards per inhabitant	2013
		Unemployment rates (15 years or over) (- sign)	2013
		Difference between unemployment rates of females and males (- sign)	2013
		Employment rates of age group 20-64	2013
		Employment rate difference between females and males of age group 20-64 (- sign)	2013
		Unemployment rates of young people (15-24) (- sign)	2013
	Education	Tertiary educational attainment of age group 25-64 (%)	2013
		Early leavers from education and training (from 18-24 years) (- sign)	2013

OBJECTIVES EUROPE 2020 STRATEGY	DIMENSIONS	INDICATORS	DATA YEAR
SUSTAINABLE GROWTH	Transport	Victims in road accidents per million inhabitants (- sign)	2013
		Freight transported by road by region of loading (Tm/Km^2) (- sign)	2013
	Environment	Municipal waste generated per inhabitant (Kg/year) (- sign)	2012
INCLUSIVE GROWTH	Social Inclusion, Poverty and Health	People at risk of poverty or social exclusion (- sign)	2013
		Life expectancy at birth	2013

Source: Author based on Eurostat (2015) and European Commission data (2014b).

The DP_2 method is defined as a synthetic indicator that aggregates the information contained in a set of variables. Following the objectives of this study, the variables selected for the research were taken from the EU's Economic and Social Cohesion Reports [8], classified according to the objectives of the Europe 2020 Strategy [11]. As in the case of the "Lisbon Agenda", the excellent options contained in the Europe 2020 strategy have to a very great extent conditioned the design of regional and cohesion policy for 2014–2020 [38].

To measure progress at sub-national levels, we dropped from the European Statistical Office (Eurostat) portfolio of cohesion those indicators lacking unbundled and updated information at NUTS level 2. Our study includes a total of 15 indicators, distributed among six dimensions, following the Europe 2020 Strategy: Research and Development; Competitiveness and Business Environment; Education; Transport; Environment; and Social Inclusion, Poverty and Health (Table 1). The variables that contribute negatively to the objective of economic and social development when integrated into the synthetic indicator were multiplied by (−1). A higher value of DP_2 thus shows greater distance from the least desirable theoretical framework, represented by a minimum value in the set of partial indicators considered as associated with the

Europe 2020 Strategy. This minimum would be attributed a value of zero in the synthetic economic and social development indicator [18].

The reference year for the data was either 2013 or, in its absence, the nearest available year. We chose the year 2013 for analysis because it marked the end of a Common Regional programming period. The programming period 2007–2013 has seen substantial changes in concentration, programming, co-participation and additionality (CRP) due to the Lisbon and Goteborg agreements and the Renewed Lisbon Strategy (RLS) [25]. Finally, to establish an order or hierarchy based on the amount of information that each indicator contributes to the DP2 in our method [46], we construct the Ivanovic discrimination coefficient (DC) [62], as defined by Zarzosa [40] and Somarriba [49]:

$$DC_i = \frac{2}{m(m-1)} \sum_{j,l>j}^{k_i} m_{ji} m_{li} \left| \frac{x_{ji} - x_{li}}{\overline{X_i}} \right|$$

where: m is the number of regions.

His measure, analyzed by Zarzosa [40], between 0 and 2, these values correspond to the two extreme theoretical cases as regards discriminant power. If a variable takes the same value for all countries, DC equals zero, indicating that this variable holds zero discriminant power. By contrast, if a variable only has a value other than zero for one country (and in the remainder, $m - 1$ is equal to zero), DC is equal to two and the variable has full discriminant power [59].

It is best to select the variable that provides the most discrimination between regions in terms of the partial indicators [18,61]. As mentioned above, if a variable discriminates totally, with a value of two in the coefficient, it provides very important information and will be useful to explain the differences in the level of objectives in the Europe 2020 Strategy attained in the territories studied (Table 1).

4. Results

The synthetic indicator DP2, constructed from the partial indicators included in Table 1, enables classification of the regions of Spain, Greece, Ireland and Portugal according to their degree of economic and social development. The result is shown in Table 2 and Table 3, which ranks the 41 regions from best to worst, as mentioned above. In this context, we must indicate that, for the period 2007–2013, of a total of

347,410 million euros in current prices, the European Cohesion policy (Structural and Cohesion Funds) granted Spain aid of 35,217 million euros in current prices; Greece 20,240 million; Portugal 21,511 million and Ireland 901 million [63].

Table 2. Territorial classification. Best and worst region of each of the four countries (2013), according to indicator of the distance method defined by Pena (DP2) and regional eligibility in the 2014–2020 programming period.

POSITION	COUNTRY	REGION	SYNTHETIC INDICATOR DP_2	REGIONAL ELIGIBILITY
1	Spain	Basque Country	20.48	3
4	Ireland	Southern and Eastern	18.33	3
12	Portugal	Metropolitan Area of Lisbon	15.39	3
13	Ireland	Border, Midland and Western	15.35	3
21	Greece	Attica	12.04	3
25	Portugal	Algarve	11.35	2
40	Greece	Western Macedonia	7.83	2
41	Spain	Autonomous City of Ceuta	5.54	3

Classification of regions in the 2014-2020 programming period:

1= Regions covered by the Convergence Objective.

2= Regions in transition (Phasing Out).

3= More-developed regions.

Source: Author based on Eurostat (2015) and European Commission data (2014b).

Table 3. Territorial classification (2013), according to indicator DP2 and regional eligibility in the 2014–2020 programming period.

POSITION	COUNTRY	REGION	SYNTHETIC INDICATOR DP_2	REGIONAL ELIGIBILITY
1	Spain	Basque Country	20.48	3
2	Spain	Chartered Community of Navarre	20.11	3
3	Spain	Community of Madrid	19.75	3
4	Ireland	Southern and Eastern	18.33	3
5	Spain	Catalonia	17.95	3
6	Spain	Aragon	17.74	3
7	Spain	La Rioja	16.72	3
8	Spain	Galicia	16.05	3
9	Spain	Castile and Leon	15.89	3
10	Spain	Principality of Asturias	15.66	3
11	Spain	Cantabria	15.47	3
12	Portugal	Metropolitan Area of Lisbon	15.39	3
13	Ireland	Border, Midland and Western	15.35	3
14	Portugal	Central	14.87	1
15	Portugal	Northern	14.70	1
16	Spain	Valencian Community	14.08	3
17	Portugal	Autonomous Region of Madeira	13.20	3
18	Spain	Region of Murcia	12.71	2
19	Portugal	Autonomous Region of the Azores	12.15	1
20	Spain	Balearic Islands	12.14	3
21	Greece	Attica	12.04	3

POSITION	COUNTRY	REGION	SYNTHETIC INDICATOR DP_2	REGIONAL ELIGIBILITY
22	Portugal	Alentejo	11.75	1
23	Spain	Castile-La Mancha	11.53	2
24	Spain	Extremadura	11.50	1
25	Portugal	Algarve	11.35	2
26	Spain	Canary Islands	11.04	2
27	Greece	Crete	11.04	2
28	Spain	Autonomous City of Melilla	10.83	2
29	Spain	Andalusia	10.43	2
30	Greece	North Aegean	10.40	2
31	Greece	Central Macedonia	10.39	1
32	Greece	South Aegean	10.25	3
33	Greece	Epirus	9.65	1
34	Greece	Eastern Macedonia and Thrace	9.55	1
35	Greece	Thessaly	9.49	1
36	Greece	Peloponnese	8.62	2
37	Greece	Western Greece	8.51	1
38	Greece	Central Greece	8.36	2
39	Greece	Ionian Islands	8.05	2
40	Greece	Western Macedonia	7.83	2
41	Spain	Autonomous City of Ceuta	5.54	3

Classification of regions in the 2014-2020 programming period:

1= Regions covered by the Convergence Objective.

2= Regions in transition (Phasing Out).

3= More-developed regions.

Source: Author based on Eurostat (2015) and European Commission data (2014b).

On the other hand, in 2013, Spain's GDP per capita registered 95% of the EU average, with a negative evolution from the beginning of the programming period, 2007. Greece and Portugal had the same value, 75% of the EU average in 2013, also with falling values for the GDP per capita from the start of the programming period. Ireland was situated above the average, with 126% in 2013 [8]. According to our results, the last column of **Table 2** and **Table 3** includes the region's classification, taking into account its eligibility in the current Regional Policy programming period (2014–2020) according to the criterion of GDP per capita.

Three groups are obtained (**Table 1**):

1. Group 1 = Regions eligible for the Convergence Objective.
2. Group 2 = Regions in transition.
3. Group 3 = More-developed regions.

The resulting classification (**Table 2** and **Table 3**) shows, first, a distance of almost 15 points between the best-positioned (Basque Country) and worst-positioned (Autonomous City of Ceuta) regions in the year 2013. We used the classification of regions in the 2014–2020 programming period: 1 = Regions covered by the Convergence Objective; 2 = Regions in transition (Phasing Out); 3 = More-developed regions. We can thus affirm a relatively high disparity between the regions analysed according to the values of the variables included in the synthetic indicator (**Table 1**).

The average of the synthetic indicator DP2 for the five worst-positioned regions is 7.66 points, a distance of almost 12 points from the average of the top five regions (19.32 points). This result reveals a maximum interregional distance of almost 15 points between the first and last region (**Table 2** and **Table 3**), or relatively high regional disparities in the year analysed. The regions ranked highest are those located mainly in the northeast of Spain (Basque Country, Chartered Community of Navarre, Catalonia and Aragon), as well as its capital (Community of Madrid). Also among the top five are the southern and eastern regions of Ireland, home to Dublin and its metropolitan area (**Table 2** and **Table 3**). In Portugal, the first-ranked region is the metropolitan area of Lisbon, in twelfth place (**Table 2**). In the case of Greece, however, we must descend to twenty-first place to find the country's first region, again the national capital (Attica), in line with the results of Lahusen [65]. The lowest portion of the classification includes most of the regions of Greece (11 out of 13) and, in last position, the Autonomous City of Ceuta (Spain).

In intermediate positions, we find several regions of the south-central Iberian Peninsula, Alentejo and Algarve in Portugal, and Murcia, Castile-La Mancha, Extremadura, Melilla and Andalusia in Spain. The Balearic Islands and the so-called ultra-peripheral regions (the Azores and Madeira in Portugal and the Canary Islands in Spain) all show values close to the average of the synthetic indicator (12.85) (**Table 2** and **Table 3**).

The information on eligibility of regions in the current period 2014–2020 (last column of **Table 2** and **Table 3**) shows, paradoxically, that two of the ten worst-situated regions no longer belong to the Convergence Objective (Autonomous City of Ceuta and South Aegean). Classified as "more developed", these territories can only finance 50% of project costs and receive fewer financial resources in overall terms than the regions covered by the Convergence Objective. Moreover, the regions ranked last in the classification are four regions of Greece (Western Macedonia, Ionian Islands, Central Greece and the Peloponnese), identified as "regions in transition" during the period 2014–2020 using the criterion based on GDP per capita. These regions will thus receive a smaller budgetary allocation and will only be able to finance a maximum of 60% of project costs, even though they show greater backwardness if we consider all variables studied (**Table 1**, **Table 2** and **Table 3**). Two regions of Portugal (central and northern) in a relatively high position (fourteenth and fifteenth, respectively, of a total of 41) will receive funds under the 2014–2020 Convergence Objective, although they ranked higher than six regions included in the "more-developed" group.

In conclusion, the results of the synthetic indicator DP2 reveal deterioration in the economic and social development of some regions during the previous programming period 2007–2013, even though these regions were either classified as "in transition" or completely excluded from the Convergence Objective. At the same time, while ranked among the last ten positions, Greece's South Aegean was excluded from the Convergence Objective and continues to be included among the more-developed areas in the current period 2014–2020. The case of the Autonomous City of Ceuta is also worth noting. It is ranked last and was chosen as a phasing out region between 2007 and 2013 but included "as an exception" in the group of more-developed regions during the 2014–2020 budget framework. Finally, other cases with strikingly low rankings (**Table 2** and **Table 3**) are the Greek regions of South Macedonia (fortieth) and Central Greece (thirty-eighth), both chosen as regions in transition for 2014–2020 and even included among the more-developed regions in 2007–2013.

4.1. Discriminatory Power of the Variables

In this section, we use the results of the DC to identify which variables provide the most information in the final result of the synthetic indicator. **Table 4** presents the values of the coefficient, which represents the discriminating power of each partial indicator included. If we analyse the results obtained in 2013 for the variables with the greatest inequality in interregional values, the most discriminating variable is "Difference between unemployment rates of females and males", included in the Competitiveness and Business Environment dimension. The second-most-discriminating variable is "Freight transported by road by region of loading (Tm/Km^2)", which is related to the volume of commodities generated by the regions.

Table 4. Order of partial indicators of cohesion by discrimination coefficient (DC).

Position	**PARTIAL INDICATORS**	**Ivanovic (DC)**
1	Difference between unemployment rates of females and males	0.98
2	Freight transported by road by region of loading (Tm/Km^2)	0.50
3	Patent applications to the European Patent Office per million of active population (average 3 years)	0.43
4	Employment rate difference between females and males of age group 20-64	0.34
5	Research & Experimental Development expenditure as % of GDP	0.32
6	Victims in road accidents per million inhabitants	0.24
7	Early leavers from education and training (18-24 years)	0.24
8	Tertiary educational attainment of age group 25-64 (%)	0.21
9	Unemployment rates (15 years or over)	0.14
10	People at risk of poverty or social exclusion	0.11
11	GDP in Purchasing Power Standards per inhabitant	0.10

12	Unemployment rates of young people (15-24 years)	0.08
13	Municipal waste generated per inhabitant (Kg/year)	0.07
14	Employment rates of age group 20-64	0.05
15	Life expectancy at birth	0.02

Source: Author based on Eurostat (2015) and European Commission data (2014b).

Another of the most informative variables is “Employment rate difference between females and males of the age group 20–64”. These results show relatively significant differences between regions in an area important to the economic and social development of a territory, gender equality in the labour market [66]. When compared to other studies, such as Rodríguez [16] and Holgado [25], this indicator shows increasing power of discrimination among the variables generally associated with employment and unemployment.

In third and fifth place are two variables associated with research and experimental development. The first reflects research results (“Patent applications to the European Patent Office (EPO) per million of active population”), and the second, resources invested in research development and enhancement (“Research & Experimental Development expenditure as percentage of GDP”) (Table 3). It is also worth stressing that two variables related to education and unemployment also have relevant power of discrimination: “Early leavers from education and training (18–24 years)” and “Unemployment rates (15 years or over). These results reinforce the need to invest in education to reduce interregional differences and to drive smart growth, goals also included in the European 2020 Strategy. Finally, beyond the variables mentioned above, the results confirm that the other partial indicators have relatively low power of discrimination, with no significant differences in their values among the 41 community regions. As the divergences are not zero (value 0 in the coefficient), we retain these variables when calculating the synthetic indicator (Table 4).

4.2. Order of the Variables

Table 5 presents the top four partial indicators in the ranking in order of entry of their variables in the DP2 and their importance in the final indicator, taking into account the absolute values of the coefficients of linear correlation between the values of the indicator for each region and the synthetic indicator.

Table 5. The correction factor $(1 - R^2)$, which indicates the new information of each partial indicator incorporated.

Position	**PARTIAL INDICATORS**	Correction factor $(1 - R^2)$
1	Employment rate difference between females and males of age group 20-64	1.0
2	Patent applications to the European Patent Office per million of active population (average 3 years)	0.80
3	Research & Experimental Development expenditure as % of GDP	0.64
4	Difference between unemployment rates of females and males	0.61

Source: Author based on Eurostat (2015) and European Commission data (2014b)

Note that this procedure only eliminates the redundant information [10,43,46]. Variable 1: "Difference between unemployment rates of females and males" has a correction factor of 1, indicating that this variable contributes the most useful (new) information in the synthetic indicator's object of study (Table 5). The second variable in order of entry is "Patent applications to the European Patent Office (EPO) per million of active population (average 3 years)", with a correction factor of 80%. This means that 80% of the information provided by this indicator is introduced in the measurement of development of the initial EU-member Cohesion Fund beneficiaries. The next variable in order of entry is "Research & Experimental Development expenditure as % of Gross Domestic Product", which retains ~64% of the information, with a high relative importance in the final result of the DP2. These variables could therefore be used to design specific measures targeted at improving each country's progress towards the objectives of the Europe 2020 Strategy in coming years. It is important to emphasize

that one priority of the European 2020 strategy is precisely to promote smart growth through more effective investments in education, research and innovation [11].

That R & D-related variables are among those with the greatest discriminating power and the greatest correction factor (Table 4 and Table 5) indicates that there are still significant disparities in this area among the regions analysed. In our research, for example, the indicator value associated with number of patents registered is neither constant nor homogeneous among the areas of Spain, Portugal, Greece and Ireland analysed.

5. Discussion and Conclusions

This paper develops a synthetic indicator to measure the degree of economic and social development in the regions of the Cohesion countries, based on a large number of variables and within the framework of the EU 2020 Strategy. This approach complements the information provided by GDP per capita in the classification of priority territories for actions under Community Regional Policy by incorporating a greater number of dimensions or areas of study.

To achieve these objectives, we applied Pena's statistical method DP2 to integrate a large number of variables expressed in different measurements and to eliminate duplicate information and arbitrary weighting of data. Since this method also fulfils a series of mathematical properties desirable in a synthetic indicator and enables estimation of the disparities between the territories studied, it is more suitable than other methods of aggregation.

We calculate the indicator in 41 regions of Spain, Portugal, Ireland and Greece for 2013, based on fifteen variables drawn from the Cohesion Reports of the EU and organized into six dimensions proposed by the Commission in the Europe 2020 strategy. The NUTS 2 Community Territorial Statistical Classification was used for regional allocation of Structural Funds. The results obtained allow us to draw the following conclusions:

From a territorial perspective, the results show considerable distance between the best- and worst-positioned regions in the classification (Table 2 and Table 3), with the Autonomous City of Ceuta ranked last. Paradoxically, Ceuta was designated a phasing-out region in the period 2007–2013 and was thus ineligible for inclusion in the 2014–2020 Convergence Objective.

Likewise, the South Aegean (Greece) is ranked low in the classification but is included in the group of most-developed regions. Although the Greek regions of Western Macedonia and Central Greece obtained low values for the variables analysed, they have been defined as regions in transition in the current period of Regional Policy.

Similarly, two regions of Portugal (Central and Northern) occupy relatively high (above-average) positions in the ranking obtained, although they are covered by the Convergence Objective in the programming period 2014–2020.

The most advanced regions are located in the northeast of Spain, and in the regions of the countries' national capitals, such as the Community of Madrid (third), Southern and Eastern Ireland (fourth), and the Metropolitan Area of Lisbon (twelfth). In Greece, in contrast, the region of Attica (Athens) is in the middle of the classification (twenty-first) (**Table 2** and **Table 3**).

The values of the DP2 indicator reveal some general disparities among the regions analysed in economic and social development, in line with other studies [**5**,**15**,**16**,**25**,**67**]. These disparities could be taken into account in programming future Regional Policy by increasing efforts in areas with lower values in the variables analysed.

If we examine the discriminating power of variables with the most unequal values between regions, the variables related to the objective of smart growth established in the Europe 2020 Strategy are the most striking. Specifically, gender differences in employment and unemployment, research results (patents) and investment in R & D register the greatest differences in values between the regions. Among the most discriminating is the variable "Freight transported by road by region of loading (Tm/Km^2)", part of the sustainable growth objective.

Of the five variables that contribute most to explaining the interregional differences, three are linked to the goal of smart growth. Promotion of research and innovation must be included as an essential future priority to develop these territories, especially those ranked lowest (**Table 2** and **Table 3**). Our results align with the findings of other studies [**36**].

The other variables show less-significant differences between regions, with more constant values in almost half of the variables considered. However, progress between regions is still unequal in some dimensions relevant to economic and social development, such as Research and Development and Competitiveness and Business Environment.

It is thus appropriate not only to include such variables in future synthetic measures of regional development but also to take them into account in future territorial allocation of Community aid under the Cohesion Objective.

As to the relative impact of each variable, the correction factor of the synthetic indicator of development shows that four variables studied (**Table 5**) contribute especially important information for determining and measuring progress towards the objectives of the Europe 2020 Strategy to promote smart, sustainable and inclusive growth in countries.

The variable that correlates most closely with the synthetic indicator is "Employment rate difference between females and males of the age group 20–64", which provides 100% of its information to the synthetic indicator. The next variables in order of entry are "Patent applications to the European Patent Office (EPO) per million of active population (average 3 years)" and "Research & Experimental Development expenditure as % of GDP", which retain 80% and 64% of the useful information, respectively.

With significant challenges still to be addressed in the Europe 2020 Strategy, it is necessary to design and implement actions and measures that generate the greatest impact for more intense reduction of the regional disparities in the EU. These areas are closely related to narrowing gender gaps in the labour market and to promoting research and development (**Table 4** and **Table 5**). Specific measures could be designed to improve performance on these variables in the backward areas of the four countries in the classification (**Table 2** and **Table 3**).

To conclude, this paper proposes a way to visualize the socio-economic reality of regions at a given time, especially following the period 2007–2013, in a context of economic crisis in which three of the initial Cohesion countries—Spain, Portugal and Greece—registered a very negative tendency in terms of GDP per capita relative to the EU average. Results show that unemployment is highly polarized across the EU regions. Portugal, Spain or Greece are experiencing high rates of unemployment forming clusters in space and time. By contrast, Germany, Austria, and nearby regions are more resilient to the economic crisis strains thus creating spatial clusters of low rates of unemployment [**68**].

This study aims to contribute greater nuance to knowledge of the impact of the variables considered in order to achieve greater economic and social development in these countries. We can continue to compare the countries after the end of the period 2014–2020 to evaluate their evolution, as well as that of any other countries analysed in future studies with similar objectives and regions using the same or other methodologies—goals we share with other researchers.

Promotion of solidarity, smart and sustainable growth, and gender equality in the EU is a priority for the future of the European integration process, which can serve as an example in these or other respects for other areas of integration globally. We believe that monitoring is central to assessing performance on the Lisbon Objectives, given the slow, unequal pace of progress registered by some regions in the initial EU-member beneficiaries of the Cohesion Fund toward fulfilment of the Objectives, as shown by our study. The results obtained point out certain reflections and assessments that are useful to make recommendations regarding public policies. Firstly, the measurement systems of the achievements of the least developed regions seems obsolete and of limited descriptive ability. Nowadays, at the international scale, achievements in terms of development are not assessed only in terms of GDP growth or job creation. As this indicator shows, the regions still dealing with socioeconomic challenges would receive lower grants, or none at all, if only the official criteria are taken into consideration. This paper proposes then that it is more logical to consider the evaluation of the variables related to the dimensions that comprise the Europe 2020 Strategy. We must also keep in mind that the goal of Europe's regional policy is to improve social and economic cohesion as well as to improve the quality of life, something that cannot only be achieved by means of economic growth. Therefore, the processes that evaluate the achievements of regional policies must be improved. Such evaluation should not be considered a minor thing given that the continuity of important flows of investment are dependent upon it. Moreover, said flows of investments are the means by which the desired convergence is reached.

The analysis of the discriminant power of the variables shows that the achievements relative to the job market cannot be evaluated only by taking into consideration the number of positions that have been created. Aspects such as the level of education or gender equality are key to reach an inclusive and competitive development. In relation to this, it is important to note that not every growth is sustainable at long-term, nor offers the same benefits to local communities. The analysis of the variables shows how important it is to support the development of education, investigation and innovation. These ideas lead to two important implications for public policies. The first is related to an aforementioned aspect: the necessity to enhance the achievements of regional development altogether with the evaluation criteria associated with Europe's regional policy. Secondly, the importance of moving towards by means of a model of growth focused on knowledge and inclusion.

Author Contributions

J.A.R.M. and J.M.M.M. designed and coordinated the research. K.A.Z.M. and J.A.S.F. were in charge of the bibliographic research and part of the conclusions. K.G.A.B. and K.A.Z.M. were in charge of the data treatment and the collection of the information derived from it as well as part of the conclusions.

Funding

J.A.R.M., the main author of the article, gratefully acknowledges the financial support provided by the following institutions: the Ministry of Economy, Industry and Competitiveness, the State Research Agency (SRA) and European Regional Development Fund (ERDF) (project reference ECO2017-86822-R).

Conflicts of Interest

The authors declare that they have no conflict of interest.

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TRABAJO 3:

Artículo: Human rights in the Horn of Africa: an index of child and maternal health

Revista: Gaceta Sanitaria (2019).

Artículo en prensa. https://doi.org/10.1016/j.gaceta.2019.11.003

Factor de Impacto en el año de publicación, fuente de impacto: WOS (JCR): 1.65

La revista Gaceta Sanitaria ocupa el puesto 113/186 (Q3), en el Área de: PUBLIC, ENVIRONMENTAL & OCCUPATIONAL HEALTH (Journal Citation Reports).

El artículo ha recibido, hasta la fecha del depósito de la Tesis, según Google Académico: 3 citas.

Human rights in the Horn of Africa: an index of child and maternal health

Los derechos humanos en el Cuerno de África: un índice de salud infantil y materna

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ABSTRACT

Objective

To construct a territorial measure and classification of child and maternal health in the countries of the Horn of Africa (HoA) based on the 2030 Agenda for Sustainable Development adopted by all United Nations Member States in 2015.

Method

The design of our index includes the variables child and maternal health defined in the Sustainable Development Goals (SDG) to enable territorial ranking of the countries. For this purpose, we used Pena's distance method for 2017.

Results

The results indicate a relatively high territorial disparity in maternal health between the countries of the Horn of Africa according to the differing values of the SDGs variables of child and maternal health.

Conclusions

We have proposed a territorial classification in the countries of the Horn of Africa. We believe that the most striking differences between countries relate to basic variables maternal health such as attended by skilled health personnel.

KEYWORDS: Africa; Child Health; Health Status Disparities; Maternal Health; Human Rights; Sustainable Development.

RESUMEN (147 palabras)

Objetivo

Elaborar una medida y clasificación territorial de la salud infantil y materna en los países del Cuerno de África (HoA), basada en la Agenda 2030 para el Desarrollo Sostenible, que fue adoptada por todos los Estados Miembros de las Naciones Unidas en 2015.

Método

El diseño del índice incluye variables de salud infantil y materna definidas en los Objetivos de Desarrollo Sostenible (ODS), para permitir la clasificación territorial de los países. Para este propósito, utilizamos el método de distancia de Pena para 2017.

Resultados

Los resultados revelan una disparidad territorial relativamente alta en salud materna entre los países del Cuerno de África, de acuerdo con los diferentes valores de las variables ODS.

Conclusiones

Hemos propuesto una clasificación territorial en el Cuerno de África. Consideramos que las mayores diferencias entre países se relacionan con variables básicas de salud materna, como la asistencia de personal de salud cualificado.

PALABRAS CLAVE: África; Derechos humanos; Desarrollo Sostenible; Disparidades en el estado de la salud; salud infantil; Salud materna.

Human rights in the Horn of Africa: an index of child and maternal health

Introduction

On 1st January 2016, the world officially began implementation of the action plan based on Sustainable Development Goals (SDGs). Goal 3 aims to ensure health and well-being for all people of all ages by improving reproductive, maternal and child health.[1]

Study of the Horn of Africa (HoA) countries is especially important, as the situation remains disastrous[2]. The HoA region is plagued by a set of complex[3], often interrelated factors including environmental degradation, climate-related disasters such as droughts and floods.[4,5]

Multiple factors hinder access to and utilization of health services in the HoA. These factors include lack of a functional health system, geographical accessibility, financial barriers and limited availability of services.[1,2]

In particular, this study aims to construct a synthetic indicator of maternal and child health to enable comparison between 5 countries in 2017 in the HoA.

The index also allows to study the impact of each variable individually so as to determine disparities in the variables associated with the SDGs for each country. Additionally, the research explores the relative impact of each variable by using the correction factor.

Methods

The methodological approaches used in this study are based on the construction of a synthetic index that follows Pena's method (DP_2).[6] The DP_2 provides an ideal solution to the problems involved in devising a synthetic indicator, particularly those related to aggregation and weighting of simple indicators and information duplicity.[7]

The DP_2 measures the distance between the issue studied in each country and a fictitious base reference. We take as reference a theoretical country that obtains the worst values for the variables studied[7].

The DP_2 from country *j* is defined as follows:

$$DP_2 = \sum_{i=1}^{n} \{(d_i/\sigma_i)(1-R^2_{i,\, i-1,\ldots,1})\}$$

where:

$d_i = |x_{ji} - x_{*i}|$ is the distance between the value of variable i in country j and the reference base. The reference base comprises the results from an imaginary country which reflects the worst possible scenario for all the variables where $X_* = (x_{*1}, x_{*2}, ..., x_{*n})$ coincides with the minimum vector. The reference base would therefore be attributed a value of zero in the synthetic indicator.[7]

n is the number of variables, σ_i is the standard deviation of variable i, and $(1-R^2_{i,\ i-1,\ldots,1})$ is a "correction factor"[6] that avoids redundancy.[2,6-9] The coefficient of determination, $R^2_{i,\ i-1,\ldots,1}$, is the determination coefficient in regression X_i over X_{i-1}, X_{i-2},…,X_1, which is already included, with $R^2_1=0$. Put differently, the coefficient measures the part of the variance of each variable explained by the linear regression estimated using the preceding variables.[2] The ordering of the variables corresponds to their relative weight measured in terms of linear correlation with the final synthetic indicator.[7] The input order of the variables is determined by an algorithm that reaches convergence when the indicator fulfils a number of desirable properties.[2,6-9]

It is also possible to establish an order or hierarchy based on the amount of information that each variable contributes to the DP_2. To determine this, we construct the Ivanovic Discrimination Coefficient (IDC).[10-12] This indicator finally shows us the amount of information provided by the i-th variable. It can range from 0 (in the event that the values of X_i are identical in all the countries) to 2 (in the event that the variable has total discriminatory power, that is, when the amount of information varies greatly across territories). Thus, the closer the IDC value is to 2, the more useful information it provides to explain the differences in the level of child and maternal health in the countries studied.[11,12]

Data were collected from the work of the United Nations Statistical Commission, which created the Inter-agency and Expert Group on SDG Indicators (IAEG-SDGs). In particular, we used 5 variables of child and maternal health associated with the goal 3,[1] (Table 1), using as a reference the detailed information contained in a set of variables set out under the SDGs in the Report 2018,[13] which provide a more extensive and more reliable set of statistics on the SDG 3 of HoA. The countries included into the analysis were Ethiopia, Kenya, Somalia, Eritrea and Djibouti. To guarantee fulfilment of the properties of the synthetic indicator, we multiply specific variables whose increase implies a worsening of the child and maternal health by −1.

The year of analysis is 2017, but for those variables where information was not available for that date, the nearest year was taken as an alternative. This has occurred in the variable “Attended by skilled health personnel, percentage”, whose available information is from 2016."

Results

Constructed from the variables included in Table 1, the result is shown in Table 2, which ranks the 5 countries by level of child and maternal health.

Table 1

The resulting classification (Table 2) shows, first, a distance of almost 5 points between the best-positioned country (Djibouti) and the worst-positioned (Somalia) in 2017. These results indicate a relatively high disparity between the countries analysed.

The results show that Djibouti made the greatest progress toward the goals for child and maternal health, with a distance of 4.56 from the baseline (Table 2). It was followed by Kenya (3.46), which accounts for 29 % of the total population of the HoA.

Table 2

Taken together, Somalia and Ethiopia account for nearly 70% of the population of the HoA. They, in contrast, are the countries with the worst theoretical scenarios (Table 2).

If we analyse the results obtained for the variables with the greatest inequality in intercountry values (IDC), [10] the most discriminating variable is "Attended by skilled health personnel, percentage" (Table 1). The second-most-discriminating variable is "Maternal mortality ratio per 100,000 live births".

In addition, by means of correction factors, the synthetic indicator DP_2 only includes the new information from each variable.[9] In particular, the variable “Maternal mortality ratio per 100,000 live births” contains all of its information, so the corresponding correction factor is 100%, as a result of being most closely correlated with it (Table 1).

Discussion and Conclusion

The DP_2 method shows territorial disparities in child and maternal health in the HoA in 2017. We obtained a difference of 4.56 units between Djibouti and the reference value. Djibouti achieved a higher level of child and maternal health, but it accounts for only 0.5% of the total HoA population. At the opposite extreme, Somalia registers extremely low values in the set of partial indicators.

Priority must be given to interventions to address the variables that have greater power to explain the differences in the values between countries relative —primarily the variable "Attended by skilled health personnel, percentage".

The differing values of these variables suggest that progress in maternal health is uneven throughout the HoA, while fewer territorial differences exist in the variables associated with child health as defined in the SDGs.

In summary, delivery of health services is greatly in need of improvement, especially in Somalia and Ethiopia, and there is an urgent need to increase the number of health workers throughout the region to lower maternal and infant mortality.[14]

In general, the DP_2 classification for these countries differs from that made by the Human Development Index (HDI) for countries with low human development in 2017 (Table 2). In this sense, our analysis takes into account a range of SDGs variables, some of which are not included in the HDI.

Authorship contributions

K.A. Zermeño, J.A. Rodríguez and J.M. Martín conceived the study and supervised all aspects of its performance. J.A. Rodríguez, K. Añaños and J.A. Salinas gathered data, interpreted the results and participated in writing the first draft of the manuscript. K.A. Zermeño, J.M. Martín and K. Añaños were in charge of the bibliographic research. J.A. Salinas and J.M. Martín were in charge of the data analysis. All authors contributed comments and ideas, interpreted the findings and reviewed the drafts of the manuscript. All of the authors approved the final version of the paper.

Conflict of interest

None to declare.

Acknowledgements

J.A. Rodríguez Martín, the corresponding author of the article, gratefully acknowledges the financial support provided by the following institutions: the Ministry of Economy, Industry and Competitiveness of Spain, the State Research Agency (SRA) and European Regional Development Fund (ERDF) (project reference ECO2017-86822-R).

Transparency declaration

On behalf of the other authors, the corresponding author guarantees the accuracy, transparency and honesty of the data and information contained in the study, and declares that no relevant information has been omitted and that all discrepancies among authors have been adequately resolved and described.

What is known about the topic?

Several factors must be analysed and monitored on a priority and constant basis in the decision-making process for distribution of international aid to the countries of the Horn of Africa to improve maternal and child health. Research on the evolution of variables associated with maternal and child health in these countries is very limited.

What does this study add to the literature?

The study provides a complete, up-to-date classification of the Horn of Africa, based on the values of the variables associated with maternal and child health. It also provides information on the variables that best explain the differences between countries. We conclude that the heterogeneous situations of the countries differ from the goals projected by United Nations. The most notable differences relate to the number of births attended by qualified health personnel.

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Table 1 Variables of child and maternal health according to the Ivanovic Discrimination Coefficient (IDC) and to the Correction factor

Partial Indicators	Ivanovic (IDC)	Correction factor
Attended by skilled health personnel, percentage (positive sign +)	0.88	0.69
Maternal mortality ratio per 100,000 live births (negative sign −)	0.61	1.00
Children under five mortality rate per 1,000 live births (negative sign -)	0.42	0.33
Adolescent birth rate, per 1,000 women (negative sign −)	0.18	0.19
Prevalence of underweight (% of children under) (negative sign −)	0.14	0.10

Table 2

Synthetic indicator of child and maternal health in the Horn of Africa (HoA), 2017

Countries ordered by Pena's relative distance (DP_2) method

	Indicator Pena's relative distance (DP_2)	Total population of the Horn of Africa (HoA) (%)	Human Development Index* (HDI)
Djibouti	4.56	0.51	0.48
Kenya	3.46	29.00	0.59
Eritrea	2.71	1.02	0.44
Ethiopia	1.85	63.00	0.46
Somalia	0.10	6.47	NA

*Countries with high human development (HDI ≥ 0.8); with medium human development

($0.5 \leq$ HDI <0.8); and with low human development (HDI < 0.5).

NA = not available.

TRABAJO 4:

Artículo: An analysis of tourism sector seasonality and its relation to the economic cycle: the case of Spain

Revista: Studies of Applied Economics (2020)

Vol 38, nº 1, pp. 1-13.

doi: http://dx.doi.org/10.25115/eae.v38i1.29

Revista indexada en ECONLIT y en el Catálogo LATINDEX, con Sello de calidad FECYT e incluida en el índice de citas Emerging Sources Citation Index (ESCI).

El artículo ha recibido, hasta la fecha del depósito de la Tesis, según Google Académico: 1 cita.

An analysis of seasonality in the tourism sector and its relation to the economic cycle: The case of Spain

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An Analysis of tourism sector seasonality and its relation to the economic cycle: The case of Spain

Análisis de la estacionalidad en el sector turístico, en relación con el ciclo económico. Aplicación al caso español

ABSTRACT

This study analyzes the changes caused by seasonal trends in the Spanish tourism sector 2007-2016, a period spanning the end of a phase of economic growth, a subsequent crisis, and recovery. The methodological originality of the analysis stems from its multi-dimensional index of tourism seasonality, which uses the DP_2 distance indicator. This method enables us to analyze changes in the intensity of destinations' seasonality and to determine both the variables with the greatest power to explain this phenomenon and the variables with the greatest discriminant value among destinations. The results indicate that urban destinations are the most sensitive to variations in the economic cycle, primarily due to the effect of variations in the arrivals of national tourists and in foreigners' average length stay.

Keywords: Crisis, Economic cycle, Seasonality, Spain, Tourism.

JEL CLASSIFICATION: A12, CO2, L83

RESUMEN

Este trabajo analiza los cambios producidos en las tendencias estacionales del sector turístico español durante el periodo 2007-2016, que coincide con el final de una fase de crecimiento económico, posterior crisis y recuperación. El análisis ofrece como novedad metodológica un indicador multidimensional de estacionalidad turística, con el indicador de distancia DP_2, que permite analizar los cambios en la intensidad de la estacionalidad, determinar las variables con mayor poder explicativo de este fenómeno y aquellas que aportan un mayor valor discriminante entre los destinos. Los resultados indican que son los destinos urbanos los más sensibles a las variaciones en el ciclo económico, principalmente, como consecuencia del efecto de las variaciones en las llegadas de turistas nacionales y de la alteración que se produce en la estancia media de los extranjeros.

***Keywords*:** Ciclo económico, Crisis; España; Estacionalidad, Turismo

1. INTRODUCTION

This study proposes an original analysis to detect possible changes in seasonal trends in the tourism sector across differences in type of destination. We perform a case study of Spain, analyzing the great heterogeneity of its tourism product and the importance of tourism in its economy (Martín et al., 2018). In addition, we consider three points in time (2007, 2013, and 2016) and distinguish among four groups of destinations: rural, coastal, urban inland and urban coastal.

The study ranks seasonal intensity for the 51 regions chosen in the years analyzed to detect changes in tourism seasonality due to type of destination and phase in the economic cycle. To perform this analysis, we use a new methodology, the DP_2 (Pena 2009) synthetic indicator of seasonality, which integrates information on seasonal patterns from the perspective of supply and demand.

This indicator also enables us to determine which variables contribute the most information to the study of seasonality and which have the greatest discriminant power among destinations. Various studies have analyzed the relationship between tourist activity and the economic cycle (Kim et al., 2006; Dwyer et al., 2010; Seetanah 2011; Tribe 2011).

More specifically, we performed studies of the effects on tourism of the crisis that began in 2008 (Stylidis and Terzidou 2014). With the global effects of periods of contraction in economic activity, the tourism sector suffers specific impacts associated with the economic cycle, such as changes in demand and tourist behavior (Smeral 2009, 2010). We approach seasonality of the sector from this position, as various issues of its behavior in periods of crisis have not yet been analyzed in depth.

From a European Union perspective, two factors converge in the southern countries (Spain, Greece, Portugal, and Italy): tourism maintains a significant role within their economic structure, and the last economic crisis had a very negative impact on their economies (Boukas and Ziakas 2013; Cellini and Cuccia 2014; Papatheodorou and Arvantis 2014). In the case of Spain, Nieto et al. (2016) recommend recognizing that sun and sand tourism operates in a very competitive market. Following crisis, therefore, other forms of tourism should be promoted, such as cultural tourism.

Seasonality is a common general phenomenon in various economic sectors, and tourist activity is possibly most affected by this trend (Cisneros and Fernández 2015). According to Butler (1994), seasonality constitutes a temporary imbalance in activity, which can become apparent in dimensions such as number of visitors and or expenditure by visitors.

Higham and Hinch (2002) argue that seasonality, although well-known characteristic of tourism, is one of least understood. Along these lines, Koenig-Lewis and Bischoff (2005) indicate that gaps remain in research on the topic.

Taking this need into account and assuming the specific objectives of this study, we propose a quantitative analysis of seasonal patterns from an integrated supply-demand perspective to provide a comprehensive image of the intensity of seasonality.

To estimate a complete measurement, we need a methodology that includes a maximum of descriptive information. We thus take as our base a set of variables of seasonality that quantify various elements of the phenomenon, in order ultimately to aggregate them into a single figure. To compose this indicator and establish a ranking of strength of seasonality in the destinations, we use the Pena distance method (DP_2), which enables measurement of disparities among different objects of study across different areas (Pena 1977; Zarzosa 1994; Somarriba and Pena 2008; Cuenca and Rodríguez 2010; Sanchez and Martos 2014; Rodríguez 2014; Rodríguez, Martín and Salinas 2017; Somarriba and Zarzosa 2019). We will summarize these properties later.

This indicator also enables us to determine which variables contribute the most information to the analysis of seasonality and which have the greatest discriminant power among destinations. This information will ultimately define the analysis of changes in seasonal patterns at different stages of the economic cycle.

Finally, as mentioned above, the heterogeneity of Spain's tourism product makes it possible to perform a study by type of destination because it guarantees sufficient volume of travelers in each category to draw significant conclusions.

2. CAUSE AND EFFECTS OF TOURISM SEASONALITY

Spain is a good subject of study for various reasons. The first is its considerable tourism activity, which constituted 11.7% of the national GDP in 2015 (INE 2017) and is directly responsible for 1.4 million jobs (Exceltur 2016). In the 2015 world ranking, Spain was third in income volume from international tourism, below only the United States and China (Hosteltur 2016).

To understand the effect of tourism seasonality and its dynamics, we must tackle the main factors determining tourism. These have been the subject of various studies. The classification proposed by Hylleberg (1992), which can serve as a reference, distinguishes among three groups of factors: climate, effects of the calendar, and time-based decisions. Parameters can also be divided into natural (motivated by elements such as weather) and institutional (based on cultural values governing society) (Allcock 1994).

The least climate-dependent destinations can provide stable or diversified tourism products throughout the year (Martín et al., 2014). Higham and Hinch (2002) describe the main causes of seasonality as part of the constraints associated with tourism. Other components that affect tourism seasonality are social pressure and inertia (Butler 1994). Rosello et al. (2004) hold that growth in tourists' income tend to improve distribution of vacations throughout the year.

In any case, the negative consequences of seasonality are related to the effects of times of both high affluence and low earnings. These imbalances can affect economic growth of regions that have opted for tourism as a means of development (Martín, Salinas and Rodríguez 2019). In general, the effects of tourism seasonality can be classified into four categories (Getz and Nilsson2004): environmental, sociocultural, economic, and labor-related.

First, environmental factors are associated with times of high concentrations of visitors. This category includes problems of congestion of rural roadways, interference in ecosystems, and production of large quantities of waste, among others. Some authors accept that areas with high tourist pressure require a rest period to recover resources (Ioannides and Petersen 2003; Lusseau and Higham 2004).

Sociocultural effects span negative impact on both the local community and visitors during peak times. Among these issues are congestion of infrastructures and intense traffic, lines to access services, increase in the cost of services, noise, and interference in everyday life (Waitt 2003; Kuvan and Akan 2005).

During the peak season, with greater tourism activity and increase in the resident population, the area must hire extra personnel to provide some public services (Murphy 1985). In high season, tourists may also receive lower-quality service, while in low season many businesses may even close (Butler 1994). This rhythm can affect the image and reputation of the destination (Flognfeldt 2001).

Economic effects are linked to periods of under-use of resources and stagnation of arrivals, which means decreased profit (Cuccia and Rizzo 2011), as well as inefficient use of resources and infrastructures (Georgantzas 2003; Rosselló et al. 2004; Getz and Nilsson 2004). It is also more difficult to maintain quality of service and ensure maintenance of facilities during the high season (Koc and Altinay 2007).

Finally, from the labor perspective, the local community must ensure income to compensate for periods without work or with lower income (Krakover 2000; Flognfeldt 2001). One of the most striking effects is business owners' difficulty of hiring good personnel and consolidating advantageous standards of quality (Baum 1999). Seasonal jobs are also usually covered by people with low qualifications (Milland Morrison 1998).

3. METHODOLOGY

3.1 GENERAL APPROACH

The proposed analysis uses three reference years: 2007, the last year of economic expansion; 2013, the arrival of the economic crisis and beginning of a new period of recovery; and 2016, the year in which some economic recovery was consolidated in Spain (INE, 2017).

We propose to monitor possible changes in seasonal patterns during this time period for a sample of destinations in each of the four areas into which tourism is divided (urban inland, urban coastal, coastal, and rural).

We first include the 10 main urban inland destinations, destinations that received over half a million travelers a year even when they had fewer arrivals.

The second group is composed of 6 urban coastal destinations that combine cultural products with beaches. In this case, the region with the smallest number of visitors received over 600,000 arrivals. The third group is composed of the 16 main coastal areas in Spain, clusters of towns around a coastal area. Within this group, the least powerful destination had over 800,000 visits a year.

The last group includes 19 rural destinations, with 1.2 million arrivals per year. Choice of destinations estimated the main Spanish tourist attractions and excluded those lacking a series of monthly data for the variables considered in the three reference years.

3.2 ALTERNATIVE MEASURES OF SEASONALITY

We must examine alternative methods to quantify seasonal trends and compare them empirically (Koenig-Lewis and Bischoff 2005). We apply deviations proportional to mobile means through dummy variables in multiple linear regressions (MLR) or other statistical applications based on a series of data. The following are some studies that use this approach: Koenig-Lewis and Bischoff (2005), Capó et al. (2007), De Cantis et al. (2011), De Cuccia and Rizzo (2011), Espinet et al. (2012), Boffa and Succurro (2012), and Pegg et al. (2012).

Analysis of seasonality, also a vital element in predictions and modelling involving tourism, can be defined as a deterministic and stochastic component in a series to be analyzed (Songy Li 2008). Some studies—such as Lim and McAleer (2001, 2002), Kulendran and Wong (2005), Alleyne (2006), Koc and Altinay (2007), Shen et al. (2009), and Chang and Liao (2010)—treat procedures for deterministic and stochastic seasonal detection.

Gil-Alana (2010) uses fractioned integration time series and long-range seasonal models. Chan and Lim (2011) propose applying spectrum analysis. Koenig-Lewis and Bischoff (2005), in turn, argue that we lack propositions to describe the phenomenon of tourism seasonality quantitatively, specifically aspects such as differentiation of seasons and comparison of trends among different regions or years. The present study emerges from precisely these lines, with definition of an indicator that can rank destinations based on intensity of their seasonality.

As Wanhill (1980), Lundtorp (2001), Fernández-Morales (2003) and Rosselló et al. (2004) argue, a complementary approach involves calculating indexes of yearly concentration, such Gini (GI) and Theil Indexes, or the variation coefficient. In essence, we aim to produce a single measure of the level of seasonal concentration for one year.

Although other measures are used, the GI is the most common in this type of analysis (Fernández-Morales 2003). By analogy, Lundtorp (2001) argues that the GI is the most stable index. The complex reality of seasonality means that calculation of a single GI based on a specific variable only partially reflects the phenomenon. Ranking the intensities of seasonality can be one or the other, depending on the variable chosen, from which the GI is calculated (Martín et al., 2014).

As a result, the GI has been one of the tools most frequently used in the economics literature to measure seasonality (Wanhill 1980; Lundtorp 2001; Koenig and Bishoff 2003; Nastassios and Sitouras 2004). The Gini coefficient may be defined as follows:

$$IG = 1 + \left(\frac{1}{n}\right) - \left(\frac{2}{(n^2 \cdot \bar{x})}\right) . (x_1 + 2x_2 + 3x_3 + \cdots . nx_{n1}) \quad (1)$$

where n is the number of observations (12 for monthly data), x is the average of the observations, and x_1,x_2,x_3…x_n are the individual observations, in decreasing order of magnitude (Weaver and Oppermann 2000).

The lowest value of this index (0) represents the equal distribution across the different months of the year, while the maximum (1) is a total concentration in a single month.

In sum, this study proposes the construction of a synthetic indicator of seasonality through partial GI estimations calculated over the monthly number of national (Spanish) travelers, foreign travelers, overnight stays by nationals (Spaniards), overnight stays by foreign travelers, personnel employed in tourist activities, and beds available for lodging. To this information we add that provided by the annual variation coefficient, estimated over the monthly data of average stay, degree of occupancy, and level of work on weekends.

Due to the impossibility of constructing the GI over the variables indicated, we must introduce a measure in addition to the GI to complement the battery of indicators that feed into the synthetic indicator. The GI must be constructed through the CV, noncumulative monthly ratios such as number of travelers that arrived or number of

overnights (Martín, Salinas and Rodríguez 2019). The CV measures the extent of the data series around an annual average (Koenig-Lewis and Bischoff 2003), such that, if indicates the standard deviation and $\overline{x}$ measures the observations for a given year, then:

$$CV = \frac{s}{\overline{x}} \quad (2)$$

As Koenig-Lewisand Bischoff (2003) show, the CV is an especially useful method for comparing the dispersion of data established with different standard deviations and different averages. One important characteristic of the CV is that it evaluates changes in the distribution. The specific place of the observations (months, in our case) is thus irrelevant. Within this framework, assuming that we must find indicators that describe seasonality (Ahas et al., 2005), this study proposes the DP_2 supply-demand indicator as a global instrument to describe seasonal intensity and study the basic factors that determine it.

Evaluation of tourism seasonality requires, however, use of a multidimensional evaluation with definition of an appropriate aggregation method. For this process, we consider choice of variables: degree of information on the level of regional tourism seasonality and proportion of non-redundant new information provided by each variable, along the lines of authors like Zarzosa and Somarriba (2013) and Rodríguez et al. (2015).

The most complicated issue in the development of synthetic indicators is treatment of the units of measurement and distribution of the weights across the different variables studied (Somarriba and Zarzosa 2009; Cuenca and Rodriguez 2010).

To answer these questions, we propose using the distance method (DP_2), defined by Pena (1977). This method has been applied successfully in multiple studies (Murias et al., 2006; Somarriba and Pena 2008; 2009; Rodríguez et al. 2012; Ray 2014; Somarriba et al. 2015; Holgado et al. 2015; Sánchez and Prada 2015; Canaviri 2016; Rodríguez et al. 2016; Somarriba and Zarzosa 2016; Rodríguez, Martín and Salinas 2017; Rodríguez et al. 2018; Somarriba and Zarzosa 2019; Rodríguez et al. 2019).

The DP_2 method answers questions related to aggregation of variables expressed in different measurements (Rodríguez et al., 2019), non-arbitrary weighting of the variables (Canaviri 2016), and duplication of information (Zarzosa and Somarriba 2013).

According to the initial goals of this study, the key difference of this indicator is its power to incorporate information derived from measurements of tourism seasonality.

3.3. MAIN PROPERTIES OF THE DP_2 METHOD

TheDP_2 satisfies a series of properties required for a synthetic indicator developed in detail in studies such as Zarzosa (2005), Escobar (2006); Somarriba and Pena (2008), Rodríguez (2011), and Zarzosa and Somarriba (2013). Specifically, the DP_2 fulfils the following properties: existence and determination, monotony, uniqueness, first-degree homogeneity, transitivity, exhaustiveness, additivity (Zarzosa 1992), invariance compared to the base reference, conformity, and neutrality (Zarzosa 1996).

More specifically, the DP_2 for destination r is defined as (Pena 1977; (Somarriba and Pena 2008; Cuenca and Rodríguez 2010; Montero et al., 2010; Rodríguez 2011; Zarzosa and Somarriba 2013; Rodríguez et al. 2019):

$$DP_2 = \sum_{i=1}^{n}\left\{\left(d_i/\sigma_i\right)\left(1 - R^2_{i,i-1,\ldots.1}\right)\right\} \quad (3)$$

with $R_1^2 = 0$, where $d_i = d_i(r^*) = |x_{ri} - x_{*i}|$, with the base reference $x_+ = (x_{*1}, x_{*2}, \ldots., x_{*n})$; where is the number of variables ; x_{ri} the value of variable is at destination; σ_i the standard deviation of the variable i; and $R^2_{i,i-1,\ldots.1}$the coefficient of determination of the regression$X_i$over$X_{i-1}, X_{i-2}, \ldots., X_1$, which includes the variance of X_i explained by the variables (Rodríguez et al., 2012; Ray 2014). This coefficient is an abstract, independent number of the units of measure in which the units are expressed (Somarriba and Pena 2009; Rodríguez et al., 2011).

The coefficient of determination$R^2_{i,i-1,\ldots.1}$measures the percentage of variance of each variable explained by the linear regression (Pena 2009; Rodríguez 2014). This factor $(1 - R^2_{i,i-1,\ldots.1})$, called the “correction factor” (Pena 1977), avoids redundancy in the variables (Murias et al. 2006; Escobar 2008; Rodríguez and Salinas 2012; Zarzosa 2012; Chasco 2014; Rodríguez, Holgado and Salinas 2015; Somarriba and Zarzosa 2016).

The DP_2 indicator thus provides each region’s distances from the theoretical reference destination. A higher DP_2 value indicates a lower level of seasonality at each destination, which is generally a great distance from the least desirable situation discussed (Somarriba et al. 2015).

Finally, this study estimates the relative importance of each partial indicator, such that the correction factor includes the additional information incorporated by each variable (Zarzosa 1992; 1996; Somarriba and Pena 2009; Pena 2009; Zarzosa 2009; Sánchez and Prada 2015).

4. RESULTS

4.1. DESCRIPTIVE ANALYSIS OF CHANGES IN TOURISM INDICATORS IN SPAIN

First, we add the information from each of the tourist destinations selected in the four categories (rural, coastal, urban inland, and urban coastal). Table 1 presents the evolution of these indicators.

More specifically, our results indicate that none of the four groups of destinations lost travelers during the period of crisis (2007-2013), relative to the base year (2007). This fact was due, to a great extent, to the effect of international arrivals of tourists, who could soften the fall in national tourism. These decreases were especially strong among urban inland and urban coastal destinations, -12.56% and -17.97%, respectively (Table1).

In aggregate, the greatest increases in number of travelers occurred in urban coastal and rural destinations. We see lower growth in arrivals in coastal and urban inland destinations.

Table 1: Descriptive indicators of evolution of tourism activity in Spain by destination

	Rural		Coastal		Urban inland		Urban coastal	
	Period of crisis	**Period of recovery**	**Period of crisis**	**Period of recovery**	**Period of crisis**	**Period of recovery**	**Period of crisis**	**Period of recovery**
Total number of travelers	6.20%	10.55%	1.54%	10.86%	3.75%	22.93%	11.22%	21.99%
Number of foreign travelers	59.70%	13.44%	11.53%	11.39%	12.50%	28.28%	29.27%	24.79%
Number of Spanish travelers	-4.60%	6.83%	-6.02%	9.55%	-12.56%	18.48%	-17.97%	18.96%
Average stay	6.62%	-10.95%	4.30%	-2.69%	-2.56%	1.09%	-8.37%	4.27%
Degree of occupancy	-9.37%	13.35%	-4.51%	10.29%	-16.51%	21.11%	-10.16%	9.96%

Source: The authors, based on data provided by the Spanish National Statistics Institute. Period of crisis: variation of data 2007-2013. Period of recovery: variation of data 2013-2016.

The data on average stay also show different behavior in urban destinations during the period of crisis, with decreases of -2.56 and -8.37% inland and on the coast, respectively, whereas the average stay grew in the other destinations. This unequal behavior of urban tourism also appears in degree of occupancy, which, despite the decrease in all types of destination, decreases more acutely in urban destinations.

In the recovery period, the number of travelers increased in the four categories of destinations, especially vigorously in urban destinations: by 28.28% in urban inland destinations and 24.97% in urban coastal ones. In this case, growth in arrivals nearly doubled that of the other two destinations. During these years, arrivals of foreign visitors grew more strongly. In contrast to the period of crisis, however, the increase in number of Spanish travelers supported the international flows.

During 2013-2016, average stay decreased in rural and coastal destinations. We note, however, a boom in urban destinations, of 1.09% and 4.27% for inland and coastal destinations, respectively. Again, we see different, cyclical behavior in the variable average stay, at both urban coastal and urban inland destinations. Finally, degree of occupancy grows in all areas, reaching a maximum of 21.11% in urban inland destinations.

This analysis reveals some patterns in the evolution of tourist activity as the economic cycle evolves. Specifically, in periods of recession, national tourism decreases, especially in urban destinations, as do average stay and degree of occupancy. These destinations seem to suffer greater change in phases of stagnation of activity.

Similarly, urban destinations show more dynamic behavior during the recovery phase. From these data, we can deduce that urban destinations seem to be more influenced by evolution of the economic situation (Table1).

4.2 INTENSITY OF TOURISM SEASONALITY

The set of representative variables provides an image of seasonality of destinations. Pena's methodology also enables us to identify the variables from the group proposed that provide the most relevant information of analysis of seasonality in the tourism sector.

A higher value of the DP_2 indicator thus means a better position in the ranking (Rodríguez 2011). Specifically, for the ranking of tourist areas, a higher value of the DP_2 indicator represents a lower intensity of tourism seasonality.

From the ranking generated for 2007 (Table 2), we see that the first quartile includes urban destinations only, while no urban destinations appear in the last two quartiles. The starting year of the sample shows greater annual stability of urban destinations and thus greater seasonality for coastal and rural ones. That this result is consistent with the literature (Martín et al. 2014; Ahas et al. 2005; Silm and Ahas 2005; Duro 2016) strengthens the validity of the indicator proposed in this study.

We also stress that, following the crisis period (ranking for 2013), 60% of urban inland destinations worsened in relative position of seasonality, as did 66.67% of urban coastal destinations. This intensification occurs in only 50% of coastal destinations and only 26.32% of rural ones (Table 2).

As to the period of economic expansion, the data for 2016 again show greater changes in urban destinations. We observe improvements in relative position of seasonality in 50% of cases, with similar figures for inland and coastal locations. Further, 37.50% of non-urban coastal destinations improve their position and 42.11% of rural ones (Table 2).

In sum, urban destinations show the greatest changes in response to evolution of the economic cycle. In this case, we see that their seasonality worsens with situations of crisis and improves with economic recovery more markedly than in other destinations. This situation could be conditioned by the decreases recorded in the number of trips by national travelers, which are more closely related to secondary trips throughout the year (Martín et al. 2014).

Higher vs. lower income per household thus conditions the number of vacation trips, and trips taken outside the main vacation periods may be the first to be eliminated. We observe that seasonality is heightened in periods of crisis and reduced in periods of recovery. This finding is also supported by the data presented on evolution of average stay and degree of occupancy.

Table 2: Ranking of tourism seasonality for the years 2007, 2013, and 2016. Main Spanish tourism destinations

Tourism destination	2007	2013	2016	POSITION 2007	POSITION 2013	POSITION 2016
UI Madrid	10.8765	10.0533	9.5183	1	1	1
UC Barcelona	10.6036	9.8785	9.3130	3	4	2
UI Seville	9.8539	9.3529	9.2270	9	9	3
UI Granada	10.6952	9.8967	9.1064	2	3	4
UI Toledo	9.8180	9.5239	9.0975	10	6	5
UI Córdoba	10.1065	9.4745	9.0954	6	7	6
UI Zaragoza	10.3301	9.5790	9.0796	5	5	7
UC Málaga	9.6419	9.1769	8.9834	11	11	8
C Island of Tenerife	9.2294	9.9565	8.8127	14	2	9
UI Salamanca	9.9269	9.3594	8.7782	7	8	10
UC Valencia	10.5856	9.2692	8.6062	4	10	11
UI Bilbao	9.8742	8.9113	8.3479	8	14	12
C Island of Lanzarote	8.1643	8.9404	8.3116	19	13	13
UC San Sebastián	9.3998	9.0108	8.2931	12	12	14
C Coast of Guipuzkoa	9.1756	8.6932	8.2340	15	16	15
C Costa Blanca	9.0388	8.4288	8.0871	16	18	16
UI Oviedo	9.2598	8.3309	7.6646	13	19	17
C Island of Fuerteventura	7.4835	7.7508	7.6441	24	21	18
R Island of Tenerife	7.8180	8.7867	7.5838	22	15	19
C Costa Del Sol (Málaga)	8.0063	7.1089	7.4282	20	24	20
R Teide National Park	7.8839	8.5349	7.1997	21	17	21
R Los Alcornocales Natural Park	6.0129	6.1718	7.0277	37	32	22
R Sierra de Aracena y Picos de Aroche Natural Park	6.8229	6.6566	6.8487	28	28	23
UI Santiago de Compostela	8.6046	8.0508	6.7517	17	20	24
UC Palma de Mallorca	8.2072	7.5314	6.6584	18	22	25
R Costa Daurada	6.3549	5.9526	6.6126	31	35	26
UC Marbella	6.7596	5.8212	6.5884	29	36	27
R Northern Extremadura	7.1422	7.0507	6.4289	26	25	28
R Basque Pyrenees	6.8560	6.4106	6.2731	27	29	29
C Palma - Calvía	7.3021	7.1966	6.1286	25	23	30
R P. Natural Volcanic Area of la Garrotxa	5.5019	6.7057	5.8455	43	26	31
R Pyrenees	6.2367	6.2945	5.8346	33	30	32
C Costa Brava	6.0893	6.2901	5.6779	35	31	33
C Island of Mallorca	6.2876	6.6596	5.6222	32	27	34
R Costa Brava	5.9311	6.1211	5.4760	40	33	35
R Costa Guipuzkoa	6.0078	5.1528	5.4679	38	46	36
R Navarre Pyrenees	6.0887	5.6885	5.3745	36	39	37
C Rías Baixas (Pontevedra and A Coruña)	6.3870	6.0387	5.2824	30	34	38
R Island of Mallorca	4.8060	5.2263	5.2318	45	45	39
C Coast of Almería	7.7638	5.5319	5.2172	23	41	40

R Aragonese Pyrenees	5.9582	5.2369	5.1461	39	44	41
C Costa De La Luz, Cádiz	6.1147	5.4272	5.0818	34	42	42
C Castellón Coast	4.7934	5.5667	5.0516	46	40	43
R Sierras de Tejeda, Almijara y Alhama Natural Park	5.9203	5.7777	5.0404	41	38	44
R Saja-BesayaNatural Park	5.2379	5.7899	4.7829	44	37	45
C Costa De La Luz (Huelva)	5.5464	4.9291	4.7398	42	47	46
C Costa Daurada	4.4338	5.2566	4.2565	47	43	47
R Picos de Europa National Park	3.4229	4.1947	3.6227	49	48	48
R Rías Baixas	3.3582	3.5883	3.4899	50	50	49
C Island of Ibiza-Formentera	3.5345	3.9914	3.3616	48	49	50
R Costa Verde	1.7712	0.8600	0.9119	51	51	51

Source: The authors, from data provided by the Spanish National Statistics Institute. C = non-urban coastal destination; R = rural destination; UI = urban inland destination; UC = urban coastal destination.

4.3 ORDER OF PARTIAL INDICATORS

This section analyzes the relative importance of each variable in the final indicator, using the correction factor (Zarzosa 2012). Using this method, we can extract the factors that most strongly determine seasonal intensity. This result is a complementary contribution of our study.

Table 3 presents the ranking of partial indicators obtained from theDP_2 procedure, as well as the correction factor for each. The cardinal order of the variables corresponds to the order in which they enter the indicator. For example, Variable 1 would be the number of overnight stays by national travelers.

Based on these results, the GI calculated over “number of overnight stays by national travelers” is the only variable that provides complete information (new and useful), with a correction factor of 100%. This variable contributes the most non-redundant information and is thus a very strong determining factor in the definition of seasonal intensity (Table 3). Further, this variable maintains the same importance in all three years analyzed, 2007, 2013, and 2016.

Table 3: Classification of variables, in order of entry, and correction factor. 2007, 2013, and 2016

Variables	2007	2013	2016
Number of overnight stays by national travelers	1.0000	1.0000	1.0000
Number of national travelers	0.1835	0.3243	0.0881
Degree of occupancy, weekends	0.3876	0.2849	0.3285
Number of foreign travelers	0.1324	0.1794	0.1381
Number of overnight stays by foreign travelers	0.3122	0.2241	0.2471
Average stay	0.2016	0.0303	0.0428
Number of beds available	0.0442	0.1060	0.1298
Degree of occupancy	0.3278	0.1046	0.1419
Personnel employed in tourism establishments	0.0342	0.0246	0.0203

Source: The authors, based on data from the Spanish National Statistics Institute, 2015.

In 2007 and 2016, the second-most-important variable is the CV calculated over "degree of occupancy on weekends". In 2013, in contrast, the GI estimated over "number of national travelers" acquires more specific weight, with a significant impact on the final result of seasonal intensity of the destinations (Table 3).

In a year of little dynamism of demand, such as 2013, the definition of seasonality was a strongly determined by the number of national travelers. In periods of economic growth like that of 2016, seasonality seems to depend to a greater extent on weekend trips (Table 3). These data are consistent with those described above, in the sense that the seriousness of the seasonality is highly conditioned on secondary trips.

4.4 DISCRIMINANT POWER OF THE VARIABLES

The Ivanovic Discrimination Coefficient (IDC) (Ivanovic 1974; Zarzosa 1996) enables us to measure the degree of information provided by the different variables simultaneously and to conclude whether one variable contains a high volume of useful information. In this way, the process of calculating the DP_2 gives us the value of the indicator for each destination. The more precise option would be the indicator that provides the most information (Zarzosa 1996; Pena 2009; Cuenca and Rodríguez 2010; Rodriguez 2014).

Based on the foregoing, we apply the results of the IDC to achieve these goals (Table 4). The resulting values of the IDC range from 0-2 (Zarzosa 1994), where 0 shows no discriminant power, and the maximum value of 2 indicates that this variable is a strong factor in determining levels of seasonality among regions.

More specifically, the variables that explain the regional divergences in levels of seasonality to the greatest extent are linked to "monthly differences in arrivals of foreign tourists". These values are highlighted in Table 4.

Table 4: Amount of information provided by the variables, according to the Ivanovic Discrimination Coefficient (IDC). 2007, 2013, and 2016

	2007	2013	2016
Number of overnight stays by national travelers	0.0172	0.0180	0.0173
Number of national travelers	0.0150	0.0244	0.0236
Occupancy, weekends	0.0210	0.0163	0.0178
Number of foreign travelers	0.0583	0.0509	0.0581
Number of overnight stays by foreign travelers	0.0584	0.0508	0.0578
Average stay	0.0359	0.0713	0.0358
Number of beds available	0.0371	0.0334	0.0334
Degree of occupancy	0.0233	0.0271	0.0318
Personnel employed in tourism establishments	0.0305	0.0325	0.0316

Source: The authors, based on data from the Spanish National Statistics Institute, 2015.

In 2013, a marked contrast again emerges. The variable with the greatest discriminant power is "average stay," which had already shown clear cyclical behavior in urban destinations. These destinations are thus primarily affected by the negative economic evolution of tourist activity, as can be deduced from our results.

Second, in 2013, the relevance of the variable "annual differences in number of overnight stays by foreigners" stands out. This variable complements the previous one in justifying the inequalities in the different levels of seasonality among regions (Table 4).

Finally, the data for 2016 grant greater discriminant power to the two variables related to the international component of tourism, number of arrivals of foreigners and number of overnight stays by foreigners. A large portion of the differences in performance of destinations is thus explained—in a world leader in tourism such as Spain (Martín et al., 2018)—by success in capturing foreigners in peak economic periods.

5. CONCLUSIONS

Contextualizing the four groups of destinations analyzed by developing the DP_2 distance method shows unequal behavior in levels of seasonality in urban destinations. These destinations seem to be the ones most affected by economic context, in periods of both crisis and economic expansion, due especially to the effect of national tourism. This result suggests that residents maintain their primary vacations but reduce secondary trips to urban destinations throughout the year, a decision that could increase these destinations' seasonality.

These trends are softened by foreign tourism, which comes from issuing markets, surely primarily markets whose tourist activity was hitless hard by the crisis. In urban destinations, the average stay seems to change in tandem with the direction of the economic cycle, decreasing markedly in times of crisis and increasing in periods of expansion.

According to the classification of seasonal intensity, seasonality during the crisis increased over that in 2007 in urban inland destinations such as Madrid and urban coastal destinations such as Barcelona (Table 2).These data register a much higher proportion than do rural enclaves like Costa Verde, for example, or non-urban coastal areas, such as Ibiza-Formentera.

The opposite occurs in periods of economic expansion. The proportion of destinations that improve their relative position in the seasonality ranking is much higher in urban destinations than in non-urban and rural coastal destinations.

Similarly, the DP_2 indicator quantifies seasonality that (despite the foregoing results) is more contained in urban destinations, since the last two quartiles of the ranking show no urban destinations (Table 2), but rather rural and non-urban coastal destinations. On this point, we would underscore that application of this indicator is one of the main contributions of this study from a methodological perspective.

The validity of the results provided is also confirmed by the fact that they are consistent with previous studies, in which urban destinations are generally shown to be less seasonal and coastal ones more affected by seasonal trends (Palang et al., 2005; Ahas et al., 2005; Martín et al., 2014; Duro 2016).

Number of overnight stays by national travelers is the partial indicator that provides the most information in construction of the synthetic indicator. It is thus a determining factor in quantifying seasonal intensity. This variable maintains the same importance in all three years analyzed.

In 2007 and 2016, the second-most-significant variable is the CV for “degree of occupancy on weekends,” whereas the GI calculated over “number of national travelers” acquired more importance in 2013.

In the year of crisis in economic activity, quantification of seasonality depended more greatly on number of national travelers, while seasonality seems to even out in periods of growth, due to weekend trips.

In 2007 and 2016, the most strongly determining partial indicators for differences in seasonal intensity among regions were those related to “monthly divergences in arrivals of foreign travelers.” These variables have a decisive impact on the annual level of stability of tourism in the regions analyzed.

In periods of economic stagnation, like that of 2013, however, the variable “average stay” shows the greatest differences among the regions, especially in urban destinations, which are highly determined by the sign of the economic cycle.

The implications of this study can be considered by organizations and public institutions dedicated to tourism in Spain, within a general framework of strengthening quality, innovation, and sustainable management in the sector. We have verified that urban destinations suffer the greatest increase in seasonality in periods of recession, with a severe impact on the results of their activity.

In situations of lower demand, public policies that support modernization and promote tourism should thus concentrate their efforts primarily on disseminating and fostering trips outside high season to urban destinations in Spain. Given that these destinations recover more actively, by analogy, public actions after the crisis (in periods of expansion) could reduce their promotion channels in urban enclaves and focus actions on the other destinations.

Finally, it is important to note that success in containing increase in seasonality depends to a great extent on flows of foreign tourists. Destinations that suffer most in periods of crisis—urban destinations—should be the subject of periodic international campaigns to promote the Spanish tourism market, campaigns that stress issues such as good practices, sustainability, knowledge, and technological innovation, along the lines of research by other authors, such as Martín et al. (2019). They should also, however, strengthen airline connections and other types of traveler transportation through support of the public and private sectors.

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