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Determination of the Public Expenditure Efficiency,
and Analysis of Technological Aspects:
A Cross-Country Study

Determinación de la Eficiencia del Gasto Público y
Análisis de los Aspectos Tecnológicos:
Un Estudio “Cross-Country”

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Este trabajo es fruto de la participación, directa o indirecta, de distintas personas, corrigiendo, opinando, dándome ánimos, teniendo paciencia y acompañándome tanto en los momentos buenos como en los no tan buenos, sobre todo en los últimos meses. A todas ellas, gracias.

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INTRODUCCIÓN

La administración de los recursos públicos ha sido fuente permanente de preocupación y debate político para la ciudadanía y sus organizaciones a fin de garantizar la prestación de los servicios públicos. Además, la gestión y el control de los recursos públicos es una cuestión fundamental para el desarrollo eficiente de la actividad económica.

La "OECD - Organisation for Economic Co-operation and Development" afirma que un gobierno eficiente contribuye a fortalecer la democracia y los derechos humanos; promueve la prosperidad económica y la cohesión social; reduce la pobreza; estimula la protección ambiental y el buen uso de los recursos naturales, acrecentando con ello la confianza en la administración pública y el gobierno.

De acuerdo con las declaraciones de Cecilia Malmström, Comisario de Asuntos de Interior en la Unión Europea, la corrupción sigue siendo un reto para Europa, un fenómeno que cuesta a la economía europea unos 120.000 millones de euros al año (EU Commission, 2014).

Los escándalos de corrupción y malversación de fondos en los que se ha visto envuelto el sector público en los últimos años, así como la crisis económica de 2008 -que trajo consigo el colapso de las instituciones financieras, empresas y economías-, han hecho aumentar aún más el interés de los ciudadanos por la buena gestión de sus instituciones públicas, solicitando el desarrollo de mecanismos efectivos de gobierno corporativo (en adelante GC), un fenómeno que tradicionalmente ha sido abordado a nivel científico desde una perspectiva más relacionada con la contabilidad y las finanzas privadas.

Según la OECD, citado por Costa Marques (2007), GC es el sistema o sistemas por el cual las sociedades -tanto públicas, como privadas- son dirigidas y controladas.

El discurso del buen gobierno en el sector público está empezando a ser tan importante como el de la responsabilidad social en el sector privado, en parte por la evolución lógica del tema y, en gran parte, por los escándalos en los que se ha visto envuelto el sector público en los últimos años (Flórez et al., 2011).

Las aportaciones son todavía incipientes y suponen una primera aproximación al tema, que se irá reforzando y ampliando a medida que los diferentes grupos de interés vayan demandando nuevas formas de gestión y rendición de cuentas. La mayoría de los trabajos desarrollados hasta ahora se centran en la caracterización del buen gobierno,

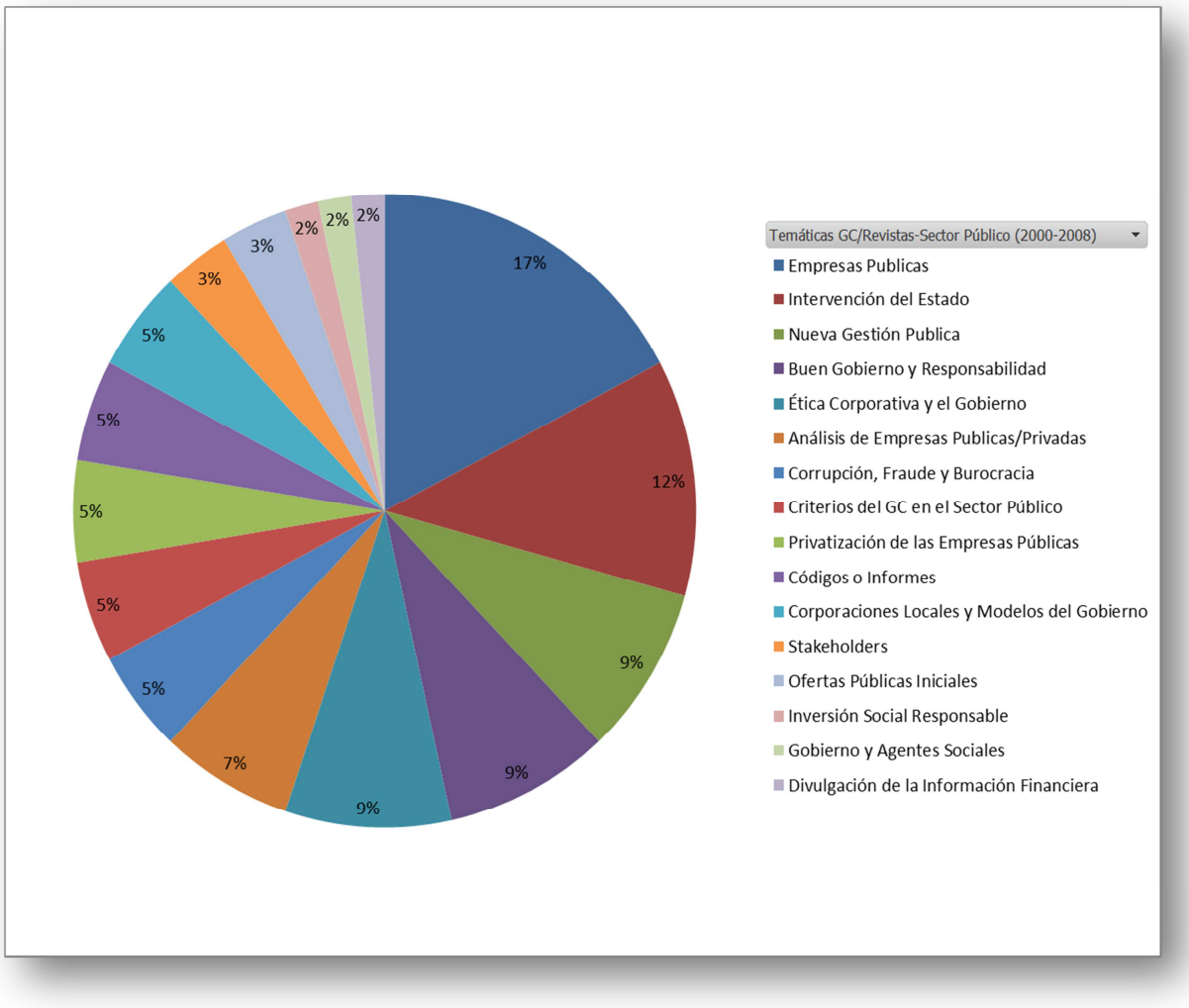
que puede ser visto como un mecanismo eficaz de gestión (Benz y Frey, 2007). Esto, tal y como trataremos más adelante, podría ayudar a restaurar la confianza en las instituciones.

Ya lo adelantó el gran filósofo chino Confucio (551 a. C. - 479 a. C.) en una de sus citas:

"…arréglese al estado como se conduce a la familia, con autoridad, competencia y buen ejemplo…"

Flórez et al. (2011), tras una amplia revisión de la literatura, afirman que las principales temáticas de GC en el sector público abordadas en los artículos publicados entre los años 2000-2008, en revistas de diferentes áreas del conocimiento -Economía; Administración y Gestión; Desarrollo y Planificación; Finanzas; Administración Pública; y Ética- incluidas en el "SSCI- Social Science Citation Index" con un índice de impacto superior a 0,25 y con más de 50 referencias, fueron: empresas públicas (17%); intervención del estado (12%); nueva gestión pública (9%); buen gobierno (9%) y ética corporativa (9%), tal y como recoge la Ilustración 1.

Ilustración 1: Temáticas de GC en el sector público (2000-2008)



Fuente: Elaboración propia a partir de Flórez et al. (2011)

Entre las distintas teorías que han enmarcado los estudios realizados hasta la fecha en GC del sector público, podemos destacar la del Imperio de la Ley (Hood, 2001; Bastida y Benito, 2007; Benito y Bastida, 2009); los "stakeholders" (Heath y Norman, 2004; Costa Marques, 2007); la teoría de la agencia (Hood, 2001; Heath y Norman, 2004; Bastida y Benito, 2007; García Sánchez, 2007; Benito y Bastida, 2009; Alt y Lowry,

2010;); del buen gobierno (Benz y Frey, 2007; Welch, 2012); los modelos inclusivos de participación (Feldman y Khademian, 2007); y la nueva gestión pública (Hood, 1991; Aucoin, 1990; Torres y Piña, 2004; García Sánchez, 2007).

Siguiendo a Hood (1991), Aucoin (1990) y Torres y Piña (2004), entre otros, la cultura organizacional en el ámbito público ha dado un giro muy importante, tomando como eje fundamental la prestación de un buen servicio a los ciudadanos, aumentando la responsabilidad e impulsando la realización de mejores prácticas. Estos cambios se han venido a denominar la nueva gestión pública o "new public management" (en adelante NGP).

Siguiendo a García Sánchez (2007), la NGP persigue la creación de una administración eficiente y eficaz. Es decir, una administración que satisfaga las necesidades reales de los ciudadanos al menor coste posible, favoreciendo para ello la introducción de mecanismos de competencia que permitan la elección de los usuarios y a su vez promuevan el desarrollo de servicios de mayor calidad, con sistemas de control que otorguen una plena transparencia a los procesos, planes y resultados, para que por un lado, perfeccionen el sistema de elección, y, por otro, favorezcan la participación ciudadana.

García Sánchez (2007) realiza una síntesis de las actuaciones desarrolladas por la NGP, cuyas líneas básicas se desglosan en la Ilustración 2.

Ilustración 2: Actuaciones de la NGP

La Nueva Gestión Pública

TEORÍA	ACTUACIONES		
PUBLIC CHOICE COSTES DE TRANSACCIÓN	Reformas en la estructura organizativa	*Reducciones puras de la dimensión*	Privatizaciones
			Gestión indirecta de servicios
		Reducciones híbridas o intermedias de la dimensión	Introducción de competencia externa
			Cooperación o colaboración
		Modificaciones en el diseño organizativo	Creación de competencia interna
NEO-TAILORISMO			Simplificación de la estructura jerárquica: La descentralización
	Racionalización normativa y cultural	*Racionalización normativa*	Racionalización procedimientos administrativos
			Desburocratización
		Racionalización cultural	Desarrollo de políticas de personal
TEORÍA DE LA AGENCIA			Introducción de técnicas privadas
			Innovación tecnológica
	Transparencia de la Administración	*Comunicación externa*	
		Participación ciudadana	

Fuente: García Sánchez (2007)

Basándonos en la teoría de la agencia, es de esperar que una mayor innovación tecnológica, comunicación y participación ciudadana en la toma de decisiones vía nuevas tecnologías, tenga efectos positivos en la creación de una administración más eficiente y eficaz.

El estudio de la e-administración y del impacto de las Tecnologías de la Información y las Comunicaciones (en adelante TIC) en las administraciones públicas, es un objeto multidimensional de investigación que debe ser abordado no sólo desde el enfoque de

las Ciencias Políticas, sino también desde el enfoque de la Ciencia de la Administración (Criado y Ramilo, 2001).

El desarrollo de las tecnologías de procesamiento de datos ha hecho posible una mejora en los informes financieros, especialmente en el sector público, donde se dispone de una gran cantidad de información necesaria para evaluar la situación económica del país. Sin embargo, esto sólo es apreciado por los agentes económicos a la hora de tomar decisiones si se suministra en el momento preciso, mejorando la credibilidad en el estado.

La globalización y los avances en materia de nuevas tecnologías, especialmente en Internet, han dado lugar a una serie de iniciativas y demandas de carácter interactivo que están sometiendo a las administraciones públicas de todo el mundo a una importante presión para innovar y cambiar la forma en la que se relacionan con los ciudadanos.

La adopción de las TIC ha sido una tendencia global y un elemento esencial en los programas de modernización de las administraciones públicas en las democracias occidentales. En la búsqueda de nuevos estilos de gobernanza, las TIC pueden resultar un instrumento positivo de mejora de la confianza de los ciudadanos en la administración, facilitando la participación ciudadana.

Actualmente, a través de Internet, los ciudadanos pueden descargar formularios, realizar consultas o pagar impuestos. Sin embargo, no todos los países, ni todos los sectores de la economía están haciendo un uso similar de las webs en materia de rendición de cuentas.

Existe una iniciativa en el entorno británico que exige a las entidades locales difundir sus cuentas en sus páginas web. Y otros países, como los nórdicos, han introducido ya sus respectivas leyes de transparencia que permiten el acceso general a documentos públicos. En nuestro país se da una cierta difusión en las webs a los presupuestos públicos, pero menos a las cuentas anuales que son las que informan sobre la situación financiera real a final de año.

Sería ideal que cualquier ciudadano pudiera acceder en todo momento, gratuitamente, de forma telemática o personal, a cualquier tipo de información, documento, o

movimiento contable detallado referente a cualquier administración pública, entidad o empresa pública y entidad o empresa privada con cualquier porcentaje de participación pública o que realice funciones públicas, sin más excepciones que los límites previstos en la Constitución.

Las TIC se perfilan como herramientas con un enorme potencial para lograr administraciones públicas que gestionen con mayor calidad, eficacia y eficiencia los servicios y recursos públicos (Criado y Ramilo, 2001).

Por otra parte, la satisfacción de los diferentes interlocutores sociales gira en torno a una demanda de mayor información y participación en la vida pública (Feldman y Khademian, 2007), lo que hace necesaria una mayor divulgación y una forma de funcionamiento más transparente en el gobierno de las instituciones.

Alt y Lassen (2006) propugnan que los incrementos en la transparencia fiscal reducen el déficit público y la deuda acumulada. Los países con mayores niveles de transparencia y normas de buen gobierno cuentan con instituciones más fuertes, que favorecen el crecimiento económico y el desarrollo social (Bastida y Benito, 2007; Siegle, 2001, citado en Benito y Bastida, 2009).

Con mayores niveles de transparencia, los políticos tienen menos posibilidad de eludir las restricciones fiscales (Reviglio, 2001), reduciéndose el riesgo de que existan problemas de agencia e información asimétrica (Hood, 2001), pudiendo así los ciudadanos juzgar mejor y con más criterio la capacidad de sus líderes y decidir en consecuencia, dando lugar a gobiernos más eficientes. Una mayor transparencia permite una mejor fiscalización de la actividad pública, contribuyendo a la necesaria regeneración democrática, lo que se espera esté positivamente relacionado con una mayor eficiencia.

El sector público tiene que aspirar a la excelencia y trabajar para conseguirla, se lo debe a los ciudadanos, sus accionistas en última instancia. Para conseguir dicha excelencia es imprescindible, hoy más que nunca, la competencia, la transparencia y el control en las operaciones en los procesos de decisión de las administraciones públicas. Se trata de dar respuesta a lo que los ciudadanos esperan.

La transparencia es garantía de confianza y objetividad. El término transparencia se refiere a una política de información relevante más accesible y fiable. Es la provisión de información al público sobre las operaciones del gobierno, un importante medio para evaluar el buen desempeño, proporcionando elementos de juicio de buena gestión o buen gobierno (Welch, 2012). Por el contrario, una pobre divulgación financiera se podría asociar a ciertas ineficiencias (Niskanen, 1975), o incluso corrupción (Hood, 2001; Matheson y Know, 2003; Bastida y Benito, 2007).

Se debería observar a nivel mundial que los países democráticos sean los que ofrecen más transparencia en sus cuentas, los que dedican más recursos a la difusión de sus gastos e ingresos y los que le otorgan mayor importancia a la credibilidad que proyectan al exterior. Y entre las democracias, los países desarrollados son los que deberían invertir más en sistemas de participación ciudadana y gobierno 2.0 apoyándose en el conocimiento de las nuevas tecnologías aplicadas a Internet.

El gobierno 2.0, gobierno en red, gobierno abierto, gobierno como plataforma o gobierno colaborativo es el reflejo de la transparencia, la apertura y la colaboración entre el ejercicio del estado y los usuarios. Una web interactiva y abierta a sus visitantes (Fages, 2008; Ramírez-Alujas, 2012).

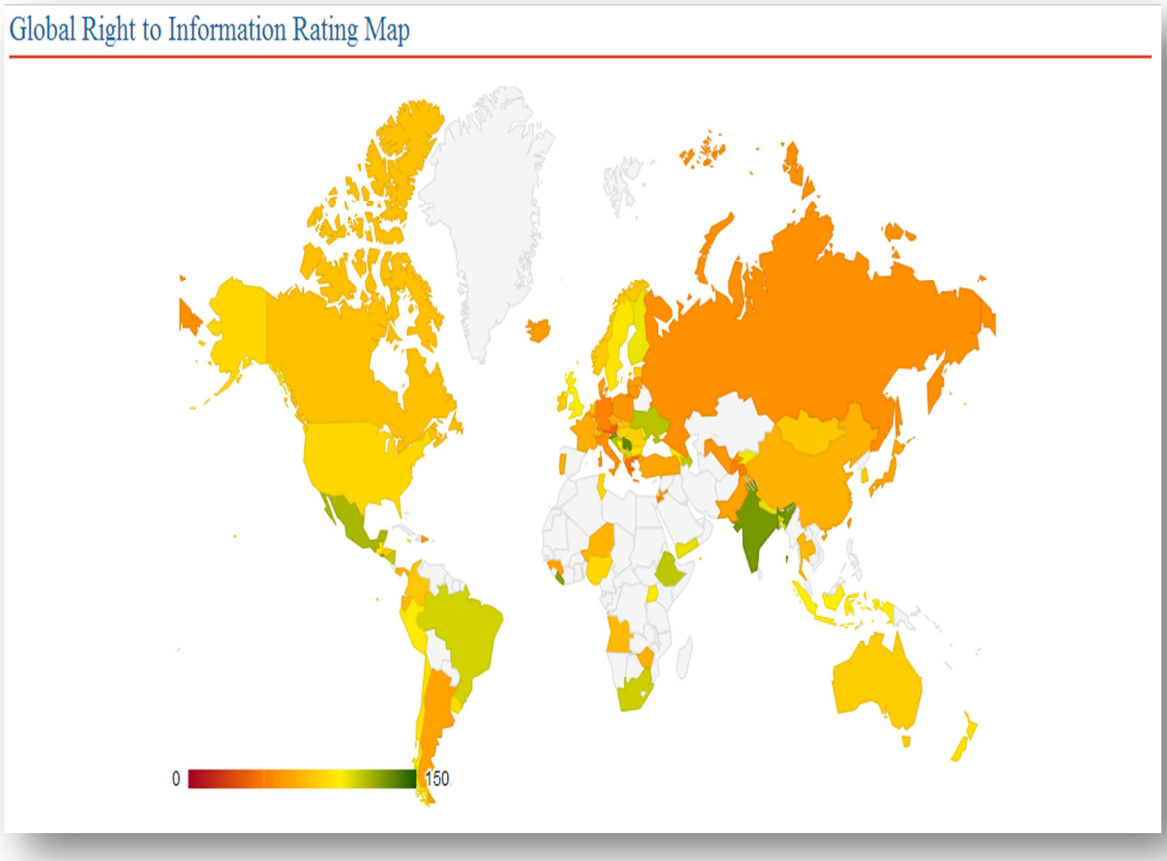
En la actualidad es clara la preocupación de los ciudadanos por la transparencia en la actividad pública, articulada a través de obligaciones de publicidad activa para todas las administraciones y entidades públicas.

Tal y como queda recogido en la Ilustración 3, a principios de 2013, según “The Global Right to Information Rating” o Calificación RTI 2013, que evalúa la solidez del marco legal de los países para garantizar el derecho a la información -sin medir la calidad de la ejecución-, más de 90 países ya tenían aprobadas leyes de acceso a la información, entre los que se podía mencionar Estados Unidos (1966), Australia (1982), República Checa (1999), México (2002), China (2007) o República Tunecina (2011), destacando Suecia por la precocidad de su norma, que data de 1766.

En 2013, junto a Chipre y Luxemburgo, España formaba parte del reducido grupo de países miembros de la Unión Europea que carecía de una normativa que abra la puerta a los documentos oficiales. El Consejo de Ministros de 27 de julio de 2012 aprobó el

Proyecto de Ley 121/19 de Transparencia, Acceso a la Información Pública y Buen Gobierno.

Ilustración 3: The Global Right to Information Rating



Fuente: Calificación RTI (2013)

El marco institucional y económico de la Unión Europea promueve la rendición de cuentas y la transparencia, fortaleciendo la participación de las organizaciones de la sociedad civil y la ciudadanía en la definición y la puesta en práctica de sus políticas.

Tal y como recoge la exposición de motivos del Proyecto de Ley 121/19 de Transparencia, Acceso a la Información Pública y Buen Gobierno (publicado en el Boletín Oficial de las Cortes Generales de 7 de septiembre de 2012), la transparencia, el acceso a la información pública y las normas de buen gobierno deben ser los ejes fundamentales de toda acción política. Solo cuando la acción de los responsables públicos se somete a escrutinio, cuando los ciudadanos pueden conocer cómo se toman las decisiones que les afectan, cómo se manejan los fondos públicos o bajo qué criterios actúan nuestras instituciones, podremos hablar de una sociedad crítica, exigente y participativa.

Según la OECD (2011), gracias a los nexos que los gobiernos crean con los ciudadanos, usuarios y funcionarios con el propósito de innovar y entregar mejores resultados en el servicio público se puede conducir a la creación de políticas más creativas que permitan a los gobiernos brindar mejores servicios públicos en una época marcada por las restricciones fiscales. Aunque la participación ciudadana todavía no se haya desarrollado del todo en muchos países, hay señales de que éstos han emprendido el rumbo hacia reducciones de costos, mejor calidad de servicios y mayor satisfacción de los usuarios.

La clave para mejorar la prestación de los servicios públicos es la apertura y desarrollo de un proceso de comunicación, responsabilidad y ajuste mutuo entre quienes pagan y los que reciben y proveen los servicios públicos (Ezzamel y Willmott, 1993).

En este contexto, la presente tesis doctoral analiza la relación existente entre una de las principales actuaciones desarrolladas por la NGP basadas en la teoría de la agencia según García Sánchez (2007) -innovación tecnológica; comunicación externa y participación ciudadana en la toma de decisiones vía nuevas tecnología- y el grado de eficiencia alcanzado por el estado, teniendo en cuenta diversas variables sociales, políticas y económicas.

La investigación se llevó a cabo dentro del programa del Doctorado en Ciencias de la Empresa, distinguido con Mención hacia la Excelencia por el Ministerio de Educación, impartido en la Universidad de Murcia y debido a su envergadura, se materializó en diversas investigaciones parciales.

Basándonos en la literatura previa, desarrollamos un índice de eficiencia del gasto público que aplicamos a los tres trabajos realizados: dos estudios transversales de una misma muestra de 35 países desarrollados -los 28 Estados miembros de la Unión Europea, 2 países candidatos a la adhesión a la UE (Islandia y Turquía) y otras economías avanzadas clave, como Estados Unidos, Japón, Suiza, Noruega y la República de Corea-; y unos datos de panel, con el objetivo de evaluar la evolución temporal de los distintos indicadores, centrándonos en el caso europeo para el período 2007-2012, con una muestra de 25 países -algunos Estados miembros de la UE -Austria, Bélgica, Bulgaria, Estonia, Finlandia, Francia, Alemania, Grecia, Hungría, Irlanda, Italia, Letonia, Lituania, Países Bajos, Polonia; Rumania, República Eslovaca; Eslovenia y España- 2 países candidatos a la UE (Albania y Turquía) y otros países europeos como Azerbaiyán, Georgia, Rusia y Ucrania.

A la hora de seleccionar los instrumentos de medición del resto de variables estudiadas, realizamos una extensa revisión bibliográfica que concluyó con aquellos más apropiados al caso objeto de estudio.

Se tuvo en cuenta la progresividad del proceso de información, la comparabilidad de la información en aquellos puntos relevantes en base a su evolución, el contexto social, político y económico, la metodología que se haya utilizado para la obtención de los datos que se ofrecen y su accesibilidad, dado que la información publicada debería ser de fácil acceso y clara en su exposición para que sea comprensible para todas las partes interesadas.

Así construimos una extensa base de datos con los diferentes indicadores para los distintos países durante el periodo objeto de estudio y utilizamos distintas técnicas estadísticas que trataremos más en profundidad en los respectivos capítulos.

Las preguntas clave fueron: ¿Los gobiernos son eficientes en la asignación de los gastos públicos?; ¿Cómo pueden las autoridades públicas gestionar los recursos públicos de una manera más eficiente?

Las principales hipótesis de partida de cada uno de los trabajos, tal y como veremos en los distintos capítulos de esta tesis, fueron:

Trabajo 1:

H1: Una mayor eficiencia pública, tanto a nivel global como en cada una de sus funciones, está significativamente asociada con un mayor nivel de desarrollo del país.

H2: Mayores niveles de democracia y densidad demográfica, así como menores niveles de corrupción, están asociados con niveles significativamente mayores de eficiencia pública.

H3: Estudiando cada función pública de forma independiente, un mayor tamaño del sector público o gasto, está asociado con un nivel significativamente mayor de desempeño o rendimiento público.

Trabajo 2:

H1: Un mayor alcance y calidad de los servicios en línea (en adelante OSI)[1] se asocia significativamente con un mayor nivel de eficiencia del gasto público, tanto para el gobierno en general como para algunas de sus funciones.

H2: Un mayor nivel de desarrollo de gobierno electrónico se asocia con un nivel significativamente mayor de eficiencia del gasto público. Esto implica que tanto el nivel de desarrollo de las infraestructuras en telecomunicaciones, como el capital humano (o nivel cultural de la población), afectan al impacto positivo de OSI sobre la eficiencia del gasto público[2].

H3: El nivel de desarrollo del país, afecta al impacto positivo que ejerce el nivel de desarrollo del gobierno electrónico sobre el nivel de eficiencia del gasto público.

[1] Esta variable recoge diversos aspectos como la participación en la toma de decisiones y la comunicación y la transparencia pública a través del uno de las TIC

[2] Matemáticamente, el nivel de desarrollo de gobierno electrónico (EGDI) es un promedio ponderado de los valores normalizados de las tres dimensiones más importantes del gobierno electrónico -el alcance y la calidad de los Servicios en Línea (OSI), el estado de desarrollo de las Infraestructuras en Telecomunicaciones y el capital humano o nivel cultural de la población del país.

Trabajo 3:

H1: Una mayor eficiencia pública a nivel global, está asociada significativamente con mayores niveles de desarrollo de gobierno electrónico, nivel cultural de la población, nivel de desarrollo del país, democracia, así como un menor nivel de corrupción.

H2: En educación, sanidad y protección social, un mayor nivel de eficiencia pública, se asocia significativamente con un mayor nivel de desarrollo de gobierno electrónico, nivel cultural de la población, nivel de desarrollo del país, democracia, así como un menor nivel de corrupción.

Esta tesis se estructura en las siguientes secciones: tres capítulos con las distintas investigaciones parciales realizadas, con sus correspondientes secciones; unas conclusiones con el resumen global de los resultados, discusión, así como aportaciones científicas y líneas de trabajo futuro derivadas directamente de la tesis doctoral; y un resumen con los objetivos de la investigación y las conclusiones finales, en el que se unifican todos los resultados parciales presentados en cada uno de los trabajos.

CHAPTER 1

FACTORS AFFECTING PUBLIC EXPENDITURE EFFICIENCY IN DEVELOPED COUNTRIES

1.1 INTRODUCTION

Effective governments improve people's standard of living by ensuring access to essential services and the opportunity to live and work in peace and security (World Bank website). Excessive bureaucracy and red tape, overregulation, corruption, dishonesty in public contracts, lack of transparency, and the political dependence of the judicial system impose significant economic costs on businesses and slow down economic development (World Economic Forum, 2013).

Citizens want more accountability and transparency from their governments, and performance measurement is increasingly seen as both a way of monitoring progress and demonstrating performance for internal and public stakeholders (Sanger, 2013).

Total government expenditure stands at over forty percent of Gross Domestic Product (GDP) in many developed countries. But key questions are: (i) are governments efficient in expenditure allocation? ; (ii) how can public authorities manage public resources more efficiently?

Over the longer term, studies that measure public efficiency will contribute to highlighting best practices, learning about causes of performance differences among governments and the impact of public sector reforms (Lonti and Woods, 2008), as well as determining the actions that need to be focused on.

There are many studies relating to efficiency in the management of public services and its relationship to other economic and financial variables. In public finance purview, a growing academic literature has been investigating the effects of public expenditure on macroeconomic stabilization and economic growth. These studies include those by Afonso and Alegre (2011), which identified how public expenditure affects economic growth. Others authors, such as Balaguer-Coll and Prior (2009), analyze the factors that influence the efficient management efficient of public services in municipalities and how these expenses affect to the economic growth. Another line of research focuses on classifying public expenditures according to different criteria like its term of realization or purpose and analyzes how each of these categories affect economic growth. Following this current, Bose et al. (2007) and Devarajan et al (1996) determine how the costs of capital and current cost affect economic growth. While the study of Giménez

and Prior (2007) analyzed the effect of costs in the short term in certain economic activities, that carried out by Landau (1983) seeks to determine the relationship between consumer spending and the GDP and its per capita growth. Some works have focused on analyzing the efficient allocation of resources. In the works of Afonso et al. (2003, 2006), Afonso and St. Aubyn (2005, 2006) and Herrera and Pang (2005) the efficiency of certain expenses, including those relating to education and health, is analyzed using non-parametric methods. Authors such as Eugene (2007) have determined the efficiency in the management of the costs of health and education in the municipalities of Belgium, while St. Aubyn (2003) analyses the efficiency in public expenditure on education in Portugal. In recent years some works have determined not only the efficiency in certain public expenses, but have also analyzed as certain variables partner-economic influence in such efficiency. Among these studies would be those made by Verhoeven et al. (2007).

There are even other lines of research that study equitable distribution of income. The works of Asimakopulos and Burbidge (1974), Barrios et al. (2014) and Seligman (1910) have analyzed how the tax system has affected the efficiency and distribution of certain public expenses. However, public efficiency research is extremely complicated due to the methods, Rueda López (2009), availability of data (homogeneous, relevant, valid and reliable), measurement difficulties, and the potential effects of many external factors, as shown in the studies of Afonso et al. (2006), Giménez and Prior (2007) and Lonti and Woods (2008), which try to determine socioeconomic variables affecting the efficiency of public expenditure and the consequences of that relationship in the management of public expenditures. Eugène (2007) establishes that the correlation among many of the indicators makes it more difficult to identify the individual impact of each one, which is complex from a statistical standpoint.

Boyne et al. (2003) determine that allocative efficiency is the match between outputs and the preferences of the public. Public expenditure is efficient when, given the amount spent, it produces the largest possible benefit for the country's population, Afonso et al. (2006).

One of the main problems that all the studies have encountered is the determination and measurement of efficiency. Efficiency is a relative concept that refers to the output-input ratio compared to a standard ratio which is considered optimal, as provided for in

Lonti and Woods (2008), Rueda López (2006, 2009), or in other words, productivity measurement compared to the idea of the production possibility frontier, which indicates feasible output levels given the scale of operations, Mandl et al. (2008). Therefore, a large number of works apply this methodology for the calculation of the efficiency of public expenditures, using non-parametric models like DEA and FDH.

However, in this paper provides a consistent methodology to measure public expenditure efficiency through the determination of an expenditure efficiency index (PEEI) at the country level, which can be obtained on a regular basis and allows countries to be rated in an international comparison over the longer term. Another contribution of this study is to test the association between public efficiency and performance, and other key socioeconomic indicators, such as public sector size; country state of development; corruption; democracy; and population density.

While some studies limit the measure of public outcome to a few parameters (Afonso et al., 2003, 2006; Eugène, 2007), this research takes more indicators into account in order to get a better measure.

Public expenditure efficiency indexes (PEEIs), both for general government and for its functions, are estimates from the aggregation of more than sixty (qualitative and quantitative) socioeconomic indicators -considered as proxies for the services provided- grouped in six weighted clusters, in line with the COFOG classification[3]: general public service, order and safety (GPSOS); economic affairs (EA); environmental protection, housing and community amenities (EP), because the United States includes environment protection expenditures in housing and community amenities ones; health (H); education (E); and social protection (SP). Defense, because the confidential nature of its data was not included; neither was recreation, culture and religion, because definitive choices about what indicators should be included are far from evident Gordon and Beilby-Orrin (2007). Appendix A and B, at the end of the paper, provides more detailed information on indicators, weights and clusters.

[3] Classification of the Functions of Government is the United Nations international standard for classifying the purpose of general government transactions related to final consumption expenditures, intermediate consumption, gross capital formation and capital and current transfers (Gordon and Beilby-Orrin, 2007)

According to Afonso et al. (2003), the overall results are not sensitive to moderate changes in the weights of sub-indicators. In contrast, according to Eugène (2007), the weight of sub-indicators influences the countries' relative efficiency. Since giving the same weights for each sub-indicators and function is equivalent to attaching the same importance to each one Eugène (2007), we have used different weights for some indicators, as well as different weights for each function. We have followed the methodology proposed by the "WEF- World Economic Forum" (2013), taking into account the country's state of development, but also the effect of different government preferences on spending taxpayers' money. Appendix A and B, at the end of the paper, provides more detailed information on indicators, weights and clusters.

Empirical analysis was applied in 2012 for a single cross-section of 35 economies -the European Union's 28 Member States, 2 EU candidate countries (Iceland and Turkey) and other key advanced economies, such as the United States, Japan, Switzerland, Norway and the Republic of Korea-.

From a theoretical point of view, we used single synthetic indicators and an FDH technique to benchmark results. DEA technique results were also calculated in order to compare them with FDH results. Statistical analysis included pairwise or quadratic correlation and significance level for each correlation coefficient, as well as regressions using an econometric model with Ordinary Least Square (OLS) technique.

The remainder of this paper is organized as follows. First we present the methodology that introduces the estimation models. This is followed by an explanation of the sample, variables and data. Data analysis results are then presented and interpreted. Finally, we draw the conclusions.

1.2 METHOLOLOGY

1.2.1 Public Expenditure Efficiency Index (PEEI)

A variety of alternative methods have been developed in the literature to assess public expenditure efficiency. In addition to composite indicators, non-frontier methods, as well as deterministic and stochastic parametric frontiers, several non-parametric

techniques have also been suggested, including DEA and the non-convex FDH technique. Composite indicators are also very often by-products of efficiency measurements, since they are constructed to serve as input or output indicators.

Composite indicators can summarize complex, multidimensional realities; assess progress of countries over time; reduce the visible size of a set of indicators without dropping the underlying information base; make it possible to include more information within the existing size limit; place issues of country performance and progress at the center of the policy arena; facilitate communication with the general public (i.e. citizens, media, etc.) and promote accountability; help to construct/underpin narratives for lay and literate audiences; as well as enabling users to compare complex dimensions effectively.

Most of the empirical studies that have used indices to determine the efficiency focus on specific functions, in particular education and health care (Afonso and St. Aubyn, 2005, 2006; Rueda López, 2009; St. Aubyn, 2003; Sutherland et al., 2007; Herrera and Pang, 2005; Verhoeven et al., 2007). There is also a small number of studies that have used global efficiency rates to determine efficiency in a limited set of countries, without being able to analyze the efficiency in each one of the different expenses that make up the budget, (Afonso et al., 2003, 2006). However, few papers, Eugène (2007) and Social and Cultural Planning Office (2004), have used cross-country data to determine the quality of the service; or have studied all the functions of the government.

The objective of this work is to develop an index that determines efficiency, and that functions both globally and at national level and is applicable to any country, so facilitating comparisons of results between the different countries. To do this, we have designed output-input indicators to measure public expenditure efficiency in the different functions of the government ($PEEI_f$). Mathematically, PEEI for the general government is a weighted average of the different (normalized) scores for public efficiency by function.

Indicators that needed to be normalized, are identified by an asterisk (*) Indicators were normalized on a 1 to 7 scale. The standard formulas to normalize indicators, where 1 and 7 corresponds to the worst and best possible results, preserve the order of, and the relative distance between, countries' scores.

We have estimated country's public sector performance, in function f and country j, as well as overall country's public sector performance, in country j, in the following equations (1 and 2):

(1) $$PSP_{fj} = \sum w_{fij}\ x_{fij}$$, wfij = xfij weight indicator

(2) $$PSP_{j} = \sum w_{fj}\ PSP_{fj}$$, wfj = PSPfj weight indicator

In democratic societies, such as the countries concerned, the budget is assumed to reflect the goals of the population (Afonso et al., 2006). Thus, to reflect the diversity amongst societal priorities, policymakers and citizens, functions were weighted depending on the choice of each government when spending taxpayers' money. Functions' weight on PEEI coincides with the expenditure by function, as a share of the country's general government expenditure.

While some studies refrain from giving different weights for each function, Afonso et al. (2003), this is equivalent to attaching the same importance to each one, which is a far from neutral choice, which is how it is developed in Eugène (2007). Goals of governments are different.

On the output side, we have measured public sector performance (PSP) by capturing quantitative and qualitative aspects of the services provided. Country's public sector performance is a weighted average of more than 60 normalized socioeconomic indicators -considered as proxies for the services provided- grouped in the different functions of the government. Indicators were selected on the basis of their quality and relevance after an extensive theoretical framework review.

Following the literature, we have reduced the weighting of linked indicators in order to avoid overrepresentation, as well as weighting some indicators depending on country's stage of development. Appendix A and B, at the end of the paper, provide more detailed information on indicators, weights and data sources.

On the input side, some researchers have taken into account physical units (Afonso and St. Aubyn, 2005, 2006) like numbers of teachers and acute care beds. Since several inputs are implemented in this context, this paper document opts for a monetary measurement, as did Afonso and St. Aubyn (2005), Eugène (2007) and St. Aubyn (2003). Moreover, given that input levels are often predetermined for public services, we focused on reflecting the ability of a public sector to maximize output for a given set of inputs. We have used the monetary expression of government expenditure as a percentage of GDP, following Eugène (2007), which measures the amount spent relative to the size of the economy.

As St. Aubyn (2003) noted, spending expressed as a ratio of GDP may tend to bias results in countries with lower levels of GDP, because at a given level, richer countries will be able to procure more education and health services than poorer countries. In any event, this bias is lower within a homogeneous group of countries, such as those studied here. Besides, we have weighted them according to their stage of development, as stated above.

Since it is impossible to distinguish between the influences of public (GE_{Hj}) or private expenditure (Private E_{Hj}) on health performance, as Eugène (2007) determines, private expenditure has also been taken into account (see equation 3 below).

(3)

$$E_{Hj} = GE_{Hj} + Private\ E_{Hj} \qquad E_{fj} = GE_{fj}$$

, in other functions

We estimated Country's public expenditure efficiency, in function f and country j, and normalized it on a 1 to 7 scale ($PEEI^*_{fj}$) in order to simplify aggregation and comparison.

(4)

$$PEEI_{fj} = \frac{PSP_{fj}}{E_{fj}/GDP_j} \longrightarrow PEEI^{\bullet}_{fj}$$

The combined share of spending items varies across countries. Thus, the overall public expenditure efficiency score for country j was calculated by adding the weighted individual scores from the six functions.

(5) (6)

$$PEEI_j = \sum PEEI^{\bullet}_{fj} w_{fj} \qquad w_{fj} = \frac{E_{fj}}{TGE_j}$$

TGE = Total Government Expenditure (adding private expenditure on health) as a % of GDP

1.2.2 FDH and DEA analysis

Besides composite indicators of public expenditure efficiency, an FDH model by Deprins et al. (2006) estimated the results of benchmarking and levels of efficiency. DEA results in a VCR-Variable Return to Scale context were also calculated for comparison with FDH results.

From a practical point of view, FDH tends to assign efficiency to more decision-making units (DMUs) than DEA does, Herrera and Pang (2005). We assumed a nonconvex technique because linear combinations of the observed input-output may not be possible locally due to complications in defining and measuring x-inefficiency, e.g. the result of cultural, climatic or religious factors, Afonso at al. (2006).

Although input levels are often predetermined for public services, Van Dooren et al. (2008), they can be reviewed or modified in a medium term - at least each year- and since we are in an era of constraints on tax revenues and public debt, we have focused on input-orientation, which focuses on minimizing inputs. So, a country was identified as inefficient when there was another, with the same public sector performance, that produces with fewer inputs.

Limitations of nonparametric methods lead to results being sensitive to the choice of indicators, Manning et al. (2006); sampling variability -omission from the sample of the relevant country with best practice may lead to underestimation of the degree of inefficiency, Sutherland et al. (2007), measurement error and statistical noise; quality of data; presence of outliers Mandl et al. (2008); see for possible solutions, respectively, Herrera and Pang (2005) and Sutherland et al. (2007), as well as differences across countries not being statistically assessed. Despite these limitations, nonparametric methods have been preferred in public sector efficiency analyses to date, due to their simplicity and applicability to small samples, and their easy use in international comparisons, Lonti and Woods, (2008).

The resulting score is a scalar measure ranging from zero (the lowest efficiency score) to one (the best-practice public sector).

1.2.3 Regression Models

Although we have described the functions of government separately, not only are they related to each other, but they also tend to reinforce each other according to Mandl et al. (2008). For example, a good general public service, with a well-functioning judiciary and a healthy and well-educated population, could be a prerequisite for a well-functioning market. Therefore, we have studied the correlation between public sector performance by functions and other economic variables.

A Pearson correlation examined the strength and direction of relationship between variables. Linear regressions analyzed the relative impact of public sector size; corruption; democracy; and population density on public sector performance, as well as on public expenditure efficiency, both for the general government and for its functions. We have also studied the relative impact of public expenditure efficiency on country state of development.

The t tests associated with the regression coefficients can be interpreted as effect sizes, with values of .20, .50, and .80 reflecting a weak, moderate and strong change, respectively.

Main regression models utilized are below:

Hypothesis1: A higher level of public expenditure efficiency, both for general government and its functions (f), is associated with a significantly higher level of GDP pc or state of development.

$$\text{State of Development} = ß_0 + ß_1 \text{ Public Expenditure Efficiency} + Ɛ$$

$$\text{State of Development} = ß_0 + \sum ß_i \text{ PEEI}_f + Ɛ$$

Hypothesis2: Higher levels of democracy and population density as well as a lower level of corruption are associated with significantly higher levels of public expenditure efficiency.

$$\text{PEEI} = ß_0 + ß_1 \text{ Democracy} + Ɛ$$

$$\text{PEEI} = ß_0 + ß_1 \text{ Population Density} + Ɛ$$

$$\text{PEEI} = ß_0 - ß_1 \text{ Corruption} + Ɛ$$

Hypothesis 3: A higher level of public sector size (per function) is associated with a significantly higher level of public sector performance per function.

$$PSP_f = ß_0 + ß_1 \text{ Expenditure }_{\text{function f}} \_GDP + Ɛ$$

The comparison of the different variables across countries provided further and more specific insights and contributions.

1.3 SAMPLE AND VARIABLES

The sample comprised 35 economies -the European Union's 28 Member States, 2 EU candidate countries (Iceland and Turkey), and other key advanced economies, such as the United States, Japan, Switzerland, Norway and the Republic of Korea. These economies accounted in 2012 for nearly fifty percent of the World's Gross Domestic Product (GDP), demonstrating that the findings are globally important.

Data are collected on a regular basis through independent sources, so minimizing the burden on future researchers to study the impact of public sector reforms and prepare the evolution map of the different variables. New surveys were unnecessary, as existing surveys are expert in measuring output and outcome measurement of public service.

On the public efficiency side, a large number of international comparative studies of respondents' opinions concerning public services were collected on a semi-permanent basis, such as the Eurobarometer, the European Values Study, the World Values Study, the European Social Survey, the World Competitiveness Yearbook (Social and Cultural Planning Office, 2004) and the EOS-Executive Opinion Survey (WEF).

Empirical application of the proposed model has been carried out using information from the EOS (WEF, 2013; WEF, 2014). Other independent sources were used, such as the World Bank; International Labour Organization (ILO); and United Nations Educational, Scientific and Cultural Organization (UNESCO).

The Competitiveness Reports (WEF, 2013, 2014), contain two types of data: hard data, objective measures of a quantity that come from indicators obtained from a variety of sources, and qualitative information results drawn from the EOS, which asks the executives, on a scale of 1 to 7, to provide their expert opinions on aspects of the business environment in which they operate.

Using the information from all the above sources, we designed output-input indicators to measure public efficiency in the different functions of the government ($PEEI_f$) and, mathematically, PEEI for the general government is a weighted average of the different (normalized) scores on the public efficiency by function, which is calculated as described earlier in the section on methodology.

Public sector size was measured by total government expenditure as a percentage of GDP (taking into account private expenditure on health). Data come from a variety of sources, such as Eurostat; OECD; AllThatStats.com; International Monetary Fund (IMF); and World Data Bank-World Development Indicators.

On the corruption side, we have used Corruption Perceptions Index (Transparency International, 2012). In order to give robustness to the analysis, we have also repeated the statistical analysis with two other variables extremely linked with corruption, namely: public trust in politicians and judicial independence (WEF, 2013).

Democracy comes from the Democracy Index (Economist Intelligence Unit, 2013). Mathematically, it is an average of five (normalized) scores: electoral process and pluralism; civil liberties; functioning of government; political participation; and political culture.

Population density (people per square km of land area) comes from the World DataBank World Development Indicators.

State of development was measured by GDPpc-Gross Domestic Product per capita in current US dollars (WEF, 2013).

Empirical analysis was applied in 2012. In order to facilitate its annual application to study the trend in future researches, data are annual values, instead of averages over a

period of several years, which may eliminate the effects of random factors, such as certain errors in measurement.

Note that as in any benchmarking exercise of this nature, data are subject to time lags and do not fully capture economic circumstances at the time of publication. Some expenditure made in one year will produce results over a period, (Eugène, 2007) or sometime later. However, this does not hinder our ability to assess public efficiency and its relationship with the other variables, given their medium to long-term nature.

Finally, some corrections were made. Variables that had a high data scatter were downplayed by using natural logarithms. When data were missing for a year, the most recently available was used. When data are unavailable or are too old to be relevant for a particular economy, we have imputed values from the average of existing data within the sub-indicator. Countries with a large lack of information were not taken into account.

Table 1 below summarizes variable definitions and main descriptive statistics.

Table1. Variable definitions and descriptive statistics

Main Variables	Mean	Median	Std. Dev.	Min	Max	Definitions
psp_GPSOS*	4.57	4.5	0.73	3.13	5.98	CI of PSP in General Public Service, Order and Safety
psp_EA	4.23	4.07	0.68	3.06	5.37	CI of PSP in Economic Affairs
psp_EP	4.70	4.67	0.74	3.36	6.17	CI of PSP in Environmental Protection, Housing and Community Amenities
psp_H*	5.08	5.79	1.54	1.35	6.91	CI of Performance in Health
psp_E*	4.58	4.70	0.67	2.85	5.88	CI of PSP in Education
psp_SP	5.04	5.02	0.78	3.65	6.3	CI of PSP in Social Protection
PSP*	**4.55**	**4.6**	**0.75**	**3.14**	**5.73**	**CI of PSP Total**
peei_GPSOS*	3.43	3.30	1.33	1	7	PEE in General Public Service, Order and Safety
peei_EA*	3.31	3.17	1.39	1	7	PEE in Economic Affairs
peei_EP*	3.18	2.47	1.69	1	7	PEE in Environmental Protection
peei_H*	3.67	3.67	1.32	1	7	Expenditure efficiency in Health (public and private)
peei_E*	2.89	2.52	1.52	1	7	PEE in Education
peei_SP*	1.99	1.81	1.02	1	7	PEE in Social Protection
PEEI	**2.53**	**2.42**	**0.50**	**1.68**	**3.84**	**Total PEE**
EXP_GDP	0.47	0.47	0.07	0.34	0.61	Public Sector Size[1]
Corruption	64.86	65	15.72	36	90	Corruption Perceptions Index
Public_trust_polit	3.33	3.3	1.27	1.5	5.7	Public trust in politicians
Judicial_indep	4.7	4.8	1.27	2.3	6.6	Judicial independence
Democracy	8.03	8.05	0.96	5.76	9.93	Democracy Index
Pop.density	174.2	110	234.27	3	1,311	Population density
Ln_ Pop.density	4.29	4.7	1.14	1.1	7.18	Natural log. population density
GDPpc	35,038	29,289	24,059	7,033	107,206	State of development
Ln_ GDPpc	10.24	10.28	0.69	8.86	11.58	Natural log. state of development

CI of PSP=Composite indicator of Public Sector Performance; PEE=Public Expenditure Efficiency

[1/]Government expenditure as a percentage of GDP -in the case of the Health, we have added private expenditure-.

1.4 EMPIRICAL RESULTS

Correlations between functions and their statistical significance show that a higher level of public sector performance in any function was associated with a significantly higher level of public sector performance in the others functions (as shown in Table 2 below). All functions of government are not only related to each other, but also tend to reinforce each other. Our results are in line with those postulated by Mandl et al. (2008) and the World Economic Forum (2013).

Table2. Pearson correlation and statistical significances between functions

	psp_GPSOS	psp_EA	psp_EP	psp_H	psp_E	psp_SP
psp_GPSOS	1					
psp_EA	.8661***	1				
psp_EP	.6213***	.5746***	1			
psp_H	.4387***	.5391***	.4969***	1		
psp_E	.4685***	.5090***	.6206***	.6134***	1	
psp_SP	.8138***	.8573***	.6406***	.7003***	.6387***	1

***, denote significance at the 1%

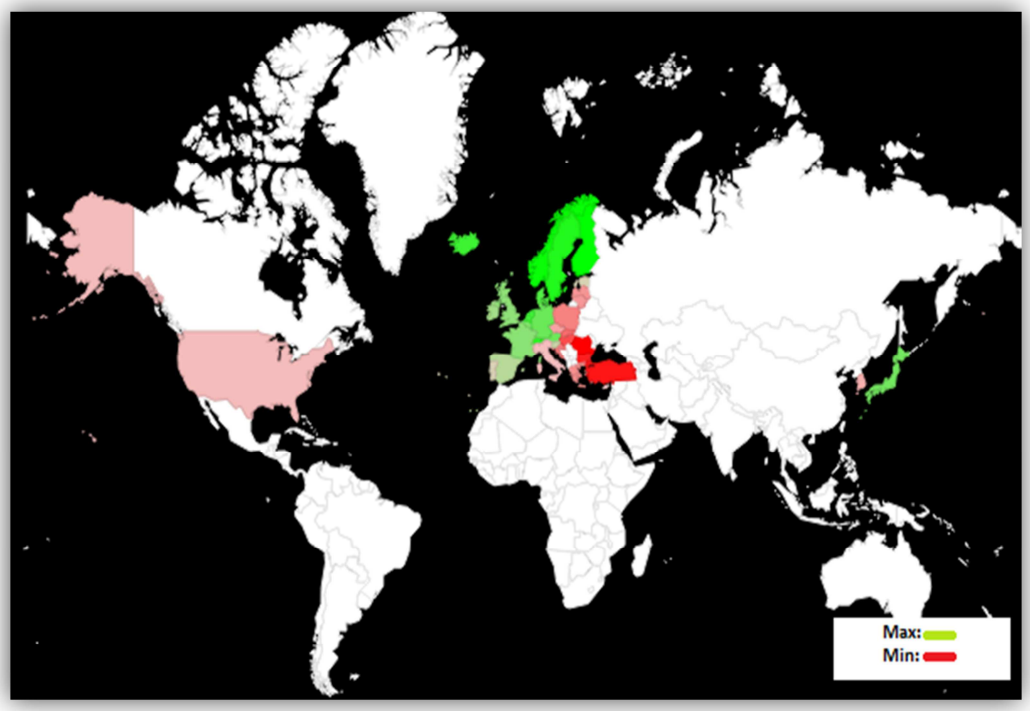
Note.-The sign of the correlation coefficient (positive) defines the direction of the relationship. The absolute value indicates the strength of thecorrelation.

Dispersion in public sector performance, as well as in public efficiency across European and benchmarking countries is plotted in Maps 1 and 2, respectively.

Maps 1 and 2 do suggest that the differences in efficiency are much more pronounced than in performance across countries. This illustrates that the public sector size may be too large in many industrialized countries.

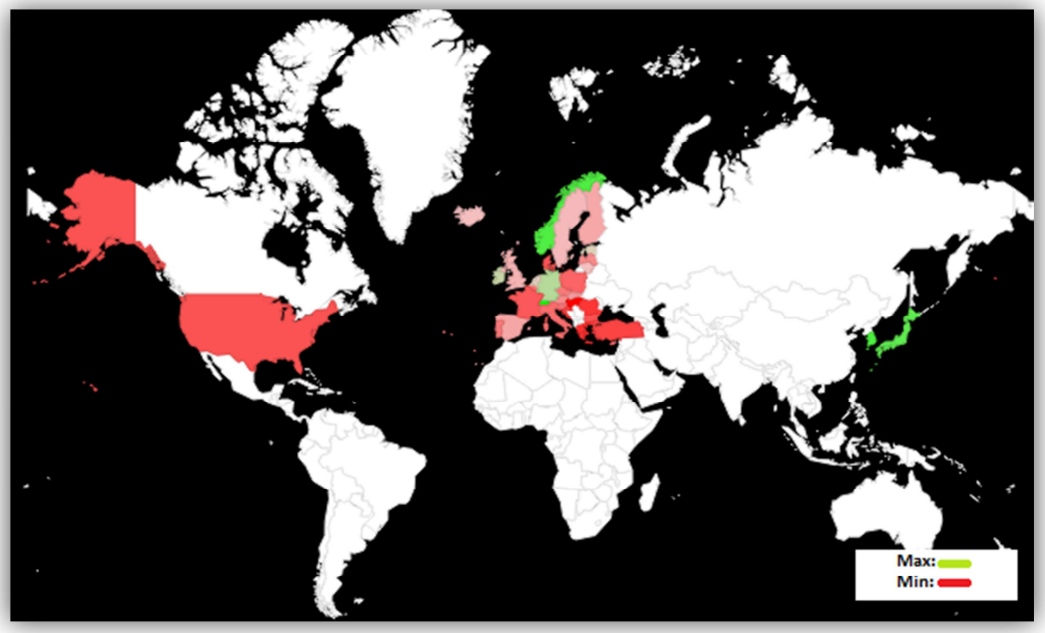
Public sector performance and public expenditure efficiency results across European and benchmarking countries are summarized in Tables 3 and 4, respectively. Economies are also ranked on a global basis from the most to the least efficient. A high low rank indicates a strong efficient position and vice-versa. Maps 1 and 2, as well as Tables 3 and 4 highlight significant differences across countries. The EU is a far from homogeneous entity in terms of public efficiency, which is supported by current research (Afonso et al., 2003; Eugène, 2007; Giménez and Prior, 2007; Mandl et al., 2008). On the contrary, large disparities exist among Member States, with some countries performing better than both the EU average and other advanced economies, such as the United States, while some Member States perform far worse.

Map 1. Public Sector Performance dispersion, 2012



Fuente: Elaboración propia

Map 2. Public Expenditure Efficiency dispersion, 2012



Fuente: Elaboración propia

Table 3. Public sector performance by public function, 2012

				General Public Service, Order and Safety (COFOG 1 & 3)		Economics Affairs (COFOG 4)		Environmental Protection, Housing and Community Amenities (COFOG 5 & 6)		Health: TE (COFOG 7)		Education (COFOG 9)		Social Protection (COFOG 10)	
Country	Code	PSP	TGE[1]	psp_GPSOS	Input	psp_EA	Input	psp_EP	Input	psp_H	Input	psp_E	Input	psp_SP	Input
Austria	AT	5.28	0.55	5.0	0.08	4.6	0.06	5.4	0.01	5.8	0.11	4.7	0.06	5.8	0.21
Belgium	BE	5.20	0.58	4.8	0.10	4.6	0.07	4.6	0.01	5.6	0.11	5.4	0.06	6.0	0.20
Bulgaria	BG	3.14	0.39	4.0	0.06	3.5	0.05	3.9	0.02	1.6	0.08	3.9	0.04	3.7	0.13
Croatia	HR	3.79	0.47	3.9	0.10	3.4	0.05	4.7	0.01	4.3	0.10	3.7	0.05	4.2	0.13
Cyprus	CY	4.33	0.50	4.2	0.15	3.8	0.03	4.0	0.03	5.6	0.07	4.6	0.07	4.8	0.12
Czech Republic	CZ	4.13	0.46	4.0	0.07	3.8	0.06	4.2	0.02	5.0	0.09	3.7	0.05	5.0	0.14
Denmark	DK	5.32	**0.61**	5.1	0.10	5.0	0.04	5.3	0.01	5.7	0.10	5.3	0.08	6.0	0.25
Estonia	EE	4.30	0.41	5.2	0.06	4.3	0.05	4.7	0.02	4.5	0.06	4.8	0.06	4.7	0.13
Finland	FI	5.73	0.59	5.8	0.09	5.2	0.05	5.8	**0.01**	6.0	0.10	5.9	0.06	6.3	0.25
France	FR	4.99	0.59	4.5	0.08	4.6	0.04	5.0	0.03	6.4	0.11	4.8	0.06	5.3	0.24
Germany	DE	5.26	0.47	5.4	0.08	4.9	0.03	5.2	0.01	5.8	0.10	4.7	0.04	5.7	0.19
Greece	GR	3.81	**0.57**	3.1	**0.16**	3.1	0.03	4.3	0.01	5.5	0.09	4.9	**0.04**	4.0	**0.21**
Hungary	HU	3.63	0.52	3.9	0.11	3.7	0.06	3.6	0.02	3.4	0.08	3.9	0.05	4.1	0.17
Ireland	IE	5.04	0.45	4.6	0.08	4.5	0.04	4.4	0.02	5.8	0.10	5.1	0.05	5.3	0.16
Italy	IT	4.36	0.53	3.6	0.11	3.5	0.03	4.4	0.02	6.5	0.09	4.3	0.04	4.4	0.21
Latvia	LV	3.78	0.39	4.5	0.06	4.0	0.05	5.5	0.02	2.3	0.06	4.5	0.06	4.3	0.11
Lithuania	LT	3.93	0.38	4.2	0.06	3.7	0.03	4.9	0.01	3.3	0.08	4.7	0.06	4.4	0.12
Luxembourg	LU	5.32	**0.45**	5.7	0.06	5.2	0.04	4.7	0.02	6.5	**0.06**	3.7	0.05	6.0	0.19
Malta	MT	4.62	0.46	4.5	0.08	4.1	0.05	3.9	0.02	5.1	0.09	4.2	0.06	5.4	0.15
Netherlands	NL	5.40	0.52	5.5	0.08	4.9	0.05	4.8	0.02	5.9	0.11	5.8	0.06	6.1	0.18
Poland	PL	3.82	0.44	4.2	0.08	3.7	0.05	4.1	0.01	4.2	0.07	4.2	0.06	3.9	0.16
Portugal	PT	4.54	0.51	4.0	0.11	3.6	0.03	5.1	0.01	5.8	0.10	4.9	0.06	4.7	0.19
Romania	RO	3.25	0.38	3.8	0.07	3.3	0.06	3.9	0.02	1.7	0.04	2.8	0.03	3.8	0.14
Slovak Republic	SK	3.76	0.40	3.6	0.08	3.7	0.04	4.3	0.02	3.4	0.09	3.9	0.04	4.6	0.12
Slovenia	SI	4.60	0.51	4.2	0.08	3.6	0.04	5.2	0.02	5.8	0.09	4.8	0.06	5.0	0.19
Spain	ES	4.66	0.50	3.9	0.08	3.8	0.08	4.9	0.01	6.2	0.09	5.4	0.05	5.0	0.18
Sweden	SE	5.49	0.54	5.8	0.09	5.1	0.04	5.8	0.01	6.4	0.09	4.9	0.07	5.9	0.21
United Kingdom	GB	4.87	0.50	4.8	0.08	5.0	**0.03**	4.8	0.02	5.8	0.10	4.8	0.06	5.4	0.18
EU 28	UE	4.54	0.52	4.5	0.09	4.1	0.04	4.7	0.02	5.0	0.10	4.6	0.05	5.0	0.20
Iceland	IS	5.12	0.49	4.7	0.11	4.5	0.05	6.2	0.02	6.9	0.09	5.3	0.08	5.5	0.11
Turkey	TR	3.34	0.39	4.1	0.08	3.5	0.04	3.4	0.02	1.4	0.06	3.5	0.04	4.4	0.12
Japan	JP	5.41	**0.44**	4.6	0.06	4.9	0.04	4.6	**0.02**	6.9	0.09	4.7	**0.04**	5.7	0.18
Korea, Rep.	KR	4.15	**0.34**	4.6	0.06	3.7	0.06	3.4	**0.02**	6.0	0.08	4.1	0.05	4.3	**0.04**
Norway	NO	5.60	**0.45**	6.0	**0.05**	5.1	0.04	6.0	0.01	6.3	0.09	5.2	0.05	6.2	0.17
United States	US	4.03	**0.50**	4.2	**0.08**	5.1	0.04	4.0	0.01	4.4	**0.18**	4.4	**0.06**	4.7	0.08
Switzerland	CH	5.40	**0.38**	5.8	0.05	5.4	0.05	5.8	0.01	6.3	0.07	4.7	**0.06**	5.9	0.13
Average		4.55		4.57		4.23		4.70		5.08		4.58		5.04	
Standard Deviation		0.75		0.73		0.68		0.74		1.54		0.67		0.78	

Table 4. Efficiency scores by public function, 2012

				General Public Service, Order and Safety (COFOG 1 & 3)		Economics Affairs (COFOG 4)		Environmental Protection, Housing and Community Amenities (COFOG 5 & 6)		Health: TE (COFOG 7)		Education (COFOG 9)		Social Protection (COFOG 10)		Health: GE (COFOG 7)		PEEI wdw (only GE on health)[2]		PEEI wsw[3]	
Country	Code	PEEI[1]	Rank	peei_GPSOS*	Rank	peei_EA*	Rank	peei_EP*	Rank	peei_H*	Rank	peei_E*	Rank	peei_SP*	Rank	Score	Rank	Score	Rank	Score	Rank
Austria	AT	2.4	18	3.5	15	2.4	24	4.6	8	3.4	25	2.6	18	1.5	26	2.0	20	2.2	21	3.0	19
Belgium	BE	2.3	25	2.7	28	1.7	31	3.8	13	3.3	26	2.8	15	1.7	20	1.9	23	2.0	26	2.7	25
Bulgaria	BG	2.1	30	3.8	12	1.9	29	1.8	26	1.0	36	5.1	4	1.6	22	1.1	35	2.1	22	2.6	31
Croatia	HR	2.0	33	2.2	31	1.7	32	5.6	4	2.5	28	1.7	29	1.8	16	1.4	34	1.8	34	2.6	27
Cyprus	CY	2.2	26	1.5	35	4.4	8	1.0	36	4.9	3	1.3	32	2.3	5	4.3	2	2.2	20	2.6	29
Czech Republic	CZ	2.3	21	3.3	17	1.9	30	1.5	32	3.5	22	1.9	25	2.1	11	1.8	28	2.0	27	2.4	33
Denmark	DK	2.1	**29**	2.8	26	5.0	4	6.4	2	3.5	24	1.1	35	1.3	33	1.8	26	1.9	33	3.4	**10**
Estonia	EE	2.9	8	5.3	4	3.2	20	2.5	18	4.6	9	1.7	28	2.2	8	2.4	13	2.5	8	3.3	14
Finland	FI	2.6	14	3.7	13	3.7	15	7.0	**1**	3.6	20	3.5	12	1.4	28	2.0	21	2.3	13	3.8	5
France	FR	2.1	28	3.3	16	4.5	7	1.2	35	3.6	19	2.1	22	1.2	34	2.1	19	1.9	32	2.6	26
Germany	DE	3.0	6	4.0	9	5.4	2	4.4	9	3.8	17	4.9	5	1.7	21	2.2	16	2.7	5	4.0	4
Greece	GR	1.9	**35**	1.0	**36**	3.2	19	5.0	7	4.0	13	5.8	**3**	1.0	**36**	2.5	6	1.7	35	3.3	**11**
Hungary	HU	1.7	36	1.9	33	1.4	34	1.8	27	2.5	29	2.3	21	1.3	32	1.8	27	1.6	36	1.9	36
Ireland	IE	3.0	7	3.5	14	4.6	6	2.3	22	3.7	18	4.0	9	1.9	15	2.2	18	2.6	6	3.3	12
Italy	IT	2.3	24	1.8	34	3.6	17	2.3	23	4.5	11	4.3	7	1.1	35	2.4	12	1.9	31	2.9	20
Latvia	LV	2.4	19	4.1	8	2.2	28	2.4	20	2.1	33	2.5	20	2.3	6	1.7	29	2.4	11	2.6	28
Lithuania	LT	2.7	10	4.0	10	3.9	14	4.1	11	2.5	30	2.7	17	2.1	12	1.6	31	2.5	9	3.2	16
Luxembourg	LU	3.1	**5**	5.5	3	4.2	10	1.7	28	7.0	**1**	1.2	34	1.8	18	3.3	4	2.6	7	3.6	7
Malta	MT	2.4	17	3.1	20	2.4	26	1.6	31	3.6	21	1.5	31	2.2	9	2.3	14	2.2	19	2.4	32
Netherlands	NL	2.8	9	4.2	7	3.1	21	1.6	29	3.5	23	4.1	8	2.0	14	1.8	25	2.5	10	3.1	18
Poland	PL	2.2	27	3.1	19	2.4	25	2.5	19	4.1	12	2.0	24	1.3	31	2.5	9	2.0	29	2.6	30
Portugal	PT	2.3	20	2.0	32	4.6	5	4.3	10	3.8	15	2.8	16	1.4	30	2.5	7	2.1	23	3.2	17
Romania	RO	2.0	34	3.1	22	1.2	35	1.6	30	2.3	32	3.6	10	1.6	24	1.6	32	1.9	30	2.2	34
Slovak Republic	SK	2.5	16	2.4	30	3.6	16	2.1	24	2.4	31	4.4	6	2.2	7	1.6	30	2.3	12	2.9	22
Slovenia	SI	2.3	22	3.1	21	3.0	22	3.0	16	4.0	14	1.8	27	1.5	27	2.2	17	2.0	28	2.7	24
Spain	ES	2.6	15	2.7	27	1.0	36	3.7	14	4.6	10	5.8	2	1.6	23	2.6	5	2.2	17	3.2	15
Sweden	SE	2.7	12	3.9	11	4.2	11	5.6	5	4.7	8	1.6	30	1.6	25	2.4	10	2.3	14	3.6	8
United Kingdom	GB	2.6	13	3.3	18	7.0	**1**	2.4	21	3.8	16	2.1	23	1.7	19	2.0	22	2.3	15	3.4	9
EU 28	UE	2.3	23	2.9	23	3.4	18	2.5	17	3.2	27	2.8	14	1.4	29	1.9	24	2.0	25	2.7	23
Iceland	IS	2.7	11	2.4	29	3.0	23	3.1	15	4.7	7	1.0	36	3.0	3	2.4	11	2.2	16	2.9	21
Turkey	TR	2.0	32	2.9	25	2.3	27	1.4	34	1.1	35	2.5	19	2.2	10	1	36	2.0	24	2.1	35
Japan	JP	3.4	**4**	4.5	5	4.0	13	2.1	**25**	4.9	4	7.0	**1**	1.8	17	2.5	8	2.9	4	4.1	3
Korea, Rep.	KR	3.5	**2**	4.4	6	1.5	33	1.5	**33**	4.8	5	2.9	13	7.0	**1**	3.4	3	3.1	2	3.7	6
Norway	NO	3.5	**3**	7.0	**1**	4.3	9	4.0	12	4.8	6	3.6	11	2.1	13	2.3	15	3.0	3	4.3	2
United States	US	2.1	**31**	2.9	**24**	5.2	3	5.5	6	1.2	**34**	1.3	**33**	3.5	2	1.5	33	2.2	**18**	3.3	**13**
Switzerland	CH	3.8	**1**	7.0	2	4.1	12	6.0	3	6.4	2	1.9	**26**	2.6	4	7.0	**1**	3.9	**1**	4.7	**1**
Average		2.53		3.43		3.31		3.18		3.67		2.89		1.99		2.29		2.28		3.08	
Standard Deviation		0.50		1.33		1.39		1.69		1.32		1.52		1.02		1.03		0.46		0.64	

Countries with the highest overall PEEI score include Switzerland, the Republic of Korea, Japan and Norway. Among EU countries, only Luxembourg is in the top 5. Even economies with a high level of efficiency, can be more efficient if they work on their weaknesses. Our results coincide with those obtained by Moore (2007), according to which our public organizations are not yet operating at their production possibility frontier. In fact, it might be possible to improve along all dimensions of performance.

The analysis shows that Japan and the Republic of Korea should focus on environmental protection; and Switzerland on education. Finland is the most efficient in environmental protection, Luxemburg in health, and the United Kingdom in economic affairs. Greece captures the worst scores in general public service, order and safety, as well as in social protection, but it is among the best in education.

Results show the United States is among the least efficient countries of the sample. The United Sates should work on general public service, order and safety; health; and education efficiency. The differences with Afonso et al. (2003), who postulated the United States is on the efficiency frontier, are due to differences in the methodology used to measure overall public expenditure efficiency, in relation to the method and number of measured functions, number of indicators, as well as the weight of each function in the overall score.

The combined share of spending items that are presumed to be more growth-friendly varies across countries. For example, Denmark (DK) is efficient in economic affairs and environmental protection, but less so in the other functions, in which it spends too high a percentage of resources. FDH and DEA analysis, as we will see later, provide more information about countries' inefficiency levels, as well as a strategy to follow.

Some of our results on health care contrast with those obtained by Afonso et al. (2003), according to which the United States is efficient, but they coincide with those obtained by Eugène (2007). This is in part because we have taken into account as input, not only public expenditure but also private expenditure on health, which in 2012, in the United States, represented nearly fifty percent of the total expenditure on health, which was more than eighteen percent of GDP (see Figure 1). Table 4 also shows the results if we had not taken into account the private expenditure on health; in which case, the United States would notably improve its ranking.

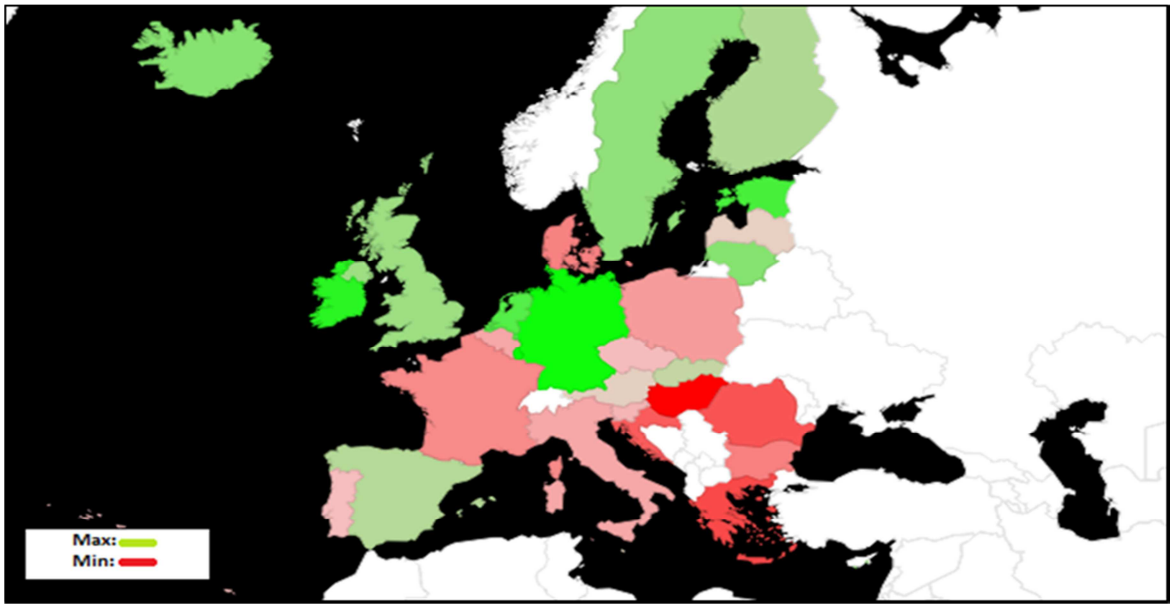
In countries where private expenditure on health is less important, our results coincide with Afonso et al. (2003), as in Japan, at the head of the most efficient countries. In contrast, although in Switzerland the private expenditure on health represented nearly seventy percent of total expenditure on health, Switzerland was among the benchmanking countries that should be imitated by the others, both when considering only public expenditure and private expenditure on health. This was because with a far better public sector performance, total expenditure on health reached less than seven percent of GDP.

Our results on education coincide with those obtained by Eugène (2007), Giménez and Prior (2007), as well as with Afonso et al. (2003), according to which Cyprus, the United States, Luxembourg, Sweden and Denmark are less efficient on education than the EU average and other industrialized countries. These countries are not achieving the academic results they should, despite the higher resources expended in education compared to other countries (Giménez and Prior, 2007). Japan, Greece and Spain are among the benchmanking countries that should be imitated by the others.

A robustness analysis in Table 4, which emulated the effect of same government preferences -in which all functions had the same weight- suggests that the overall results are sensitive to changes in the weights of each function. It highlights the case of Denmark, Greece and the United States, which would pass from being among the least efficient countries of the sample to being among the fifteen most efficient. This is because the government produces some functions efficiently but it may be producing too few of others, compared to what the population would prefer to have, according to public spending ratio by function as a share of country's total general expenditure.

Dispersion in PEEI, across European countries if we had not taken into account the outlier of benchmark countries is plotted in Map 3.

Map 3. Public Expenditure Efficiency dispersion in Europe, 2012



Fuente: Elaboración propia

As Map 3 shows, similar disparities prevail at a regional level. Our result coincides with those obtained by Social and Cultural Planning Office (2004), while EU Member States in northern and north-western European are at the forefront in public efficiency, Europe's southern and south-eastern economies are critically and increasingly falling behind. This is in part associated with differences in the state of development between regions, as we discuss below.

In order to show the ranking robustness to alternative ways of estimation, we next present the results with other ranking criteria and alternative specifications for the efficiency frontier. Table 5 gives input-oriented or focused on how to cut public expenditures, FDH and DEA with VCR-Variable Return to Scale estimate results benchmarking and countries' inefficiency level. FDH results in output-oriented, which are focused on how to make the most of limited public resources, are also provided. The production possibility frontier is presented in Figure 1.

Regardless of the model, Switzerland, Norway and the Republic of Korea always appear as efficient. This helps to verify their robustness in terms of public efficiency, as well as their candidacy to be, in general, units to be emulated by others. On the other hand, Belgium, Denmark, France, Greece, Hungary and the United States are at the head of the countries with less input efficiency -less than seventy percent- which means that these countries could get the same Public Sector Performance by cutting over thirty percent in public expenditures. Figures 2-7 provides the different production possibility frontiers by function, which could be analyzed to give more results in depth.

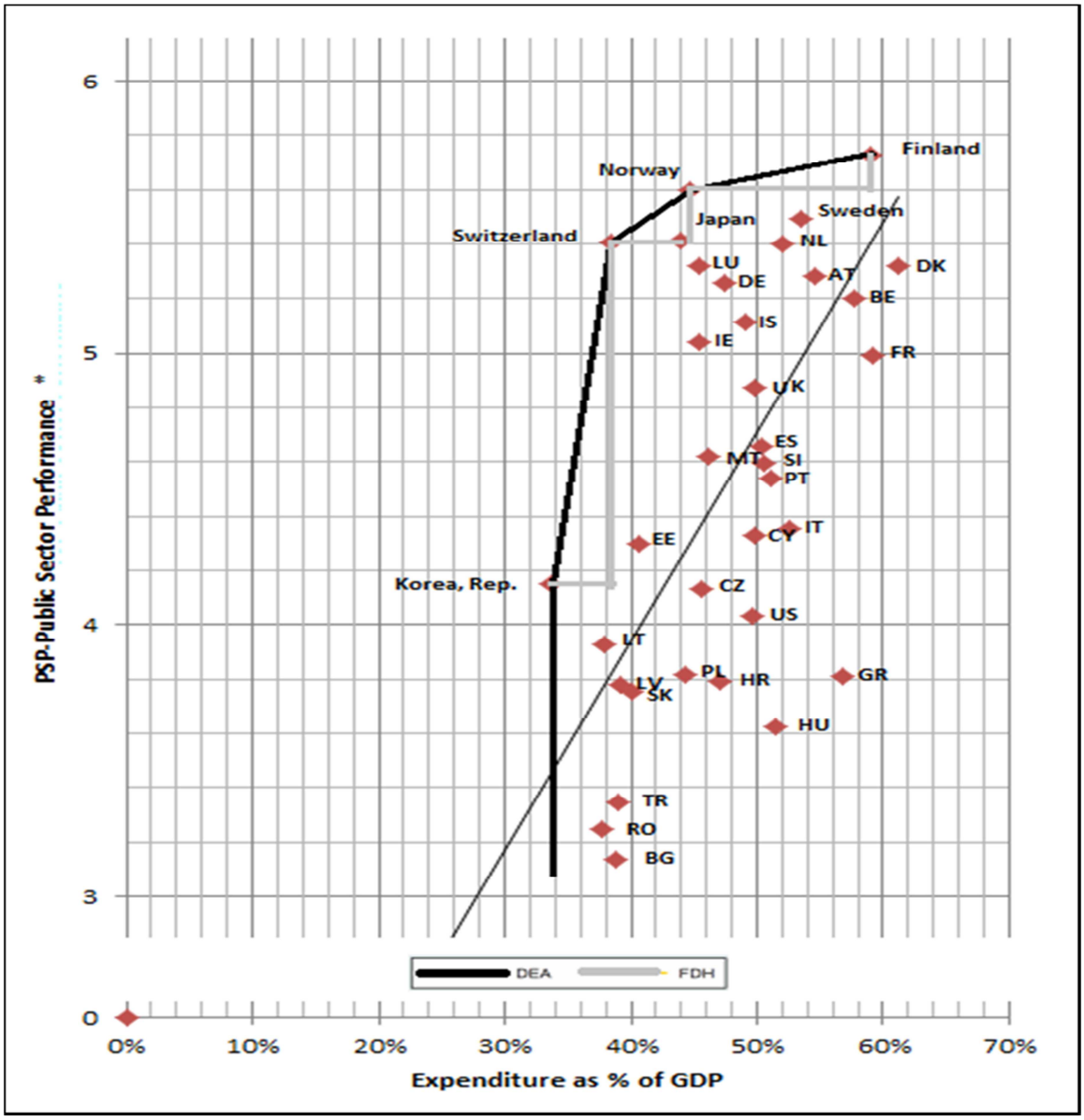
Besides, in order to take into account both orientations, Table 6 classifies the countries as efficient-inefficient regarding the average and provides a strategy to follow.

Table 7 shows the main Pearson correlation coefficients and statistical significances between variables.

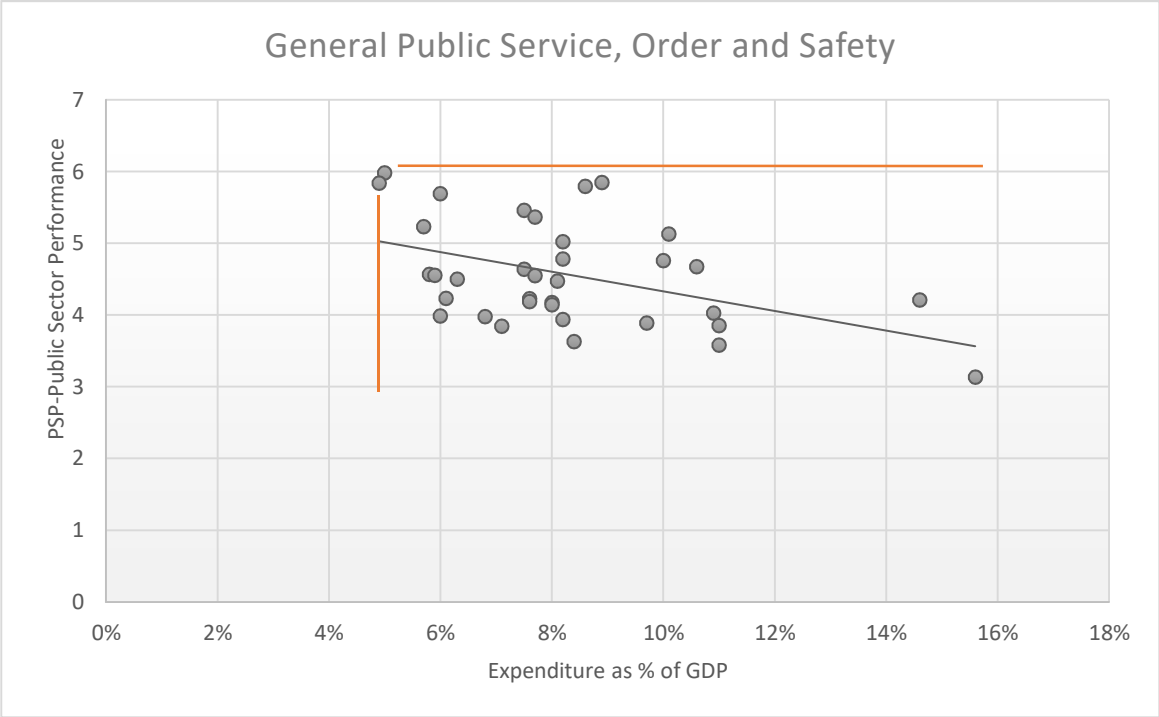
Table 5. FDH and DEA analysis results, 2012

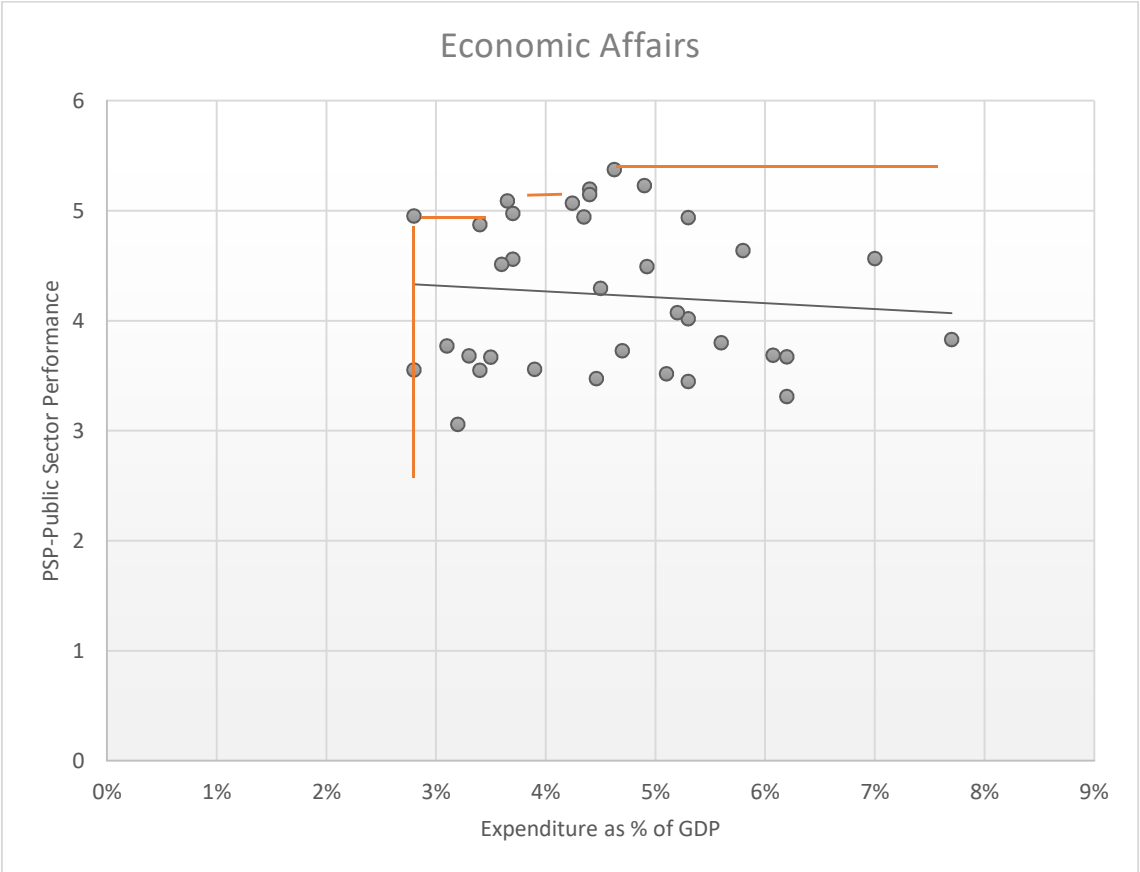
Output-Oriented FDH Efficiency	DMU Name	Inputs Expenditure as % of GDP	Outputs PSP	Input-Oriented FDH Efficiency	Rank	Rank	Input-Oriented DEA-VRS Efficiency	Optimal Lambdas with Benchmarks			
0.94	Austria	0.55	5.28	0.70	29	26	0.70	0.90	Switzerland	0.10	Korea, Rep.
0.93	Belgium	0.58	5.20	0.67	31	32	0.65	0.84	Switzerland	0.16	Korea, Rep.
0.58	Bulgaria	0.39	3.14	0.87	10	8	0.87	1.00	Korea, Rep.		
0.68	Croatia	0.47	3.79	0.72	28	23	0.72	1.00	Korea, Rep.		
0.77	Cyprus	0.50	4.33	0.77	20	27	0.69	0.86	Korea, Rep.	0.14	Switzerland
0.74	Czech Repu	0.46	4.13	0.74	26	21	0.74	1.00	Korea, Rep.		
0.93	Denmark	0.61	5.32	0.63	34	33	0.62	0.93	Switzerland	0.07	Korea, Rep.
0.80	Estonia	0.41	4.30	0.94	6	12	0.84	0.12	Switzerland	0.88	Korea, Rep.
1.00	Finland	0.59	5.73	**1.00**	1	1	**1.00**	1.00	Finland		
0.87	France	0.59	4.99	0.65	33	34	0.62	0.67	Switzerland	0.33	Korea, Rep.
0.94	Germany	0.47	5.26	0.81	17	15	0.80	0.88	Switzerland	0.12	Korea, Rep.
0.68	Greece	0.57	3.81	0.59	35	35	0.59	1.00	Korea, Rep.		
0.65	Hungary	0.52	3.63	0.65	32	31	0.65	1.00	Korea, Rep.		
0.91	Iceland	0.49	5.12	0.78	18	19	0.76	0.77	Switzerland	0.23	Korea, Rep.
0.90	Ireland	0.45	5.04	0.84	14	14	0.81	0.71	Switzerland	0.29	Korea, Rep.
0.78	Italy	0.53	4.36	0.73	27	30	0.65	0.16	Switzerland	0.84	Korea, Rep.
1.00	Japan	0.44	5.41	**1.00**	1	7	0.88	0.03	Norway	0.97	Switzerland
1.00	Korea, Rep.	0.34	4.15	**1.00**	1	1	**1.00**	1.00	Korea, Rep.		
0.70	Latvia	0.39	3.78	0.86	12	10	0.86	1.00	Korea, Rep.		
0.95	Lithuania	0.38	3.93	0.89	9	6	0.89	1.00	Korea, Rep.		
0.95	Luxembourg	0.45	5.32	0.84	13	13	0.84	0.93	Switzerland	0.07	Korea, Rep.
0.83	Malta	0.46	4.62	0.83	16	17	0.77	0.38	Switzerland	0.62	Korea, Rep.
0.96	Netherlands	0.52	5.40	0.74	25	20	0.74	0.99	Switzerland	0.01	Korea, Rep.
1.00	Norway	0.45	5.60	**1.00**	1	1	**1.00**	1.00	Norway		
0.71	Poland	0.44	3.82	0.76	23	18	0.76	1.00	Korea, Rep.		
0.81	Portugal	0.51	4.54	0.75	24	28	0.69	0.31	Switzerland	0.69	Korea, Rep.
0.78	Romania	0.38	3.25	0.89	8	5	0.89	1.00	Korea, Rep.		
0.70	Slovak Repu	0.40	3.76	0.84	15	11	0.84	1.00	Korea, Rep.		
0.82	Slovenia	0.51	4.60	0.76	22	25	0.70	0.36	Switzerland	0.64	Korea, Rep.
0.83	Spain	0.50	4.66	0.76	21	24	0.71	0.40	Switzerland	0.60	Korea, Rep.
0.98	Sweden	0.54	5.49	0.94	7	16	0.77	0.46	Norway	0.54	Switzerland
1.00	Switzerland	0.38	5.40	**1.00**	1	1	**1.00**	1.00	Switzerland		
0.62	Turkey	0.39	3.34	0.86	11	9	0.86	1.00	Korea, Rep.		
0.87	United King	0.50	4.87	0.77	19	22	0.73	0.57	Switzerland	0.43	Korea, Rep.
0.72	United State	0.50	4.03	0.68	30	29	0.68	1.00	Korea, Rep.		
0.84	Average	0.48	4.55	0.81			0.78				

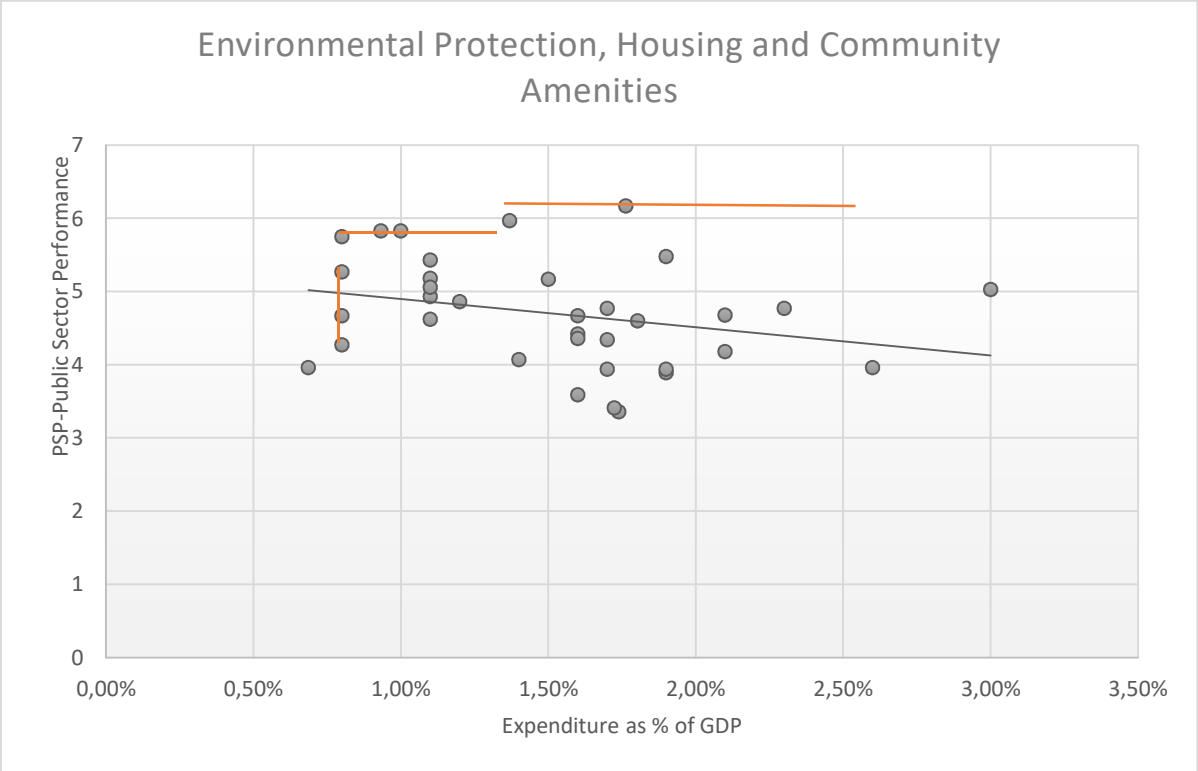
Figure 1. Production possibility frontier, 2012

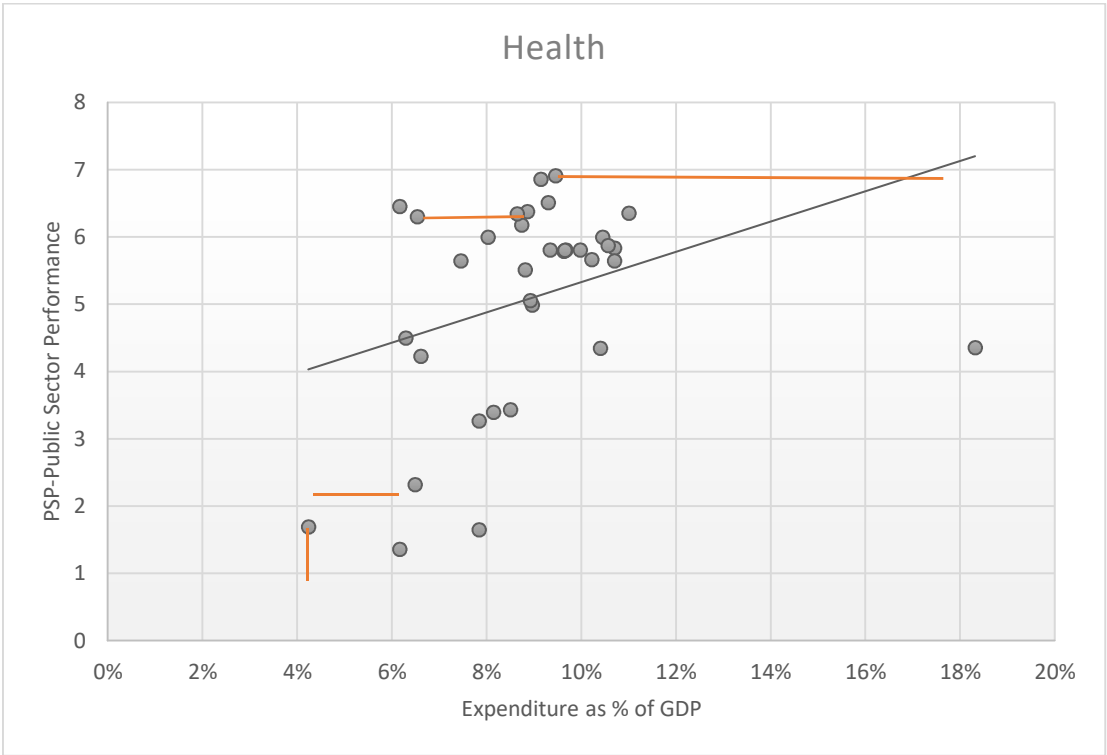


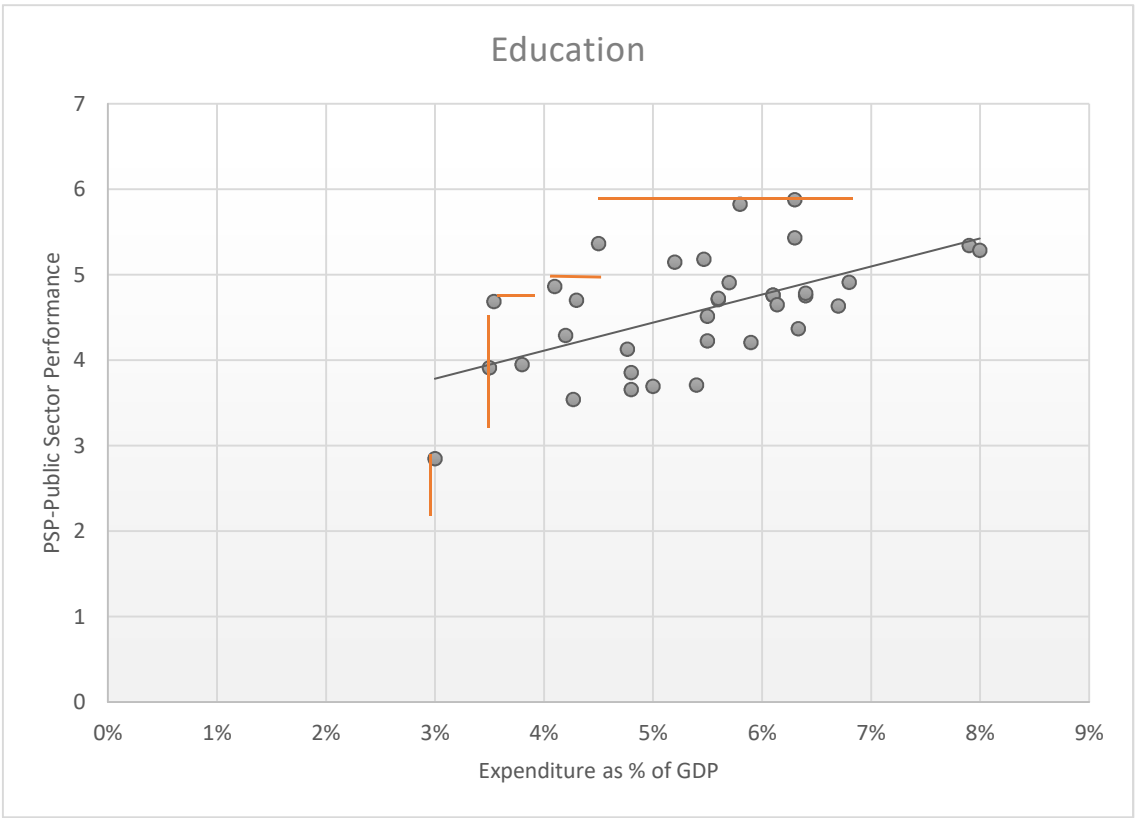
Figures 2-7. Production Possibility Frontiers by function, 2012






Environmental Protection, Housing and Community Amenities
PSP-Public Sector Performance
0
1
2
3
4
5
6
7
0,00%
0,50%
1,00%
1,50%
2,00%
2,50%
3,00%
3,50%
Expenditure as % of GDP


Health
PSP-Public Sector Performance
0
1
2
3
4
5
6
7
8
0%
2%
4%
6%
8%
10%
12%
14%
16%
18%
20%
Expenditure as % of GDP


Education
PSP-Public Sector Performance
0
1
2
3
4
5
6
7
0%
1%
2%
3%
4%
5%
6%
7%
8%
9%
Expenditure as % of GDP

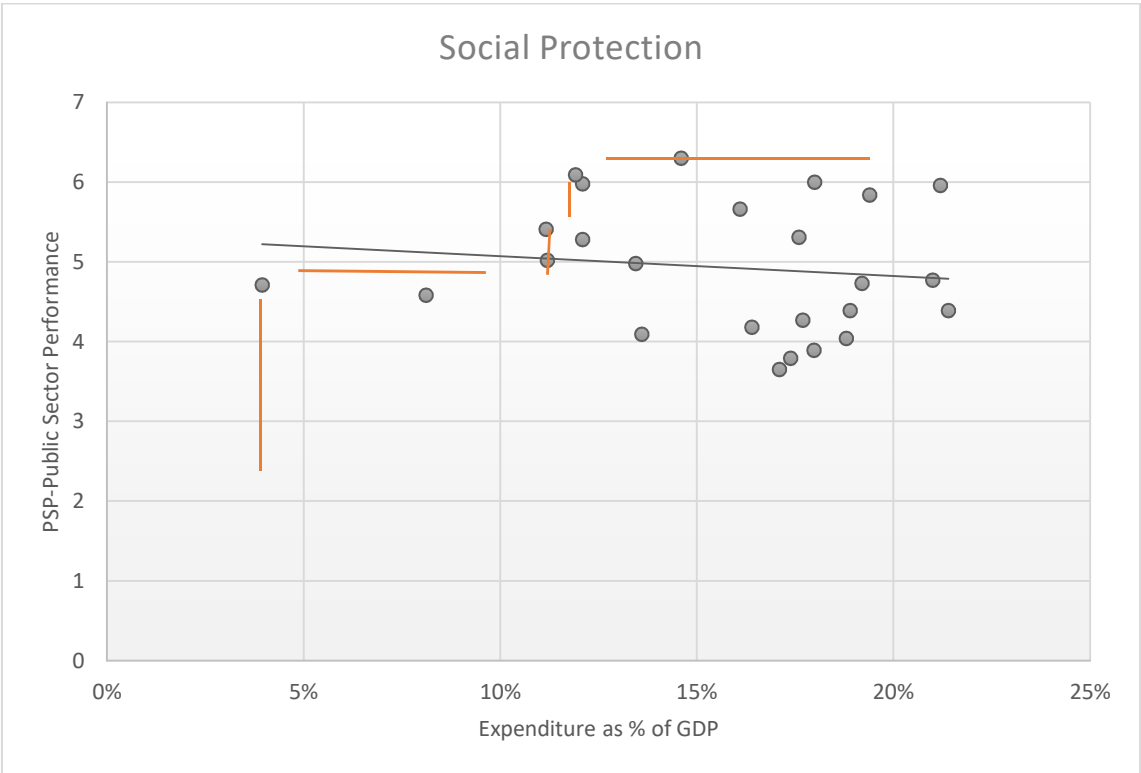

Social Protection
PSP-Public Sector Performance
0
1
2
3
4
5
6
7
0%
5%
10%
15%
20%
25%
Expenditure as % of GDP

Table 6. Ranking and recommendation matrix, 2012

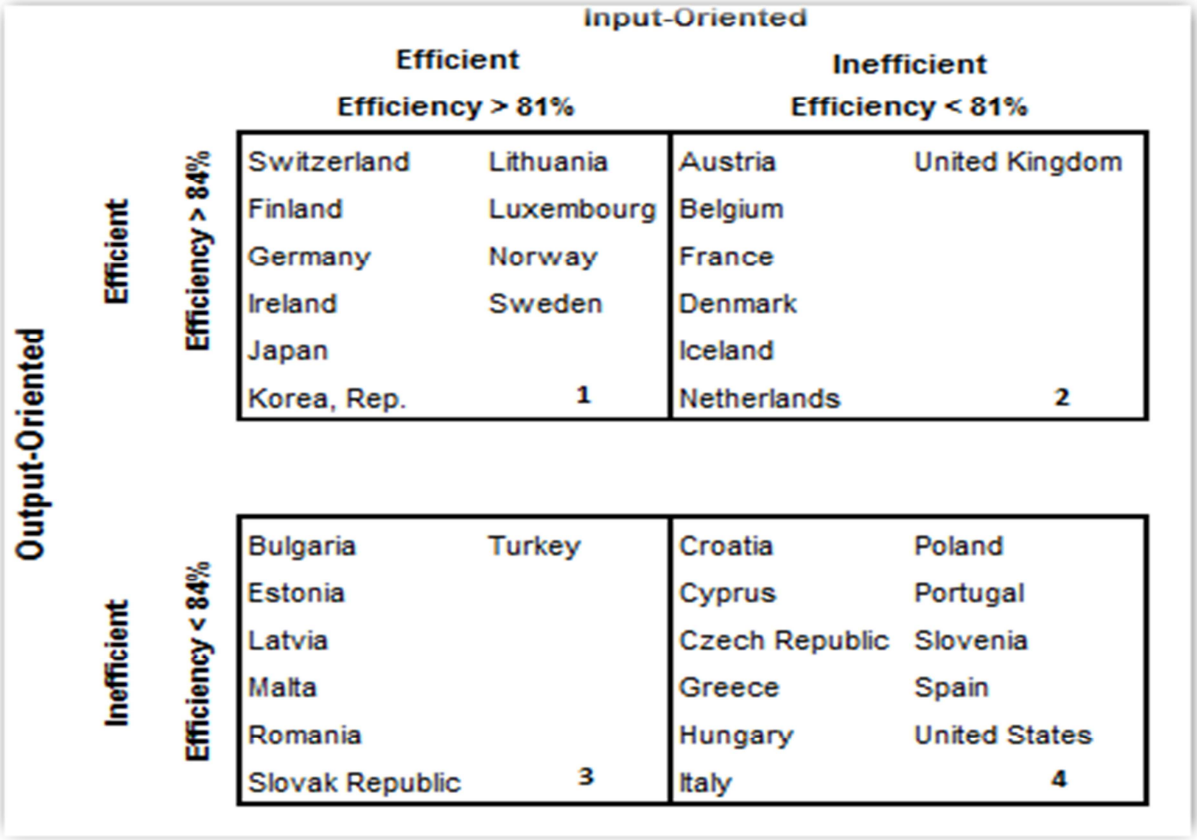


Table 7. Pearson correlation coefficients and statistical significances between variables

	PEEI	**peei_GPSOS***	**peei_EA***	**peei_EP***	**peei_H***	**peei_E***	**peei_SP***
State of development	**.5742*****	.4351***	.5673***	.3714**	.6364***	-.0828	.0224
Corruption	**.5127*****	.4767***	.5228***	.4158**	.4814***	-.2335	.0074
Democracy	**.5534*****	.4201**	.4243**	.4406***	.5938***	-.1459	.0741
Population density	**.0727**	-.0477	-.0505	-.3474**	.1177	.1714	.0703

***, **,* denote significance at the 1%, 5%, and 10% level, respectively.

Note.-The sign of the correlation coefficient (ie, positive or negative) defines the direction of the relationship. The absolute value indicates the strength of the correlation.

A higher level of public expenditure efficiency, both for general government and for some of its functions, was associated significantly with a higher level of state of development. Multiple regression analysis confirms hypothesis 1, as is seen below.

Table 8. Results of multiple regression analysis with four independent variables

State of development	$ß_i$	Std. Err.	P	[95% Conf. Interval]	
peei_GPSOS*	.085	.060	.165	-.037	.208
peei_EA*	.178	.056	.003	.064	.293
peei_EP*	.099	.045	.035	.007	.190
peei_H*	.245	.061	.000	.119	.370

Effective governments improve people's standard of living by ensuring access to essential services and the opportunity to live and work in peace and security (World Bank website), but public efficiency is also key to improving a country' state of development.

A higher level of public efficiency was associated with a significantly lower level of corruption. In the same way, a lower level of corruption was associated with a significantly higher level of GDP pc or state of development. Our result coincides with those obtained by the World Economic Forum (2013), according to which excessive bureaucracy and red tape, overregulation, corruption, dishonesty in public contracts, lack of transparency, and the political dependence of the judicial system impose significant economic costs on businesses and slow down the process of economic development. Results are the same with both public trust in politicians and judicial independence variables, which confirms the relationship.

The negative effect of corruption on public expenditure efficiency is especially greater for economic affairs, followed by health care, general public service, order and safety, and environmental protection. We found no empirical evidence that in education or in

social protection the level of corruption was significantly associated with the level of public efficiency, which means that efficiency in both functions, in the countries studied, is not influenced by the country's level of corruption.

A higher level of democracy was associated with significantly higher levels of public expenditure efficiency; state of development, as well as with a lower level of corruption.

The right way to end corruption, improve people's standard of living and obtain more public efficiency is through a higher level of democracy. Our result coincides with those obtained by the United States Institute of Peace (2010).

Despite an acute awareness that in many contexts the ideals of democratic governance and efficient governance are mutually obstructive Blühdorn (2007), strong democracies have lower levels of corruption, largely because citizens give the government the legitimacy to govern and, therefore, the citizens can hold the government to greater transparency in its operations; and if money and resources available to government are diverted by corrupt officials, instead of being channeled for the benefit of citizens, the clock turns back on social and economic development (Economist Intelligence Unit, 2013; Transparency International; United States Institute of Peace, 2010)

We found no empirical evidence that in education or in social protection, the level of efficiency is influenced by country's level of corruption and democracy. In these functions other key variables exist, which should be studied in depth in the future.

According to Afonso et al. (2003), scale economies may also play a role in public sector policies, as they are able to deliver better outcomes in labor intensive services, such as education. We have tested the association between population density, and public efficiency and performance in the different functions. The results only support this hypothesis in environmental protection.

Hypothesis 2 was partly confirmed. A higher level of population density was associated with significantly lower levels of public efficiency and performance in environmental protection, which coincides with Malthus's theories (2013) and EPA- Environmental Protection Agency data (Cox, 2011). Besides, if we exclude the outlier of Malta, we find empirical evidence that a higher level of population density is also associated with

significantly higher levels of public expenditure efficiency (PEEI), especially in social protection, as well as with a higher level of performance in health

Leverage against residual squared plot showed that Malta and Iceland are clear outliers in population density. For this reason, we have also studied the effect if we exclude them from the different regressions to minimize distortion. Results were the same as we explained above.

As can be seen in Table 9 below, linear regressions of the data coincide with the findings obtained by Afonso et al. (2003), according to which small governments post the highest efficiency amongst industrialized countries, but reject others, according to which countries with small public sectors report higher scores for performance.

Table 9. Pearson correlation coefficients and statistical significances between variables

	PEEI	**peei_GPSOS***	**peei_EA***	**peei_EP***	**peei_H***	**peei_E***	**peei_SP***
Expenditure per function	**-.376****	-.809***	-.827***	-.878***	-.227	-.679***	-.750***
	PSP*	**psp_GPSOS***	**psp_EA**	**psp_EP**	**psp_H***	**psp_E***	**psp_SP**
	.489***	-.426**	-.092	-.272	.349**	-.559***	.494***

***, **,* denote significance at the 1%, 5%, and 10% level, respectively.
Note.-The sign of the correlation coefficient (ie, positive or negative) defines the direction of the relationship. The absolute value indicates the strength of the correlation.

Hypothesis 3 was partly confirmed. A higher level of public sector size was associated with a significantly higher level of overall public sector performance, especially in health and social protection. On the other hand, in general public service, order and safety; as well as in education, a higher level of expenditure was associated with a significantly lower level of public sector performance, as Afonso et al. (2003) defend.

We found no empirical evidence that public sector size was associated significantly with a level of PSP in economic affairs and environmental protection. In these functions, other key variables exist, e.g. the result of cultural or climatic factors, which should be studied in depth in the future.

1.5 CONCLUSIONS

The major contribution of this research is that it provides a consistent methodology to measure public expenditure efficiency (PEEI) at the country level, both for the general government and for its functions, which can be obtained on a regular basis and allows countries to be rated in an international comparison over the longer term. Besides both FDH and DEA techniques were utilized, checking that the results obtained with our index do not differ from those obtained by applying these methodologies.

The overall PEEI score consists of more than 60 weighted socioeconomic indicators, grouped in six weighted clusters or functions in line with the Classification of the Functions of Government (COFOG) and taking into account the state of development and the choice of each government when spending taxpayers' money.

This paper enabled us to draw a general picture of the performance and expenditure efficiency in the public sector. Empirical analysis was applied in 2012 for a single cross-section of 35 developed economies -the European Union's 28 Member States, 2 EU candidate countries (Iceland and Turkey) and other key advanced economies, the United States, Japan, Switzerland, Norway and the Republic of Korea- and shows their weaknesses and strengths.

Our results highlight significant differences across countries. Public organizations are not yet operating at their production possibility frontier. In fact, it might be possible to improve in all dimensions of performance.

The EU is a far from homogeneous entity in terms of public efficiency. In fact, large disparities exist among Member States, with some countries performing better than both the EU average and other advanced economies, such as the United States, while others perform far worse.

Differences in efficiency are much more pronounced than in performance across countries, which illustrates that the size of government may be too large in many industrialized countries.

The combined share of spending items that are presumed to be more growth-friendly varies across countries. Governments produce some functions efficiently but may be

producing too little of others, compared to what the population would prefer to have - according to the public spending ratio by function as a share of country's total general expenditure.

Similar disparities prevail at the regional level. While EU Member States in northern and north-western European are at the forefront in public efficiency, Europe's southern and south-eastern economies are critically and increasingly falling behind. This is in part associated with differences in the state of development between regions.

The results should produce a reflection in the governments of those countries and encourage them to restructure and improve management policies of public expenditures, paying special attention to those costs in which inefficiency is greater. It is necessary to restructure services, personnel and policies of redistribution of resources among the various expenditures in the country. The improvement of efficiency in the provision of public services improves economic growth, and the welfare state, so positively influencing the lives of citizens.

Cost-efficiency measures were calculated through different non-parametric technologies.

FDH and DEA techniques estimated result benchmarking and countries' inefficiency level. Regardless of the model, Switzerland, Norway and the Republic of Korea always appear as efficient. This helps to verify their robustness in terms of public efficiency, as well as their candidacy to be, in general, units to be emulated by others.

In order to take into account both input-output orientations, we have also classified the countries as efficient-inefficient regarding the average, and we provide a strategy to follow.

Finally, we tested the association between public sector performance, as well as public efficiency, and other key socioeconomic indicators, such as public sector size, country state of development, corruption, democracy, and population density.

Although we have described the functions separately, not only are they related to each other, they also they tend to reinforce each other. Correlations between public functions performance and their statistical significance show that a higher level of public sector

performance in any function is associated with a significantly higher level of public sector performance in the other functions. A good general public service with a well-functioning judiciary and a healthy and well-educated population is a prerequisite for a well-functioning market.

A higher level of public expenditure efficiency was associated with significantly higher levels of GDP pc or state of development, democracy, public trust in politicians and judicial independence, as well as with a lower level of corruption.

The effect of corruption and democracy on public expenditure efficiency is especially greater for economic affairs, health care, general public service, order and safety, and environmental protection. We found no empirical evidence of this relationship in education or in social protection. Efficiency in both functions in the countries concerned is not influenced by a country's level of corruption and democracy.

Moreover, a higher level of democracy was also associated with a significantly higher level of GDP pc or state of development, as well as with a significantly lower level of public sector corruption. Therefore, the right way to end corruption, improve people's standard of living and obtain more public efficiency is through a higher level of democracy.

We have also tested the association between population density, and public efficiency and performance. A higher level of population density was associated with significantly fewer levels of public efficiency and performance in environmental protection.

A higher public sector size was associated with significantly a higher level of overall public sector performance, especially in health and social protection.

Elsewhere, in general public service, order and safety, a higher level of public expenditure was associated with a significantly lower level of public sector performance.

We found no empirical evidence that in economic affairs or in environmental protection, the level of public expenditure was associated with the level of PSP achieved by the country. In these functions, other key variables exist, e.g. result of cultural or climatic factors, which should be studied in depth in the future.

The results obtained put of manifest that is necessary apply a policy reform and increase investments to further Europe's economic and social progress. This offers policymakers and business leaders an important tool in the formulation of improved economic policies and institutional reforms, so contributing to long-term prosperity during the exit of the global economic crisis.

CHAPTER 2

ANALISYS OF THE RELATION BEWEEN E-GOVERNMENT AND PUBLIC EXPENDITURE EFFICIENCY

2.1 INTRODUCTION

The technological revolution has affected all sectors of society including public administrations. Advances in the processing and management of information and communication have allowed governments to simplify and improve the management of public services and achieve a more fluid relationship with the citizens (WEF, 2014; La Porte et al., 2002; Heeks, 2003; Bekkers and Homburg, 2007). This process coincided with the application of a new theory of public administration - new public management (Hood, 1995, 1998) – that seeks to improve efficiency in the provision of public services through a profound reform of the management and control procedures. E-government is an essential element in achieving this Sivarajah et al. (2015).

As the developed countries emerge from the worst financial and economic crisis of the past 80 years, the need to focus on long-term strategies to ensure the provision of public services has never been greater. The lack of resources has worsened, with a series of problems affecting public administrations.

Excessive bureaucracy, overregulation, corruption, dishonesty in public contracts, lack of transparency and the political dependence of judicial systems all impose significant economic costs on businesses and slow down economic development WEF (2013).

Due to the decrease of economic resources and to the demands of citizens for higher quality public services governments have begun to implement a series of policies and new management systems aimed at more efficient provision of public services with limited economic resources. For this reason, governments have devoted much of their resources to the implementation of e-government, which can help governments to better address corruption, political representation, stovepipe bureaucracies, delivery of services, trust, leadership, security, conflict management, innovation, transparency, accountability (WEF, 2014a; Haigh and Griffiths, 2008; Srivastava and Teo, 2007; Haldenwang, 2004; West, 2004; Banerjee and Chau, 2004; Cho and Choi, 2004; Wong and Welch, 2004; Bertot et al., 2010; Bertot et al., 2012; Stamati et al., 2015) and so facilitate citizens' access to public services by improving quality and productivity (Prins, 2001; Borras, 2004; Chiang and Liao, 2009; Verdegem and Verleye, 2009).

The relationship between efficiency in the provision of public services and the new e-

government management system as established by the World Economic Forum (2014b), Dawes (2008) and Ahn and Bretschneider (2011). E-government has been studied by several authors (Thompson and Garbacz, 2007; Sung, 2007; Chiang and Liao, 2009; Ala-Mutka et al., 2009; Huijboom et al., 2009), who determine that it increases productivity through standardization and digitization in the development of public activities, which reduces costs and improves the delivery of public services and, therefore, should increase their efficiency.

The management and control of public resources is a key issue for an efficient economy. In the long term, public efficiency studies will contribute to learning about the causes of performance differences among governments and the impact of public sector reforms. Measuring public efficiency and studying the impact of e-government can help governments to benchmark progress, identify gaps, and learn from best practices across the world.

However, the implementation of e-government requires large investment in infrastructure and continuous technological adaptation Centeno et al. (2004), since it is a sector in constant evolution. In addition, it is necessary to allocate resources to facilitate the citizen access to these technologies. Therefore, governments should allocate part of their resources to implement and maintain the system of e-government, which is a major obstacle for countries with a shortage of resources. This is especially acute if the country has a large population or a large land area, which require larger investments in providing telecommunications infrastructure UN (2014). As low income countries have to invest more effort to achieve a given level of e-government than small, high income countries, degree of development was included in the statistical tests as a covariate.

According to the academic literature, e-government are tools that can help public authorities to be more efficient (Criado and Ramilo, 2001; Garson, 2004; Instituto Mexicano para la Competitividad IMCO, 2006; Ala-Mutka et al., 2009; Huijboom et al., 2009; UN, 2014; WEF, 2014a) and recent reports draw on surveys to study to what extent the use of e-government by the government improves the quality of government services to citizens WEF (2014c). However, observational studies in this area that test the relationship between impact of e-government on access to basic services and public efficiency are extremely complicated due to the methods used, data availability

(homogeneous, relevant, valid and reliable), measurement difficulties, and the potential effects of many external factors in the dependent variable, public efficiency.

The objective of our study is to determine if there is a relationship between efficiency in the provision of public services and e-government. To do this, this paper provides a consistent methodology to measure public expenditure efficiency (PEEI) at country level, and this can be obtained on a regular basis and allows countries to be compared and rated internationally over the long term. The overall PEEI score consists of more than 60 weighted socioeconomic indicators grouped in six weighted clusters or functions, in line with the Classification of the Functions of Government (COFOG).

Not only will it determine the relation of variable online services using a multiple linear regressions with efficiency in the provision of services in general and the provision of certain services classified by functions, in accordance with COFOG Classification, but it will also analyze the effect of certain control variables (telecommunication infrastructure and human capital) on the variable e-government and, as this affects relationship, the influence of e-government on the efficiency of public services in general and by functions.

In addition, we analyze how the GDP pc control variable, influences the efficiency of public services, since more developed governments should have "being more efficient" among their priorities, and they can apply and maintain the technology needed to implement e-government.

The remainder of this paper is organized as follows. First, the methodology is presented and we present the estimation models. We then offer an explanation of the sample, data and variables. The data analysis results are then given and interpreted. Finally, we draw the conclusions.

2.2 METHODOLOGY

2.2.1 Public Expenditure Efficiency Index (PEEI)

A variety of alternative methods have been developed in the literature to assess public expenditure efficiency. In addition to composite indicators, non-frontier methods, as well as deterministic and stochastic parametric frontiers, several non-parametric techniques have also been suggested, including Data Envelopment Analysis (DEA) and the non-convex Free Disposal Hull (FDH) technique.

Most of the empirical studies carried out focus on specific functions, in particular education and health care (Afonso and St. Aubyn, 2005, 2006; Rueda López, 2009; St. Aubyn, 2003; Sutherland et al., 2007; Herrera and Pang, 2005; Verhoeven et al., 2007). There are also global studies at national level or in a limited set of countries (Afonso et al.; 2003; Afonso et al., 2006). However, few papers have used cross-country data (Eugène, 2007; Social and Cultural Planning Office, 2004) that have captured the quality of the service or have studied all the functions of the government.

The dependent variable Public Expenditure Efficiency is an estimate with the aggregation of the more than 60 most representative socioeconomic indicators (xfij)-considered as proxies for the services provided - in macroeconomic environment, public institutions, economic performance, infrastructures, innovation, markets, environmental protection, health, education and social protection, grouped in six weighted clusters in line with the COFOG classification: general public service, order and safety (GPSOS); economic affairs (EA); environmental protection, housing and community amenities (EP) - because United States includes environment protection expenditures in housing and community amenities; health (H); education (E); and social protection (SP). Defence, because the confidential nature of its data was not included; neither were recreation, culture and religion, because definitive choices about what indicators should be included are far from evident (Gordon and Beilby-Orrin, 2007).

We have designed output-input indicators to measure public efficiency in the different functions of the government ($PEEI_f$) and, mathematically, PEEI for the general government is a weighted average of the different normalized scores of the public efficiency by function.

We have estimated country's public sector performance, in function f and country j, as well as overall country's public sector performance, in country j, in the following equations (1 and 2):

(1) $$PSP_{fj} = \sum w_{fij}\ x_{fij}$$, wfij = xfij weight indicator

(2) $$PSP_{j} = \sum w_{fj}\ PSP_{fj}$$, wfj = PSPfj weight indicator

Although we have described the functions separately, not only are they related to each other, but they also tend to reinforce each other. For example, a good general public service, with a well-functioning judiciary and a healthy and well-educated population, could be a prerequisite for a well-functioning market. Therefore, we have also studied the correlation between functions.

Hard data indicators were normalized on a 1 to 7 scale in order to align them with the main database, the Executive Opinion Survey's result (WEF, 2013; WEF, 2014b). Since all economies' statistics were standardized, they could be aggregated to compute the Indexes.

Indicators that were not derived from the Executive Opinion Survey (EOS), and therefore needed to be normalized, are identified by an asterisk (*) in this document. The standard formulas to normalize hard data, where 1 and 7 corresponds to the worst and best possible outputs-outcomes, are the same as those used by the World Economic Forum (2013), and preserve the order of, and the relative distance between, countries'

scores. But it is important to know that with these indicators, progress over time is measured relative to other countries and not to own past performance. So, the Indexes are constructed on a comparative basis that rates each country relative to the other concerned States.

The weight of partial indicators influences the relative countries' efficiency (Eugène 2007).While some studies refrain from giving different weights for each function (Afonso et al., 2003), this is equivalent to attaching the same importance to each one, which is a far from neutral choice (Eugène, 2007). The goals of the governments are different. Thus, we have taken into account two kinds of weights: one for some indicators (wfij), depending on the stage of development. Besides, in line with the literature, we reduced the weight of linked indicators in order to avoid over-representation.

In democratic societies, such as the countries concerned, the budget is assumed to reflect the goals of the population Afonso et al. (2006). Thus, to reflect the diversity among the societal priorities, policymakers and citizens, functions were weighted depending on the choice of each government when spending taxpayers' money. Function weight on PEEI coincides with the expenditure by function, as a share of the country's general government expenditure.

On the output side, country's public sector performance is a weighted average of more than 60 normalized[4] socioeconomic indicators considered as proxies for the services provided, are grouped in the different functions of the government. Indicators were selected on the basis of their quality and relevance after an extensive theoretical framework review.

Following the literature, we have reduced the weighting of linked indicators in order to avoid over-representation, and some indicators were weighted depending on the

[4]Hard data indicators were normalized on a 1 to 7 scale in order to align them with the main database, the Executive Opinion Survey's result (WEF, 2013; WEF, 2014b). Indicators that were not derived from the Executive Opinion Survey (EOS), and therefore needed to be normalized, are identified by an asterisk (*) in this document. The standard formulas to normalize hard data, where 1 and 7 corresponds to the worst and best possible results, preserve the order of, and the relative distance between, countries scores.

country's stage of development[5]. Appendix A and B, at the end of the paper, provide more detailed information on indicators, weights and data sources.

On the input side, some researchers have taken into account physical units (Afonso and St. Aubyn, 2005, 2006) like numbers of teachers and acute care beds. Since several inputs are implemented in this context, this document opts for the monetary measurement (Afonso et al., 2006; Eugène, 2007; St. Aubyn, 2003). Moreover, given that input levels are often predetermined for public services, we focused on reflecting the ability of a public sector to maximize output for a given set of inputs.

Some studies on health and education have used expenditures per capita in purchasing power parity (St. Aubyn, 2003; Verhoeven et al. 2007), in which for comparisons over time, the amounts must also be corrected for inflation. We have used the monetary expression of government expenditure as a percentage of GDP (Eugène, 2007), which measures the amount spent relative to the size of the economy. Since it is impossible to distinguish between the influences of public or private expenditure on health performance (Eugène, 2007), private expenditure has also been taken into account.

Since it is impossible to distinguish between the influences of public (GE_{Hj}) or private expenditure (Private E_{Hj}) on health performance, as Eugène (2007) determines, private expenditure has also been taken into account (see equation 3 below).

(3) $E_{Hj} = GE_{Hj} + Private\ E_{Hj}$, in other functions $E_{fj} = GE_{fj}$

We estimated country's public expenditure efficiency, in function f and country j, and normalized it on a 1 to 7 scale ($PEEI^*_{fj}$) in order to simplify aggregation and comparison. Equation (4)

[5]We have used Global Competitiveness Index rules (WEF, 2013).

(4) $$PEEI_{fj} = \frac{PSP_{fj}}{E_{fj}/GDP_j} \longrightarrow PEEI^{*}_{fj}$$

As St. Aubyn (2003) noted, spending expressed as a ratio of GDP may tend to bias results in countries with lower levels of GDP, because at a given level, richer countries will be able to procure more education and health services than poorer countries. In any event, this bias is lower within a homogeneous group of countries, such as those studied here. We have also weighted them according to their stage of development.

Finally, all indexes by function were normalized on a 1 to 7 scale to simplify aggregation and comparison.

In democratic societies, like the countries here, the budget is assumed to reflect the goals of the population (Afonso et al., 2006). Thus, to reflect the diversity among the societal priorities, policymakers and citizens, the functions' weight on PEEI coincides with the expenditure by function, as a share of a country's general government expenditure.

The combined share of spending items varies across countries. Thus, the overall public expenditure efficiency score for country j was calculated by adding the weighted individual scores from the six functions. (See equations 5 and 6).

(5) $$PEEI_j = \sum PEEI^{*}_{fj} w_{fj}$$

$$w_{fj} = \frac{E_{fj}}{TGE_j} \quad (6)$$

TGE = Total government expenditure (adding private expenditure on health) as a % of GDP

2.2.2 Regression Models

To test the association between the impact of e-government and public expenditure efficiency, both for the general government and for its functions, the statistical analysis included correlation and multiple linear regressions.

A Pearson correlation examined the strength and direction of the relationship between variables.

Linear regressions analysed the relative impact of the most important dimensions of e-Government [namely: scope and quality of online services (OSI), development status of telecommunication infrastructure (TI), and inherent human capital (HC)] on public expenditure efficiency, both for the general government and for its functions. Finally, state of development [Gross Domestic Product per capita (GDP pc)] has been included as a control variable.

Regression results show that a higher level of public sector performance in any function was associated with a significantly higher level of public sector performance in the other functions.

The t tests associated with the regression coefficients tested the linear effect of each independent variable on public efficiency. The scores can be interpreted as effect sizes, with values of .20, .50, and .80 reflecting a weak, moderate and strong change, respectively.

Hypothesis and regression models utilized are below:

Hypothesis1: A higher level of online services (OSI) is associated with a significantly higher level of public expenditure efficiency, both for the general government and for some of its functions.

$PEEI = ß_0 + ß_1 OSI + Ɛ$

$PEEI_f = ß_0 + ß_1 OSI + Ɛ$

Hypothesis 2: A higher level of e-government development is associated with a significantly higher level of public expenditure efficiency. This also means that both telecommunication infrastructure (TI) and human capital (HC) affect the positive impact of online service on public expenditure efficiency.

$$PEEI = ß_0 + ß_1 EDGI + Ɛ = ß_0 + ß_1 (1/3OSI*1/3TI*1/3HC) + Ɛ$$

$$PEEI_f = ß_0 + ß_1 EDGI + Ɛ = ß_0 + ß_1 (1/3OSI*1/3TI*1/3HC) + Ɛ$$

Hypothesis 3: The state of development affects the positive impact of e-government development on public expenditure efficiency.

$$PEEI = ß_0 + ß_1 (EDGI*GDPpc) + Ɛ$$

$$PEEI_f = ß_0 + ß_1 (EDGI*GDPpc) + Ɛ$$

To test the reliability of the study we have also tested the relationship between PEEI, both for general government and for its functions, and other indicators that measure the impact of information and communication technology on access to basic services, whose data are collected on a regular basis through the Executive Opinion Survey (WEF, 2014c). The results obtained were coincident.

2.3 SAMPLE AND VARIABLES

Sample size comes from WEF (2014b). Due to the lack of information on governments, some countries were not taken into account. The final sample comprised 35 economies - the 28 European Union Member States, 2 EU candidate countries (Iceland and Turkey)

and other key advanced economies, such as the United States, Japan, Switzerland, Norway and the Republic of Korea. These economies accounted in 2012 for nearly fifty per cent of the World's GDP, demonstrating that the findings are globally important.

Data are collected on a regular basis through independent sources, so minimizing the burden on future researchers to study the impact of public sector reforms and cast the evolution map of the different variables. New surveys were unnecessary, as existing surveys are expert in measuring the capacity of national administration to use information and communication technology to deliver public service, as well as output and outcome measurement of public service.

On the public efficiency side, a large number of international comparative studies of respondents' opinions concerning public services are collected on a semi-permanent basis, such as the Eurobarometer, the European Values Study, the World Values Study, the European Social Survey, the World Competitiveness Yearbook (Social and Cultural Planning Office, 2004) and the EOS-Executive Opinion Survey (WEF).

Empirical application of the proposed model was carried out using information from the EOS (WEF, 2013; WEF, 2014b; WEF, 2014c). Other independent sources were used, such as The World Bank; International Labour Organization (ILO); and United Nations Educational, Scientific and Cultural Organization (UNESCO). Appendix A and B, at the end of the paper, provide more detailed information on data sources and variable definitions.

The Competitiveness Reports, WEF (2013) and WEF (2014b), contain two types of data: hard data, objective measures of a quantity that come from indicators obtained from a variety of sources, and qualitative information results drawn from the EOS, which asks the executives, on a scale of 1 to 7, to provide their expert opinions on aspects of the business environment in which they operate.

Using the information from all the above sources, we designed output-input indicators to measure public efficiency in the different functions of the government ($PEEI_f$) and mathematically, PEEI for the general government is a weighted average of the different normalized scores on the public efficiency by function, which is calculated as described earlier in the section on methodology.

On the e-government side, we have used the United Nations e-government development index (EDGI) and the set of indexes it comprises.

Mathematically, the EGDI is a weighted average of three normalized scores on the most important dimensions of e-government, namely: scope and quality of online services (OSI), development status of telecommunication infrastructure (TI), and inherent human capital (HC). Each of these sets of indexes is itself a composite measure that was extracted and analysed independently.

EGDI = (⅓ * online service index) + (⅓ * telecommunication infrastructure index) + (⅓ * human capital index)

To arrive at a set of online services index values, e-government survey 2012 (United Nation, 2014) assessed each country's national website, including the national central portal, e-services portal and e-participation portal, as well as the websites of the relevant ministries of education, labour, social services, health, finance, and environment.

The assessment questionnaire consisted of four sections, corresponding to the four stages of e-government development (emerging information services; enhanced information services; transactional services; and connected services).

Telecommunication infrastructure index is an arithmetic average composite of five indicators: internet users; telephone lines; mobile subscription; fixed internet subscriptions; and fixed broadband.

Human capital index is a weighted average composite of two indicators: adult literacy rate and the combined primary, secondary, and tertiary gross enrolment ratio, with two-thirds weights assigned to adult literacy rate and one-third weight assigned to the gross enrolment ratio.

The empirical analysis was applied in 2012. To simplify the method and thus facilitate its annual application to study the trend, the data are annual values, instead of averages

over a period of several years, which may eliminate the effects of random factors, such as certain errors in measurement.

Notice that as in any benchmarking exercise of this nature, the data are subject to time lag and do not fully capture the economic circumstances at the time of publication. Policy results sometimes take years to materialize and some expenditure made in one year will produce results some time later. However, this does not hinder our ability to assess public efficiency, given its medium to long-term nature.

A correction was made for missing indicators. When data were missing for a year, the most recently available was used. When data are unavailable or are too old to be relevant for a particular economy, we have imputed values from the average of existing data within the sub-indicator. Finally, the countries with a large lack of information were not taken into account.

Table 1 below summarizes the variable definitions and main descriptive statistics

Table 1. Variable definitions and descriptive statistics

Main Variables	**Definitions**
psp_GPSOS	Public Sector Performance in General Public Service, Order and Safety
psp_EA	Public Sector Performance in Economic Affairs
psp_EP	Public Sector Performance in Environmental Protection
psp_H	Public Sector Performance in Health
psp_E	Public Sector Performance in Education
psp_SP	Public Sector Performance in Social Protection
peei_GPSOS	Public Expenditure Efficiency in General Public Service, Order and Safety
peei_EA	Public Expenditure Efficiency in Economic Affairs
peei_EP	Public Expenditure Efficiency in Environmental Protection
peei_H	Public Expenditure Efficiency in Health
peei_E	Public Expenditure Efficiency in Education
peei_SP	Public Expenditure Efficiency in Social Protection
PEEI	**Public Expenditure Efficiency (for general government)**
OSI	Online Service Index
TI	Telecommunication Infrastructure index
HC	Human Capital index
EDGI	**UN e-Government Development Index**
ITCaccess	Impact of Information and Communication Technology on access to basic services
GDPpc	Gross domestic product per capita in current US dollars

	Mean	Median	Std. Dev.	Min	Max
psp_GPSOS	4.57	4.5	0.73	3.13	5.98
psp_EA	4.23	4.07	0.68	3.06	5.37
psp_EP	4.70	4.67	0.74	3.36	6.17
psp_H	5.08	5.79	1.54	1.35	6.91
psp_E	4.58	4.70	0.67	2.85	5.88
psp_SP	5.04	5.02	0.78	3.65	6.3
peei_GPSOS*	3.43	3.30	1.33	1	7
peei_EA*	3.31	3.17	1.39	1	7
peei_EP*	3.18	2.47	1.69	1	7
peei_H*	3.67	3.67	1.32	1	7
peei_E*	2.89	2.52	1.52	1	7
peei_SP*	1.99	1.81	1.02	1	7
PEEI	**2.53**	**2.42**	**0.50**	**1.68**	**3.84**
OSI	0.70	0.67	0.16	0.4641	1
TI	0.67	0.67	0.14	0.35	0.88
HC	0.90	0.91	0.04	0.77	0.95
EDGI	**0.76**	**0.77**	**0.10**	**0.53**	**0.93**
ITCaccess	4.93	5.10	0.74	3.6	5.9
GDPpc	35,038	29,289	24,059	7,033	107,206

2.4 RESULTS OF EMPIRICAL ANALYSIS

The operational question we attempt to answer is if e-government can be a tool that enables governments to be more efficient, and if so, in what functions the effect is greater.

Although we have described the government functions separately, they are not only related to each other, but also tend to reinforce each other. For example, a good general public service, with a well-functioning judiciary and a healthy and well-educated population, could be a prerequisite for a well-functioning market. Therefore, we studied the correlation between functions. Regression results show that a higher level of public sector performance in any function was associated with a significantly higher level of public sector performance in the other functions (see Table 2 below).

Table 2. Pearson correlation coefficients and statistical significances between functions

	psp_GPSOS	psp_EA	psp_EP	psp_H	psp_E	psp_SP
psp_GPSOS	1					
psp_EA	.8661***	1				
psp_EP	.6213***	.5746***	1			
psp_H	.4387***	.5391***	.4969***	1		
psp_E	.4685***	.509***	.6206***	.6134***	1	
psp_SP	.8138***	.8573***	.6406***	.7003***	.6387***	1

***, denote significance at the 1%

Note.-The sign of the correlation coefficient (ie, positive or negative) defines the direction of the relationship. The absolute value indicates the strength of the correlation.

Table 3 shows the Pearson correlation coefficients and statistical significances between the variables.

Table 3. Pearson correlation coefficients and statistical significances

	PEEI	OSI	TI	HC	**EDGI**	ITCaccess	EDGI*GDPpc
OSI		1	.6456***	.4971***	.9160***	.6373***	
peei_GPSOS	.8048***	.3683**	.4136**	.0344	.4010**	.5852***	.6174***
peei_EA	.2968*	.41**	.4176**	.1678	.4437***	.3266*	.4991***
peei_EP	.0678	.28*	.3561**	.362**	.3734**	.2341	.3383**
peei_H	.6404***	.21	.5853***	.2449	.4515***	.4417***	.5911***
peei_E	.1565	-.0463	-.2452	.1491	-.1214	-.2882*	-.1164
peei_SP	.4436***	.3004*	.2186	.828	.2777	.3303*	.0261
PEEI	1	**H1.- .3829****	.5448***	.1955	**H2.- .4941*****	6245***	**H3.- .5963*****

***, **,* denote significance at the 1%, 5% and 10% level, respectively.

Note.-The sign of the correlation coefficient (ie, positive or negative) defines the direction of the relationship. The absolute value indicates the strength of the correlation.

Hypothesis1:

A higher level of online services (OSI) was associated with a significantly higher level of public expenditure efficiency, both for the general government and for most of its functions.

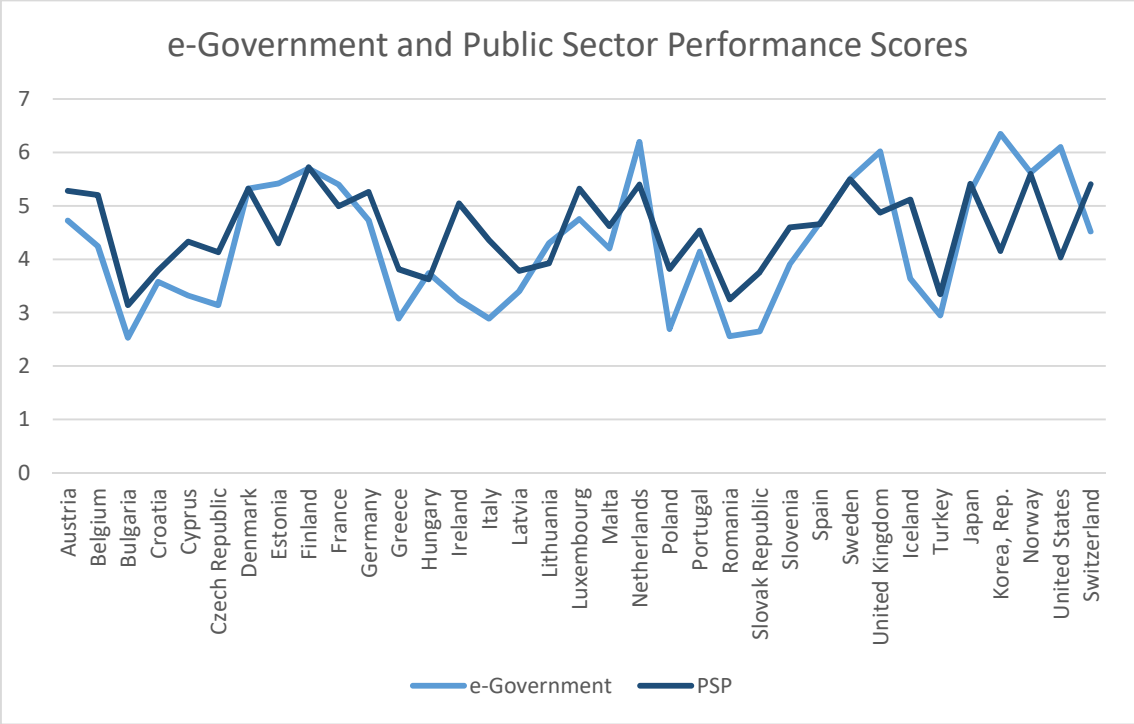
E-government (OSI) affords citizens faster and easier access to all basic services of public institutions, which increases the degree of efficiency in the provision of such services. The use of e-government (OSI) standardizes services and simplifies their management, so facilitating and streamlining decision making in the public administrations (Jakobs, 2000; Fang, 2002; and Schachter, 2007). This process favors the reduction of costs in the provision of public services, due to the decrease in staff and simplification of processes, so increasing the availability of resources for the provision of services. This result coincides with those obtained by Higgins and Hallström (2007), Galera et al. (2008) and Chiang and Liao (2009).

The positive effect of online services (OSI) on public efficiency differs across functions. On the other hand, no consistent association was observed between online services (OSI) and public expenditure efficiency in health, or in education. This situation is due to the nature of the services; some allow the application of technological systems standardized, reducing management costs and facilitating the access of the population (Jakobs, 2005, Isaak, 2006, Sung, 2007 and Thompson and Garbacz, 2007), and some do not, due to their particular characteristics. In the latter, it is necessary to apply individualized processes adapted to each situation that arise. This involves the application of a significant volume of resources that ensure the development of the appropriate technology for the services provision. These results agree with those obtained by Jakobs (2005) and Wang and Kim (2007).

Hypothesis2: A higher level of e-government development (EDGI) was associated with a significantly higher level of public expenditure efficiency.

Graphic 1 shows more clearly the relationship between e-government (EDGI) and public sector performance.

Graphic 1. E-government and public sector performance scores



In order to correctly apply e-government (EDGI) governments must make a great effort in providing public administrations the necessary infrastructure. Governments have therefore made large investments in computer systems and information processing, Al-Khanjari et al. (2014).

However, not all administrations have used the same procedures of treatment of information, which prevents a correct interrelation between the different administrations, Moen (2001) and Gatautis et al. (2009). A more consistent e-government (EDGI) requires a proper interconnection between the different administrations and a correct application of telecommunications infrastructure (TI), Al-Khanjari et al. (2014).When authorities make a proper application of the best TI the more effective the e-government is, and this will have a greater impact on the efficiency of public services. Zhao (2013) establishes a positive and significant relationship between the variable telecommunication infrastructure (TI) and the variable e-

government (EDGI). Therefore it is appropriate to consider what variable affects the variable e-government and consideration of other variables is needed to obtain a better measurement of that variable and quantify its relationship with efficiency in the provision of public services. These results agree with those of Jakobs (2005), Higgins and Hallström (2007) and Galera et al. (2008).

The implementation of e-government (EDGI) in public administrations requires its citizens to have enough preparation to be able to access and use this service properly. The studies by Dwyer et al. (2005), Srite and Karahanna (2006) and Zhang and Maruping (2008) determined that a suitable cultural level of the population is essential for a proper use of e-government (EDGI). Zhao (2013) determines that human capital (HC) influences the variable e-government (EDGI) significantly and positively. Therefore, we consider it appropriate to include the effect of the HC variable to determine the behavior of the variable e-government (EDGI) in relation to the efficiency of public services.

This also means that a higher telecommunication infrastructure (TI) and a higher human capital (HC) are associated with a significantly higher effect of the positive impact of online service (OSI) on public expenditure efficiency (PEEI), both for the general government and for most public functions.

The results show how the variable e-government (EDGI) has a positive and significant relationship with the level of efficiency in the provision of public services. These results agree with those of Mathieson (2007) and Purao and Souza (2011). In addition, the variable e-government (EDGI) has a significant and positive relationship with efficiency in the provision of each of the services classified by functions.

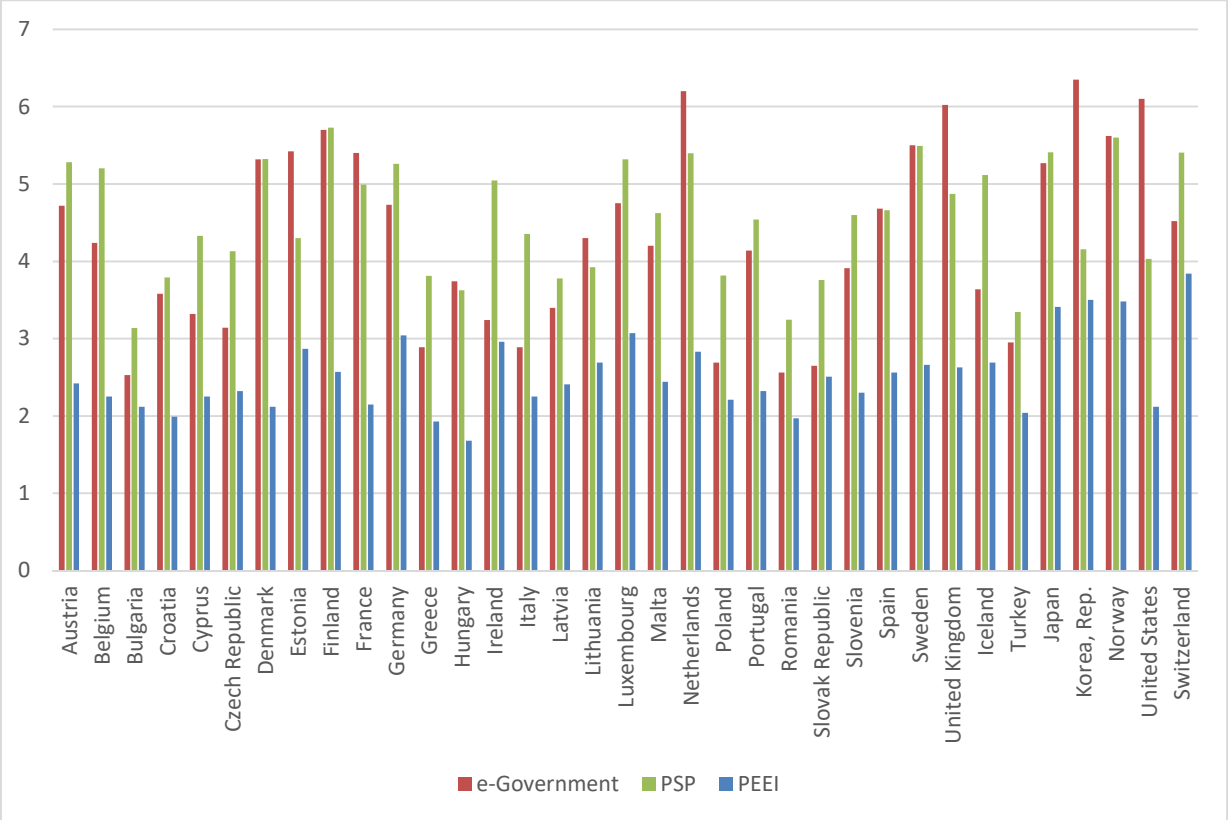
These results do not coincide with those obtained for Hypthesis 1, therefore, control variables telecommunication infrastructure (TI) and human capital (HC) positively affect the effect of the positive impact of online service on public expenditure efficiency in health.

Hypothesis3: A higher state of development was associated with a significantly higher effect of the positive impact of e-government (EDGI) development on public expenditure efficiency.

The positive effect of e-government (EDGI) on public efficiency, both for the general government and for most of the public functions, is greater in countries with higher GDP pc or state of development.

The application of e-government to the management of public services requires large investment in technology and training of both staff and citizens. Such a volume of investment can only be made by countries with a high level of economic development. These results agree with those obtained by Torkzadeh et al. (1999), Khan (2002) and Deng et al. (2004).

Graphic 2: e-government, PSP and PEEI results



As Graphic 2 above shows, empirical results also reveal that the EU is far from a homogeneous entity in terms of public efficiency and e-government (EDGI) development. On the contrary, large disparities exist among Member States, with some countries performing better than both the EU average and other advanced economies, such as the United States, while others perform far worse. Many countries with low levels of e-government (EDGI) remain at lower levels of public efficiency, while many countries with high levels of e-government (EDGI) remain at higher levels of public efficiency. This situation coincides with the results obtained, since those countries with a lower GDP pc have not completed the necessary technological reform in their public administrations and the population does not have the necessary resources to be able to relate to the administration through e-government (Van Deursen et al., 2006; Bertot and Jaeger, 2008; and Van Dijk et al., 2008). Therefore, the lack of resources and investment is one of the major problems that these countries have in getting e-government (EDGI) to improve quality and efficiency in the provision of public services.

Furthermore, similar disparities prevail at a regional level. While EU Member States in northern and north-western Europe are at the forefront in e-government (EDGI), as well as in public efficiency, Europe's southern and south-eastern economies are critically and increasingly falling behind, due to the differences in the state of development between regions.

Efficiency and e-government (EDGI) results across European and benchmarking countries are summarized in Table 4 below, where the economies are also ranked on a global basis. A high ranking indicates that countries with a strong e-government (EDGI, have a strong efficient position, and countries with low e-government (EDGI) have a low efficient position. The results coincide with those of Thompson and Garbacz (2007), which determines that those countries with greater technological investment and Internet development are more efficient in the provision of public services. More developed countries (with a higher GDP pc) are achieving greater technological development and greater efficiency in the provision of public services.

Table 4 highlights significant differences across countries. Countries with the highest overall PEEI score are Switzerland, the Republic of Korea, Norway and Japan. Among EU countries, only Luxembourg is in the top 5. Even economies with a high level of efficiency, can be more efficient if they work on their weaknesses. The analysis shows that Japan and the Republic of Korea should focus on Environmental Protection; the United States on General Public Service, Order and Safety, as well as on Health and Education; and Switzerland on Education. Finland is the most efficient in Environmental Protection, Luxemburg in Health, and the United Kingdom in Economic Affairs. If we do not take into account private expenditure on health, the United States would notably improve its rank.

The comparison of the different sub-indicators across countries may provide further and more specific insights and lessons.

On the e-government side, the Republic of Korea, the United States and the United Kingdom are the leaders in Online Service. Switzerland and Iceland in telecommunication infrastructure (TI) and, finally, Ireland and the Republic of Korea in human capital (HC).

In relation to the state of development, if we classify the economies by GDP pc according to the Global Competitiveness Index rules (see WEF, 2013), economies in state 2 and transition offer low levels of e-government, as well as in public efficiency. Estonia, Latvia and Lithuania are outliers that might be worth studying.

Table 4. E-Government and Efficiency scores, 2012

Country	**EDGI**	**Ranking**	OSI	**Ranking**	TI	HC	**PEEI**	**Ranking**	peei_GPSOS	**Ranking**	peei_EA	**Ranking**	peei_EP	**Ranking**	peei_H	**Ranking**	peei_E	**Ranking**	peei_SP	**Ranking**
Austria	0.78	**15**	0.75	**14**	0.70	0.91	2.42	**18**	3.48	**15**	2.43	**23**	4.62	**8**	3.40	**25**	2.63	**17**	1.54	**26**
Belgium	0.77	**18**	0.65	**21**	0.74	0.93	2.25	**24**	2.66	**27**	1.73	**30**	3.84	**13**	3.28	**26**	2.82	**14**	1.68	**20**
Bulgaria	0.61	**33**	0.49	**34**	0.50	0.85	2.12	**29**	3.79	**12**	1.91	**28**	1.84	**25**	1.00	**35**	5.14	**4**	1.62	**22**
Croatia	0.73	**21**	0.64	**22**	0.70	0.86	1.99	**32**	2.20	**30**	1.72	**31**	5.57	**4**	2.49	**27**	1.71	**28**	1.85	**16**
Cyprus	0.65	**29**	0.56	**27**	0.52	0.88	2.25	**25**	1.53	**34**	4.39	**8**	1.00	**35**	4.92	**3**	1.28	**31**	2.28	**5**
Czech Republic	0.65	**30**	0.54	**28**	0.52	0.89	2.32	**21**	3.31	**17**	1.86	**29**	1.50	**31**	3.48	**22**	1.91	**24**	2.14	**11**
Denmark	0.89	**4**	0.86	**8**	0.86	0.95	2.12	**28**	2.85	**25**	5.00	**4**	6.36	**2**	3.47	**24**	1.14	**34**	1.31	**32**
Estonia	0.80	**14**	0.82	**11**	0.66	0.91	2.87	**8**	5.32	**4**	3.16	**19**	2.48	**17**	4.62	**9**	1.74	**27**	2.22	**8**
Finland	0.85	**9**	0.88	**5**	0.72	0.95	2.57	**14**	3.75	**13**	3.69	**15**	7.00	**1**	3.61	**20**	3.47	**12**	1.42	**28**
France	0.86	**6**	0.88	**6**	0.79	0.92	2.15	**27**	3.35	**16**	4.47	**7**	1.16	**34**	3.63	**19**	2.09	**21**	1.18	**33**
Germany	0.81	**11**	0.75	**13**	0.78	0.90	3.04	**6**	3.99	**9**	5.42	**2**	4.37	**9**	3.80	**17**	4.91	**5**	1.67	**21**
Greece	0.69	**27**	0.58	**25**	0.55	0.93	1.93	**34**	1.00	**35**	3.17	**18**	5.04	**7**	3.98	**13**	5.76	**3**	1.00	**35**
Hungary	0.72	**22**	0.69	**17**	0.57	0.91	1.68	**35**	1.90	**32**	1.45	**33**	1.76	**26**	2.48	**28**	2.29	**20**	1.32	**31**
Ireland	0.71	**25**	0.54	**30**	0.66	0.95	2.96	**7**	3.52	**14**	4.57	**6**	2.31	**21**	3.67	**18**	3.98	**9**	1.87	**15**
Italy	0.72	**23**	0.58	**25**	0.67	0.91	2.25	**23**	1.75	**33**	3.58	**17**	2.27	**22**	4.51	**11**	4.26	**7**	1.12	**34**
Latvia	0.66	**28**	0.59	**24**	0.51	0.89	2.41	**19**	4.09	**8**	2.23	**27**	2.44	**19**	2.05	**32**	2.45	**19**	2.26	**6**
Lithuania	0.73	**20**	0.70	**15**	0.58	0.92	2.69	**10**	3.97	**10**	3.92	**14**	4.13	**11**	2.48	**29**	2.66	**16**	2.14	**12**
Luxembourg	0.80	**13**	0.70	**15**	0.86	0.84	3.07	**5**	5.51	**3**	4.23	**10**	1.75	**27**	7.00	**1**	1.23	**33**	1.81	**18**
Malta	0.71	**26**	0.61	**23**	0.72	0.81	2.44	**17**	3.12	**20**	2.35	**25**	1.56	**30**	3.56	**21**	1.47	**30**	2.19	**9**
Netherlands	0.91	**2**	0.96	**4**	0.83	0.94	2.83	**9**	4.17	**7**	3.05	**20**	1.58	**28**	3.48	**23**	4.11	**8**	2.03	**14**
Poland	0.64	**31**	0.54	**30**	0.49	0.90	2.21	**26**	3.14	**19**	2.40	**24**	2.47	**18**	4.08	**12**	1.97	**23**	1.34	**30**
Portugal	0.72	**24**	0.65	**20**	0.60	0.89	2.32	**20**	2.01	**31**	4.64	**5**	4.26	**10**	3.80	**15**	2.81	**15**	1.40	**29**
Romania	0.61	**34**	0.52	**32**	0.42	0.88	1.97	**33**	3.05	**22**	1.17	**34**	1.58	**29**	2.35	**31**	3.61	**10**	1.58	**24**
Slovak Republic	0.63	**32**	0.50	**33**	0.51	0.87	2.51	**16**	2.39	**29**	3.60	**16**	2.09	**23**	2.39	**30**	4.42	**6**	2.24	**7**
Slovenia	0.75	**19**	0.67	**19**	0.65	0.93	2.30	**22**	3.11	**21**	2.96	**21**	3.04	**16**	3.95	**14**	1.78	**26**	1.48	**27**
Spain	0.78	**17**	0.76	**12**	0.63	0.94	2.56	**15**	2.68	**26**	1.00	**35**	3.68	**14**	4.56	**10**	5.81	**2**	1.61	**23**
Sweden	0.86	**7**	0.84	**10**	0.82	0.91	2.66	**12**	3.85	**11**	4.17	**11**	5.56	**5**	4.66	**8**	1.55	**29**	1.56	**25**
United Kingdom	0.90	**3**	0.97	**3**	0.81	0.90	2.63	**13**	3.30	**18**	7.00	**1**	2.36	**20**	3.80	**16**	2.08	**22**	1.71	**19**
Iceland	0.78	**16**	0.54	**28**	0.88	0.93	2.69	**11**	2.45	**28**	2.96	**22**	3.09	**15**	4.73	**7**	1.00	**35**	3.00	**3**
Turkey	0.53	**35**	0.46	**35**	0.35	0.77	2.04	**31**	2.91	**24**	2.33	**26**	1.43	**33**	1.07	**34**	2.52	**18**	2.17	**10**
Japan	0.80	**12**	0.86	**7**	0.65	0.90	3.41	**4**	4.53	**5**	4.02	**13**	2.09	**24**	4.87	**4**	7.00	**1**	1.82	**17**
Korea, Rep.	0.93	**1**	1.00	**1**	0.84	0.95	3.50	**2**	4.44	**6**	1.52	**32**	1.48	**32**	4.85	**5**	2.86	**13**	7.00	**1**
Norway	0.86	**8**	0.86	**8**	0.79	0.93	3.48	**3**	7.00	**1**	4.29	**9**	4.01	**12**	4.75	**6**	3.60	**11**	2.10	**13**
United States	0.87	**5**	1.00	**1**	0.69	0.92	2.12	**30**	2.93	**23**	5.23	**3**	5.50	**6**	1.20	**33**	1.26	**32**	3.53	**2**
Switzerland	0.81	**10**	0.67	**18**	0.88	0.89	3.84	**1**	6.97	**2**	4.14	**12**	6.01	**3**	6.41	**2**	1.87	**25**	2.63	**4**

Note.-Each sub-indicator contribute to PEEI with different weight (wfj), that emulate the effect of different government preferences.

2.5 DISCUSSION

The Digital Agenda for Europe aims to accelerate the roll-out of high-speed internet and reap the benefits of a digital single market for households and firms. The gap with other advanced economies is particularly evident, with other countries rapidly pressing ahead WEF (2014b).

Higher level of e-government (EDGI) development was associated with a significantly higher level of public expenditure efficiency, both for general government, as well as for most of its functions. So we can assert that if e-government enables access to public services for all citizens, public authorities will manage public resources more efficiently, a conclusion that supports the academic literature assertions on e-government (EDGI) as tools that enable public authorities to be more efficient (Criado and Ramilo, 2001; Garson, 2004; Instituto Mexicano para la Competitividad IMCO, 2006; UN, 2012; WEF, 2014a).

The positive effect of e-government (EDGI) development on public efficiency is greater in those States with more GDP pc or state of development, thus supporting the United Nations' assertion that income per capita imposes a limiting factor on access to e-government (EDGI). The lack of online services (OSI) and telecommunication infrastructures (TI) in developing countries is a major constraint on e-government development UN (2014).

Estonia, Latvia and Lithuania are outliers that might be worth studying due, possibly, to their proximity to the leaders -Finland, Sweden and Norway- and their small population and small area, thus supporting the United Nations' assertion of lower income countries' having a higher marginal cost if the country has a large population and/or a large land area (UN, 2012).

Open data, social media and e-participation, can help governments to rebuild citizen trust WEF (2014a). Furthermore, e-government (EDGI) aims to make public administration more efficient and transparent. According to Nye (2014), this variable can give voice to a plethora of networked groups, and make it easier to participate in decision-making processes, which can allow for a greater transparency of government actions and service delivery. Therefore, in a future piece of research we will study the

relationship between e-government/e-participation and public transparency and citizen trust.

Yet while technology can strengthen good government, the digital era also brings challenges. Keeping pace with changing tools and technologies can be complex and expensive. Security and protection of data becomes a critical risk to be managed. The more essential government services that are delivered electronically, the greater the risk to citizens who do not have access to technology, or are not comfortable with it. Hence, the subject of innovation and technology provides a broad range of study for future research.

2.6 CONCLUSIONS

Public administrations have devoted a large part of the resources available to the implementation of the e-government (EDGI), to achieve a more efficient management of all their activities and in the provision of public services. In this work we analyze how they affect the variables online services (OSI) and e-government (EDGI) efficiency in the provision of public services in general, and classify these services by functions, following the Classification of the Functions of Government (COFOG). We use a sample of 35 countries, representing almost 50% percent of the world GDP.

First we determined the general efficiency by functions of each of these countries by means of an index, Public expenditure efficiency (PEEI). We subsequently obtained the variable online services (OSI) by using the information of the United Nations development index. We have used the variable e-government (EDGI), which is made up of two control variables, telecommunication infrastructure (TI) and human capital (HC), in combination with online services (OSI). To determine the relationship between these variables, we applied multiple linear regressions, taking into account the control variable GDP per capita.

The results show the existence of a significant relationship between the impact of online services (OSI) on access to basic services and public efficiency. Online services (OSI) simplifies management of public services and reduces production costs, therefore having a positive impact on the efficiency of the public services.

However, if we analyze this variable with the efficiency of public services by functions, we note that in the health and education functions there is no significant relationship, since these services list some features related to the provision of services that prevent a more effective application of the online services (OSI).

To enhance our analysis we incorporated the variable online services (OSI), the effect of the control telecommunication infrastructure (TI), and human capital (HC) variables and obtained a new variable e-government (EDGI). The results show a significant and positive relationship with the efficiency in the provision of services in general and functions. We take into account factors that may influence a better implementation of e-government (EDGI) and that they can significantly affect the efficiency of public services, including Health, despite its special characteristics.

Furthermore, the positive effect is higher in those states with more GDP pc or state of development. This result confirms that for a proper implementation of e-government (EDGI), governments should invest a significant amount of resources and maintain this investment over time, since technological advances require continuous updates of the system, and continuous training of citizens. Therefore, only countries with greater resources can implement these systems of communication and management properly and effectively. These results agree with Higgins and Halström (2007), Galera et al. (2008) and Chiang and Liao (2009).

CHARTER 3

ANALASYS OF FACTORS AFFECT THE NATIONAL EXPENDITURE EFFICIENCY: A CROSS COUNTRY STUDY

3.1 INTRODUCTION

Effective governments improve people's standard of living by ensuring access to essential services and the opportunity to live and work in peace and security. Excessive bureaucracy and corruption impose significant costs, not only on the private sector, but also on the public.

Efficiency is the way to be effective with the less possible cost or resources. So, by definition, public efficiency can be affected for both national expenditure (as input) and public performance (as output).

The input-output ratio is the most basic measure of efficiency. However, compared to productivity measurement, the efficiency concept incorporates the idea of the production possibility frontier, which indicates feasible output levels given the scale of operations. The greater the output for a given input or the lower the input for a given output, the more efficient the activity is.

Performance measurement is increasingly seen as both a way of monitoring progress and demonstrating performance for internal and public stakeholders (Sanger, 2013).

Analyzing what variables affect public efficiency can help governments to benchmark progress, identify gaps, and learn from best practices around the world, as well as determining the actions that need to be focused on.

The primary focus of world public administration attention for the past decade has been on the way to decelerate the growth rate of national expenditure. The question of how to reduce the expenditure or at least do not make them bigger can be solved both, by reduce public services quality (public performance) or by get more efficient governments.

A well-functioning public administration provide conditions for the prosperity by modernizing communication networks, systems of information services, support to investments and others.

Citizens are not willing to receive worse or less public services, nor do they want to pay more taxes, so the only solution governments can pursue is to be more efficient.

Citizens need more efficient governments that do not ask for more taxes to afford the growing national expenditure in providing better public services.

In this context, we endeavor to address the following research questions: (i) e-government development, population's level of education, state of development, democracy and corruption are between the main determinants of public expenditure efficiency? , and; (ii) what are the lessons for governmental institutions?

To answer the above research questions, we use panel data from 25 European countries over a 6-year period. On a first step, we analyze national expenditure efficiency effects of e-government; human capital; state of development; democracy and corruption. While on a second step, we reproduce the same model by focusing on the main government functions -education; health care; and social protection-.This paper is structured as follows. Section 2 briefly reviews the relevant literature. The data are then described in Section 3, followed by the presentation of the econometric specification in Section 4. The empirical results are discussed in Section 5, before concluding in Section 6.

3.2 LITERATURE REVIEW

This paper belong to a series of three articles focused on public expenditure efficiency and its effect of some socioeconomic variables. We reproduce the two previous research, but taking into account a wider period of time in order to study the dynamics of adjustment.

Over the longer term, studies that measure public efficiency will contribute to highlighting best practices, learning concerning causes of performance differences among governments, and the impact of public sector reforms (Lonti and Woods 2008), as well as determining, the actions that need to be focused on.

We are focused on what can do the government to get better efficiency results. This paper analyses national expenditure efficiency effects of e-government; human capital; state of development; democracy and corruption.

A growing academic literature has been investigating the stabilization, allocation, and distribution effects of public expenditure. But measuring public sector efficiency is extremely complicated due to the methods, limited availability of data (homogeneous and accurate), and the potential effects of many external factors. And for that, analyzing what variables affect public efficiency is still very limited.

Although there is an abundant presence of literature based on the analysis of public efficiency, most of them had focused on specific functions, such as education and health care (Afonso et al. 2003, 2006; Afonso and St. Aubyn, 2005, 2006; Eugene, 2007; Herrera and Pang, 2005; St. Aubyn, 2003). We are focused on both total public expenditure efficiency -for the general government- and by functions.

Based on the information on efficiency enhancing reforms, a great part national reform initiatives during the last years tackle following encouraging the use of Information and Communication Technologies tools (ICT). Many countries use ICT to reduce administrative costs and enhance the quality of service delivered to businesses and citizens by creating the possibility for interaction with the public via the internet, but also by optimizing internal processes through a wider use of electronic information flows (Mandl et al., 2008).

E-government changes the way that governments deliver the online services and becomes an integral part of governmental strategies (Zhang, Xu, and Xiao, 2014).

E-governments have become an increasingly integral part of the virtual economic landscape (Azab et al., 2009; Lim et al., 2012). Although the linkage of ICT/e-government and efficiency/service quality has been examined in the literature (Pang et al., 2014; Tan et al., 2013), it is not focus on national expenditure efficiency, neither at the general level nor by functions.

Following Kasemsap (2017), to the extent that e-government makes it easier for citizens to conduct their affairs with government and to simply retrieve important information they need, e-government can both increase efficiency and increase the relevance of the government in the aspects of the citizens and businesses. The significant advantages of e-government for businesses and governments include the reduced cost of doing business, increased access to information, and the growth in public esteem for governments.

Intellectual capital[6] and public sector performance relationship has been analyzed in previous books and articles (Kamaruddin and Abeysekera, 2013). Analyze human capital or population's cultural level effects can give us more insights and lessons.

Education outcomes are critically important for social welfare and economic growth, and we can think that with a better-educated population, public efficiency results will be higher, as it was already demonstrated in the privet sector. Not only because it will make more efficient workers with better ideas and results, but also because country's capacity to participate in the information society will be higher (UN e-Government Surveys).

Finally, despite in many contexts the ideals of democratic governance and efficient governance are mutually obstructive (Blühdorn, 2007), strong democracies have lower levels of corruption, largely because citizens give the government the legitimacy to govern and therefore the citizens can hold the government to greater transparency in its operations; and if money and resources available to government are diverted by corrupt officials instead of being channeled for the benefit of citizens, the clock turns back on social and economic development (Economist Intelligence Unit; Transparency International; United States Institute of Peace, 2010).

Corruption corrodes the fabric of society. It undermines people's trust in political and economic systems, institutions and leaders. It can cost people their freedom, health, money -and sometimes their lives (Transparency International). Corruption is clearly one of the major societal challenges that governments need to address.

Table 1 below, summarizes main results of the previous literature on the impact of e-government; state of development; corruption; as well as democracy on national expenditure efficiency.

[6] Intellectual capital represents the collective knowledge of an organization which is embedded in the personnel, organizational routines and network relationship of an organization (Kamaruddin and Abeysekera, 2013)

Table 1: Main results of the previous literature

Paper by	Central results:	Time period	Sample	Methods
Andersen, T. B. (2009)	Estimates the impact of e-government on the "control of corruption"	1996 and 2006	149 countries	Panel: OLS, 2SLS
Balaguer-Coll and Prior (2009)	Size of the municipality, the per capita tax revenue, the per capita grants and the amount of commercial activity are some of the factors related with local government efficiency.	1992-1995	Spain: 258 municipalities	DEA
Charoensukmongkol and Moqbel (2014)	Country's investment in ICT can have both negative and positive effect on corruption	2003-2007	42 countries	OLS
Lim et al. (2012)	E-government developmental model for restoring public trust	2001-2004	Singapore	Thematic analysis.
Pang et al. (2014)	Higher IT investments are related to greater cost efficiency	2001-2005	U.S. State Governments	Regression. Cost inefficiency: Stochastic Frontier.
Srivastava et al. (2016)	e-government can be helpful in alleviating corruption	2004-2007	63 countries	Panel data
Tan et al. (2013)	Model of e-government Service Quality. Performance of an e-government website.	-	United States, Singapore, Canada. 647 current users of public e-services	Online survey PLS
Verhoeven et al. (2007)	Assesses education and health spending efficiency of in G7. Some Factors related with government efficiency: effectiveness in acquiring real resources; lower spending; student-teacher ratios; immunizations; doctors' consultations; autonomy for schools.	-	G7 countries	DEA Second-Stage Analysis

Notes: PLS= Partial least squares, OLS=ordinary least squares, 2SLS= Two-stage least-squares regression, DEA= Data Envelopment Analysis methodology

3.3 DATA

The global financial crisis of 2008 brought with it the financial collapse, further increasing the interest of citizens in the good management of their government to get an efficient administration that satisfies the actual needs of citizens at the lowest possible cost.

Following Srivastava et al. (2016); and Moreno-Enguix and Lorente-Bayona (2017), we used four major data sources: International Monetary Fund Data (IMF DATA) on Government Finance Statistics for the Expenditure by Functions of Government (COFOG); United Nations E-Government Survey; Transparency International Corruption Perceptions Index; and World Economic Forum (WEF) Global Competitiveness Reports.

Empirical analysis was applied for six years from 2007 through 2012, to study the effect before and after financial collapse. In order to facilitate its annual application to study the trend in future researches, data are annual values, instead of averages over a period of several years, which may eliminate the effects of random factors, such as certain errors in measurement.

Good quality data are needed because the techniques available to measure efficiency are sensitive to outliers and may be influenced by exogenous factors.

Data are collected on a regular basis through independent sources, so minimizing the burden on future researches on the same topics and achieve the evolution map of the different variables.

To have a consistent panel data analysis, we needed data on similar constructs across all of the years, and this was the key factor that determined the time period we examined. Further, as the variables used in this study were taken from all four sources, it was essential to consider only those countries for which data were available in all the reports. Consequently, we were left with data from 25 European countries.

Unfortunately, data availability out of Europe is limited with regard to Expenditure by Functions of Government according COFOG classification[7].

25 European countries analysed are some European Union's Member States -Austria, Belgium, Bulgaria, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Netherlands, Poland; Romania, Slovak Republic; Slovenia, and Spain- 2 EU candidate countries (Albania and Turkey) and other European countries as Azerbaijan, Georgia, Russia and Ukraine.

Efficiency cannot be directly measured. Composite indicators are very often by-products of efficiency measurements since they are constructed to serve as input or output indicator.

The input-output ratio is the most basic measure of efficiency. However, compared to productivity measurement, the efficiency concept incorporates the idea of the production possibility frontier, which indicates feasible output levels given the scale of operations. The greater the output for a given input or the lower the input for a given output, the more efficient the activity is. Productivity, by comparison, is simply the ratio of outputs produced to input used (Mandl et al., 2008).

The analysis of efficiency is about the relationships between inputs, outputs and outcomes. The relative efficiency of spending (PEEI) is assessed following the model propose by Moreno-Enguix and Lorente-Bayona (2017), by comparing expenditure levels and associated outputs.

Mathematically, public expenditure efficiency index is a weighted average of six (normalized) scores on the public efficiency by functions in line with the COFOG classification, namely: general public service, order and safety (GPSOS), economic affairs (EA), environmental protection, housing and community amenities (EP), health (HEALTH), education (EDUC), and social protection (SOC PROT).

PEEI is an output-input indicators to measure public expenditure efficiency, where output is a proxy of the public sector performance or an associated outcomes by using

[7] UN-Classification of the Functions of Government (COFOG): 01 - General public services; 02 – Defense; 03 - Public order and safety; 04 - Economic affairs; 05 - Environmental protection; 06 - Housing and community amenities; 07 – Health; 08 - Recreation, culture and religion; 09 – Education; 10 - Social protection.

more than 60 weighted socioeconomic indicators, which takes into account inter alia quality of public civil services. Input is the government expenditure as a percentage of GDP (see for more detail Moreno-Enguix and Lorente-Bayona, 2017).

PEEI resulting score is a scalar measure ranging from zero (the lowest efficiency score) to one (the best-practice public sector).

E-government is an assessment of the website development patterns in a country. We used E-Government Development Index (United Nations E-Government Survey), which presents the state of E-Government Development of the United Nations Member States.

The E-Government Development Index incorporates the access characteristics, such as the infrastructure and educational levels, to reflect how a country is using information technologies to promote access and inclusion of its people. It is a composite measure of three important dimensions of e-government, namely: provision of online services, telecommunication connectivity and human capital.

Human capital is the measures for population's level of education, taken from the UN e-government survey. Human capital index is a weighted average composite of two indicators: adult literacy rate and the combined primary, secondary, and tertiary gross enrolment ratio, with two-thirds weights assigned to adult literacy rate and one-third weight assigned to the gross enrolment ratio.

According Transparency International, corruption is the abuse of entrusted power for private gain. It can be classified as grand, petty and political, depending on the amounts of money lost and the sector where it occurs. Corruption is assessed through the web measure Corruption Perceptions Index (Transparency International). Besides, in order to give robustness to the analysis, we have also repeated the statistical analysis with other two variables extremely linked with corruption, namely: Public Trust in Politicians and Judicial Independence (WEF).

Democracy is assessed through Democracy Index (Economist Intelligence Unit). Mathematically, it is an average of five (normalized) scores: Electoral Process and Pluralism, Civil Liberties, Functioning of Government, Political Participation, and Political Culture.

State of Development was measured by Gross Domestic Product per capita in current U.S. dollars, taken from the WEF reports.

A Pearson correlation examined the strength and direction of relationship between variables. The t tests associated can be interpreted as effect sizes, with values of .20, .50, and .80 reflecting a weak, moderate and strong correlation, respectively.

Main variable definition, descriptive statistics, and correlations matrix are presented in Table 2 and 3 respectively.

Table 2. Descriptive statistics

Variables	Mean	Median	Standard Dev	Min	Max
PEEI	4.71	4.78	0.77	3.18	6.06
EGOVERM	0.64	0.65	0.11	0.42	0.91
HUMAN	0.72	0.89	0.29	0.27	0.99
GDPpc	23315.83	16103.99	16705.98	2658.02	61809.61
CORRUP	5.37	5.00	1.95	1.90	9.20
DEMOC	7.17	7.36	1.48	3.15	9.53

Notes: PEEI=Public expenditure efficiency; EGOVERM=e-government; HUMAN=human capital; GDP pc=state of development; CORRUP=corruption; DEMOC=democracy.

Table 3. Correlation matrix

	PEEI	EGOVERM	HUMAN	GDPpc	CORRUP	DEMOC
PEEI	1					
EGOVERM	0.566**	1				
HUMAN	0.054	0.301	1			
GDPpc	0.509**	0.759**	0.134	1		
CORRUP	-0.618**	0.267*	0.021	0.333*	1	
DEMOC	0.665**	0.750**	0.105	0.837**	0.815**	1

Notes: **, * Significantly different from zero at the 0.01 and 0.05 levels, respectively
PEEI=Public expenditure efficiency; EGOVERM=e-government; HUMAN=human capital; GDP pc=state of development; CORRUP=corruption; DEMOC=democracy.

Pearson correlations and statistical significances between variables show possible relationship between:

- public expenditure efficiency and e-government; state of development; corruption and democracy
- e-government and state of development and democracy
- state of development and corruption and democracy
- corruption and democracy

These result coincides with those obtained by the United States Institute of Peace (2010), according to which the right way to end corruption, improve people's standard of living and obtain more public efficiency is through a higher level of democracy.

3.4 ECONOMETRIC SPECIFICATION

Within the social sciences, panel data analysis has enabled researchers to undertake longitudinal analyses in a large variety of fields.

Panel data have both, benefits and limitations. According to Pindado and Requejo (2015), the panel data methodology should be used if the unobservable heterogeneity problem arises. But also panel data analysis has other benefits, such as more informative data; more variability, less co-linearity among the variables, more degrees of freedom and more efficiency; panel data are better able to study the dynamics of adjustment; better able to identify and measure effects that are simply not detectable in pure cross-sections or pure time-series data; allow us to construct and test more complicated behavioral models than purely cross-section or time-series data; and are usually gathered on micro units , like individuals, firms and households.

On the other hands, between the limitations we can highlight design and data collection problems; distortions of measurement errors; selectivity problems; and short time-series dimension.

The data were analyzed using fixed effects regression to assess the relationship between public efficiency and e-government; human capital; state of development; corruption; and democracy. Fixed effects models control for, or partial out, the effects of time-invariant variables with time -invariant effects.

The t tests associated with the regression coefficients can be interpreted as effect sizes, with values of .20, .50, and .80 reflecting a weak, moderate and strong change, respectively.

Main hypothesis and regression models, as well as conceptual motel utilized are below:

Model 1: A higher level of public expenditure efficiency, for general government, is associated with significantly a higher level of e-government, human capital, state of development, democracy, as well as lower level of corruption.

$$PEEI = \beta_0 + \beta_1*EGOVERM + \beta_2*HUMAN + \beta_3*GDPpc + \beta_4*CORRUP+ \beta_5*DEMOC + \varepsilon$$

Model 2

Hypothesis1: A higher level of public expenditure efficiency, on education, is associated with significantly a higher level of e-government, human capital, state of development, democracy, as well as lower level of corruption.

$$EDUC = \beta_0 + \beta_1*EGOVERM + \beta_2*HUMAN + \beta_3*GDPpc + \beta_4*CORRUP+ \beta_5*DEMOC + \varepsilon$$

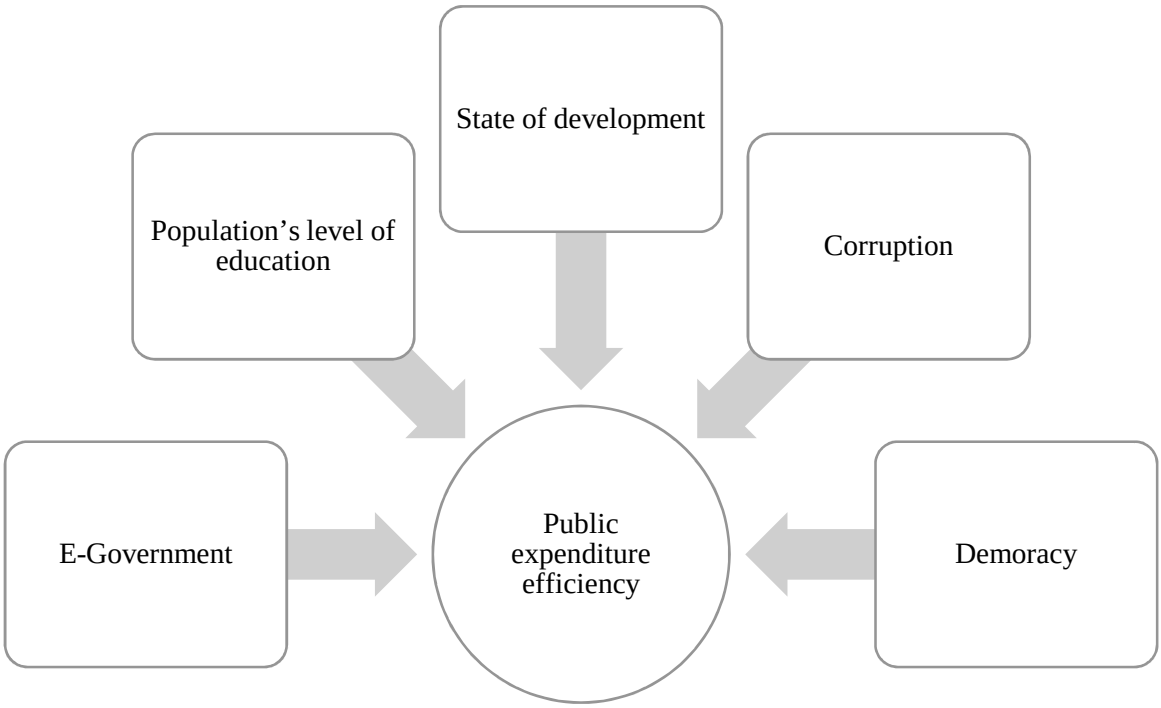
Hypothesis2: A higher level of public expenditure efficiency, on health care, is associated with significantly a higher level of e-government, human capital, state of development, democracy, as well as lower level of corruption.

$$HEALTH = \beta_0 + \beta_1*EGOVERM + \beta_2*HUMAN + \beta_3*GDPpc + \beta_4*CORRUP+ \beta_5*DEMOC + \varepsilon$$

Hypothesis3: A higher level of public expenditure efficiency, on social protection, is associated with significantly a higher level of e-government, human capital, state of development, democracy, as well as lower level of corruption.

$$SOC\ PROT = \beta_0 + \beta_1*EGOVERM + \beta_2*HUMAN + \beta_3*GDPpc + \beta_4*CORRUP+ \beta_5*DEMOC + \varepsilon$$

Figure 1: Conceptual Model



Fuente: Elaboración propia

3.5 PANEL REGRESSION RESULTS

We analyze the empirical relation between expenditure efficiency and e-government by means of multivariate regression models. We estimate a cross-sectional OLS regression in ours models. Model 1 we analyze the expenditure efficiency in general and in Model 2 we study the efficiency by functions.

The results of Model 1 determine the positive and significate relation between expenditure efficiency and e-government. The use of e-government allow for public authorities improve and simplify the provision of public services and a better connection with the citizens. The result of our study shows expenditure efficiency is better when the authorities use the e-government to provision of public services. E-government decreases the administrative process and the number of civil servant to provide public services. Furthermore, these technologies make easier the communication between the administration and citizens. Our results coincides with those of Kasemsap (2017) and Azab et al. (2009), according to which electronic

government (e-government) is regarded as a means for modernizing the public sector and increasing government productivity and efficiency. Von Haldenwang (2004), Kearns (2004) and Yu (2008) determines that the use of e-government promote the efficiency. Karunasena et al. (2011), Alhsehri and Drew (2011), Grindle (2007), Kumar and Best (2006) establishes the use of e-government and ICT increase the efficiency in public services.

Therefore, our findings show that an organizational variable like corruption influences negative in the level of efficiency. The corruption decreases the quality of the provision public services Nguyen et al. (2017). The principal reason for this is the decrease of financial resources and civil servant to provide public services. Furthermore, in these public administrations increase the transparency and the internal control system. Our results show this situation when the corruption is lower the expenditure efficiency is higher.

The authorities needs less financial resources and civil servant to provide quality public services and they have more resources to realize other activities. The economic and financial crisis has provoked an increase the measure to decrease the corruption in the provision of public services. We obtained this result in a previous research (Moreno-Enguix and Lorente-Bayona, 2017), as well as with those obtained by the World Economic Forum (2013), according to which excessive bureaucracy and red tape, overregulation, corruption, dishonesty in public contracts, lack of transparency, and the political dependence of the judicial system impose significant economic costs on businesses and slow down the process of economic development. This result is obtained for some authors such as Berg (2015), who affirms that when low efficiency is due to corruption rather than waste, there is a stronger consumption case for increasing public investment simply because extra waste is no longer a cost of scaling up. Nguyen et al. (2017) concludes that corruption significantly decrease the quality of public services. Other authors like Kim and Kim (2014), Lewis (2017), Bosco (2016) and Valle-Cruz and Sandoval-Almazán (2016) have obtained the same results.

Our study determine a significant a positive relation between efficiency and human capital. When the level of education is higher the citizens demands more quality public services and more efficiency in the financial management of public resources. The use of e-government and ICT to provision of public services needs a level de education of

the citizens. These technologies increase the efficiency of the public administration and the level of education of the population. Our results coincide with the studies of Kasemsap (2017) and Azab et al. (2009).

In relation to the others variables, we found no empirical evidence that the level of public efficiency is influenced by both country's level of democracy and state of development.

Finally, Model 2 shows the relationship between expenditure efficiency by functions and with the variables of our study. There is no empirical evidence that the level of efficiency in heath and efficiency in education is influenced by e-government; population's level of education; state of development; democracy or corruption. In health care it is necessary to study other key variables like result of cultural or climatic factors. In relation to efficiency of education, some authors like Afonso et al. (2003) and Verhoeven et al. (2007) determine that other variables should be included in the model likes scale economies.

The regression results show that a higher level of public expenditure efficiency, especially in social protection, is associated with a significantly higher level of e-government development and population's level of education, as well as with a lower level of corruption. Some authors like Porter (2005), Shirish and Thompson (2007) determine that e-government permit to apply the social measures more easily, and the authorities can reach a great number of citizens and provision more public services. Furthermore, the level of education of the population increases when the authorities promote more social public services.

Table 4: Multiple linear regression models

Models: $PEEI = \beta_0 + \beta_1*EGOVERM + \beta_2*HUMAN + \beta_3*GDPpc + \beta_4*CORRUP + \beta_5*DEMOC + \varepsilon$ $VD = \beta_0 + \beta_1*EGOVERM + \beta_2*HUMAN + \beta_3*GDPpc + \beta_4*CORRUP + \beta_5*DEMOC + \varepsilon$				
Model coefficients (Std. error)				
Predictors	**PEEI**	**VD = EDUC**	**VD = HEALTH**	**VD = SOC PROT**
Intercept	3.718 (0.251)***	6.486*** (1.126)	6.977*** (1.204)	20.117*** (2.857)
EGOVERM	0.608 (0.256) **	-0.417 (1.146)	-0.086 (1.226)	10.172 (2.910)***
HUMAN	0.128 (0.040) ***	.152 (0.182)	0.403 (0.194)	2.088*** (0.461)
GDPpc	2.700 (4.480)	-0.142 (0.637)	-0.425 (0.681)	2.406 (1.617)
DEMOC	0.115 (0.142)	8.640 (0.000)	0.000 (0.000)	
CORRUP	6.003 (1.242) **	-10.748* (5.556)	-2.569 (5.943)	-0.001*** (0.000)
N	75	75	75	75
R^2 (adjusted)	0.40	0.187	0.456	0.731
F	6.08***	2.08*	4.71***	24.48***

Notes: *, **, *** Significantly different from zero at the 0.10, 0.05 and 0.01 levels, respectively, (two-tailed)
EGOVERM=e-government, HUMAN=human capaity, GDP pc=state of development, CORRUP=corruption, DEMOC=democracy, EDUC= education efficiency, HEALTH= health care efficiency, SOC PROT=social protection efficiency.

3.6 CONCLUSIONS

This paper belongs to a series of three articles focused on public expenditure efficiency and its effect of some socioeconomic variables. We reproduce the two previous research, but taking into account a wider period of time in order to study the dynamics of adjustment.

This research enabled us to draw a general picture of the performance and expenditure efficiency in the public sector. To take into account both input-output orientations, we have classified the countries as efficient-inefficient regarding the average. Empirical analysis was applied for six years from 2007 through 2012.

25 European countries analysed are some European Union's Member States -Austria, Belgium, Bulgaria, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy,

Latvia, Lithuania, Netherlands, Poland; Romania, Slovak Republic; Slovenia, and Spain- 2 EU candidate countries (Albania and Turkey) and other European countries as Azerbaijan, Georgia, Russia and Ukraine.

Our results highlight Europe is a far from homogeneous entity. On the contrary, large disparities exist between countries. Public organizations are not yet operating at their production possibility frontier. In fact, it might be possible to improve in all dimensions of performance.

We tested the association between public sector efficiency - both for general government and for its functions- and other key socioeconomic indicators, such as e-government, population's level of education, state of development; democracy and corruption.

Model 1 and Hypothesis 3 of Model 2 was partly confirmed. As you can see in Table 4 above, regression results show that a higher level of public expenditure efficiency, especially in social protection, is associated with a significantly higher level of e-government development and population's level of education, as well as with a lower level of corruption.

We found no empirical evidence that the level of efficiency in education is influenced by e-government, population's level of education; state of development or democracy. Other variables should be included in the model. Scale economies may play a role in public sector policies, as they are able to deliver better outcomes in labor intensive services, such as education. (Afonso et al., 2003; Verhoeven et al., 2007).

On the other hand, in Europe, a higher level of efficiency in education is associated with a significantly higher level of corruption. It could be interesting to study more in deep this relationship.

We found no empirical evidence that the level of efficiency in heath is influenced by e-government; population's level of education; state of development; democracy or corruption. In health care, other key variables exit, e.g. result of cultural or climatic factors, which should be studied in depth in the future.

We believe that our findings may provide significant implications for policy makers, managers and government officials. We hope that this paper will encourage positive

policy reform and the necessary investments required to further Europe's economic and social progress. It offers policymakers and business leaders an important tool in the formulation of improved public efficiency through provision of online services, telecommunication connectivity and human capital, as well as controlling corruption.

As far as possible, it is proposed that the empirical study be extended over the following years.

Our empirical model and choice of measures are drawn from the literature on public economics, and our baseline estimation as well as a range of sensitivity analyses offers strong support to our main hypothesis. In addition, according to our estimation, the relationship between e-government intensity and national expenditure efficiency endures over a period of years.

It can be deduced from our case analysis and the preceding discussions that the sociopolitical climate of Europe does not invalidate the generalizability of our developmental prescriptions and technological specifications.

Finally, main limitation in our study that we need to address is our key independent variable public expenditure efficiency, a composite indicator which model is specified in our previous research Moreno-Enguix and Lorente-Bayona (2017).

Limitations of nonparametric methods lead to sensitivity of results to the choice of indicators (Manning et al. 2006); sampling variability -omission from the sample of the relevant country with best practice may lead to underestimation of the degree of inefficiency (Sutherland et al., 2007,)-; measurement error and statistical noise; quality of data; presence of outliers (Mandl et al. 2008; see for possible solutions, respectively, Herrera and Pang (2005) and Sutherland et al. (2007); as well as differences across countries not being statistically assessed.

Despite these limitations, nonparametric methods have been preferred in public sector efficiency analyses to date, due to their simplicity and applicability to small samples, often encountered in international comparisons Lonti and Woods (2008).

CONCLUSIONES

Esta investigación se llevó a cabo dentro del programa del Doctorado en Ciencias de la Empresa, distinguido con Mención hacia la Excelencia por el Ministerio de Educación, impartido en la Universidad de Murcia y debido a su envergadura, se materializó en diversas investigaciones parciales enfocadas a la eficiencia del gasto público y el efecto de algunas variables socioeconómicas.

La principal contribución de esta investigación es que proporciona una metodología consistente para medir la eficiencia del gasto público, tanto a nivel de país, como para cada una de sus funciones, que se puede obtener de forma regular y permite a los países ser calificados en una comparación internacional a largo plazo, tal y como ya se hace para determinar los niveles de competitividad del país (WEF).

PEEI es un índice compuesto por más de 60 indicadores socioeconómicos, ponderados y agrupados en seis funciones -siguiendo la clasificación de las Naciones Unidas del gasto por funciones (COFOG)-. A su vez, estas funciones fueron ponderadas teniendo en cuenta el nivel de desarrollo del país y la elección de cada gobierno a la hora de gastar el dinero de sus contribuyentes.

Además, para llevar a cabo el estudio, y dadas las limitaciones económicas, desarrollamos una hoja de cálculo que permite realizar tanto un análisis DEA, como uno FDH de eficiencia con un número indefinido de “DMUs-decision-making units”. Utilizamos diversas soluciones de softwares demo descargados gratuitamente desde Internet -Frontier Analyst; y DEAFrontier- para testar que los resultados eran coincidentes si utilizábamos el número máximo de unidades DMU permitidas en las versiones demo descargadas.

Esta investigación nos ha permitido trazar un cuadro general de desempeño y eficiencia del gasto en el sector público. Teniendo en cuenta tanto una orientación input, como output, clasificamos los países como eficientes-ineficientes con respecto a la media. El análisis empírico más amplio, se aplicó durante seis años, de 2007 a 2012, a una muestra de 25 países europeos.

Nuestros resultados destacan que Europa no es una entidad homogénea, sino todo lo contrario, donde existen grandes disparidades entre los países. Las organizaciones públicas están bastante lejos de operar en sus respectivas fronteras de posibilidades de

producción (Moore, 2007). De hecho, podría ser posible mejorar en todas las dimensiones del rendimiento.

Algunos de nuestros resultados, contrastan con los obtenidos por Afonso et al. (2003), según los cuales Estados Unidos es uno de los países más eficientes del mundo en sanidad, pero coinciden con los obtenidos por Eugène (2007). Esto se debe en parte a que hemos tenido en cuenta como input, no sólo el gasto público, sino también el gasto privado en salud, que en 2012 por ejemplo, representó en Estados Unidos casi el cincuenta por ciento del gasto total en salud, más del dieciocho por ciento del PIB.

En un primer momento un mayor nivel de democracia se asoció con niveles significativamente más altos de eficiencia del gasto público; nivel de desarrollo, así como con un menor nivel de corrupción, pero una parte de estas afirmaciones no fue confirmada en el panel de datos realizado con posterioridad. Habría que estudiar más en profundidad estas hipótesis.

Nuestros resultados en educación coinciden con los obtenidos por Eugène (2007), Giménez y Prior (2007), así como con Afonso et al. (2003), según los cuales Chipre, Estados Unidos, Luxemburgo, Suecia y Dinamarca son menos eficiente en educación que la media de la UE y otros países industrializados. Estos países no están logrando los resultados que deberían, a pesar de los mayores recursos gastados en educación en comparación con otros países (Giménez y Prior, 2007). Japón, Grecia y España se encuentran entre los más eficientes, en gran parte debido al bajo salario de los docentes en comparación con el resto de países europeos, o a otros factores culturales o socioeconómicos, como la situación económica del país que ayuda a mejorar los resultados en educación en épocas de crisis económica.

Se probó la asociación entre la eficiencia del sector público -tanto para el gobierno general como para sus funciones- y otros indicadores socioeconómicos clave, como el gobierno electrónico, el nivel de educación de la población, el estado de desarrollo; democracia y corrupción.

Algunas de las hipótesis de partida fueron parcialmente confirmadas. Los resultados de regresión muestran que un mayor nivel de eficiencia del gasto público, especialmente en la protección social, se asocia significativamente con niveles más altos de desarrollo del

gobierno electrónico y de educación de la población, así como con menores niveles de corrupción.

Un mayor nivel de gobierno electrónico se asoció con niveles significativamente mayores de eficiencia de gasto público, tanto para las administraciones públicas como para la mayoría de sus funciones. Podemos afirmar que si el gobierno electrónico permite un mejor acceso a los servicios públicos para todos los ciudadanos, los recursos públicos serán manejados de una manera más eficiente. Conclusión respalda por afirmaciones previas de la literatura académica sobre gobierno electrónico (Criado y Ramilo, 2001; IMCO, 2006; United Nations, 2014; World Economic Forum, 2014).

No encontramos evidencia empírica de que el nivel de eficiencia en la educación esté influenciado por el gobierno electrónico, el nivel de educación de la población; el estado de desarrollo del país o el nivel de democracia. Otras variables deben ser incluidas en el modelo. Las economías de escala podrían desempeñar un papel clave en las políticas del sector público, ya que son capaces de ofrecer mejores resultados en aquellos servicios de mano de obra intensiva, como la educación. (Afonso et al., 2003, Verhoeven et al., 2007).

Por otro lado, en Europa, un nivel más alto de eficiencia en la educación se asocia con un nivel significativamente más alto de corrupción. Podría ser interesante estudiar más en profundidad esta relación.

No encontramos evidencia empírica de que el nivel de eficiencia en sanidad esté influenciado por los niveles de desarrollo del gobierno electrónico; educación de la población; nivel de desarrollo del país; la democracia o la corrupción. En el cuidado de la salud, podría haber otras variables clave como el resultado de factores culturales o climáticos, que deberían ser estudiados en profundidad en el futuro.

Un nivel más alto de densidad demográfica se asoció con niveles significativamente más bajos de eficiencia y desempeño público en protección medioambiental, lo que coincide con las teorías de Malthus (2013) y “Environmental Protection Agency” (Cox, 2011).

Creemos que nuestros hallazgos pueden aportar implicaciones significativas para los encargados de formular las políticas públicas, los gerentes y los funcionarios públicos.

Esperamos que este documento fomente reformas políticas positivas, así como las inversiones necesarias para impulsar el progreso económico y social de Europa. Ofrece a los encargados de formular políticas y a los líderes empresariales una importante herramienta para mejor la eficiencia pública mediante la prestación de servicios en línea, la conectividad de las telecomunicaciones y el capital humano, así como el control de la corrupción.

Los datos utilizados se pueden recopilar de forma regular a través de fuentes independientes, minimizando así la carga de futuras investigaciones en la misma línea que deseen estudiar el mapa evolutivo de las diferentes variables. En la medida de lo posible, se propone extender el estudio empírico en los años siguientes.

Nuestro modelo empírico y la elección de las medidas se extraen de la literatura sobre economía pública, y tanto la base de nuestra estimación, como una serie de análisis de sensibilidad, ofrecen un fuerte apoyo a nuestras hipótesis principales. Además, según nuestras estimaciones, la relación entre la intensidad del gobierno electrónico y la eficiencia del gasto nacional perdura durante un período de años.

Puede deducirse de nuestro análisis y de las discusiones precedentes que el clima sociopolítico de Europa no invalida la generalización de nuestras conclusiones.

Por último, la principal limitación de nuestro estudio que debemos abordar es la variable independiente eficiencia del gasto público, un indicador compuesto que se especifica en el Capítulo1 y cuyo estudio fue publicado a principios de este año (Moreno-Enguix y Lorente-Bayona, 2017).

Las limitaciones de los métodos no paramétricos conducen a una sensibilidad de los resultados a la elección de los indicadores (Manning et al., 2006); variabilidad del muestreo por no haber tenido en cuenta el país con las mejores prácticas, lo que puede conducir a una subestimación del grado de ineficiencia (Sutherland et al., 2007); errores de medición y ruido estadístico; calidad de los datos; presencia de valores atípicos (Mandl et al., 2008; ver para posibles soluciones, respectivamente, Herrera y Pang, 2005, y Sutherland et al., 2007); así como las diferencias entre países que no se han evaluado estadísticamente

A pesar de estas limitaciones, los métodos no paramétricos han sido preferidos en los análisis de eficiencia del sector público hasta la fecha, debido a su simplicidad y aplicabilidad a muestras pequeñas, frecuentemente encontradas en comparaciones internacionales (Lonti y Woods, 2008).

RESUMEN

La presente investigación doctoral persiguió los siguientes objetivos: realizar una profunda revisión de las medidas de eficiencia más adecuadas para las administraciones públicas; desarrollar un índice de eficiencia del gasto público, tanto para el gobierno en su conjunto como para cada una de sus funciones[8], que pueda ser calculado de forma regular y permita a los países ser calificados en una comparación internacional a lo largo del tiempo; identificar aquellos países benchmarking a ser imitados por el resto del mundo; analizar la correlación existente entre la eficiencia y el rendimiento en las distintas funciones del gobierno; así como estudiar el papel de factores como el nivel de desarrollo de gobierno electrónico o e-government, sobre el rendimiento y el nivel de eficiencia alcanzado por el sector público, teniendo en cuenta otras variables socioeconómicas clave como el tamaño del sector público; nivel de desarrollo del país; corrupción; democracia; densidad demográfica; y nivel cultural de la población.

Este documento proporciona una metodología consistente para medir la eficiencia pública a través de un índice compuesto que hemos llamado "PEEI-public expenditure efficiency index", así como también se realizaron análisis DEA y FDH de eficiencia para detectar las mejores prácticas a nivel mundial.

PEEI es un indicador output-input, donde el output es una proxy del desempeño público, teniendo en cuenta más de 60 ponderados indicadores socioeconómicos, y el input se aproxima mediante el nivel de gasto público en relación al Producto Interior Bruto del país (PIB).

Utilizamos principalmente cuatro fuentes de datos: datos del Fondo Monetario Internacional sobre estadísticas del Gasto por Funciones de Gobierno (COFOG); las encuestas sobre gobierno electrónico realizadas por las Naciones Unidas; el Índice de Percepción de la Corrupción (Transparencia Internacional); y los Informes sobre Competitividad Mundial (WEF), teniendo en cuenta no sólo datos cuantitativos, sino también cualitativos.

Las conclusiones finales unificando los resultados parciales de los distintos trabajos son:

Las correlaciones y significatividad estadística mostraron que un mayor nivel de desempeño del sector público en cualquier función se asoció con un nivel

[8] Siguiendo la clasificación de las funciones del gobierno propuesta por las Naciones Unidas (COFOG Classification).

significativamente mayor de desempeño del sector público en otras funciones. Todas las funciones del gobierno no sólo están relacionadas entre sí, sino que también tienden a reforzarse entre sí. Nuestros resultados están en línea con los postulados por Mandl et al. (2008) y WEF (2013).

La UE es una entidad que presenta grandes disparidades en términos de eficiencia pública, lo que coincide con otras investigaciones previas (Afonso et al. 2003; Eugène, 2007; Giménez y Prior, 2007; Mandl et al., 2008). Con algunos países que tienen mejores resultados que la media europea y otras economías avanzadas, mientras que otros muestran resultados bastante peores.

Cierta similitud de disparidades prevalece a nivel regional. Nuestros resultados coinciden con los obtenidos por la Oficina de Planificación Social y Cultural (2004), según los cuales, mientras que los Estados miembros de la UE en el norte y el noroeste están a la vanguardia en eficiencia pública, las economías del sur y del sudeste van a la cola.

Entre los países con mayor eficiencia del gasto público a nivel mundial destacan Suiza, la República de Corea, Japón y Noruega. Luxemburgo es el único país dentro de la UE que está entre los top 5 del mundo.

Tanto Japón, como la República de Corea podrían ser más eficientes en protección del medio ambiente; y Suiza podría ser más eficiente en educación. Finlandia está a la cabeza en eficiencia medioambiental; Luxemburgo en salud y Reino Unido en asuntos económicos.

Los resultados muestran evidencia significativa de que existe cierta asociación entre eficiencia pública y los niveles de desarrollo económico, democracia y corrupción, así como con la densidad demográfica del país, especialmente si hablamos de protección medioambiental. El sentido de la asociación entre el tamaño del sector público y el desempeño por funciones difiere, siendo positivo en relación a la salud pública y a la protección social.

Existe una relación positiva y significativa entre la eficiencia del gasto y el nivel de desarrollo de gobierno electrónico. El uso del gobierno electrónico permite a las autoridades públicas mejorar y simplificar la prestación de servicios públicos y una

mejor conexión con los ciudadanos. El resultado de nuestro estudio muestra como la eficiencia del gasto es mejor cuando las autoridades utilizan el gobierno electrónico para la prestación de servicios públicos. El gobierno electrónico disminuye el proceso administrativo y el número de funcionarios públicos para prestar servicios públicos. Además, estas tecnologías facilitan la comunicación entre la administración y los ciudadanos. Nuestros resultados coinciden con los de Kasemsap (2017) y Azab et al. (2009), según el cual el gobierno electrónico es considerado como un medio para modernizar el sector público y aumentar la productividad y la eficiencia pública. Von Walderberg (2004), Kearns (2004) y Yu (2008) determinan que el uso del gobierno electrónico promueve la eficiencia. Karunasena et al. (2011), Alhsehri y Drew (2011), Grindle (2007), Kumar y Best (2006) establecen el uso del gobierno electrónico y las TIC para aumentar la eficiencia en los servicios públicos.

Analizamos también el impacto relativo en la eficiencia del gasto público de las dimensiones más importantes del gobierno electrónico -alcance y calidad de los servicios en línea, nivel de desarrollo de las infraestructuras en telecomunicaciones y capital humano o nivel cultural de la población-, tanto para el gobierno en general como para cada una de sus funciones.

Un nivel más alto de alcance y calidad de los servicios en línea fue asociado con un nivel significativamente más alto de eficiencia, tanto para el gobierno general como para la mayoría de sus funciones.

El gobierno electrónico ofrece a los ciudadanos un acceso más rápido y fácil a todos los servicios básicos de las instituciones públicas, lo que aumenta el grado de eficiencia en la prestación de dichos servicios. El uso del gobierno electrónico estandariza la prestación de los servicios y simplifica su gestión, facilitando la toma de decisiones en las administraciones públicas (Jakobs, 2000; Fang, 2002; y Schachter, 2007). Este proceso favorece la reducción de costos en la provisión de servicios públicos, debido a la disminución de personal y la simplificación de procesos. Este resultado coincide con los obtenidos por Higgins y Hallström (2007), Galera et al. (2008) y Chiang y Liao (2009).

El efecto positivo del alcance y calidad de los servicios en línea sobre la eficiencia pública difiere entre las funciones. No se observó asociación consistente ni en el

servicio de salud, ni en el de educación. Esta situación se debe a la naturaleza de estos servicios, que necesitan aplicar procesos adaptados a cada situación, lo que implica la aplicación de un volumen significativo de recursos que aseguren el desarrollo de la tecnología apropiada para la provisión de estos servicios. Estos resultados coinciden con los obtenidos por Jakobs (2005) y Wang y Kim (2007).

Una mejor infraestructura de telecomunicaciones y un mayor capital humano fueron asociados positiva y significativamente con un mayor impacto del alcance y calidad de los servicios en línea sobre la eficiencia del gasto público, tanto para el gobierno en general como para la mayoría de sus funciones públicas.

Un gobierno electrónico más consistente requiere una desarrollada infraestructura de telecomunicaciones (Al-Khanjari et al., 2014; Zhao, 2013; Jakobs, 2005; Higgins y Hallström, 2007; y Galera et al., 2008). Cuanto mejores sean las infraestructuras, más eficaz será el gobierno electrónico, y esto tendrá un mayor impacto en la eficiencia de los servicios públicos.

La implementación del gobierno electrónico también requiere que sus ciudadanos tengan suficiente preparación para poder acceder y utilizar este servicio adecuadamente. Los estudios de Dwyer et al. (2005), Srite y Karahanna (2006) y Zhang y Maruping (2008) determinaron que un nivel cultural adecuado de la población es esencial para un uso adecuado del gobierno electrónico. Zhao (2013) determinó que el capital humano influye de manera significativa y positiva en la variable gobierno electrónico.

Nuestros resultados también muestran que la corrupción influye negativamente en el nivel de eficiencia pública. La corrupción disminuye la calidad de la prestación de servicios públicos (Nguyen et al., 2017). En las administraciones públicas más eficientes, se incrementa la transparencia y el sistema de control interno. Las autoridades necesitan menos recursos financieros y funcionarios públicos para prestar servicios públicos de calidad y tienen más recursos para realizar otras actividades. La crisis económica y financiera ha provocado un aumento de las medidas para disminuir la corrupción en la prestación de servicios públicos (Moreno-Enguix y Lorente-Bayona, 2017), así como con los obtenidos por el WEF (2013), según el cual la excesiva burocracia, sobre-regulación, corrupción, deshonestidad en los contratos públicos, falta de transparencia y la dependencia política del sistema judicial imponen importantes

costos económicos a las empresas y frenan el proceso de desarrollo económico. Este resultado es obtenido también por autores como Berg (2015), quien afirma que cuando la baja eficiencia se debe a la corrupción en lugar de a una mala gestión, existe una tendencia a una mayor inversión pública ya que ese gasto ya no se ve como un coste de inversión. Nguyen et al. (2017) concluyen que la corrupción disminuye significativamente la calidad de los servicios públicos. Otros autores como Kim y Kim (2014), Lewis (2017), Bosco (2016) y Valle-Cruz y Sandoval-Almazán (2016) han obtenido los mismos resultados.

Nuestro estudio determina una relación positiva significativa entre la eficiencia pública y el nivel cultural de la población. Cuando el nivel de educación es mayor, los ciudadanos exigen más servicios públicos de calidad y más eficiencia en la gestión financiera de los recursos públicos. Por otro lado, el uso del gobierno electrónico y las TIC para la provisión de servicios públicos necesita cierto nivel de educación en los ciudadanos. Estas tecnologías y el nivel de educación de la población aumentan la eficiencia de la administración pública. Nuestros resultados coinciden con los estudios de Kasemsap (2017) y Azab et al. (2009).

En relación con las otras variables, no encontramos evidencia empírica de que el nivel de eficiencia pública esté influenciado ni por el nivel de democracia, ni por el estado de desarrollo del país.

Por último, centrándonos en la eficiencia pública por funciones. No hay evidencia empírica de que ni el nivel de eficiencia en sanidad, ni en educación, esté influenciado por el nivel de desarrollo de gobierno electrónico; educación de la población; estado de desarrollo del país; democracia o corrupción. En el cuidado de la salud es necesario estudiar otras variables claves como resultado de factores culturales o climáticos. En relación con la eficiencia de la educación, algunos autores como Afonso et al. (2003) y Verhoeven et al. (2007) determinan que otras variables deben ser incluidas en el modelo como las economías de escala.

Los resultados de la regresión muestran que un mayor nivel de eficiencia en el gasto público, especialmente en protección social, se asocia significativamente con niveles mayores de desarrollo del gobierno electrónico y educación de la población, así como un menor nivel de corrupción. Algunos autores como Porter (2005), determinan que el

gobierno electrónico permite aplicar las medidas sociales más fácilmente, y las autoridades pueden llegar a un mayor número de ciudadanos y proporcionar más servicios públicos. Además, el nivel de educación de la población aumenta cuando las autoridades promueven más servicios públicos sociales.

Por otra parte, un menor nivel de corrupción se asoció con un nivel considerablemente más alto de desarrollo del país. Nuestro resultado coincide con los obtenidos por el WEF (2013).

Por otra parte, un mayor nivel de democracia también se asoció con un nivel considerablemente más alto de nivel de desarrollo del país, así como con un nivel significativamente más bajo de corrupción. Por lo tanto, la forma correcta para acabar con la corrupción, mejorar el nivel de vida de la gente y obtener una más eficiencia administración pública es a través de un mayor nivel de democracia.

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APPENDIXES

Appendix A. Public Expenditure Efficiency Index (PEEI)

Mathematically, Public Expenditure Efficiency is a weighted average of six (normalized) scores on the public efficiency by functions in line with the COFOG classification, namely: General Public Service, Order and Safety (GPSOS), Economic Affairs (EA), and Environmental Protection, Housing and Community Amenities (EP), as the United States include environment protection expenditures in housing and community amenities of: Health (H), Education (E), and Social Protection (SP)[9].

Functions_ weight on PEEI coincides with the expenditure by function ($Expenditure_{functionf}$), as a share of the country's expenditure-EXP (general government expenditure + private expenditure on H).

$PEEI = \sum PEEI\_function\ f * (Expenditure_{functionf} / EXP)$

PEEI=PEEI_GPSOS*(GE_GPSOS/EXP)+PEEI_EA*(GE_EA/EXP)+PEEI_EP*(GE_EP/EXP)+PEEI_H*[(GE_H+privateexpenditureonH)/EXP]+PEEI_E*(GE_E/EXP)+PEEI_SP*(GE_SP/EXP)

Public Expenditure Efficiency Index by function-PEEI_function f

PEEI_function f=Public sector performance_function f / GE_function f as a percentage of GDP

Sources

INPUT side: Eurostat (2014), OECD (2014), AllThatStats Data Base Hits (2014), International Monetary Fund (2014), World DataBank-World Development Indicators (2014) (Health private expenditure as per cent of GDP).

Psp_GPSOS. Public sector performance on General Public Service, Order and Safety (COFOG 01and 03)

psp_GPSOS=(1/3 * Macroeconomic environment)+(2/3 * Public institutions)

Macroeconomic environment	33, 33%

[9] Defense, because the confidential nature of its data was not included; nor were Recreation, Culture, and Religion, because definitive choices about what indicators should be included are far from evident Gordon and Beilby-Orrin (2007).

Mathematically, Macroeconomic environment is the average of five (normalized) scores, namely: Government budget balance (%)*; Gross national savings (%)*; Inflation*; Government debt (%)*; and Country credit rating*.

Source: WEF (2013) The Global Competitiveness Report 2013–2014.

Public institutions 66, 66%

Mathematically, Public institution is the average of four (normalized) scores, namely: Ethics and corruption*; Undue influence*; Government efficiency*; and Security*.

Source: WEF (2013) The Global Competitiveness Report 2013–2014.

PEEI_GPSOS. Public Expenditure Efficiency in General Public Service, Order and Safety (COFOG 01and 03)

PEEI_GPSOS=psp_GPSOS / GE_GPSOS as a percentage of GDP

psp_EA. Public sector performance on Economic Affairs (COFOG 04)

psp_EA=(Wbr * Basic requirements)+(Wi * RandD Innovation)+(Wee * Efficiency enhancers)[10]

Basic requirements Wbr

Mathematically, Basic requirements is the average of two (normalized) scores: Economic performance; and Transport, electricity and telephony.

Source: WEF (2013) The Global Competitiveness Report 2013–2014.

RandD Innovation Wi

Mathematically, RandD Innovation is the average of eight (normalized) scores, namely: Capacity for innovation; Quality of scientific research institutions; Company spending on RandD; University-industry collaboration in RandD; Government procurement of advanced technology products; Availability of scientists and engineers; PCT patent applications*; and Intellectual property protection.

Source: WEF (2013) The Global Competitiveness Report 2013–2014.

Efficiency enhancers Wee

Mathematically, Efficiency enhancers is the average of four (normalized) scores, namely: Goods market efficiency; Labour market efficiency; Financial trustworthiness and confidence; and ICT use.

Source: WEF (2013) The Global Competitiveness Report 2013–2014.

PEEI_EA. Public Expenditure Efficiency in Economic Affairs (COFOG 04)

[10] The weights are as specified below. According to stage of development.

PEEI_EA=psp_EA / GE_EA as a percentage of GDP

psp_EP. Public Sector Performance on Environmental Protection (COFOG 05and06)

psp_EP=Environmental sustainability

Mathematically, Environmental sustainability is the average of seven (normalized) scores: Share of renewable electricity production*; Terrestrial biome protection*; Environmental treaty ratification*; Enforcement of environmental regulations; Quality of natural environment; CO2 intensity*; and Particulate matter (2.5) concentration*.

Source: WEF (2014) The Europe 2020 Competitiveness Report 2014.

PEEI_EP. Public Expenditure Efficiency in Environmental Protection (COFOG 05and06)

PEEI_EP=psp_EP / GE_EP as a percentage of GDP

psp_H. Performance on Health (COFOG 07)

psp_H=(1/2 * Infant mortality*)1(1/2 * Life expectancy*)

Sources: World DataBank-World Development Indicators (2014); WEF (2013) The Global Competitiveness Report 2013–2014.

PEEI_H. Expenditure Efficiency in Health (COFOG 07)

PEEI_H=psp_H / Total expenditure in Health as a percentage of GDP

psp_E. Performance on Education (COFOG 09)

psp_E=[(Wbr1Wi/2) * Primary education]1[(Wi/21Wee) * Higher education]

Primary education, average of two (normalized) scores	**(Wbr1Wi/2)**
Primary education enrolment rate*	50%
Quality of primary education	50%

Sources: World DataBank-World Development Indicators (2014); WEF (2013) Global Competitiveness Report 2013–2014.

Higher education, average of two (normalized) scores (Wi/21Wee)

Sources: World DataBank-World Development Indicators (2014); WEF (2013) Global Competitiveness Report 2013–2014; UNESCO Institute for Statistics Data Centre (UIS.Stat) (2014).

PEEI_E. Public Expenditure Efficiency in Education (COFOG 09)

PEEI_E=psp_E / GE_E as a percentage

psp_SP. Public Sector Performance on Social Protection (COFOG 10)

psp_SP=Social inclusion

Mathematically, Social inclusion is the average of five (normalized) scores: Accessibility of healthcare services; Gini coefficient*; Government effectiveness in reducing poverty and inequality; Social safety net protection; Social mobility

Source: WEF (2014) The Europe 2020 Competitiveness Report 2014.

PEEI_SP. Public Expenditure Efficiency in Social Protection (COFOG 10)

PEEI_SP=psp_SP / GE_SP as a percentage
Note: *Indicator has been normalized on a 1 to 7 scale.

Appendix B. Notes of Variable Definitions

General public service, order, and safety	Diversion of public funds	In your country, how common is diversion of public funds to companies, individuals, or groups due to corruption? [15very commonly occurs, 75never occurs] | 2012–13 weighted average
	Public trust in politicians	In your country, how would you rate the ethical standards of politicians? [1=extremely low, 7=extremely high]
	Irregular payments and bribes	Average score across the five components of the following EOS question
	Judicial independence	In your country, to what extent is the judiciary independent from influences of members of government, citizens, or firms? [1=heavily influenced, 7=entirely independent]
	Favoritism in decisions of government officials	In your country, to what extent do government officials show favoritism to well-connected firms and individuals when deciding upon policies and contracts?
	Wastefulness of government spending	In your country, how efficiently does the government spend public revenue? [1=extremely inefficient]
	Burden of government regulation	In your country, how burdensome is it for businesses to comply with governmental administrative requirements?
	Efficiency of legal framework in settling disputes	In your country, how efficient is the legal framework for private businesses in settling disputes?
	Efficiency of legal framework in challenging regulations	In your country, how easy is it for private businesses to challenge government actions and/or regulations through the legal system?
	Transparency of government policy making	In your country, how easy is it for businesses to obtain information concerning changes in government policies and regulations affecting their activities?

	Business costs of terrorism	In your country, to what extent does the threat of terrorism impose costs on businesses?
	Business costs of crime and violence	In your country, to what extent does the incidence of crime and violence impose costs on businesses?
	Organized crime	In your country, to what extent does organized crime (mafia-oriented racketeering, extortion) impose costs on businesses?
	Reliability of pólice services	In your country, to what extent can police services be relied upon to enforce law and order?
Economic affairs	GDP per capita*	GDP per capita in current U.S. dollars | 2012
	GDP growth (annual %)*	Annual percentage growth rate of GDP at market prices based on constant?
	Intensity of local competition	In your country, how intense is competition in the local markets?
	Extent of market dominance	In your country, how would you characterize corporate activity?
	In your country, how would you characterize corporate activity?	In your country, to what extent does antimonopoly policy promote competition?
	Effect of taxation on incentives to invest	In your country, to what extent do taxes reduce the incentive to invest?
	Total tax rate*	This variable is a combination of profit tax (% of profits), labor tax and contribution (% of profits), and other taxes (% of profits)
	Agricultural policy costs	In your country, how would you assess the agricultural policy? [1=excessively burdensome for the economy]

Prevalence of trade barriers	In your country, to what extent do nontariff barriers (e.g., health and product standards, technical and labeling requirements) limit the ability of imported goods to compete in the domestic market?
Prevalence of foreign ownership	In your country, how prevalent is foreign ownership of companies?
Business impact of rules on FDI	In your country, to what extent do rules and regulations encourage or discourage foreign direct investment (FDI)? [15strongly discourage FDI, 75strongly encourage FDI]
Burden of customs procedures	In your country, how efficient are the customs procedures (related to the entry and exit of merchandise)?
Imports as a percentage of GDP*	Imports of goods and services as a percentage of GDP
Hiring and firing practices	In your country, how would you characterize the hiring and firing of workers? [1=heavily impeded by regulations]
Redundancy costs*:	Redundancy costs in weeks of salary
Effect of taxation on incentives to work	In your country, to what extent do taxes reduce the incentive to work? [1=significantly reduce the incentive to work]
Country capacity to attract talent	Does your country attract talented people from abroad?
Country capacity to retain talent	Does your country retain talented people?
Unemployment rate per country (%)*	Percentage of labor forcé
Female participation in labor force*:	Ratio of women to men in the labor force*

	Soundness of banks	In your country, how would you assess the soundness of banks?
	Regulation of securities Exchanges	In your country, how effective are the regulation and supervision of securities exchanges?
	Legal rights index*:	Degree of legal protection of borrowers_ and lenders_ rights on a 0–10 (best) scale
	Internet users*	Percentage of individuals using the Internet
Health	Infant mortality*:	Infant (children aged 0–12 months) mortality per 1,000 live births
	Life expectancy*	Life expectancy at birth (years)
Education	Primary education enrollment rate*	Net primary education enrollment rate | 2012 or most recent year available
	Quality of primary education	In your country, how would you assess the quality of primary schools?
	Secondary education enrollment rate*	Gross secondary education enrollment rate | 2012 or most recent year available
	Tertiary education enrollment rate*	Gross tertiary education enrollment rate | 2012 or most recent year available
	Quality of the educational system	How well does the educational system in your country meet the needs of a competitive economy?
	Quality of	In your country, how would you assess the quality of math and

math and science Education	science education in schools?
Quality of management schools	In your country, how would you assess the quality of business schools? [1=extremely poor— among the worst in the world]
Internet access in schools	In your country, how widespread is Internet access in schools?