ANALES DE ECONOMÍA APLICADA

ANAIS DE ECONOMIA APLICADA

2009

José Pires Manso
João Dionísio Monteiro
(Directores)

DELTA PUBLICACIONES

sepelt Internacional Economía Aplicada

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ASEPELT son las siglas de la Asociación Científica Internacional de Economía Aplicada. El objetivo de la Asociación, recogido en sus estatutos y que inspira su actividad, es organizar, promover y favorecer trabajos originales de carácter científico en el dominio de la Economía Aplicada.

Para ello, desde la Asociación se definen las siguientes líneas de actuación:

1. El intercambio de información, entre sus miembros, de sus trabajos de investigación.
2. La publicación de una Revista Científica: "Estudios de Economía Aplicada".
3. La publicación de selecciones de artículos o de obras colectivas.
4. La organización de seminarios, coloquios o congresos.

La Asociación se convierte, de esta manera, en un foro abierto al intercambio y debate de las distintas ideas y aportaciones científicas, que se desarrollan tanto en el ámbito universitario como en el empresarial, dentro del campo de la Economía Aplicada.

Las Reuniones Anuales de la Asociación, punto de encuentro de un elevado número de investigadores involucrados en estas cuestiones, proporcionan un medio excepcional para el mejor conocimiento mutuo, embrión de futuras colaboraciones.

Esta publicación ANALES DE ECONOMÍA APLICADA es la expresión del camino que están tomando las nuevas iniciativas en el ámbito de la investigación y de la innovación en Economía Aplicada.

ASEPELT são as siglas da Associação Científica Internacional de Economia Aplicada. O objectivo da Associação, transcrito nos seus estatutos, e que inspira a sua actividade, é organizar, promover e favorecer trabalhos originais de carácter científico no domínio da Economia Aplicada.

Para isso, a Associação define as seguintes linhas de actuação:

1. O intercâmbio de informação, entre seus membros, de seus trabalhos de investigação.
2. A publicação de uma Revista Científica: “Estudios de Economía Aplicada”.
3. A publicação de selecções de artigos ou de obras colectivas.
4. A organização de seminários, colóquios ou congressos.

A Associação converte-se, desta forma, num fórum aberto ao intercâmbio e debate de distintas ideias e contributos científicos, que se desenvolvem tanto no âmbito universitário como no empresarial, dentro do campo da Economia Aplicada.

As Reuniões Anuais da Associação, ponto de encontro de um elevado número de investigadores envolvidos na discussão destas questões, proporcionam um meio excepcional para o melhor conhecimento mútuo, embrião de futuras colaborações.

Esta publicação ANAIS DE ECONOMIA APLICADA é a expressão do caminho que estão a tomar as novas iniciativas no âmbito da investigação e da inovação na Economia Aplicada.

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Reunión IV	1990	Murcia
Reunión V	1991	Las Palmas de Gran Canaria
Reunión VI	1992	Granada
Reunión VII	1993	Cádiz
Reunión VIII	1994	Mallorca
Reunión IX	1995	Santiago de Compostela
Reunión X	1996	Albacete
Reunión XI	1997	Bilbao
Reunión XII	1998	Córdoba
Reunión XIII	1999	Burgos
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Reunión XVI	2002	Madrid
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Reunión XVIII	2004	León
Reunión XIX	2005	Badajoz
Reunión XX	2006	Tenerife
Reunión XXI	2007	Valladolid
Reunión XXII	2008	Barcelona
Reunión XXIII	**2009**	**Covilhã (Portugal)**

APRESENTACÃO

A ciência económica evolui muito rapidamente e cada vez mais para áreas interdisciplinares; e essa evolução tem tido reconhecimento público como é o caso da recente atribuição do prémio Nobel da Economia a um investigador da área da psicologia económica; mas outras áreas há que se têm vindo a afirmar progressivamente como é o caso da economia da energia e do ambiente, da economia da saúde, da economia experimental, da economia da estratégia, ou da economia da inovação, entre outras.

Neste XXIII Congresso Internacional de Economia Aplicada, o XXIII Encontro Anual e primeiro da ASEPELT Internacional, dada a sua recente mudança de nome, a par das tradicionais áreas da economia, abriu-se o leque a algumas destas novas áreas científicas e a verdade é que os investigadores corresponderam totalmente à nossa expectativa apresentando trabalho de indubitável interesse e em quantidades dignas de registo, como o prova o resultado da dupla revisão a que os mesmos artigos foram sujeitos e que aprovou a apresentação de um razoável número desses artigos. Esperemos que seja também essa a opinião dos investigadores que se dignarem assistir ao XXIII congresso na Covilhã.

Ao todo as áreas científicas a concurso foram dezasseis, das mais tradicionais a outras mais recentes como as já referidas áreas da economia da energia e do ambiente, da estratégia económica, da economia da inovação, da economia do conhecimento. O número de artigos recebidos foi de várias centenas, dos quais se seleccionaram, após a referida dupla revisão por avaliadores anónimos e independentes, cerca de duas centenas que estão englobados no CD dos Anais de Economia Aplicada que a Delta Publicaciones acaba de editar. Alguns desses artigos, distinguidos pelos próprios avaliadores, merecem um destaque especial e por isso se publicam como 'ponencias' na versão em livro dos mesmos Anais, a par dos resumos de todas as comunicações seleccionadas para apresentação no congresso; quer um quer o outro desses documentos apresenta ISBN.

No âmbito desta nota introdutória cabe um agradecimento especial ao imenso trabalho desenvolvido pelos inúmeros revisores anónimos e independentes, espanhóis e portugueses, de todos os artigos recebidos, alguns deles em áreas bem densas e complexas.

Também queremos destacar o trabalho do Comité Organizador constituído por colegas da Universidade da Beira Interior, realçando apenas o nome do colega João Dionísio Monteiro pela sua total disponibilidade e empenho desde o início deste processo, e o trabalho do secretariado com destaque para a técnica superior Elisabete

Ramos, e ainda a Delta Publicaciones que pacientemente foi aguardando o envio dos nossos trabalhos, apesar do extremamente curto espaço de tempo de que dispunha.

Uma palavra breve para agradecer ao Presidente da ASEPELT Internacional, Prof. Ginés Guirao, pelo apoio sempre disponibilizado e por ter confiado nas nossas mãos a organização deste congresso, o congresso da internacionalização da ASEPELT.

Como é evidente o maior realce vai para as centenas de autores dos artigos seleccionados; são eles os verdadeiros responsáveis por esta obra e pelo seu mérito científico.

Um obrigado a todos pela colaboração dispensada.

Covilhã, Junho de 2009

José Ramos Pires Manso
João Dionísio Monteiro
(directores)

PRESENTACIÓN

La ciencia económica evoluciona muy rápidamente y cada vez más para áreas interdisciplinares; y esa evolución ha tenido reconocimiento público como es el caso de la reciente atribución del Premio Nobel de Economía a un investigador del área de la Psicología Económica; pero hay otras áreas que se están afirmándose progresivamente como es el caso de la Economía de la energía y del medioambiente, Economía de la Salud, Economía experimental, Economía de la estrategia o la Economía de la innovación, entre otras.

En este XXIII Congreso Internacional de Economía Aplicada, o XXIII Encuentro Anual y primero de ASEPELT Internacional, dado su reciente cambio de nombre, junto a las áreas tradicionales de la Economía, se abre el abanico a algunas de estas nuevas áreas científicas y la verdad es que los investigadores correspondieron totalmente a nuestra expectativa, presentando trabajos de indudable interés y en cantidades dignas de mención, como prueba el resultado de la doble revisión a la que los mismos artículos fueron sujetos y que aprobó un razonable número de ellos. Esperemos también que esta sea también la opinión de los investigadores que se dignaron a asistir al XXIII Congreso en Covilhã.

Finalmente las áreas científicas a concurso fueron dieciséis, desde las más tradicionales a otras más recientes como las ya referidas áreas de Economía de la energía y del medioambiente, Economía de la estrategia económica, Economía de la innovación y Economía del conocimiento. Fueron cientos los artículos recibidos, de los cuales se seleccionaron tras la referida revisión doble por evaluadores anónimos e independientes, cerca de dos centenares que están recogidos en el CD de los Anales de Economía Aplicada que Delta Publicaciones acaba de editar. Algunos de estos artículos, distinguidos por los propios evaluadores, merecen una relevancia especial y por ello se publican como "ponencias" en la versión en libro de los mismos Anales, así como los resúmenes de todas las comunicaciones seleccionadas para su presentación en el Congreso; en todo caso, cualesquiera de esos documentos presenta ISBN.

En el ámbito de esta nota introductoria, cabe un agradecimiento especial al inmenso trabajo desarrollado por los innumerables revisores anónimos e independientes, españoles y portugueses, de todos los artículos recibidos, algunos de ellos en áreas muy densas y complejas.

También queremos agradecer el trabajo del Comité Organizador constituido por colegas de la Universidade da Beira Interior, destacando apenas el nombre del colega João Dionísio Monteiro por su total disponibilidad y empeño desde el inicio de este proceso, y el trabajo de secretariado, con especial mención a la labor técnica superior

de Elisabete Ramos, e incluso a Delta Publicaciones que pacientemente aguardó el envío de nuestros trabajos, a pesar del extremadamente corto espacio de tiempo del que disponía.

Unas breves palabras también para agradecer al Presidente de ASEPELT Internacional, Prof. Ginés Guirao, por el apoyo siempre dispuesto y por haber confiado a nuestras manos la organización de este congreso, el congreso de la internacionalización de ASEPELT.

Como es evidente, el mayor realce va para los centenares de autores de los artículos seleccionados; son ellos los verdaderos responsables de esta obra y por su mérito científico.

Agradecemos a todos la colaboración dispensada

Covilhã, Junho de 2009

José Ramos Pires Manso
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IMPACT OF THE EUROPEAN INTEGRATION PROCESS ON THE EXPORTS FROM CASTILLA Y LEÓN (1993-2007): AN ECONOMETRIC ANALYSIS FROM THE GRAVITY EQUATION

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Resumen

Este trabajo analiza el impacto del proceso de integración europea sobre el volumen de exportaciones de Castilla y León hacia los países comunitarios (UE-27) durante el período 1993-2007. La metodología utilizada se basa en la estimación de una ecuación de gravedad, que constituye una herramienta útil en la modelización de los flujos de comercio bilateral. Tras aplicar un análisis de datos de panel, los resultados indican que la riqueza del país importador y de Castilla y León, la población regional, así como la distancia y una frontera común entre ellos, son las variables que mejor explican el flujo exportador analizado. Respecto a los distintos acontecimientos vinculados al proceso de integración, la pertenencia del país importador a la UE sólo produjo un impacto positivo y significativo a mediados de la década de los noventa, mientras que el hecho de compartir una moneda común inhibió la cifra de exportaciones a lo largo de todo el período considerado.

Palabras clave: Exportaciones, Proceso de Integración Europea, Ecuación de Gravedad, Castilla y León
Área Temática: Métodos Cuantitativos para la Economía y Empresa.

Abstract

The aim of this work is to develop an econometric framework to determine the impact of the European integration process on the exports from Castilla y León to the EU-27 countries during the period 1993-2007. This framework is based on the estimation of a gravity equation, which has proved a very useful tool in modelling bilateral currents of trade. After applying panel data analysis, results indicate that incomes of the importing country and Castilla y León, the regional population, the bilateral distance and a common land border are the main explanatory factors of export flows from this Spanish region. Regarding the different events associated to the integration process, the EU membership of the importer country only caused positive and significant effects between 1994 and 1996, whereas the EMU membership reduced export flows from Castilla y León to the European countries during the whole period.

Classification JEL: F13, F14, F15
Keywords: Exports, European Integration Process, Gravity Equation, Castilla y León
Thematic Area: Quantitative Methods for Economics and Business.

1. INTRODUCTION

The internationalisation process experienced by the Spanish economy during the recent years represents one of the main structural changes that have enabled a very brief transition from a slow growth model, with a very high level of protection and intervention, to a much

faster model, open to international competition. This internationalisation process has evolved in clear parallelism with the growing integration in the Community Europe, being business activity its main growth factor for the whole of productive sectors.

A number of relevant events have occurred in the process of Community integration consolidation from the beginning of the Spanish association with the European Communities. The first one would be agreed and ratified between 1992 and 1993 with the entry into force of the Maastricht Treaty, by virtue of which not only the European Union (EU) is officially created, but also the free circulation of persons, services, goods and capitals is definitely fostered among the 12 states that formed the Community space at the time (Germany, Belgium, Denmark, Spain, France, Greece, Holland, Ireland, Italy, Luxembourg, Portugal and United Kingdom). This Treaty therefore represents a crucial step on the economic integration process, creating a large internal market, free from barriers and customs, to which three new Western European members are incorporated later, in January 1995, (Austria, Finland and Sweden), forming together the so-called 15 EU.

The second milestone in the integration process took place on January 1st 1999, with the creation of the European Monetary Union (EMU), that involved the institutionalisation of a central authority responsible for defining and implementing a common monetary and exchange policy, as well as managing the new Community currency; although the unification did not become effective until 2002, when the Euro started to circulate as single legal currency in 12 of the 15 EU member countries[1]. At present, four other countries are sharing the single currency, what forms a 16 European countries[2] Monetary Union. With the definitive Euro implementation, the commercial relations among Community members have been consolidated, apart from eliminating the transaction costs linked to the exchange rate fluctuations.

Until 2004 the Community strengthening focused on the consolidation of the economic and monetary integration process among the 15 Western European member countries. But another essential event happens that year with the incorporation of new members to the EU. On May 1st 2004, 10 countries enter the EU (Czech Republic, Cyprus, Slovakia, Slovenia, Estonia, Hungary, Latvia, Lithuania, Malta and Poland, the EU-10), that have different economic, politic and social roots, as well as a very heterogeneous profile compared to the traditional EU-15, forming together the EU-25. The enlargement process continues with the incorporation of Bulgaria and Rumania on January 1st 2007, framing the current 27 member states EU (EU-27).

The chronology of these events, linked to the European integration process, offer an important potential to form a driving force of the Community bilateral trade. They explain the beginning of the study in 1993, with the Maastricht Treaty entry into force, and its end in 2007, the last year with public available data and when the joint effects of the above-mentioned events are already evidenced in commercial relations among member states[3]. In this context our work intends to contribute filling the gap in the study of Spanish external commerce behaviour during that period: the modelling of the Comunidad Autónoma de Castilla y León exports to the rest of the 27-UE countries.

The three specific objectives of this investigation are: First, the analysis of the factors that have influenced the volume of exports from this region to the rest of the Community countries during the last years. Second, to find out if the economic and monetary events linked to the European unification process have affected that export flow. Third, to detect if the economic and monetary integration impact has been constant (such as it is implicitly assumed in most empirical studies), or it has varied throughout time. The so-called "gravity equation" is used to reach these objectives, a widely used econometric tool in the estimation of the bilateral trade standard determinants.

[1] From the fifteen countries that formed the EU, Denmark, United Kingdom and Sweden availed of a voluntary exclusion clause in the adoption of the Monetary Union, which still keeps them outside the Euro.

[2] On January 1st 2007 the Euro starts to circulate in Slovenia. Later, on January 1st 2008, Cyprus and Malta adopt it, while Slovakia does it on January 1st 2009.

[3] Baldwin (2006) indicates that when it comes to study the effects of the European integration process in the commercial flows, it can be adequate to start the sampling period after 1992, since a change in the calculation process and commerce statistics presentation at Community level takes place from that year.

The report describes in the first place the Castilla y León export behaviour to the Community countries during the study period. Next, the theoretic support and the empirical background of the gravity equation are reviewed, specifying the econometric model that will explain the exports intensity from Castilla y León to the rest of the EU-27 countries. The aspects related to the data base, variables and adopted methodology are described subsequently. The fifth section summarises the results obtained, and finally, the main conclusions of the study are presented.

2. THE EXPORT BEHAVIOUR OF CASTILLA Y LEÓN TOWARDS THE EU-27 COUNTRIES (1993-2007)

The Comunidad Autónoma of Castilla y León has been object of important transformations during the past years, among which the gradual internationalisation of its economy stands out, with the commercial facet as main determinant. During the period between 1993 and 2007 in particular, this region's exports rate increased remarkably, tripling the total numbers delivered by the Castilla y León companies (Chart 1). This export dynamism is marked by a high concentration around the EU-integrated countries. Chapter 1 specifically points out that during all the period the exports to the Community countries have always involved more than 80% of international sales.

Chart 1: Temporary dynamic of the Castilla y León exports to the European Union

Exports Volume (in million Euro)															
	1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
EU 15	2.361	3.251	3.944	4.219	4.750	5.936	6.583	7.147	7.110	6.753	7.438	7.809	7.366	7.351	7.653
EU 10	17	26	71	56	71	128	141	173	305	323	254	314	412	396	446
EU 2	0,32	1.04	0.60	1.31	1.53	4.69	3.74	17.70	24.45	15.06	16.99	39.27	89.99	157	201
EU 27	2.378	3.278	4.015	4.275	4.821	6.064	6.724	7.320	7.415	7.076	7.692	8.123	7.778	7.904	8.300
Castilla y León Total Export	**2.912**	**3.601**	**4.114**	**4.736**	**5.370**	**6.623**	**7.427**	**8.239**	**8.254**	**7.920**	**8.653**	**9.212**	**8.949**	**9.090**	**9.769**
Representativeness (% on total exports)															
EU 15	81,08	90,28	95,87	89,08	88,45	89,63	88,64	86,75	86,14	85,27	85,96	84,77	82,31	80,87	78,34
EU 10	0,58	0,72	1,73	1,18	1,32	1,93	1,90	2,10	3,70	4,08	2,94	3,41	4,60	4,36	4,57
EU 10 + EU 2	0,59	0,75	1,73	1,18	1,32	1,93	1,90	2,10	3,70	4,08	2,94	3,41	4,60	6,08	6,62
EU 27	81,67	91,03	97,59	90,27	89,78	91,56	90,53	88,85	89,84	89,34	88,89	88,18	86,91	86,95	84,96

Chart by authors.
Source: Special Taxation and Customs Department of the Tax Administration Government Agency (AEAT).
The 2007 data are provisional.

Nevertheless, there are important disparities among the 27 member countries when observing the export dynamic during the analysed period. On the one side, we can point out the essential interpenetration with the EU-15 area of consolidated commercial relations with Castilla y León based on important exchanges volumes, that have however progressively lost representativeness. The EU-15 area involved 78,84% of the region's total exports in 2007; this means a drop of almost 3 percentage points in comparison with 1993 and more than 17 points in comparison with 1995, when that area reached the maximal representativeness of total exports. On the other side, we can observe an emerging link with the new adhesion countries from 2004 (EU-10 and EU-2), that has presented exponential growth during the reference period, even though it still carries low volumes, that at the end of 2007, did not represent more than 6,62% of the total exports dispatched from Castilla y León (Chart 1).

Three periods with different impact on the above-mentioned areas stand out, other than the indisputable disparity in the exported volumes to the traditional EU-15 and the enlarged EU (EU-10 and EU-2), as well as the evolution of its representativeness. In 1993, with the definitive

implementation of the Common Internal Market, the basis for a continuous and sustained growth of the Castilla y León exports to the EU-15 countries is provided. The elimination of barriers and obstacles to the mobility of production inputs and outputs encouraged and deepened the volumes negotiated towards these Community countries during the 1990s. Nevertheless, the volume of exports starts to stabilise from the year 2000, going however through certain corrections and subsequent volume recuperations until the year 2007. In 2002 the economic weakness situation of the main importer countries for Castilla y León (France, Germany, Italy and Portugal), determined a reduction in the exports volume to the EU-15, that would slightly recover in the two following years as the crisis was overcome. Again in 2005 the exports figures decreased, next to the EU-10 incorporation and the emerging competitiveness loss of Spanish products, even though the exports to the EU-15 increased slightly in 2007. In terms of representativeness there is a more noticeable participation of this area in the total exports of Castilla y León between 1994 and 1998, setting 1995 up as the year with a maximum Community specialisation in the exports from Castilla y León (Chart 1). But from 1999, with the official creation of the EMU, the growth observed in the consignments volume to the EU-15 (although with certain corrections), starts to contrast with the constant reductions in their representativeness. The currency unification process subsequently does not seem to have proved very relevant in the export dynamic of Castilla y León to the EU-15 area.

On the other side, the announcement of the future incorporation of 10 Eastern European countries in 2001, and its effective association in 2004 determined the base years in which the Castilla y León exports were relaunched to the EU-10 area. Thereby, in the current decade the new enlarged countries have monopolised the most outstanding growth in the Castilla y León external trade with the EU, both in the consignments volume and the representativeness of the total exported. As seen in Chart 1, the exporting interest of the Castilla y León economic agents did not focus in this area during most of the 1990s, since it did not enjoy trading profits. Nevertheless, the advantages of the quota and customs expenses elimination in trade were advanced, starting a growing export process with the possible incorporation of these 10 new members from 1998, and especially from 2001, coinciding with its officialisation. In particular it is from 2004 when that process experience a notable relaunch period, coinciding with the effective incorporation of the 10 countries to the large Community internal market.

Finally in 2005, when the link of Rumania and Bulgaria to the EU starts to show, the basis of an astonishing growth of Castilla y León exports to the EU-2 area is formed. Regarding its representativeness on the region total exports, Chart 1 shows that the participation of these two countries is much reduced until their incorporation into the Community is official. However, in 2006 and 2007, once their effective adhesion is known, these two new members attain more relevance in the total Castilla y León exports.

Chart 2 shows the progressive geographical diversification experienced during 1993-1997 by the exports consignment from Castilla y León. Thus, in 1993 the prevalence of three bordering countries with similar cultures is noticed: France, Portugal and Italy, that during that year monopolised 81,82% of the Community exports, representing 66,85% of the total Castilla y León exports for that period. However, the attraction exercised by the French market stands out. Although this is an aspect shared at national level, it is more pronounced in Castilla y León, given the relevance of the Renault multinational settled in Valladolid, which generates an important intra-industrial trade with its parent company, located in France.

Chart 2: Exports from Castilla y León to the Community countries (EU-27)

Exports Volume (in million Euro) and Representativeness (% in Community exports)

COUNTRIES	1993		1999		2007		Variation index 1993-2007	
	Million Euro	%	Million Euro	%	Million Euro	%	Million Euro	%
France	1.329,35	55,88	3.981,91	59,17	3.208,26	38,65	141,34	-30,83
Netherlands	43,92	1,85	133,34	1,98	216,85	2,61	393,74	41,51
Germany	127,36	5,35	417,54	6,20	944,32	11,38	641,46	112,51
Italy	305,24	12,83	691,36	10,27	804,61	9,69	163,60	-24,45
United Kingdom	91,49	3,85	230,11	3,42	826,93	9,96	803,85	159,05
Ireland	2,09	0,09	10,46	0,16	37,57	0,45	1.697,61	415,22
Denmark	5,67	0,24	15,88	0,24	76,64	0,92	1.251,68	287,41
Greece	6,50	0,27	111,92	1,66	97,80	1,18	1.404,62	331,24
Portugal	311,81	13,11	769,44	11,43	939,21	11,32	201,21	-13,67
Belgium Luxembourg	115,42	4,85	150,89	2,24	349,44	4,21	202,76	-13,23
Sweden	12,36	0,52	37,04	0,55	64,95	0,78	425,49	50,61
Finland	3,05	0,13	11,09	0,16	38,96	0,47	1.177,38	266,11
Austria	6,87	0,29	22,94	0,34	47,60	0,57	592,87	98,58
EU-15	**2.361,13**	**99,25**	**6.583,92**	**97,84**	**7.653,14**	**92,20**	**224,13**	**-7,10**
Malta	0,36	0,02	1,02	0,02	5,14	0,06	1.327,78	309,22
Estonia	0,00	0,00	0,34	0,01	2,68	0,03	26.700,00	7.581,20
Latvia	0,00	0,00	1,85	0,03	3,18	0,04	31.700,00	9.014,26
Lithuania	0,01	0,00	0,76	0,01	6,19	0,07	61.800,00	17.641,27
Poland	5,11	0,21	15,97	0,24	124,27	1,50	2.331,90	597,01
Czech Republic	0,26	0,01	8,39	0,12	56,88	0,69	21.776,92	6.170,18
Slovakia	0,15	0,01	3,44	0,05	30,98	0,37	20.553,33	5.819,49
Hungary	0,69	0,03	6,18	0,09	46,20	0,56	6.595,65	1.819,05
Slovenia	8,58	0,36	100,96	1,50	154,74	1,86	1.703,50	416,90
Cyprus	2,40	0,10	2,95	0,04	16,14	0,19	572,50	92,75
EU-10	**17,56**	**0,74**	**141,86**	**2,10**	**446,4**	**5,38**	**2.442,14**	**628,61**
Romania	0,28	0,01	2,05	0,03	194,30	2,34	69.292,86	19.788,81
Bulgaria	0,036	0,00	1,69	0,03	6,62	0,08	18.288,89	5.170,47
EU-2	**0,316**	**0,01**	**3,74**	**0,06**	**200,92**	**2,42**	**63.482,28**	**18.123,43**
EU-27	**2.379,01**	**100**	**6.729,52**	**100**	**8.300,46**	**100**	**248,90**	**0,00**

Chart by authors.
Source: Special Taxation and Customs Department of the Tax Administration Government Agency (AEAT).
The 2007 data are provisional.

At the end of the 1990s the exports to France are intensified (as shown in Chart 2, in 1999 they involve 59,17% of the Community exports), while Portugal and Italy lose ground in terms of representativeness in favour of other EU-15 countries such as the United Kingdom and Germany, more distant physically and "psychologically"[4], but with high income levels and large demand markets.

During the current decade, the geographical diversification keeps consolidating, so in 2007 not only a redistribution of the exports consignment to the EU-15 takes place (in which Portugal, Italy and specially France lose relevance versus the import reinforcement of Germany, United Kingdom, the Netherlands, Denmark or Finland, for example), but also EU enlarged countries (EU-10 and EU-2) that stand out because of their productive and demographic dimension, such as Slovenia, Poland, Czech Republic, Hungary, as well as Romania, move on to demand 7,32% of the Community total.

3. THE GRAVITY EQUATION: BACKGROUND REVIEW AND SPECIFICATION PROPOSAL

The gravity equation is one of the most widely used and successful tools for the study of international trade flows determining factors (Evenett y Keller, 2002; Baldwin, 2006). The main idea consists of applying to bilateral trade relations an analogue concept to the Newton Law,

which links the gravity attraction between two objects to their mass size and relative distance. In particular, this equation was originally posed by Tinbergen (1962) and Pöyhönen (1963), who independently suggest that the bilateral trade flow between two countries is positively associated to their income levels, and inversely proportional to their distance. Later, Linnemann (1966) adds the demographic variables (population of both countries) to reflect the economies of scale role. Thereby, the most basic and commonly employed gravity equation can be presented as follows:

$$X_{ijt} = \beta_1(Y_{it} * Y_{jt}) + \beta_2(N_{it} * N_{jt}) + \beta_3(D_{ij}) + \varepsilon_{ijt} \quad (1)$$

X_{ijt} is the total bilateral trade volume between i and j countries in t year; (Y_{it} * Y_{jt}) is the income product of i and j countries in the year t; (N_{it} * N_{jt}) is the populations product of i and j countries in the year t; D_{ij} is the distance between i and j countries; and, ε_{ijt} is the error term.

The income levels of i and j countries normally represent the potential demand of tradeable products from i country and the potential offer of j country, respectively. Therefore, their coefficients are expected to be positive. The distance between i and j countries, intends to evaluate the transport and time costs, as well as the market information access and the markets themselves. These costs increase with distance, so a negative coefficient for this variable is predictable. Regarding populations, several interpretations have been offered, generating an ambiguity in the expected signs of their coefficients. On the one side, the bigger the population is, the more possibilities the country has of taking advantage of the economies of scale, increasing this way its productive specialisation. Under this perspective, it might be expected that it gets more actively involved in the international trade.

The specification of the gravity equation (1) justifies the opportunity of applying natural logarithms to obtain a lineal relation between the trade flows logarithm and the logarithm of the different cause variables, which involves that the estimated coefficients have to be interpreted in terms of elasticity. After applying this transformation, the gravity equation is defined as follows:

$$L_n(X_{ijt}) = \beta_1 L_n(Y_{it}) + \beta_2 L_n(Y_{jt}) + \beta_3 L_n(N_{it}) + \beta_4 L_n(N_{jt}) + \beta_5 L_n(D_{ij}) + \varepsilon_{ijt} \quad (2)$$

The equation (2) reveals the bilateral trade volume among a group of countries during a certain period of time ("*multi-country approach*"). However, the gravity equation can also be used to estimate the unilateral trade flows of a certain country with the rest ("*sole-country approach*"). The main differences between both approaches are the following (Földvári, 2006): (1) with the "*multi-country approach*" the total bilateral trade flows between two countries are usually estimated –exports plus imports[5]-, while with the "*sole-country approach*" it is necessary to estimate two different models; one for exports (*EXP*) and another one for imports (*IMP*); (2) with the "*multi-country approach*" temporal *dummys* can be included to control the unobservable effects dependant on time, while with the "*sole-country approach*" it is necessary to omit such variables in order to read properly the impact of the explanatory variables that only vary over time, such as the income and the reference country population (Y_t y N_t). Since the objective of our work is coherent with the "*sole-country approach*", the referent gravity equation to modelize the export flow is the following:

$$L_n(EXP_{it}) = \beta_1 L_n(Y_{it}) + \beta_2 L_n(Y_t) + \beta_3 L_n(N_{it}) + \beta_4 L_n(N_t) + \beta_5 L_n(D_i) + \varepsilon_{it} \quad (3)$$

EXP_{it} is the exports volume from the reference country to the i country in the t year; Y_t is the reference country income in the t year; N_t is the reference country population in the t year; D_i is the distance between the reference country and the i country; and ε_{it} is the error term.

Despite the gravity equation explanatory power (Minondo, 2007), several authors have added other variables, more or less systematically, that determine the transaction costs and the easiness of the trade relations between two countries. Certain dummy variables stand out among

[5] A criticism to the gravity equation assigned to the "*multi-country approach*" is that the use of the total bilateral trade as a dependent variable can be inappropriate, since it does not enable the discrimination between imports and exports (Dhar and Panagariya, 1999).

them, such as the belonging to a regional trade block, the use of a common language, the border effect and the countries insular character, among others.

3.1. Theoretical justification of the gravity equation

Although the first application of the gravity equation dates back to 1962, a theoretical justification according to the conjectures about international trade has been searched for more than forty years. In this regard, the most notable attempts were those of Anderson (1979) and Bergstrand (1985, 1989). Anderson infers a functional form similar to the gravity equation on the basis of an expenditure system in which all the states have the same utility function and there is product differentiation by country of origin. Therefore, except for this last consideration, the rest of the assumptions are compatible with the Heckscher-Ohlin theory. Bergstrand determines that the gravity equation is a reduced form of a partial balance subsystem emanating from a world trade general balance model, involving in this case the differentiation of companies by country of origin. It is therefore a hybrid between the Heckscher-Ohlin model, that involves perfect competition and goods homogeneity, and the Monopolistic Competition model.

Besides, there are other justification attempts of the gravity equation, a lot more *ad-hoc* than the ones above-mentioned. Thereby, Helpman and Krugman (1985) and Krugman (1995) prove that the gravity equation can proceed from the Monopolistic Competence model with scale rising incomes. Deardorff (1998) on his part, evaluates the gravity equation utility in the trade alternative models test and proves that it can be compatible with both the Ricardian and the Heckscher-Ohlin models. Later, Evenet y Keller (2002), derive the gravity equation both from the Heckscher-Ohlin theory and the scale rising income hypothesis, under the product perfect an imperfect specialisation assumptions, while Eaton and Kortum (2002) develop a Ricardian trade model of homogeneous goods that fits the equation. This large theoretic support explains the recent opinion that the gravity equation is coherent with the most relevant international trade theories (Feenstra, 2004; Anderson and Wincoop, 2004 and Baldwin, 2006, among others). This suggests it can be considered "*one of the higher explanatory power equations of the economic science*" (Minondo, 2007), which has increased the trust in its utility to predict the bilateral trade patterns.

3.2 Empirical background of the gravity equation

An important number of empirical works has led to the suitability of the gravity equation as a tool to explain the international trade flows. While some of them have improved the econometric specification of the equation (Mátyás, 1997; Egger, 2000, 2002; Anderson and Wincoop, 2004; Chen and Wall, 2005; De Nardis *et al*., 2008), others have contributed to the refinement of the explanatory variables or the addition of new variables (Bougheas *et al*., 1999; Limao and Venables, 2007; Voicu and Horsewood, 2007).

Furthermore, recently the use of the gravity equation has become very popular as an empirical study instrument of the effect of several economic integration processes at international level within the bilateral trade pattern (e.g. Baldwin, 1997; Nilsoon, 2000; Rose, 2000; Glick and Rose, 2002; Micco *et al*., 2003; Bun and Klaasen, 2007; De Nardis *et al*., 2008). Several of these studies have been carried out in the specific field of the European Union. While some of them prove that the Community block member states conduct more trade inside than outside their borders (Nitsch, 2000; Evans, 2003; Chen, 2004; Minondo, 2007), others try to consider the European Monetary Union effects (De Souza, 2002; Flam and Nordstrom, 2003; De Nardis and Vicarelli, 2003).

In the Spanish case, the gravity equation has also been used in some works, from which Sanso *et al.* (1989) and (1990) stand out. While the first one tries to analyse if the gravity equation is compatible with the Heckscher-Ohlin theory when explaining the international trade bilateral flows, the main concern of the second one is to determine the functional form of that equation in the study of the external Spanish trade between 1960 and 1985. More recently, Martínez *et al*. (2003) focus their study on the determinants assessment of the international trade bilateral flows among 34 countries during 1980-1999, as well as the preferential agreements effects of several economic blocks, concentrating on Spanish-Mexican relations. On his part,

Gil *et al* (2003) tries to quantify with a 1988-2001 panel data, the impact of the Euro on the Spanish external trade with the EU-15 countries, while Gil *et al.* (2005) uses the gravity equation to estimate the border effect for the whole of the Spanish economy.

3.3. Proposal of our gravity equation

Our first tool to analyse the exports volume from Castilla y León to the Community countries is the gravity equation (3). Two dummy variables *(EU_{it}* and *EMU_{it})* are added to this basic equation, which reveals if the economic and monetary integration process associated to the EU has influenced that export flow during the analysed period. Also, an additional dummy variable is introduced to observe the effect of sharing a common border with the importer country (*$Front_i$*). Therefore, the extended gravity equation can be presented as follows:

$$Ln(EXP_{it}) = \beta_1 Ln(Y_{it}) + \beta_2 Ln(Y_t) + \beta_3 Ln(N_{it}) + \beta_4 Ln(N_t) + \beta_5 Ln(D_i) + \beta_6 UE_{it} + \beta_7 UME_{it} + \beta_8 Front_i + \varepsilon_{it} \quad (4)$$

being:

EXP_{it} is the Castilla y León export intensity to the "*i*" country in the *t* year
Y_{it} is the "*i*" country income in the *t* year
Y_t is the Castilla y León income in the *t* year
N_{it} is the "*i*" country population in the *t* year
N_t is the Castilla y León population in the *t* year
D_i is the distance between Valladolid and the "*i*" country capital
EU_{it} is a dummy variable that shows if the "*i*" country belongs to the EU in the *t* year
EMU_{it} is a dummy variable that shows if the "*i*" country belongs to the EMU in the *t* year
$Front_i$ is a dummy variable that shows if the Spain and the "*i*" country share a common border
ε_{it} is the error term

The extended gravity equation (4) involves that the EU_{it} and EMU_{it} dummy variables effect remains constant along the time. In order to analyse if their impact changes over time, the *EUyearit* or *EMUyearit* will be alternatively included in that equation, eliminating the original dummy variable in each case. These new variables are calculated as the product of the original dummies multiplied by the different yearly *dummy* ($_tYear$), as follows: *EUyearit* = EY_{it} * $_t$Year, where *t* covers the period from 1993 until 2007, and *EMUyearit* = EMU_{it}* $_t$Year, where *t* covers the period from 1999 until 2007. These variables coefficients can be respectively read as the economic integration (EU) and monetary integration (EMU) impact on the Castilla y León exports volume in each *t* year. These variables ratios can be read as the impact of the economic integration (EU) and the monetary integration (EMU) on the Castilla y León exports volume in the *t* year. Accordingly, the two new gravity equation specifications would be:

$$Ln(EXP_{it}) = \beta_1 Ln(Y_{it}) + \beta_2 Ln(Y_t) + \beta_3 Ln(N_{it}) + \beta_4 Ln(N_t) + \beta_5 Ln(D_i) + \beta_6 UEaño_{it} + \beta_7 UME_{it} + \beta_8 Front_i + \varepsilon_{it} \quad (5a)$$

$$Ln(EXP_{it}) = \beta_1 Ln(Y_{it}) + \beta_2 Ln(Y_t) + \beta_3 Ln(N_{it}) + \beta_4 Ln(N_t) + \beta_5 Ln(D_i) + \beta_6 UE_{it} + \beta_7 UMEaño_{it} + \beta_8 Front_i + \varepsilon_{it} \quad (5b)$$

4. INVESTIGATION DESIGN

4.1. Data base

The analysed sample includes the other 26 countries of the EU-27 (all, except for Spain) that can act as Castilla y León goods importers. These countries are, in particular, Germany, Austria, Belgium, Bulgaria, Cyprus, Denmark, Slovakia, Slovenia, Estonia, Finland, France, Greece, Holland, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, United Kingdom, Czech Republic, Rumania and Sweden. The investigation period goes from 1993 until 2007. Therefore, there are a total of 390 observations[6].

[6] In the cases of Belgium and Luxembourg, there are only separated data regarding their external trade from 1999. Therefore, there is an incomplete panel data.

4.2. Variables measure

Castilla y León export intensity (EXP_{it})

The dependant variable was quantified from the total number of exports (FOB) from Castilla y León to the respective Community countries in each studied year, in constant million Euro (base year 2000). The initial information to measure this variable was taken from the External Trade Statistics elaborated by the Junta de Castilla y León, deflating the resulting series with the EU-27 CPI, obtained from the OECD data bases.

Yearly income level (Y_{it} , Y_t)

In order to measure the yearly income level, the Gross Domestic Product (GDP) per capita at constant prices was used, (base year 2000). In order to determine its value, the EUROSTAT yearbooks were used in the case of the Community countries, as well as the Spanish Regional Accounting yearbooks elaborated by the National Statistics Institute (INE), in the case of Castilla y León. The original series at current market prices ware deflated using the EU-27 and the national GDP; both obtained from the OECD data bases.

Population (N_{it} , N_t)

The population measure employed was the number of inhabitants, in thousands, on January 1st of the selected year. This data was obtained from the EUROSTAT yearbooks for the different Community countries and from the Spanish Regional Accounting yearbooks elaborated by INE for Castilla y León.

Distance (D_i)

The distance between the capital of Castilla y León (Valladolid) and those of the Community countries was calculated in kilometres, based on the latitude and longitude of the respective geographical centres (geodesic distance). The data was obtained from the Geodesic Utilities Service (IGN), offered by the National Geographic Institute.

European Union Membership (EU_{it})

This dummy variable considers the incentive for the Castilla y León exporters of belonging to a single market of goods, services, persons and capitals, which includes the participation of the export destination country. This variable takes value 1 when Castilla y León exports to the EU *i* country in the *t* year, or value 0 in the opposite case. So, in 1993 and 1994 this variable only equals 1 for the 12 signatory countries of the Maastricht Treaty in 1992. From 1995 until 2003 the variable takes value 1 in the 12 above-mentioned countries, as well as in the exports to Austria, Finland and Sweden, which join the European Union in 1995. In 2004 and 2006 the variable equals 1 for the 15 aforementioned countries, as well as for the 10 states that joined the European Union in 2004. Finally, in 2007 it takes value 1 for the 26 countries of the sample.

European Monetary Union Membership (EMU_{it})

This dummy variable measures the stimulating effect that the use of a common currency with the export destination country can have on the Castilla y León exports. This variable takes value 1 when Castilla y León exports to the EMU *i* country in the *t* year, and 0 value in the opposite case. Therefore, since the EMU took place in 1999, this variable is 0 for all the trade flows before that year. From 1999 until 2006, the variable takes value 1 for the exports from Castilla y León to the countries that adopted the single currency from the beginning (from 2001 in the case of Greece). Finally, in 2007 this dummy variable takes value 1 for the 12 aforementioned countries, as well as Slovenia, that joined the eurozone at the beginning of that year.

Border ($Front_i$)

This dummy variable considers if the export destination country shares a border with Spain. So it shows if the existence of a common border facilitates the trade between two market areas, by reason of geographic proximity or the potential existence of cultural or historic links. This variable takes value 1 if this is the case, and 0 value in the opposite case.

Year ($Año_t$)

It is a temporary dummy variable that allows to control the non-observable effects dependant on time (t = 1993,…2007). Since in this work the gravity equation is contemplated under the *"sole-country approach"*, this variable is not directly included in the analysis to the extent that it would prevent the correct reading of the explanatory variables impact that only vary with time (such as the Castilla y León income and population). In fact, this variable is only used for the construction of the *UEyearit* and *UMEyearit* variables, allowing to detect if the economic integration (EU) and the monetary integration (EMU) vary over time.

Chart 1 considers the different variables introduced in the gravity equation to analyse the export flow from Castilla y León to the Community countries during 1993-2007

Chart 1. Study variables

* These variables are introduced in the gravity equation in the form of logarithms.

Dependant variable	**Measure**	
$*EXP_{it}$	Export figures from Castilla y León to the *i* country in the *t* year (*constant million €*)	
Independent variables	**Measure**	**Expected effect**
$*Y_{it}$	Real income level of the *i* country in *t* year (*GDP per capita at constant prices*)	Positive
$*Y_t$	Castilla y León real income level in *t* year (*GDP per capita at constant prices*)	Positive
$*N_{it}$	Population of *i* country in *t* year (*thousands of inhabitants on January 1st)*	Positive/Negative
$*N_t$	Castilla y Leon population in *t* year (*thousands of inhabitants on January 1st*)	Positive/Negative
$*D_i$	Geodesic distance between Valladolid and *i* country capital (*kilometres*)	Negative
EU_{it}	EU Membership of *i* country in *t* year (*Dichotomous: 0,1*)	Positive
EMU_{it}	EMU Membership of *i* country in *t* year (*Dichotomous: 0,1*)	Positive
$Border_i$	*i country shares border with Spain* (*Dichotomous: 0,1*)	Positive
$Year_t$ (t =1993 until 2007)	Export flow regarding *t* year (*Dichotomous: 0,1*)	

4.3 Estimation method

The gravity equation was initially developed to address cross-cutting analysis. Nevertheless, these analysis have an essential problem, since they do not take into consideration any heterogeneous characteristic associated with the bilateral trade relation; this means that a region can export to two countries in a different way, even though they are equal in size and distance, due to certain non-observable characteristics linked to cultural, historic, politic or geographic factors, which if not considered could affect the validity of the results. For this reason it is said that the cross-cutting models suffer a heterogeneity bias.

At present, in order to solve this problem, the gravity equation estimations are normally conducted through panel data analysis techniques. It is generally accepted that the estimators based on this type of analysis are a lot more precise than those obtained through other techniques, reducing as well the problems concerned with the models identification. In this respect, static and dynamic panel data analyses are identified, as far as their specifications include or not variables belonging to different time periods[7].

[7] A static panel data analysis has been applied to estimate the gravity equation in the works of Mátyás (1997), Glick and Rose (2002), Martínez *et al.* (2003), Cheng and Wall (2005) and Bun and Klaassen (2007), among others. On the other side, the works from Bun and Klaassen (2002), De Nardis and Vicarelli (2003) and De Nardis *et al.* (2008) have used with this purpose a dynamic panel data analysis.

If static models are used, the non-observable heterogeneity can be studied including fixed or random effects in the model. With the *fixed effects estimator* (EF), the "country" and "time" effects are assumed as fixed parameters since they are estimated and correlated with the regressors. In this case, for econometric reasons, all the explanatory variables that remain constant over time (distance and border, for example), have to be excluded from the specification, and the individual differences will be captured by the constant term. On the contrary, with the *random effects estimator* (EA), the "country" and "time" effects are stochastic assumptions, non-correlated with the regressors. Therefore, the inclusion of time-invariant explanatory variables is allowed in the specification of these models. The Hausman[8] contrast allows determining which of the two estimators is more appropriate in each case.

The dynamic models are used when the variables present an autoregressive character; that is, when the retarded dependant variable is among the explanatory variables. So they can be applied to estimate the gravity equation to the extent that the external trade operations of a certain period can be related to those of previous periods. However, this circumstance generates inconsistent estimations when working with panel data. Different estimation models can be applied in order to address these inconsistencies, especially the Anderson and Hsiao model (1981), the GMM estimator (Arellano and Bond, 1991), the GMM-System estimator (Blundell and Bond, 1998) and the LSDV correction method (Bun and Kiviet, 2003).

The academic community has recognised that when the *"sole-country approach"* is used, generally involving the provision of a small sample to estimate the gravity equation, it proves more convenient from the econometric point of view to apply a panel data static analysis versus a dynamic one (Egger, 2000, 2002; Martínez *et al*., 2003; Chen and Wall, 2005). For this reason, the panel data static analysis[9] has been employed in this work, so the error term of the different models is defined as $\mu_{it} = \alpha_i + \varepsilon_{it}$, where α_i collects the "destination country" unobservable effects that do not vary over time and influence the different observations in a different way (non-observable heterogeneity) and ε_{it} is a white noise variable that fits the following properties:

$E[\varepsilon_{it}] = 0 \quad i = 1, \ldots, N; \quad t = 1, \ldots, T$
$E[\varepsilon_{it}^2] = \alpha_\varepsilon^2 \quad i = 1, \ldots, N; \quad t = 1, \ldots, T$
$E[\varepsilon_{it}\,\varepsilon_{js}] = 0 \quad i, j = 1, \ldots, N; \quad t, s = 1, \ldots, T \;$ such that $i \neq j$ ó $t \neq s$

5. ANALYSIS RESULTS

Chart 2 presents the main descriptive statistics of the data panel. It particularly shows information about the mean, median, standard deviation, maximum and minimum value of the gravity equation base variables, expressed in the original measurement unit. On the other side, chart 3 shows the frequencies of the three dummy variables introduced in the extended equation.

[8] The Hausman contrast (1978) analyses the possible correlation between the error term and the regressors in order to decide between a fixed effects or random effects estimation. Under the null hypothesis of no difference between both estimators, the Hausman statistic converges in distribution to a chi-squared distribution with K degrees of freedom, where K is the number of explanatory variables included in the model specification.

[9] Additionally, apart from applying a panel data statistical analysis, the different specifications of the gravity equation were estimated from a dynamic model – the GMM-System estimator, implanted in the STATA program with the *xtabond2* command-. After the estimation, the results obtained reveal that the retarded dependant variable does not result significant in any specification, proving the inconvenience of applying a panel data dynamic analysis. Regarding the rest of equation variables, the results generally agree with those obtained in the static analysis. It all confirms the convenience of applying a panel data static model in this case.

Chart 2. Descriptive statistics

EXP_{it} is the exports figure from Castilla y León to the *i* country in *t* the year (in constant million €); Y_{it} is the real income of the *i* country in the *t* year and Y_t is the real income of Castilla y León in the *t* year (in GDP per capita at constant prices); N_{it} is the population of the *i* country in the *t* year and N_t is the Castilla y León population in the *t* year (in thousands of inhabitants); D_i is the geodesic distance between the capital of Castilla y León -Valladolid- and the *i* country capital (in kilometres).

Variables	N	Mean	Median	S.D.	Minimum	Maximum
EXP_{it}	378	184,182	17,998	494,572	0,009	3.240,430
Y_{it}	385	12.724,832	10.558,008	9.238,584	235,185	46.598,530
Y_t	390	11.323,090	11.264,341	1.752,098	8.537,863	14.308,450
N_{it}	390	17.057,738	8.595,500	22.188,893	371,000	82.520,000
N_t	390	2.517,560	2.493,918	40,496	2.479,118	2.584,407
D_i	390	2.440,153	2.419,500	800,677	588,000	3.978,000

*p < 0.10; ** p < 0.05; *** p < 0.01

Chart 3. Chart of Frequencies

UE_{it} is a dummy variable that reflects whether or not the *i* country belongs to the EU in the *t* year; UME_{it} is a dummy variable that reflects whether or not the *i* country belongs to the EMU in the *t* year; $Border_i$ is a dummy variable that reflects if Spain and the *i* country share a common border.

	EU_{it}	EMU_{it}	$Border_i$
NO (0)	144 (36,9%)	293 (75,1%)	360 (92,3%)
YES (1)	246 (63,1%)	97 (24,9%)	30 (7,7%)
N	390	390	390

Chart 4 shows the results of the estimation of our gravity equation. Their different specifications are estimated through panel data analysis techniques; in particular, on the basis of the EF and EA estimators, among which the respective Hausman contrast is carried out.

Chart 4. Results of the gravity equation estimation

Dependant variable: Exports figure from Castilla y León to the *i* country in the *t* year (at constant prices)

Y_{it} is the *i* country real income in the *t* year and Y_t is the Castilla y León real income in the *t* year (in GDP per capita at constant prices); N_{it} is the *i* country population in the *t* year and N_t is the Castilla y León population in the *t* year (in thousands of inhabitants); D_i is the geodesic distance between Valladolid and the *i* country capital (in kilometres); EU_{it} is a dummy variable that reflects if the *i* country belongs to the EU in the *t* year; EMU_{it} is a dummy variable that reflects if the *i* country belongs to the EMU in the *t* year; $Border_i$ is a dummy variable that reflects if Spain and the *i* country share a common border; *EUyearit* refers to the 15 variables resulting from multiplying the dummy variables EU_{it} and $Year_t$, where *t* goes from 1993 until 2007; *EMUyearit* refers to the 9 variables resulting from multiplying the dummy variables EMU_{it} and $Year_t$, where *t* goes from 1999 until 2007.

	Basic gravity Equation		Extended gravity Equation		Extended Equation with EU evolution		Extended Equation with EMU evolution	
Variables	**Model 1 EF**	**Model 1´ EA**	**Model 2 EF**	**Model 2´ EA**	**Model 3 EF**	**Model 3´ EA**	**Model 4 EF**	**Model 4´ EA**
Constant	65,008*** (25,059)	53,089** (24,042)	70,459*** (25,481)	59,941** (24,524)	62,487 (51,905)	48,005 (49,042)	37,447 (32,555)	17,061 (31,541)
$Ln(Y_{it})$	2.094*** (0,196)	1,808*** (0,132)	1,910*** (0,197)	1,701*** (0,135)	1,780*** (0,203)	1,547*** (0,142)	1,877*** (0,198)	1,482*** (0,107)
$Ln(Y_t)$[a]	1,797*** (0,411)	1,973*** (0,332)	2,279*** (0,483)	2,608*** (0,394)	3,187*** (0,859)	3,866*** (0,817)	2,828*** (0,576)	3,703*** (0,475)
$Ln(N_{it})$	-2,147 (1,564)	0,897*** (0,136)	-1,051 (1,556)	0,882*** (0,132)	-0,208 (1,612)	0,874*** (0,132)	-0,542 (1,591)	0,915*** (0,076)
$Ln(N_t)$[a]	-10,047*** (2,746)	-10,679*** (2,815)	-12,348*** (2,818)	-12,974*** (2,808)	-13,225** (5,454)	-12,669** (5,457)	-9,322*** (3,379)	-8,185** (3,609)
$Ln(D_i)$	–	-1,216*** (0,498)	–	-0,410 (0,690)	–	-0,504* (0,689)	–	-0,796** (0,401)
EU_{it}[b]			0,126 (0,140)	0,964 (0,139)			0,027 (0,151)	0,073 (0,156)
EMU_{it}[c]			-0,554*** (0,147)	-0,703*** (0,137)	-0,469** (0,188)	-0,580*** (0,177)		
$Border_i$			–	2,423** (1,003)	–	2,283** (1,001)	–	2,157** (0,570)
UEyearit[a]					EU_{94} +*** EU_{95}+** EU_{96}+**	EU_{94}+*** EU_{95}+** EU_{96}+**		
EMUyearit							EMU_{99}-* EMU_{00}-* EMU_{01}-* EMU_{02}-** EMU_{03}-** EMU_{04}-*** EMU_{05}-** EMU_{06}- ** EMU_{07}-***	EMU_{99}-* EMU_{00}-** EMU_{01}-* EMU_{02}-*** EMU_{03}-*** EMU_{04}-*** EMU_{05}-*** EMU_{06}-*** EMU_{07}-***
Hausman	χ^2 (4) = 30,28***		χ^2 (6) = 11,72*		χ^2 (20) = 7,83		χ^2 (14) = 9,62	
R^2	0,66		0,68		0,83		0,84	
N	373		373		373		373	

a. Only the significant variables are shown with the respective signs and signification levels.

The values are the non-standardised ratios, with the typical mistakes in brackets.
* p < 0.1; ** p < 0.05; *** p < 0.01

The [*1*] and [*1´*] *Models* refer to the EF y EA estimators for the basic gravity equation (3). The [*2*] and [*2´*] *Models* collect the results of both estimators for the extended gravity equation (4). The [*3*] and [*3´*] *Models* are for the EF and EA estimators of the extended gravity equation with the evolution of the EU impact over time (5a) and, finally, the [*4*] y [*4´*] *Models* reflect the results of both estimators for the extended equation with the evolution of the EMU effect (5b). Before making the estimations, it is confirmed that the different models do not have autocorrelation or heterocedasticity problems. Besides, after applying the F test we can observe that in all cases, the unobservable "destination county" effects are jointly significant, indicating that there is unobservable heterogeneity and thereby, the adequacy of the panel data analysis application.

Regarding the basic gravity equation ([*1*] and [*1´*] *Models*), the Hausman contrast indicates that it is correct to consider the individual effects as fixed effects, and therefore to interpret the variables ratios that vary over time, obtained from the EF estimator ([*1*] *Model*)[10]. In this respect, the results reveal that the *importer country income level* contributes to explain a higher export flow from Castilla y León to the Community countries. The wealth of a country has a direct impact on the exports figure to that country, which proves the importance of the buying capacity of the buyer country. In fact, Western European countries with high per capita income levels and advanced infrastructures, such as France, Italy, Germany and the United Kingdom, have traditionally been the main destination of the dispatches from Castilla y León. Even within this group of countries, a reduction in the representativeness of the exports to France and Italy occurred during 1993-2007, possibly as a consequence of their slowed economic growth, while the volumes dispatched to Germany and the United Kingdom – countries with a high living standard – has increased significantly. Besides, other Western European countries, such as Finland, Sweden, Austria and Denmark, have reached a growing importance as importers during the last years, as well as other Eastern countries, like Poland, Czech Republic, Slovakia and Hungary, with higher wealth levels, and faster economic growths and purchasing power than the rest of countries.

On the other side, the positive influence of the *Castilla y León income level* proves the importance of the productive capacity of this region to foster its exports. A high regional income level shows a high production, and thereby, more export resources. The importance of the income level on the own exports rests on the modern theories that link the export volumes to the offer factors. According to these theories, those regions able to generate competitive advantages in an exogenous way, will be more successful in their openness to the external markets. So the higher export figures will concentrate on the regions where those advantages are more easily developed due to the market relative dimension, new technologies investment capacity and the availability of more human capital stock.

Regarding the *population* variables, the results show that only the number of Castilla y León inhabitants affects in a statistically significant way the exports volume to the EU-27 countries. In particular, this seems to be the most significant factor in the region export flow, with an important negative influence to the extent that a smaller number of inhabitants results in a smaller self-sufficiency tendency and therefore, a higher external trade commitment. In this sense, since Castilla y León is characterised by a constant reduction in the number of inhabitants, it is consistent to induct its growing openness to international markets.

Regarding the enlarged gravity equation ([*2*] y [*2´*] *Models*), the Hausman contrast also shows that it is convenient to interpret the coefficients obtained, based on the EF estimator ([*2*] *Model*)[11]. As it can be observed, the wealth levels of the buyer country and Castilla y León, as well as the population level of the region, still have a significant statistical effect. Besides, regarding the new dummy variables introduced in this specification, the results show that the

[10] The EF estimation of *Model* [*1*] does not present any ratio for the "distance" variable because its value remains constant over time.

[11] The EF estimation of *Model* [*2*] does not present any coefficient for the "*distance*" and "*border"* variables because their values remain constant over time.

fact that the *importer country is a member of the EU regional block* has affected in a positive but insignificant way the Castilla y León Community exports during the analysed period. In particular, the fact that the buyer country belongs to the EU, has only increased on average 13,4% the export flow of this region between 1993 and 2007[12]. This means that if the economic integration process has had any favourable impact on the Castilla y León exports, this has been unimportant. Two reasons can explain this fact: (1) the exports growing volumes to the EU-15 only kept a high rate of growth until the end of the 1990s. From then, apart from the fact that the main competitive advantages were already deducted, an economic slow down occurs in some of the main target markets of the Castilla y León exports, beginning a progressive loss of representativeness in the numbers dispatched to the EU-15; and (2) the export flow that, from 2001 directs towards the Community countries of Eastern Europe, despite its fast growth and, thus acquisition of a larger role in the final figures of Castilla y León, still assumes reduced export volumes. Therefore, despite that the international sales of Castilla y León businesses have benefited from the process of European economic integration, the results have been limited, having been unable to take advantage of the total potential derived from the larger size of the European internal market and, above all, the free circulation of goods within it.

In regard to the *membership of the import country to the EMU*, the results reveal that the process of monetary unification has not had the hoped for stimulus in the exports from Castilla y León. Thus, in contrast to what was expected, the fact of sharing a common currency with the import country has produced a significant negative effect on the sales of this region towards the Community countries in the reference period. In particular, this process has led to an average reduction of 42 percent in the export flow. Effectively, since 2002, reductions have been observed in export figures towards such countries as France, Italy, Portugal and Greece. Faced with this fact, there have been increases in the volume of dispatches towards the Western European countries that have not voluntarily joined the eurozone (United Kingdom, Denmark and Sweden) as well as the Eastern European countries that have not reached the required convergence criteria. Without considering other factors with potential to influence this unexpected result (for example, the de-acceleration of fundamental economies of the Community Europe), our finding permits to infer that Castilla y León has had growing difficulties to obtain advantages of the monetary integration, probably caused by the progressive loss of the competitiveness of Spanish products. Therefore, once the advantages of the exchange rates eliminated, the penalty that has generated a high and rising inflation on the exportable products has been revealed, together with higher labour costs. In this line of argument, Berger and Nitsch (2005) point out regarding the single currency, that the abolition of national currencies can lead to intra-Community trade flows, but also demand that the decisions about exporting within the eurozone are taken, since then, in function of the products competitiveness and quality. It is to say, with a single currency, the relative prices factor becomes the only determinant in the real exchange rate; that is, the competitiveness of external trade.

Regarding the extended gravity equations that consider that the impact of membership of the EU (*Models [3] and [3']*) and to the EMU (*Models [4] and [4']*) is not constant and can vary over time, the Hausman contrast leads to the acceptance of the null hypothesis and, therefore, the results of the EA estimator can be interpreted in both cases (*Models [3'] and [4']*). In these two specifications, the basic variables of the gravity equation continue to show the previously detected effects on the basis of the EF estimator, with the exception of the population from the export destination country, whose coefficient is now positive and significant. This result would reflect the growing importance of the "size of market" effect in international trade, with a general openness increase of foreign trade.

In addition, the results of both models indicate that, just as expected, *the distance* affects significantly and negatively the export flow from Castilla y León. Thus, the larger the route to cover between the geographic centres of this region to the import country, the lower the attraction of trade will be between them, due to, among other aspects, the larger time and

[12]The way the gravity equation is defined in *Model* [*2*], the interpretation of the coefficient matching the UE_{it} variable, has to be carried out on the basis of the following expression: $(e^{0,126}-1)*100 = 13,4\%$.

transport costs. With countries like France, Portugal and Italy, key to the regional export, this variable may have been essential to explain the export flow from Castilla y León. Regarding the *border* variable, the estimation of both models shows the importance of sharing a common border with the buying country, for the sales of this Spanish region to the EU-27 countries; this means that the Community countries tend to trade more intensely with the businesses of Castilla y León as a result of their geographic location and/or the existence of possible cultural and historic links. In fact, of all the EU countries, France and Portugal have always been the principal destination markets of the Castilla y León exports. The sign and significance of this variable is important in that it can explain, at least partially, the lack of statistical significance of the variable that reflects the membership of the import country to the EU.

Finally, when the *Model [3']* introduces the different variables that collect changes in the impact of the economic integration in the EU between the years 1993-2007, it is possible to point out that, in the large part of the studied period, the import country membership of this regional block has no significant effect on the exports of Castilla y León, so that only in 1994, 1995 and 1996 the influence appears to be positive and significant. So this Autonomous Community only benefited significantly from the advantages derived from the creation of a common market, without hindrance or barriers in trans-border sales, during the three years that followed the creation of the European Union. Regarding the variables that reflect if the effect UME membership changes over the analyzed period, the *Model (4)* results indicate that from 1993 to 2007, the fact that the importer country shares a common currency with Castilla y León, has a negative and significant impact on the export flow of this region; this means that during all that period, the EMU produces an inhibiting effect on the Castilla y León exports to the Community countries. This find indicates that Castilla y León has suffered difficulties to adapt to the challenges of the monetary unification process, inhibiting the exploitation of the comparative advantages of a European market that negotiated a single currency.

6. CONCLUSIONS

The most relevant change that the economy of Castilla y León has experienced in the past years has been, without a doubt, its progressive opening to international markets, especially to the EU countries. For this reason, the main purpose of this report has been to try to explain what the impact of the EU integration process has been on the export volume from Castilla y León to the rest of the community countries (EU-27) during the period of 1993-2007.

Specifically, there have been three objectives to reach. First, to determine what factors have influenced the external sales of this region to the community countries during the study period. Second, to determine if the events linked to the European economic and monetary integration have served as a true incentive for the Castilla y León exports. Third, to discover if the integration process has been constant or has varied over the course of time. In order to reach these objectives, a gravity equation estimated on the basis of panel data analysis, was specified. The obtained results can prove of vital importance in the identification of the countries with a higher tendency to import products from Castilla y León; that is to say, the potential export markets for the companies of this Autonomous Community. As a result, they can provide a valuable guide for the development of the internationalisation policy of this Spanish region.

With respect to the first objective, our findings indicate that most of the basic variables of the gravity equation are relevant and reveal the expected results. Thus, taking into account the type of goods exported from Castilla y León, elaborated with medium-high technology and meeting medium quality standards, a factor such as the standard of living of the buying countries becomes fundamental when it comes to explain the number of exports from this region to the Community countries. In effect, besides Western European countries with high income per capita, such as France, Italy, Germany, United Kingdom, Finland and Denmark, the consignments originating in Castilla y León have also gone towards other eastern importers, such as Poland, the Czech Republic, Slovakia and Hungary, characterized by growing purchasing power and important economic growth. The richest countries tend to import more

goods, not only because of their income volume, but also because their wealth allows them more and better infrastructure.

In reference to the characteristics of Castilla y León, its income level as much as a fall in the size of its population, appear to augment the export flow from this region towards European countries. These results show the relevance of the supply factors related with the level of development in Castilla y León, as well as the number of inhabitants of this Autonomous Community, when it comes to determine the magnitude of its commercial relations in the European sphere.

On the other hand, in accordance with economic intuition, exterior sales from this Spanish region to the remainder of the Community countries appear to increase when the distance is less between them. Furthermore, it can be qualified that among the nearest Community countries, Castilla y León tends to export more intensely towards those geographically adjacent, confirming in this manner the positive impact of the so called "border effect" (Minondo, 2007). In fact, France and Portugal have always monopolized a large portion of the total exports of Castilla y León towards European countries.

The results obtained regarding the *second and third objectives* indicate that, in general, during the period of 1993-2007, the creation of the EU only stimulated in a limited form the growth of export volumes from Castilla y León to the rest of the countries belonging to this regional block, except for the three years immediately following its officialisation, when the membership of the import country to the EU had an important favourable impact on the number of consignments originating in this region. This allows to point out that the companies located in Castilla y León rapidly deduced the commercial advantages derived from the creation of a single market. In addition, even though in the new decade the internal market grew with the incorporation of 12 new commercial partners towards which Castilla y León redirected a growing volume of exports, the trade figures reached very little representativeness within the overall Community exports and the total dispatched from this region.

In regard to the monetary unification process (EMU), contrary to expectations, the fact of sharing a common currency – the euro – with the buying country, significantly and negatively affected the external sales of Castilla y León towards the European countries during the period of 1993-2007. Besides, this adverse effect has remained constant over the course of time, manifesting itself in all the years during the analyzed period. The initial introduction of the euro became effective only among Castilla y León business partners that belonged to the traditional EU-15 (leaving the Eastern European countries out), corresponding with mature markets where the commercial advantages had already been exploited. Therefore, the introduction of a common currency may have become an obstacle for the exports of this Spanish region, due to the heightened loss of competitiveness of the products from Castilla y León, and the relative factor price (penalised by a growing and elevated inflation, together with high labour costs compared to those of our community environment) becoming the only determinant of the competitiveness of external trade. Nevertheless, it is important to note that these conclusions are only acceptable as measures of the initial impact, not of the long-term effects of the European integration process. In fact, it has been pointed out that in general, it takes a few years before a regional integration process produces a significant amplifier effect on bilateral trade between the countries involved (De Nardis *et al*., 2008).

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