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THE CASE OF THE POSTAL SECTOR**

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Departament d'Economia de l'Empresa

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PUBLIC ENTERPRISE REFORMS AND EFFICIENCY IN REGULATED ENVIRONMENTS: THE CASE OF THE POSTAL SECTOR

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Abstract

Purpose - This paper focuses on analyzing the effect that public reforms have on the efficiency of state-owned enterprises in regulated environments.

Design/methodology/approach - The research is focused in the postal sector where public and private companies must obey a legal framework related to provide a universal service. The analysis is carried out using a panel of 7 European postal operators for the period 1997-2003. The activity analyzed was the letter mail division; we take as key variable the unit cost of a letter and use a translog cost function where as independent variables we include traffic levels, labor cost per employee, quality and availability of the service as well as the type of ownership (public or private). Additionally, in a second stage the geographical differences among countries are considered.

Findings - Results indicate that postal operators that experienced organizational changes without being privatized, such as the Spanish and Greek operators, do not have higher unit costs than privatized postal operators like the one of Germany and the Netherlands. Moreover, we find that in all cases the operator of Ireland appear to be the most efficient. In this case restructuring process has been carried out giving an important leadership role to workers. This suggests us that labor culture could be a key variable to study when analyzing reform processes in public enterprises.

Originality/value - Our findings show that in a regulated environment like in the postal sector, public and private companies can obtain similar efficiency levels in term of unit costs.

Keywords: efficiency, public enterprise reforms, postal sector.

Category: Research paper

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1. Introduction

In market economies, public enterprises together with direct regulation and the concession system, are the main governmental mechanisms used to intervene in the economy. According to conventional economic theory, state-owned enterprises and direct regulation are justified in the presence of market imperfections, limitations or failures. However, a controversial debate remains about the efficiency of state-owned and privately owned firms under the same kind of regulation.

Empirical literature favoring the efficiency of privately owned firms is quite extensive: (Meyer, 1975), (Neuberg, 1977), (Borchending, Pommerhne and Schneider, 1982), (Pryke, 1982), (Boardman and Vining, 1989), (Megginson, Nash and Van Randenborgh, 1994). However, there are authors that have not found significant differences in their studies: (Caves and Christensen, 1980), (Millward and Parker, 1983), (Kole and Mulherin, 1997). These latter studies generally support the idea that under competitive conditions government and private firms are equally efficient (Kay and Thompson, 1986; Bishop and Kay, 1989; Hernández de Cos, Argimón and González-Páramo, 2004). However, studies on comparative efficiency under market regulation are scarce.

It has been also argued that differences in efficiency could be better explained from the background of the agency theory because similar agency problems arise in public and private firms (Vickers and Yarrow, 1991). Thus, the efficiency would depend more on the control and incentive scheme the principal (owner) sets upon the agent (manager), to reward a good performance, than on the type of ownership itself. In fact, some authors that have studied privatization programs (Megginson et al, 1994; Dewinter and Malatesta, 2001) find significant improvements in government firms before privatization in some cases; which suggests that governments, at least regarding some firms, efficiently restructure the control and incentive scheme before selling them to private investors. Thus, if governments restructure the supervision on public firms and as a result improve their performance before privatization, then the improvement can not be attributed to the change in ownership (Dewinter and Malatesta, 2001). There are some empirical studies that examine cases where economic reforms on public enterprises have been implemented instead of, or prior to, full privatization (Majumdar, 1996;

Martin and Parker, 1997). Regarding that issue, Megginson and Netter (2001:338), after analyzing the case of China, conclude:

“The evidence from China suggests that enterprise restructuring, concentrating on improving the allocation of property rights and incentives, can yield large benefits even without privatization. Naturally, this begs the question whether economic reform coupled with privatization could lead to even greater performance improvements.”

This is consistent with the findings of Brickley and Van Horn (2000) that the managers of non-profit hospitals face similar incentives as the managers of for profit hospitals and behave in a similar manner.

Nevertheless, the authors underline that more research is required about the effect that application of reforms, other than privatization processes, have on the efficiency of state-owned enterprises (Megginson and Netter, 2001:382).

The purpose of this paper, therefore, is to assess whether organizational changes of public enterprises lead to equivalent improvements in efficiency as in privatized firms, when firms move from a monopolist to a partial-competitive condition.

To carry out this objective we focused on the postal sector which, despite of having been formally re-regulated in the European Union, still operates under monopolistic conditions. In the European Union most of the Universal Service Providers (USPs)¹ have experienced a continuous reform process since 1992, when the Postal Green Book of the European Commission was published. From then onward many USPs have had to adapt their structure to operate in a competitive market and at the same time to provide a universal service in a regulated market.

Among the European USPs, the case of the Spanish dominant postal operator (Correos) is especially interesting for analyzing efficiency in the presence of organizational reforms. Firstly, because Spain is the country where legal changes in postal services have gone farther in the aim of getting a more competitive environment² and second, it has undergone several relevant organizational reforms since 1992, without being privatized³. In a previous study on this case Morales (2005), a cross time analysis of the efficiency for the period 1987-2002 has been done. The author found significant improvements in financial efficiency and also increases in productivity as well in service quality in a minor proportion. In the present paper we extend

previous researches by comparing the efficiency of the Spanish operator with other European postal operators which have different organizational ownership status.

To carry out this comparative analysis, a sample of seven countries for the period 1997-2003 was chosen. Although the small number of analyzed units could appear to be an insufficient sample, the virtual monopoly of letter postal service⁴ by all of these postal operators and the variety in their ownership structures⁵, enable to draw from this panel a representative contribution to the issue of the efficiency levels and organizational status in a regulated environment like that of the postal sector.

More specifically, the key questions considered in this paper are:

1. What are the main factors that explain differences in unit costs of European postal operators?
2. To which extent is the ownership a key variable in explaining differences among their unit costs?
3. Can public enterprise reforms achieve equivalent efficiency improvements as privatizations?

The paper is organized as follows. In the next section we summarize the main features of the postal market in the European Union, focusing our attention in seven countries. Methodology and approach are described in section 3. Then, a short description of the variables and the data are presented, followed by the results of the research (section 4). Finally, in section 5 we discuss the main conclusions of the study and their implications for future research.

2. The postal market in the European Union (EU)

The postal sector has undergone a significant transformation during the last decade since the green book came up in 1992. Many of the former traditional postal administrations have changed into corporations and in some cases have even been privatized or there are plans to do so.

The above trend is reflected in the regulatory policy development by the European Commission through the Directives 97/67/EC and 2002/39/EC. Both directives aim to a gradual though controlled market opening of the postal sector throughout the European Union. Thus, after the Directive 97/67/EC was issued, all mail items weighing more than 350g were liberalized and

some time later the new Directive 2002/39/EC restricted the reserved area up to 100g for 2003 and up to 50g for 2006. The objective is to get full liberalization by 2009.

The postal directive 97/67/EC defines the minimum requirements respect to the scope of the universal services: access conditions for citizens, delivery requirements, and quality of service, as well as complaint and redress procedures. In general, the universal service obligations (USO) that are agreed with the national postal operator ensure that every citizen may use postal services on reasonable conditions and at an uniform tariff for a given postal product of a certain weight.

The scope of universal services and delivery requirements do not deviate much between Member States legislations. In 2004 all of members in the European Union (EU) were fulfilling established standards and much of them were on the standard. It means that services and market conditions to be compared are similar.

Take in Figure 1

In general, the universal postal service includes the collection, sorting, transport and delivery of addressed mail up to 2 kilograms and of parcels up to 10 or 20 kilogram, as well as services to register or to insure an item. Express and other services are outside the universal service, which are offered under market conditions. Collection and delivery takes place five or six days per week with a few exceptions for certain rural regions.

The segmentation of the postal market is as shown in figure 1. In this paper for homogeneity reason we will deal with letter post division, excluding from that newspapers and advertising mail. Presence of public network in the market is smaller in express and other services than in universal services.

Parcel and express mail have also been excluded from the study because of differences among countries in USO scope, mix of products, and account information between the countries are significant.

In this research seven of the fifteen countries of the EU are analyzed (Denmark, Germany, Greece, Ireland, The Netherlands, Spain and United Kingdom). For the rest of the member countries it was not possible to obtain complete and reliable information, especially on the unit cost of letter division.

2.1. Market regulation: brief analysis of the sample's countries⁶

The continuous process of liberalization implemented in the postal sector of the European Union has forced the organizational reform of the postal administrations. In fact, all postal operators included in the sample have had organizational changes, some of them ending up in privatization. The sample includes 7 postal operators with a great variety of property forms: two of them with presence in the stock market, like in The Netherlands and Germany; four postal operators fully owned by the State, two of them with possible entry of private capital (Post Danmark and Royal Mail); and finally, an operator with presence of labor capital (An Post from Ireland).

Companies with presence in the stock market:

Royal PTT Post BV, the Dutch postal service, represents the more recent case of participation in the stock market. Royal PTT Post is a subsidiary entirely owned by the holding company TNT Post Group (TPG) since 1998. In 2003 the State held 34.7 % of TPG's shares, but in 2005 this percentage was reduced to 17%. The remaining shares are traded on four stock exchanges. Postal staff have their own status as employees of PTT Post.

The postal Law of 1 June 2000 recognized PTT Post as the Universal Service Provider in Netherlands giving an exclusive concession for the reserved services. The Dutch postal market has been relatively open to competition since 1989, when the delivery of letter mail above 500 gram was liberalized. During the last fifteen years, the size of the reserved area was lowered in compliance with the postal directives 97/67/EC and 2002/39/EC and currently is around 52%. Furthermore, Dutch postal sector regulation has stimulated the development of competition because no license or registration is required to offer postal services. Actually, the competitors have a market share of around 5% of the delivery of addressed mail, equaling a market share of about 10% of the liberalized part of the addressed mail market.

The Dutch postal market is one of the most interesting in the European Union. Total mail volumes and per capita mail volumes are relatively high in comparison with surrounding countries. Moreover, the geographical circumstances in the Netherlands are almost ideal due to the absence of mountains and remote areas. In addition, the Netherlands has a high population density compared to other countries.

Other firm with participation in the stock market is Deutsche Post Aktiengesellschaft (AG), a joint-stock company managed under private law. Until 1 January 1995 this company operated as Deutsche Bundespost POSTDIENST when it was transformed into Deutsche Post AG. Since then it is part of Deutsche Post World Net, considered as a global integrator in mail, express and logistics. In 1998 was given to Deutsche Post AG the exclusive license for the conveyance of the USO area valid until 2007. In addition, in November 2000 took place the IPO of Deutsche Post AG and the State sold 31% of shares. At present, 34% of shares are still held by the State and its staff consists of workers, employees and civil servants.

Since 1998 the monopoly rights of Deutsche Post AG have been reduced significantly by the new postal law and licensed operators have been able to provide non-reserved letter mail services. Access to the market is possible after a relevant license has been granted by the Regulatory Authority. The number of licenses is not restricted.

However, Deutsche Post takes around two thirds of the large market for mail, courier, express and parcels services. In the provision of mail, in particular the licensed sector, Deutsche Post has a market share of 95%, in terms of turnover (96% in volume) despite of 32% of the German addressed mail market is liberalized. Although the number of licensed active postal operators in Germany seems very high, most postal operators are just small local companies that distribute mail in municipalities or a cluster of municipalities. In the mail business, Deutsche Post is systematically leveraging the opportunities available from increasing market liberalization and had acquired postal operators in the USA, the UK, the Netherlands, France and Spain by 2004.

Companies wholly public:

On the other hand, there are companies that have always been wholly public. One of the cases where the State possesses a mayor control in the management is Hellenic Post (ELTA). It is the USP in Greece, constituted as a State enterprise under the supervision of the Ministry of Transport and Communications through the national regulatory authority (Hellenic Telecommunications & Post Commission (EETT)). The Hellenic Post staff do not have the same status as State employees, but ELTA is not autonomous with regard to creating and doing away with jobs, or recruitment. The postal sector is regulated in the Greek Postal Act, Law 3185/2003, amending Law 2668/1998 and the market opening follows the EU directives. Nevertheless,

Hellenic Post keep the 99.5% of the market share, in spite of 18% of the postal market have been liberalized.

One of the most important characteristics influencing the Greek postal market is the geography of the country. Due to the many islands and the low degree of urbanization, the average cost of collection and delivery is relatively high. In addition, both the total and the per capita mail volumes are relatively low. The share of direct mail in the total mail volume is around 6%, a figure that is very far below the European average. Due to the high costs of postal delivery a large increase in direct mail volumes is not very likely, with the possible exception of Athens and some urban areas.

In the same manner the USP in Spain (Correos y Telégrafos) is a State enterprise (limited company) created under law of 29 December 2000 to replace the Commercial Public Company. The entire share of Correos belongs to the State. According to 2003 figures, approximately two thirds of the Correos y Telégrafos staff are civil servants. An important element related to this is that since 1998 have been applied an incentive program to the delivery staff according to the performance.

The Ministry of Fomento under the Subdirección General de Regulación de Servicios Postales is responsible for the regulation of the Spanish postal market. The current postal law (Ley 24/1998) was modified at the end of 2002 to conform to European standards. At present, the reserved service refers to ordinary domestic inter-city mail, including letters and postcards within the weight and price limits set by Directive 2002/39/EC, as well as inward and outward cross-border items of the same category. The intra-city postal service, the largest part of the postal system, has never included in the postal reservation. In fact, despite of a specific or general authorization is required to perform postal activities in Spain, private operators deliver a substantially higher percentage of letter post items (7 - 8%) than in member states which have repealed the reserved area entirely.

The Spanish market is attractive for competitors because it is large and some major cities generate a large share of volumes. In addition, in the past few years, the volume of addressed mail delivered has increased. However, the low density of population and the great size of rural areas make difficult the competence in the inter-city letter mail.

In Denmark the situation has been different because the State has prepared the company to be privatized. Post Danmark operated as Danish Post Office till 1995 when was converted in independent, public company managed by a Board of Directors. Thus, Post Danmark was granted a concession as public postal operator until 2009. In 2002 was transformed into Limited Liability Company and with this change the opportunity for the Ministry of Transport to sell up to 25% of the share capital was created. In fact, at 8 June 2005, the Danish Ministry signed a share purchase agreement with CVC Capital Partners (CVC) on the sale of a 25% stake in Post Danmark. In 2005 46% of the staff were civil servants or were employed on terms similar.

The Danish mail market is relatively mature with mail volumes per capita ranking among the higher levels in Europe, but the total mail volume is low compared to other countries because of the reduced size of the population. Due to a high population density and a large degree of urbanization, the postal market can nonetheless be qualified as attractive for competitor postal operators, in particular in the urbanized areas. However, in Danish postal legislation, a legal entry barrier is in place making it more difficult for (potential) entrants to compete in the provision of postal services with the universal service provider. Actually, despite of having liberalized 40% of the postal market, the share market of the competitors just grew up to 2%.

In the UK the Government has followed a similar strategy to Denmark even though in this case the company has not been privatized. In UK postal services were provided by British Post Office until March 2001, when it was replaced by Consignia Plc. Consignia is a public limited company wholly owned by the Government. The Consignia group operates under the trading names of Royal Mail, Parcelforce and Post Office Ltd and their staff have their own status as employees of the group. Royal Mail is the designed to provide postal service in the USO area.

The postal regulator in the UK is the Postal Services Commission (Postcomm). Since the new postal law of June 2000, a reform program has been implemented following a major review of the UK postal market. Currently, in the United Kingdom, there is technically no reserved area by law, but there remains a small reserved area in fact. The British postal law creates a licensed area and instructs the regulator, Postcomm, to grant licenses to applicants based upon three criteria: protection of universal service, promotion of competition, and promotion of efficiency. Actually, since April 2001 the provision of postal services within the former reserved and consolidation area is partly allowed as the delivery of bulk mailings over 4,000 items is open to

competition which represents about 40% of the market. However, the level of competition that has developed in the British market to date has been less than what Postcomm anticipated. In 2003, the market share of seven licensed private operators amounted only 0.27 percent.

Company with labor capital:

In our sample we have the particular case of An Post (Ireland) where the State has given capital participation to workers. An Post, the designated USP since 2000, is a public company which has a mandate to conduct its operations on a commercial basis. It was established in 1984 under the Postal and Telecommunications Services Act, 1983. Postal staff are employees of An Post, but those recruited prior to 1 January 1984 have greater security of tenure. All shares of the company were held by the Government until 2000 when An Post established a restructuring on its remuneration policy. As part of that reorganization program the Government approved an Employee Share Ownership Plan (ESOP). Under this plan was given to workers the chance to hold up to 14.9% of the shares in An Post directly linked to the achievement of a specified level of annual cost savings. Thus, the ownership of the State was reduce to 85,10%.

The Irish postal market is relatively small compared to other European countries and the market for addressed direct mail is particularly underdeveloped. On the other hand, the market for un-addressed mail is significant, while the market for cross border mail, especially from and to the United Kingdom, constitutes a large part of total volume. Currently there is no real competition in the provision of domestic universal services. The absence of a system of postcodes and the hard geographical circumstances, such as for instance the lack of presence of highways and the low density of population, make it for this moment difficult for entrants to develop activities. The activities more attractive to competitor postal operators are inbound cross border mail and the local market of urbanized areas.

In table 1 we summarize the main characteristics of the sample analyzed in this section. It is important to highlight that all postal operators included in the sample have had organizational changes, some of them finishing in privatization. That means, we compare reformed (without being privatized) versus privatized enterprises.

Take in Table I

3. Specification of the cost function

In this study we use a translog cost function in line with other empirical research in the postal industry⁷. We estimate a fixed effect model with panel data. Therefore, we assume that heterogeneity is captured only in the constant term μ . The β coefficients to be estimated are constants for the companies, assuming similar technologies. Thus, standard error component model assume that disturbances are homoskedastic with the same variance across time and individuals. The general cost function is shown as:

$$\begin{aligned} C_{it} &= \mu + \beta X_{it} + U_{it}, \\ U_{it} &= \alpha_i + \lambda_t + \varepsilon_{it}, \\ \varepsilon_{it} &\approx (0, \sigma^2), \end{aligned} \tag{1}$$

where the random disturbance for firm i in year t (U_{it}) consists of a firm specific effect α_i , a time effect λ_t , and a purely random term ε_{it} . In this equation λ_t has the same value for each company and varies through time. This variable includes any possible technical change across the analysed period and also the price effects of inputs omitted in the equation. The term α_i represents the different intercepts and can be interpreted as fixed overhead costs. However, this method does not allow for considering size variables that affect companies' costs when these variables show constants across time. Nevertheless, it is possible in a second stage using the methodology applied by (Matas and Raymond, 1998) for urban bus companies. Thus, α_i can be corrected by the next equation:

$$\alpha_i = \gamma_0 + \gamma_1 Y_i + \eta_i, \tag{2}$$

where η_i is the residual and indicates the corrected fixed effects by the Y variables introduced to control the size differences. The estimation of the cost function with this model allows us to calculate two relative efficiency measures among the companies. The proposed estimation is a two-stage method which first estimates the standard cost function and then relates the fixed effects to disturbance term. In the first stage the most efficient postal operator will be the one with lower α_i and in the second stage will be the one with the lower η_i .

Cost specifications traditionally assume operating cost as a function of output and input prices (labor, capital and material). However, to have a more accurate approach we consider other exogenous variables which can further explain cost differences among the observations. To

obtain a more homogeneous comparison only letter mail activity was considered, so the unit cost of letters (UC) is used as dependent variable. Total volume of letters (V) was employed as output; and costs per employee (E) as input price. Given the importance of network features to explain differences in mail line (letters) among countries we also consider necessary to introduce as explanatory variable the service quality (Q) as a measure of effectiveness of the postal operator (*i*) in a determinate time (*t*). As quality variable we take quality in time of delivery (Q) and service availability (A). In a previous analysis the grade of ruralization of the country appeared negatively correlated to service quality (it variable was included as geographical problems GP) , so we dropped this variable from the analysis. It suggests that when letters' time of delivery is adapted to the density of population, the density of population appears not relevant. Finally, as institutional factor we take the state ownership share (S). The translog cost function used is specified as:

$$\ln UC_{it} = \mu + \alpha_i + \lambda_t + \beta_1 \ln V_{it} + \beta_2 \ln E_{it} + \beta_3 \ln Q_{it} + \beta_4 \ln A_{it} + \beta_5 \ln S_{it} + \varepsilon_{it} . \quad (3)$$

Additionally, α_i was corrected by the equation [2] using as specific size effect the geographical variable (G).

3.1. Specification of the variables

The variables used for estimating the average cost function have been calculated as follows. Average costs (UC), came from dividing total mail costs by the respective total volume of letters (V). Labor unit cost (E) ⁸ was obtained by dividing annual labor costs by average employee in the year.

Thus, following the Directive 97/67/EC, the key variable for controlling $Q_{i,t}$ has been measured by the time of letters' delivery and according to (Morales, 2005) it can be defined as:

$$\begin{aligned} Q_{it} &= \sum_{z \in Z} \left(pD_t^{J+n,z} \right) qn_{z,t_0}, \\ Z &= \{d, e\}, \\ \sum qn_{z,t_0} &= 1, \end{aligned} \quad (4)$$

where pD is the probability of deliver the letter in J (the day of posting) plus n days. In this work we only consider $J+1$ and $J+3$, when the scope of the dispatch (Z) is domestic (d) or European

(e), respectively. Finally, qn is the proportion of mail dispatched in Z and t_0 is the year of reference, which in our case is 1998.

The service availability (A) indicates facilities to use the service. We considered relevant to include the different access options pondered by the relative importance for each target⁹. So, it can be defined as:

$$A_{i,t} = \left[\left(\frac{LB}{Hab} \right)_{i,t} \cdot (S_{P,t_0} \cdot qn_{t_0}^o) \right] + \left[\left(\frac{PO}{Hab} \right)_{i,t} \cdot (S_{P,t_0} \cdot qn_{t_0}^r) \right] + \left[\left(\frac{PO + SC}{Hab} \right)_{i,t} \cdot S_{B,t_0} \right], \quad (5)$$

$$S_{P,t_0} + S_{B,t_0} = 1,$$

where LB is number of letter boxes, PO number of post offices and SC number of sorting centers per inhabitant (Hab). S is the proportion of senders, whom can be private (P) or businesses (B). The term qn is the proportion of ordinary (o) or registered (r) mail dispatched in the year of reference t_0 (1998).

State ownership share (S) represent the percentage of capital held by the government. This percentage varies in three of the seven countries studies across time.

In a second phase, to take in account size variables we estimate the equation [2]. As size variable we include geographical factors (G) for controlling differences between countries. It measures the postal operator difficulties to provide the universal service. Initially G was pondered by the grade of ruralization obtaining the geographical problem variable (GP), but as it was said it had correlations problems that can be seen in table 2. Finally, this variable was defined as:

$$G_i = \frac{1}{10} \cdot \sum_{ci=1}^4 \sum_{cj=i+1}^5 (D_{(i,ci),(j,cj)}), \quad (6)$$

where D is a measure function that computes the distance in kilometers between the five most populated cities of country i . Taking in account that all postal operator must obey the universal service, we believe it is more reliable to consider the effect of country size on unit costs thinking over distances among main points of traffic of letters.

For carry out the analysis we constructed our data base collecting the necessary information from different sources. Financial data were mainly obtained from annual reports provided by the companies. In some cases key information was collected from reports prepared for the

European Commission. Quality information was provided by the International Post Corporation and statistical information was obtained from the Universal Postal Union.

Descriptive statistics for the selected variables are show in table 2 in absolutes values. Unit cost of letters (UC) is expressed in euros and costs per employee (E) in thousand of euros. Volume (V) is expressed in number of items dispatched and quality (Q) in percentage of letters delivered in the fixed time. The availability (A) is measure by an index where the maximum value is 1. Finally, state ownership is expressed in percentage.

Take in Table II

4. Quantitative results

Equation [3] was estimated using ordinary least squares with an unbalanced pool of 46 observations. Values of unit costs and costs per employee were deflated according to the harmonized indices of consumer prices. Any country was selected as reference, so μ coefficient indicates the average interception. Additionally, according to Arellano (1987), White robust standard errors were computed. In table 3 we can observe results from the model 1.

Take in Table III

From table 3 we can observe the standard error value shows a good fit and the statistics test point to high confidence levels. The coefficients for fixed effect are significant in all cases. However, the cost function reflects a long-term constant increase which could express influence of omitted input prices. A possible reason could be the expenditures in automation which has effect in a long-term.

4.1. Cost analysis

The estimation results of the cost function show the expected sign for the different variables. It can be seen the key factor that explain the variation in unit cost is the labor prices. The coefficient of the cost per employee (E) variable suggest an increase of 1% in its value raise the unit cost around 1,24%. It confirms unit cost is very sensible to changes in the salaries.

Another significant coefficient than explains the variation in unit cost is the volume of letters (V). It indicates an increase in volume of letters lead to a reduction less than proportional in unit cost holding other variables constant. It suggests the presence of economies of scale in the postal sector confirming results reported in Cohen and Chu (1997) and Cazals, Florens, Roy (2001).

The coefficient of the service availability (A) is positive and significant. This means an increase in this variable implicates an increase less than proportional in unit cost. The service quality (Q) also shows a positive and significant coefficient. This indicates that improvements in delivery time lead to higher unit costs.

Governmental ownership (S) shows as not significant. Thus, the reduction in Government participation does not lead to lower unit costs.

4.2. Efficiency analysis

Estimation by panel data allows comparing efficiency differences between companies. However, in spite of controlling for the variables of the last paragraph, results from the model 1 even show significant fixed effects in the sample. In our case companies fixed effects are also affected by the size of the country. Considering that local market represent an important part of the total volume of letters for all the operators, we take the mean of distance among 5 principal cities of each country as our size variable. In figure 2 can be seen a first approach.

Take in Figure 2

Empirical findings from equation [2] confirm that the relationship between these variables is positive and statistically significant. Results of η_i are presented in the “corrected fixed effect column” of table 4.

$$\alpha_i = -3,640036 + 0,653545 * \text{Ln}G_i + \eta_i$$

$$\text{t-Statistic } (-2,358410) \quad (2,359332)$$

$$\text{R-squared: } 0,526804 \quad \text{S.E. of regression: } 0,437594$$

In table 4 we show unit costs differences (in rate of differences) for each company, in respect to the global mean, comparing the three different measurements used to evaluate the efficiency: original differences calculated from the financial information; variations in unit costs after considering influence of variables analyzed in table 3 (model 1); results of the second model where the fixed effects from table 3 are corrected by geographical variable. These findings indicate that postal operator's efficiency is affected by distance between principal cities.

Take in Table IV

When the size effect is eliminated differences among postal operators are significantly reduced and efficiency improvements are showed for companies operating in larger countries. On the contrary, efficiency of operators from smaller countries is significantly reduced. In both cases the postal operator of Ireland comes out like the most efficient.

Take in Figure 3

For concluding the analysis it is relevant to comment that effective differences in efficiency are really insignificant among companies, such as can be seen in figure 3. When the companies are compared with Spain's operator, after applying the second model, the mayor distance is showed by Ireland which has unit costs 5,97% lower than Spain. That means that differences are practically inexistent.

5. Conclusions

Results regarding cost structure show that labor cost is the main factor that explains differences in unit costs between countries. We also confirm the presence of economies of scale in the postal sector. In addition, quality and availability of the service appears significant in explaining differences in unit costs. We also find letters' time of delivery varies significantly according to the grade of ruralization of the country. Finally, State ownership was not a key variable to explain different unit costs. These findings are especially important since the postal operators must obey a legal framework related to provide a universal service.

So, we can conclude than in a regulated environment such as the postal sector, where in spite of being partially liberalized still market shortcoming and imperfections are important, public and private companies tend to obtain similar unit costs.

After controlling for these variables, postal operators still show statistically significant differences. However, when differences in efficiency (measure as overhead unit costs) were adjusted according to size of the countries, there was a considerable reduction in unit cost differences. In both models, the postal operator of Ireland appears like the most efficient company, although distances respect to the others are very short. In the case of Ireland restructuring process has been carried out giving an important leadership role to workers. This suggests us labor culture could be a good variable to study when we analyze reform processes. Thus, according to results from table 4, postal operators which have had organizational changes without being privatized, such as the Spain's and Greece's, do not show higher unit

costs than privatized postal operators like Germany's and the Netherlands'. Nevertheless, it could be interesting in further research to include in the sample new entrant operators from Eastern countries to which no reform processes have been applied in order to contrast performances.

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¹ The Directive 97/67 of the European Commission defines the *universal service provider* ("USP") as "the public or private entity providing a universal postal service or parts thereof within a Member State, the identity of which has been notified to the Commission". In each country of the European Union there is a USP and in some cases one or more Competitive Postal Operator (CPO).

² In Spain, the postal reservation has never included intra-city postal service, the largest part of a modern postal system. So, private operators in Spain deliver a substantially higher percentage of letter post items than in member states.

³ Up to 1991 Correos was a *Dirección General* (Directorate General) of the following Ministries: Government, Interior and Transport, Tourism and Communications. From 1991 to 1998 had the title of *Organismo Autónomo* (Autonomous Entity) with commercial nature, and from April 1 1998 up to the 2001 was a Managerial Public Entity. Later, in July 3 2001 Correos y Telégrafos became a *Sociedad Anónima Estatal* (Public enterprise)

⁴ The Spanish postal operator is there one which has the least market share (92% in the traditional postal market).

⁵ Some of the analysed operators only have State ownership, but there are also public entities with private capital, public with worker capital and exclusively private.

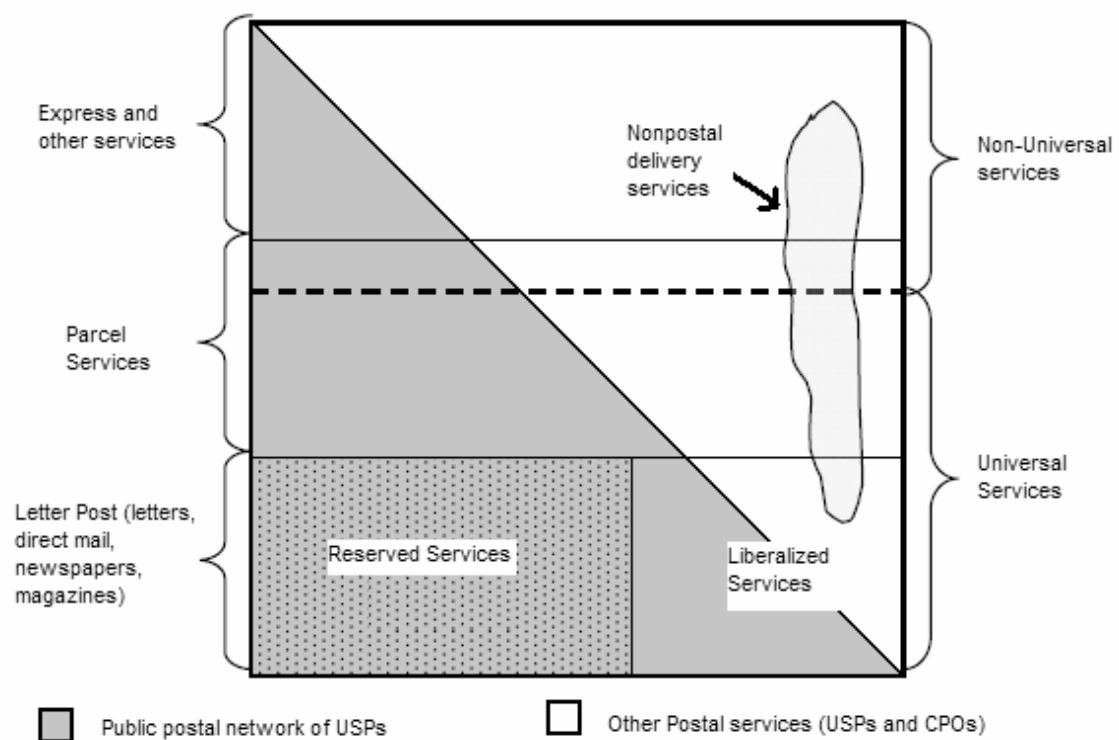
⁶ The required information to elaborate this section was obtained from the annuals reports of the companies, postal laws, reports provide by the Universal Postal Union (2002) and by reports from the European Commission DG Internal Market elaborates by ECORYS (2005), WIK Consult (2004) and Nera Economic Consulting (2004).

⁷ The translog cost function is used by Mizutani y Uranishi (2003) and Nera (2004) to analyse efficiency in postal sector.

⁸ Staff costs represent around 75% of total in postal sector apart from differences staff prices between the countries.

⁹ Business customers send in average 85% of the total volume of letters in the analyzed countries.

Figure 1: Structure of the postal market



Source: Wik-Consult (2004:22)

Figure 2: Relation unit cost vs distance in the postal sector

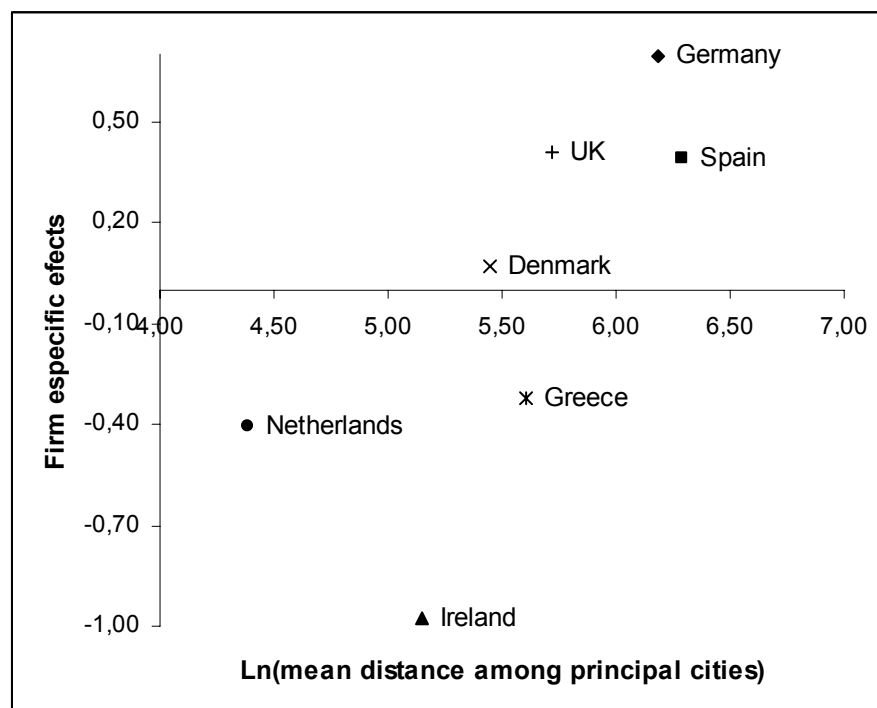


Figure 3: Relative differences in efficiency respect to Spain.

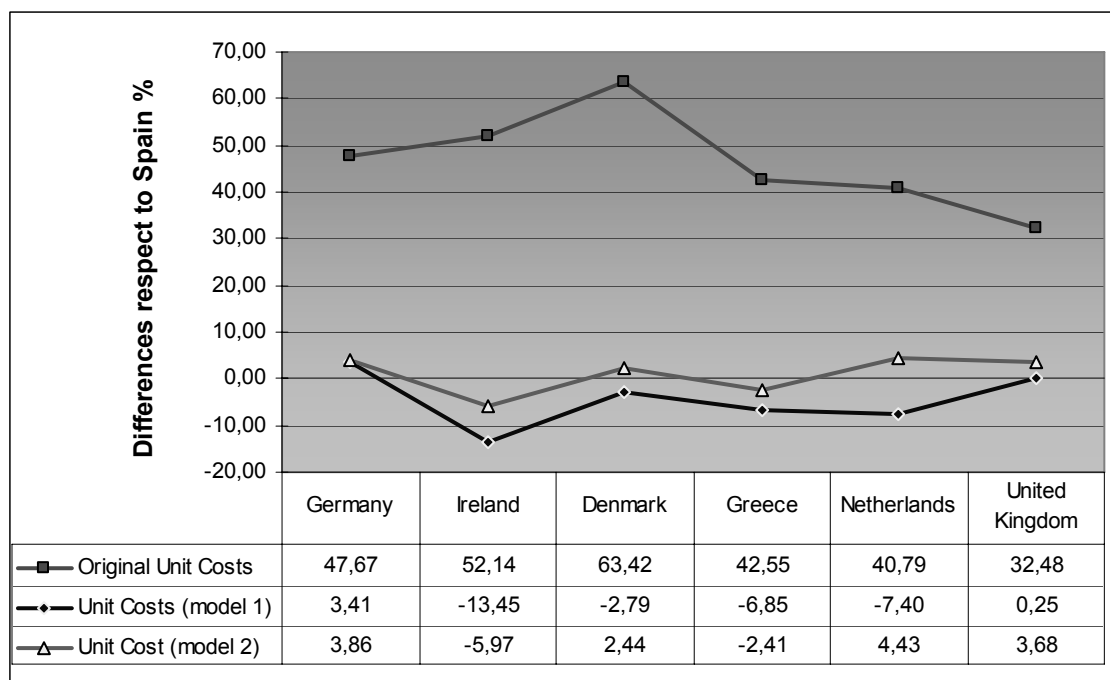


Table 1: Analysis of the sample

Postal Operator	Country	Property rights	Stock Market	Market Share (2003)	Relevant Organizational Changes
Deutsche Post	Germany	Majority public	Yes (Nov.-2000)	96%	1998; 2000
Correos	Spain	Wholly Public	No	92,9%	1998; 2001
An Post	Ireland	Majority public	No	100%	2000
Post Danmark	Denmark	Wholly public (SO)	No	98%	1999; 2002
Hellenic post	Greece	Wholly public	No	99,5%	1998
TPG Post	The Netherlands	Majority Private	Yes (1997)	95%	1998; 2000
Royal Mail	United Kingdom	Wholly public (SO)	No	99,7%	2000

SO= selling option

Table 2: Descriptive statistics and correlations

	UC	E	V	Q	A	S	GP	G
UC	1.000000	* 0.504548	-0.046273	*0.649792	0.291621	0.006670	*-0.501426	-0.478547
E	* 0.504548	1.000000	0.100781	* 0.746727	0.029080	*-0.737955	*-0.835258	*-0.780317
V	-0.046273	0.100781	1.000000	0.427019	-0.075685	-0.012390	-0.332408	0.371284
Q	* 0.649792	0.746727	0.427019	1.000000	0.219659	-0.351050	*-0.854690	-0.447078
A	0.291621	0.029080	-0.075685	0.219659	1.000000	0.459837	-0.022028	-0.258675
S	0.006670	*-0.737955	-0.012390	-0.351050	0.459837	1.000000	*0.550452	* 0.523026
GP	*-0.501426	*-0.835258	-0.332408	*-0.854690	-0.022028	* 0.550452	1.000000	* 0.657462
G	-0.478547	*-0.780317	0.371284	-0.447078	-0.258675	0.523026	* 0.657462	1.000000
Mean	0.448786	35912.29	8314.74	82.22248	0.430062	87.50	59.05464	2.993609
Median	0.467492	35476.09	3936.95	91.40804	0.394299	100.00	59.26052	2.713000
Maximum	0.663018	60882.05	21760.00	95.96443	0.686136	100.00	123.8027	5.369000
Minimum	0.211287	14138.69	543.00	40.21850	0.285365	34.80	8.223296	8.060000
Std. Dev.	0.119892	12243.67	8186.32	18.33782	0.118325	22.21	37.70431	1.579816

*Denotes significance at the 1% level.

Table 3: Estimation results of the translog cost function

Variable	Coefficient	t-Statistic	P-value 1- confidence levels
μ	-9.780811	-8.285511	0.0000 *
Ln(V)	-0.379178	-2.825805	0.0086 *
Ln(E)	1.170641	7.526268	0.0000 *
Ln(Q)	0.115802	3.975084	0.0004 *
Ln(A)	0.372973	2.730261	0.0108 *
Ln(S)	-0.059096	-1.116004	0.2739

Fixed Effects (Cross) α_i				Fixed Effects (Period) λ_t			
	Coefficient	t-Statistic	Prob.		Coefficient	t-Statistic	Prob.
Germany	0.664880	-7.629644	0.0000*	1997--C	-0.036539	-8.364421	0.0000*
Spain	0.343259	-8.481388	0.0000*	1998--C	-0.026005	-8.329885	0.0000*
Ireland	-0.926123	-8.645472	0.0000*	1999--C	-0.014414	-8.308105	0.0000*
Denmark	0.079736	-8.205127	0.0000*	2000--C	-0.006458	-8.296159	0.0000*
Greece	-0.302880	-8.390707	0.0000*	2001--C	-0.010447	-8.265041	0.0000*
Netherlands	-0.355430	-7.925874	0.0000*	2002--C	0.031353	-8.224148	0.0000*
United Kingdom	0.366750	-8.183538	0.0000*	2003--C	0.062511	-8.218300	0.0000*
R-squared	0.980264	S.E. of regression	0.052873	F-statistic		81.80760	
Adjusted R-squared	0.968281	Durbin-Watson	1.413021	P-value (F-statistic)		0.000000	

*Denotes significance at the 1% level.

Table 4: Ranking of companies' efficiency (overhead unit costs respect to mean)

Postal operator	Country	Differences in Ln(UC)	Ranking	Fixed effect	Ranking	Corrected Fixed effect	Ranking
Deutsche Post	Germany	0,117393	5	0,66488	7	0,29588	6
Correos	Spain	-0,589228	1	0,34326	5	-0,08503	3
An Post	Ireland	0,183704	6	-0,92612	1	-0,67437	1
Post Danmark	Denmark	0,350845	7	0,07974	4	0,15607	4
Hellenic post	Greece	0,041544	4	-0,30288	3	-0,32234	2
TPG Post	Netherlands	0,015449	3	-0,35543	2	0,35205	7
Royal Mail	United Kingdom	-0,107836	2	0,36675	6	0,27775	5
Standard deviation		0,300728		0,543771		0,382731	

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