Fundación BBVA

Documentos de Trabajo 6

2009

Francisco Alcalá
Pedro J. Hernández

Firms' Main Market, Human Capital and Wages

Fundación BBVA

Firms' Main Market, Human Capital and Wages

Francisco Alcalá [1,2]
Pedro J. Hernández[1]

[1] *UNIVERSITY OF MURCIA*
[2] *VALENCIAN ECONOMIC RESEARCH INSTITUTE (Ivie)*

Abstract

Recent international trade literature emphasizes two features in characterizing the current patterns of trade: efficiency heterogeneity at the firm level and quality differentiation. This working paper explores human capital and wage differences across firms in that context. We build a partial equilibrium model predicting that firms selling in more-remote markets employ higher human capital and pay higher wages to employees within each education group. The channel linking these variables is firms' endogenous choice of quality. Some of these predictions are tested using Spanish employer-employee matched data that classify firms according to four main destination markets: local, national, European Union and rest of the world. Employees' average education is increasing in the remoteness of firm's main output market. Market-destination wage premia are large, increasing in the remoteness of the market, and increasing in individual education. These results suggest that increasing globalization may play a significant role in raising wage inequality within and across education groups.

Key words

Vertical differentiation, exporters, Alchian-Allen effect, wage inequality, unobservable skills.

Resumen

La investigación más reciente en economía internacional destaca dos aspectos de los patrones actuales del comercio: la heterogeneidad de las empresas en términos de eficiencia y la diferenciación de los productos según su calidad. En este contexto, este documento de trabajo explora las diferencias salariales y de capital humano entre las empresas. Se construye un modelo de equilibrio parcial que predice que las empresas que venden en mercados más remotos emplean más capital humano y pagan salarios más elevados según el nivel de educación. El mecanismo que relaciona endógenamente estas variables es la elección que hacen las empresas de la calidad de su producción. Estas predicciones se contrastan mediante datos cruzados de trabajadores y establecimientos para la economía española que clasifican a las empresas de acuerdo con su principal mercado de destino, contemplándose cuatro grandes mercados: local, nacional, Unión Europea y resto del mundo. Se comprueba que la educación media de los empleados de una empresa es creciente en la lejanía de su principal mercado. Las primas salariales asociadas al principal destino de las ventas son muy elevadas, se incrementan en función de la lejanía del mercado y de la educación del individuo. Los resultados sugieren que la creciente globalización juega un papel significativo en la ampliación de la desigualdad salarial entre grupos educativos e, incluso, en el mismo grupo.

Palabras clave

Diferenciación vertical, empresas exportadoras, efecto Alchian Allen, desigualdad salarial, habilidades inobservables.

Firms' Main Market, Human Capital and Wages

EDITA / PUBLISHED BY
Fundación BBVA, 2009
Plaza de San Nicolás, 4. 48005 Bilbao

DEPÓSITO LEGAL / LEGAL DEPOSIT NO.: M-11.380-2009
IMPRIME / PRINTED BY: Rógar S. A.

Impreso en España – *Printed in Spain*

La serie Documentos de Trabajo de la Fundación BBVA está elaborada con papel 100% reciclado, fabricado a partir de fibras celulósicas recuperadas (papel usado) y no de celulosa virgen, cumpliendo los estándares medioambientales exigidos por la legislación vigente.

The Working Papers series of the BBVA Foundation is produced with 100% recycled paper made from recovered cellulose fibre (used paper) rather than virgin cellulose, in conformity with the environmental standards required by current legislation.

El proceso de producción de este papel se ha realizado conforme a las normas y disposiciones medioambientales europeas y ha merecido los distintivos Nordic Swan y Ángel Azul.

The paper production process complies with European environmental laws and regulations, and has both Nordic Swan and Blue Angel accreditation.

C O N T E N T S

1. Introduction

In recent years, a new strand in the international trade literature has uncovered and explained a wide range of empirical regularities by placing firm efficiency heterogeneity and trade barriers at the center of the analysis. In parallel, a second strand of literature has stressed the importance of specialization along the quality dimension in characterizing the current patterns of trade. This paper explores the implications of these circumstances (firm efficiency heterogeneity, trade barriers, and quality differentiation) on the skill composition of employees across firms and the average wages they pay. We build a partial equilibrium model that predicts that firms selling in more-remote markets will employ higher human capital and pay higher wages to employees within each education group. The channel linking these variables is product quality, which is endogenously determined by a firm's efficiency. These predictions are tested using Spanish employer-employee matched data that classify firms according to four main destination markets: local, national, European Union and rest of the world. The empirical analysis lends support to the theoretical hypothesis. Results have significant implications for the future of wage inequality across and within education groups and may be relevant for economic policies aimed at increasing the number of higher-quality better-paid jobs.

The surge of the firm-based analysis of trade was pioneered by the empirical work of Bernard and Jensen (1995). It has been shown that only the most efficient firms self-select into exporters, which are then more productive, larger, and strongly in the minority. Bernard et al. (2003) and Melitz (2003) have provided the general framework for much of the subsequent analyses. In contrast with the conventional approach to international trade where there is no role for specific analysis at the firm level, this approach has shown that firm heterogeneity is a prominent phenomenon that can help explain the distribution of trade flows, assess its welfare effects, and design better policies. Tybout (2003), Bernard, Redding and Schott (2007) and Greenaway and Kneller (2007) have surveyed this rapidly growing literature. The second cited strand of literature has revealed that international trade is decreasingly characterized by horizontal specialization across goods and increasingly characterized by quality specialization within goods. Richer

countries and countries with more abundant human capital tend to specialize in exporting higher qualities within each good (see Schott, 2004, Hummels and Klenow, 2005 and Khandelwal, 2007, among others). Both strands of research have now merged in several papers analyzing vertical specialization within goods in the context of efficiency-heterogeneous firms (see Alcalá, 2007, Baldwin and Harrigan, 2007, Johnson, 2007 and Hallak and Sivadasan, 2008). In this context, Hummels and Skiba (2004) document a positive relationship between export quality and transportation costs to destination market, which has been termed the Alchian-Allen effect. This evidence has been extended by Baldwin and Harrigan (2007) and Johnson (2007) who find that unit prices of exports tend to increase with the remoteness of trade partners (where remoteness may involve geographic distance as well as cultural and historical variables). They argue that previous firm-heterogeneous trade models cannot explain this pattern unless they are modified to take into account the quality differentiation of firms' output. Accordingly, they extend Melitz's model in this direction. In their models, more-efficient firms tend to endogenously produce higher-quality goods and sell in more-remote markets.

However, none of these papers explore the possible links between firms' human capital, wages, and destination markets [1]. The analysis of these links is the main goal of this paper. We build a simple partial equilibrium model where firms that are heterogeneous in terms of their efficiency optimally choose output volume, quality, employees' composition (in terms of education and unmeasured skills), and destination markets. In equilibrium, more-efficient firms produce higher quality, are larger, employ a bigger proportion of workers with high education and skills, and sell in more-remote markets (i.e., markets with higher barriers to trade). As a result, the model predicts a positive link at the firm level between remoteness of its destination markets, output quality, human capital, and average wages paid within each education group.

Manasse and Turrini (2001), Yeaple (2005) and Verhoogen (2008) are models considering heterogeneous firms, heterogeneous labor, and exporting decisions. However, the differences with this model are significant. In Manasse and Turrini (2001) there are skilled workers which are heterogeneous and homogeneous unskilled workers. Each firm employs only one

1. Similarly, other general equilibrium models of trade with quality differentiation assume homogeneous labor within each country. Therefore, they do not analyze implications on firms' labor composition and wages. See Flam and Helpman (1987), Falvey and Kierzkowski (1987), Stokey (1991) and Murphy and Shleifer (1997).

skilled worker and a variable number of unskilled workers. The skilled worker is then most naturally interpreted as the entrepreneur and their specific skills are what make firms heterogeneous. Moreover, there is not an analysis of the optimal choice of output quality by the firm but an exogenous one-to-one correspondence between entrepreneur's skill and firm's output quality. Yeaple (2005) considers an economy with different available technologies leading to endogenously heterogeneous firms. Assuming that more skilled workers have a comparative productivity advantage when using the lower unit cost technology, he shows that exporters will be larger and employ more-skilled workers. However, he does not consider quality differentiated goods which is necessary to be consistent with the evidence in Hummels and Skiba (2004), Baldwin and Harrigan (2007) and Johnson (2007). Verhoogen (2008) lays out a model with both labor heterogeneity and quality differentiation, which is closest to ours. A key difference is that in Verhoogen (2008) there is no substitutability between workers with different skills as the firm raises output quality. Instead, producing one unit of output always requires one unit of blue-collar and one unit of white-collar labor. Then, the only way to produce higher quality is by increasing the quality (i.e., effort or skills) of these two units of labor. See also Hallak and Sivadasan (2008) for a model with two-dimensional firm heterogeneity which mostly follows Verhoogen (2008) on the specification of labor heterogeneity. There are also noticeable differences between our model and the usual analysis of firms' self-selection as exporters to different markets. These differences will be discussed in the next section after laying out the model.

The model's implications on the relationship between firm efficiency, output quality, and the number and remoteness of destination markets are consistent with the evidence in Eaton, Kortum and Kramarz (2004), Eaton, Kortum and Kramarz (2005), Hummels and Skiba (2004), Baldwin and Harrigan (2007) and Johnson (2007). In the empirical part of this working paper, we focus on the model's implications for the relationship between human capital, wages, and destination markets. We test the hypothesis using data from the 2002 Spanish Encuesta de Estructura Salarial (Survey on the Wage Structure). This survey provides matched data for more than 15,000 establishments and 150,000 employees, and classifies establishments according to four main market destinations: local, national, European Union and rest of the world. This classification allows us to go further than the usual exporter versus non-exporter dichotomy. We find that employees' average education is increasing in the remoteness of firms' main output market. In turn, market-destination wage premia are all significant, increasing in the remoteness of the market, and increasing in individual education. We also

find positive wage effects of firm size and employees' average education [2]. Overall, estimated firm-characteristics wage effects are substantial and provide important patterns of wage inequality within education groups. For example, the estimated wage of a college graduate working in an establishment with favorable characteristics (i.e., large exporter with average employees' education in the forth quintile of the distribution) almost doubles the wage of an individual with the same observable personal attributes who works in a firm with unfavorable characteristics (i.e., small local-market firm with coworkers' education in the first quintile of the distribution). Our results also suggest that increasing globalization may play a significant role in raising wage inequality across education groups. Note that, in this respect, the estimated wage effects of a firm's output destination markets are about triple for college graduates than for individuals that did not complete secondary studies.

There are a number of related empirical papers in the literature. Intuitively appealing as the link between human capital and exporting status may be, it is not so well documented. Existing studies use databases that do not contain information on individual workers' education. As a result, analyses tend to rely on a blue-collar (or production workers) versus white-collar (or non-production workers) distinction, sometimes complemented with additional information on occupations (see Bernard and Jensen, 1997, Bernard and Jensen, 1999, Maurin, Thesmar and Thoenig, 2002, Biscourp and Kramarz, 2007, and Bernard et al., 2007). In the case of the exporting wage premium, almost all previous studies use data on average wage at the plant or firm level, and therefore do not control for the individual characteristics of workers (see the extensive survey of this literature in Schank, Schnabel and Wagner, 2007). This is disturbing since, as our results show, average education is positively correlated with exporting status. Hence, it is unclear in this literature whether the exporter wage premium would disappear if the analysis were able to control for employee's education. The exception is Schank, Schnabel and Wagner (2007) who are able to control for the individual characteristics of workers. These authors find a positive significant effect of the exporting intensity of firms, even after controlling for worker education.

---

2. The existence of a positive firm-size wage premium has been extensively documented. See Idson and Oi (1999) and Troske (1999), among others. Lallemand, Plasman and Rycx (2005) provide reviews of empirical results and theoretical arguments. However, these arguments had not analyzed the firm's efficiency-size-quality link so far. There is also an empirical literature pointing at the effect of average coworkers' education upon individual wages. See Bayard and Troske (1999), Troske (1999), Battu, Belfield and Sloane (2003) and Alcalá and Hernández (2006).

However, the quantitative results in this paper largely differ from ours. They find that the exporting wage premium almost vanishes when worker characteristics are controlled for. Moreover, they find that the premium is larger for blue-collar than for white-collar employees. As we discuss below, these differences may be due to differences between the German and the Spanish economies, the type of data, and the estimation technique.

At any rate, the main empirical contribution of this paper is the evidence showing a positive relationship between the remoteness of a firm's destination markets and a firm's human capital and wages. In contrast to the relatively large literature that has analyzed the exporting wage premium, this is the first paper to provide some account of the human capital and wage differences within non-exporters and exporters, and to relate these differences to the remoteness of a firm's main market. Interestingly, we find that the difference in average education between local-market firms and national-market firms is as large as the difference between domestic-market firms and exporters. Similarly, the wage premium enjoyed by national-market firms' employees with respect to local-market firms' employees is as large as the exporting wage premium. In sum, these results add a new coherent piece to the firm-based literature of international trade, which only recently has started to explore the human capital and wage implications at the firm level. From the policy perspective, the results are relevant for economic policies aimed at increasing the number of higher-quality better-paid jobs. This is especially important in countries with seeming problems of over-education among young employees such as Spain. Notwithstanding, a formal analysis of the policy issues is beyond the reaches of our partial equilibrium model.

The working paper is organized as follows. The theoretical model is laid out in the next section. Section 3 explains the details of the database being used. Section 4 tests the model's implications on the relationship between establishment main market and employees' average education. The analysis on the relationship between establishment characteristics and wages is carried out in section 5. Section 6 summarizes and concludes.

2. The Model

IN this section, we characterize differences in labor composition and average wages across firms as a function of observable firm characteristics such as the number and remoteness of destination markets for output. The key mechanism linking these variables is the optimal choice of output quality by efficiency heterogeneous firms. Note that the analysis does not aim at explaining the determinants of wages across education levels. Rather, the model takes competitive wages for each type of worker as given. Average wages for each education group may then be different across firms because workers not only differ in education but in other skills. Indeed, the model shows that more-efficient firms systematically employ workers with higher unmeasured skills (besides having higher average education), which brings about higher average wage to each education group.

2.1. Technology and demand

Firms produce output using physical capital and labor. Labor is characterized by two attributes: *education* and *skill*. Both attributes are observable by firms. However, *skill* is meant to represent worker unmeasured characteristics which cannot be not controlled for in the empirical analysis. Let y_j be firm j's output, q_j is the quality it produces, and k_j is its capital. Workers can be educated *(E)* or non-educated *(N)*, and skilled *(S)* or unskilled *(U)*. Hence, there are four types of workers: *ES, EU, NS* and *NU*. We denote by l_j^i the number of type-i workers employed by firm j. Producing higher quality comes at the cost of lower output per worker, according to the following production:

$$y_j = A_j \left(\frac{a_k (k_j)^\rho}{(q_j)^{\gamma k}} + \sum\nolimits_{i = NU,\, NS,\, EU,\, ES} \frac{a_i (l_j^i)^\rho}{(q_j)^{\gamma i}} \right)^{1/\rho}, \gamma_k, \gamma_i \geq 1, \rho < 1, \qquad (2.1)$$

where A_j is a firm-specific efficiency parameter (all other parameters are common to all firms). Note that, for any given choice of output quality q_j, this is a standard CES production function. Moreover, technical marginal

rates of substitution between different types of labor depend on the quality to be produced:

$$\frac{dl_j^i}{dl_j^h} = (q_j)^{\gamma^i - \gamma^h} \frac{a_h}{a_i} \left(\frac{l_j^i}{l_j^h} \right)^{1-\rho}.$$

We assume that skilled (respectively, educated) labor has a comparative advantage with respect to unskilled (resp., non-educated) labor in producing higher quality. Or, in other words, unskilled (resp., non-educated) work becomes a worse substitute for skilled (resp., educated) work when producing higher quality. Formally, we assume,

$$\gamma_{ES} < \gamma_{NS} < \gamma_{NU},$$
$$\gamma_{ES} < \gamma_{EU} < \gamma_{NU}.$$

On the demand side, we assume that consumers are identical in all markets, though markets may differ in size (i.e., in the number of its consumers). Superscript n indicates the market. Demand for firm j's output in market n, y_j^n, is homogeneous of degree one in the market's size, M^n, decreasing in firm's price, p_j^n, and increasing in its output quality, q_j^n, according to the following inverse demand function [3]:

$$p_j^n = \theta\,(q_j^n) + \sigma\,(y_j^n/M^n). \tag{2.2}$$

3. This indirect demand function can be obtained as the result of utility maximization in a market with a continuum of consumers of measure M^n and the following assumptions. Each individual consumes a variable amount of a non-differentiated good (which is used as the *numeraire)* and one unit of a differentiated good. The differentiated good is produced by a measure-J continuum of firms which are indexed by j. Utility if consuming the variety produced by firm j is $U_j = u(z) + q_j + \varepsilon$, where $u(.)$ is the subutility function for the non-differentiated good satisfying standard conditions, z is consumption of this good, and ε is a random consumer/differentiated-good match term. Assuming that the price of each variety of the differentiated good is small with respect to consumers' income and under standard conditions for the random term ε, this utility implies the following inverse market demand function:

$$p_j^n = \bar{\theta} \cdot q_j^n - \bar{\sigma} \cdot ln\,(y_j^n/M^n) - \bar{\sigma} \cdot ln \int_J \exp\left[(\bar{\theta}/\bar{\sigma})\, q_j^n - (1/\bar{\sigma})\, p_j^n\right] dj,$$

where $\bar{\theta}$ and $\bar{\sigma}$ are positive parameters that may depend on consumers' income (see Verhoogen, 2008). Assuming that the number of firms is large, each firm takes the last term in this expression as a constant to maximize profits. Equation (2.2) is then a slight generalization of this expression, where the linear function for the term in q_j^n and the logarithmic function for (y_j^n/M^n) have been substituted for the more general functions $\theta\,(.)$ and $\sigma(.)$.

It is assumed [4]:

$$\frac{\partial \theta}{\partial q_j^n} \equiv \theta' > 0, \ \frac{\partial^2 \theta}{\partial (q_j^n)^2} \equiv \theta'' \leq 0,$$

$$\frac{\partial \sigma}{\partial (y_j^n / M^n)} \equiv \sigma' < 0, - (y_j^n / M^n) \cdot \frac{\sigma''}{\sigma'} < 2,$$

$$\theta (1) + \sigma (0) = 0.$$

2.2. Production and transportation costs

Education and skills are observable to all agents in the economy and labor markets are perfectly competitive. Hence, workers with the same characteristics earn the same wage no matter their employers' characteristics. Denote the cost of capital by r and wages by w^i, $i = NU, NS, EU, ES$ [5]. It is natural to assume $w^{ES} > w^{EU}$ and $w^{NS} > w^{NU}$. Minimization of the cost function $C_j (y, q) = rk_j + \Sigma_i l_j^i w^i$ for a given pair (y_j, q_j) subject to the production function yields the following first order conditions:

$$\frac{a_k}{(q_j)^{\gamma k} r} (k_j)^{\rho - 1} = \frac{a_i}{(q_j)^{\gamma i} w^i} (l_j^i)^{\rho - 1}, \quad i = NU, NS, EU, ES. \tag{2.3}$$

Hence the cost function for optimal input decisions is:

$$C_j (y_j, q_j) = \frac{\phi (q_j)}{A_j} y_j, \text{ where } \phi (q_j) \equiv \left(\left(\frac{(q_j)^{\gamma k}}{a_k} r \right)^{\frac{\rho}{\rho - 1}} + \sum_{i = NU, NS, EU, ES} \left(\frac{(q_j)^{\gamma i}}{a_i} w^i \right)^{\frac{\rho}{\rho - 1}} \right)^{\frac{\rho - 1}{\rho}}. \tag{2.4}$$

Note that $\phi' (q_j) > 0$ and $\phi'' (q_j) > 0$. Hence, unit costs $\phi (q_j) / A_j$ are constant with respect to quantity, and increasing and convex with respect to quality.

---

4. The condition $-(y_j^n/M^n)\sigma''/\sigma' < 2$ on the curvature of the (per capita) inverse demand function σ guarantees the second order conditions for profit maximization. The last assumption $\theta (1) + \sigma (0) = 0$ is just a normalization on quality. It implies that $q = 1$ is the minimum quality for the good to be of any use (so that demand is strictly positive at a zero price if and only quality is above this level).

5. Assuming that firms have different access to financial markets (e.g., they face different cost of capital) would have implications similar to the existence of differences in the efficiency parameter A_j.

So far, we have only considered production costs. Selling to each market involves specific transportation and other non-production costs. We assume that selling to market n involves an additional cost τ^n per unit of output. We may expect this cost to be increasing in the remoteness of the market. Thus, firm j's constant marginal cost of producing and selling quality q_j in market n, denoted $c_j^n(q_j)$, is:

$$c_j^n(q_j) = \frac{\phi(q_j)}{A_j} + \tau^n, \quad \phi' > 0, \ \phi'' > 0. \tag{2.5}$$

2.3. Equilibrium and output destination markets

For each market n, firm j's profit maximization subject to the demand function (2.2) implies the following two first order conditions that determine the optimal volume of sales y_j^{n*} and quality q_j^{n*} in the market:

$$\theta'(q_j^{n*}) = \frac{\phi'(q_j^{n*})}{A_j}, \tag{2.6}$$

$$y_j^{n*} / M^n = -\frac{\theta(q_j^*) + \sigma'(y_j^{n*}/M^n) - \phi(q_j^*)/A_j - \tau^n}{\sigma'(y_j^{n*}/M^n)}. \tag{2.7}$$

Assuming $\theta'(1) > \phi'(1)/A_j$, equation (2.6) has a unique solution $q_j^* > 1$, which is independent of the market. Since $\theta''(q) \leq 0$ and $\phi''(q) > 0$, equation (2.6) implies that higher-efficiency firms choose higher quality in equilibrium:

$$\frac{dq_j^*}{dA_j} = \frac{\theta'}{\phi'' - A_j\theta''} > 0.$$

In turn, sales by more-efficient firms are larger in every market where they are active [6]:

$$\frac{dy_j^{n*}}{dA_j} = -\frac{M^n}{\sigma'} \frac{\phi}{(A_j)^2} \frac{1}{2 + (y_j^{n*}/M^n)\sigma''/\sigma'} > 0.$$

6. Note that assumptions on $\sigma(.)$ imply that $2 + (y_j^n/M^n)\sigma''/\sigma'$ is positive.

Note that expression (2.7) only holds conditional on the firm being active in market *n;* that is, conditional on $y_j^{n*} > 0$. Let us analyze the decision to be active in a given market. A firm will be active in a given market as long as, for an optimal quality choice, the firm can sell a positive output at a price higher than the corresponding constant marginal cost (unit cost). Consider graph 2.1. The thicker line draws the inverse demand function (2.2) for $y_j^n = 0$. This line shows the maximum prices that firm *j* could obtain for each quality level. For $y_j^n > 0$, the price schedule would shift downwards. The thinner line in this graph draws firm's unit cost as a function of output quality. If there is a non-empty set of possible qualities such that firm unit cost is below the corresponding price (as in graph 2.1), then the firm can profitably sell in market *n*. In fact, any quality-price pair in the space contained between these two schedules would bring about positive profits [7]. For a lower efficiency A_j, the cost schedule would shift upwards.

Given the cost τ^n of exporting to market *n,* there is an efficiency level sufficiently low, denoted $\overline{A}^n$, such that the two schedules are tangent (see graph 2.2). This efficiency level satisfies:

$$\theta\,(q_j^*(\overline{A}^n)) - \sigma\,(0) = \frac{\phi\,(q_j^*(\overline{A}^n))}{\overline{A}^n} + \tau^n. \tag{2.8}$$

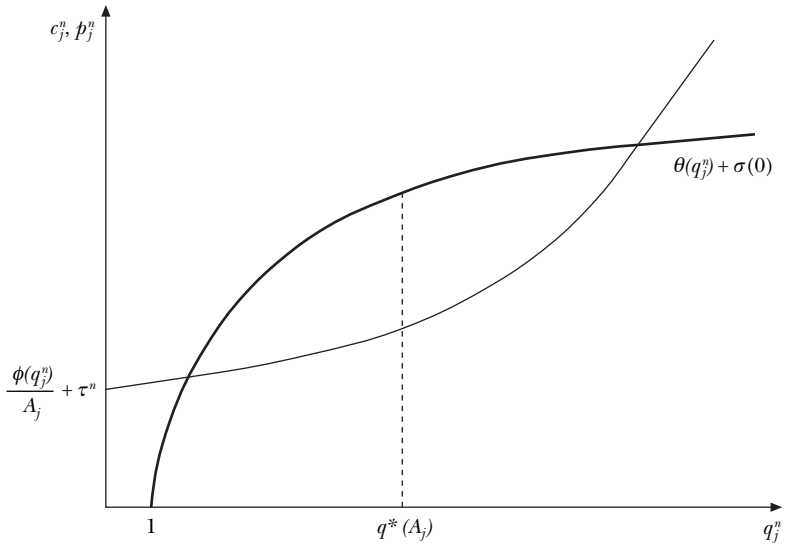
Clearly, $\overline{A}^n$ is the efficiency cutoff for a firm to be active in market *n*. Firms such that $A_j < \overline{A}^n$ cannot make non-zero profits at any positive output and quality levels. Clearly, the efficiency cutoff $\overline{A}^n$ for market *n* is increasing in the cost of bringing the product to this market:

$$\frac{\partial \overline{A}^n}{\partial \tau^n} = \frac{(\overline{A}^n)^2}{\phi\,(q_j^*(\overline{A}^n))} > 0.$$

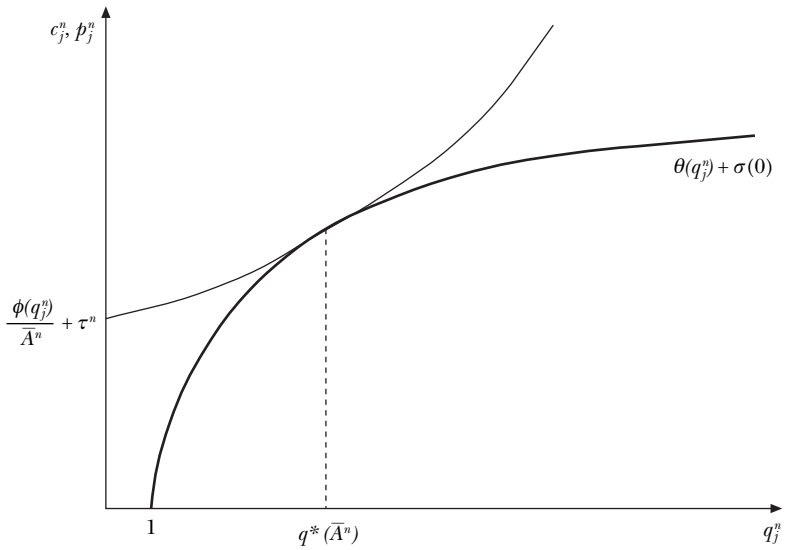
This implies that the number and remoteness of markets in which a firm sells is informative about its efficiency: if firm *j* sells in market *n* but firm *j'* does not, it must be the case that $A_j > \overline{A}^n \geq A_{j'}$. Since more-efficient firms produce higher quality, this implies that firms selling in more and more-remote markets produce higher quality. In addition, more-efficient firms are also larger in terms of output because their sales are bigger in every market

7. Optimal quality corresponds to the level such that the two schedules have the same slope (see expression [2.6]). The optimal price (and therefore, the optimal volume of sales) could be shown in the graph by drawing the iso-profit ellipses within the space contained between the two schedules.

GRAPH 2.1: Unit costs and maximun prices for each quality



GRAPH 2.2: Efficiency cutoff to be active in market *n*



where they are active (expression [2.7]) and because they are active in more markets.

It may be worth pointing out the main difference between this model and previous models on the link between a firm's efficiency and the number and remoteness of its destination markets, which follow Melitz (2003).

The usual assumptions in the literature imply that each firm faces a strictly positive demand for its output, in every market, at any positive price set by the firm (this is for example the case implied by CES preferences). Therefore, in the absence of fixed costs of exporting to each destination, these models would imply that all firms export to all markets. Hence, fixed cost of exporting to each market (together with the fact that more-efficient firms are larger) is the key mechanism in these models for the result that only the more efficient firms sell in the more remote markets. To the contrary, each individual firm in this model faces a demand with finite choke prices for each quality. Consequently, the reason for the exclusion of the less-efficient firms from the more-remote markets is their inability to produce at low enough marginal costs. Furthermore, the mechanism in this model for the link between destination-market remoteness and export quality (the Alchian-Allen effect) is also different from the usual one. The mechanism usually considered is that if transport costs are not proportional to shipment's value but have a per unit component, then a higher transport cost to a more remote market reduces the relative price of higher-quality exports with respect to lower-quality exports (see Hummels and Skiba, 2004). Then, under usual assumptions on demand, this implies that shipments to more remote markets have a bigger proportion of higher-quality goods. The mechanism in this model is that the higher the trade costs, the stronger the selection effect on exporters. Since more-efficient firms produce higher quality, trade costs result in higher quality to more remote markets. In the next subsection, we turn to the model's implications on human capital and wage differences across firms.

2.4. Labor sorting and average wages

Consider now the education and skill composition of employees in firm *j*. We assume an interior solution; i.e., $l_j^{is} > 0$, $i = N, E$, $s = U, S$. From expression (2.3) we have that, for each education group, the ratio of skilled workers is larger in firms producing higher quality:

$$\frac{d(l_j^{iS}/l_j^{iU})}{dq_j} = \frac{\gamma_{iU} - \gamma_{iS}}{1-\rho}\left[\frac{a_{iS}\tilde{w}^{iU}}{a_{iU}\tilde{w}^{iS}} q_j^{\gamma_{iU}-\gamma_{iS}}\right]^{1/(1-\rho)} q_j^{-1} > 0,\ i = N, E. \qquad (2.9)$$

Similarly, for each skill group, the ratio of educated workers is larger in firms producing higher quality:

$$\frac{d(l_j^{Ei}/l_j^{Ni})}{dq_j} = \frac{\gamma_{Ni} - \gamma_{Ei}}{1-\rho}\left[\frac{a_{Ei}w^{Ni}}{a_{Ni}w^{Ei}}q_j^{\gamma Ni-\gamma Ei}\right]^{1/(1-\rho)} q_j^{-1} > 0,\ i = U, S.$$

Denote $l_j^E \equiv l_j^{EU} + l_j^{ES}$, $l_j^N \equiv l_j^{NU} + l_j^{NS}$, $l_j \equiv l_j^E + l_j^N$. From the last expression and assuming $l_j^{ES} / l_j^E \geq l_j^{NS} / l_j^N$ [8], we obtain that the ratio of educated workers $e_j = l_j^E / l_j$ is also larger in firms producing higher quality:

$$\frac{de_j}{dq_j} = \frac{l_j^N l_j^E}{(l_j)^2}\left[\frac{1}{l_j^E}\frac{dl_j^E}{dq_j} - \frac{1}{l_j^N}\frac{dl_j^N}{dq_j}\right] > \frac{l_j^N l_j^E}{(l_j)^2}\left(\frac{l_j^{ES}}{l_j^E} - \frac{l_j^{NS}}{l_j^N}\right)\left[\frac{1}{l_j^{NS}}\frac{dl_j^{NS}}{dq_j} - \frac{1}{l_j^{NU}}\frac{dl_j^{NU}}{dq_j}\right] \geq 0. \quad (2.10)$$

Now, since more-efficient firms produce higher quality, equations (2.9) and (2.10) imply that more-efficient firms use a larger proportion of skilled workers within each education group and a larger proportion of high-education workers with respect to their total employment:

$$d\,(l_j^{iS} / l_j^{iU}) / dA_j > 0, \quad i = N, E. \quad (2.11)$$

$$de_j / dA_j > 0. \quad (2.12)$$

Let w_j^i denote the average wage paid by firm j to workers with education level i:

$$w_j^i = \frac{w^{iU} l_j^{iU} + w^{iS} l_j^{iS}}{l_j^{iU} + l_j^{iS}} = w^{iU}\,\frac{1 + (w^{iS}/w^{iU})\, l_j^{iS}/l_j^{iU}}{1 + l_j^{iS}/l_j^{iU}},\ i = N, E.$$

Since $w^{iS} / w^{iU} > 1$, $i = E, N$, expression (2.11) implies that more efficient firms pay higher average wages to employees in every education level:

$$\frac{dw_j^i}{dA_j} = \frac{dw_j^i}{d(l_j^{iS}/l_j^{iU})}\,\frac{d(l_j^{iS}/l_j^{iU})}{dq_j}\,\frac{dq_j}{dA_j} > 0,\ i = \text{N, E.} \quad (2.13)$$

Note that the positive relationship between efficiency and average wages is the consequence of the (equilibrium) positive relationship between efficiency and quality. If output quality were assumed the same for all firms

8. It is seems unanimously agreed that unmeasured skills and education are positively correlated. Hence the fraction of skilled workers that are educated should be larger than the fraction of unskilled that are educated.

as in conventional models, firms would choose the same labor composition no matter their efficiency [9].

A final question is whether these firm characteristic effects on wages are different across education groups. In the model, this amounts to ascertaining the sign of $d\,(w_j^E / w_j^N) / dA_j$. The sign of this derivative depends on the value of most parameters in the model as well as on the distribution of skills in every education group, on which we could only make conjectures. Notwithstanding, the model does predict that the relationship between firm characteristics and the wage ratio w_j^E / w_j^N should have the same sign for all firm characteristics being considered (market remoteness, size, and employees' average education). The reason is that, given the sign of $d\,(w_j^E / w_j^N) / dA_j$, the sign of the relationship between A_j and any of the three firm characteristics is positive in all cases. We also investigate this issue in the empirical analysis that follows.

In summary, the model shows that, under reasonable assumptions, quality differentiation implies that more-efficient firms employ more-skilled and more-educated workers. Since, in equilibrium, more-efficient firms also sell in more-distant markets, we should observe that: 1) Firms selling in more-remote countries employ workers with higher average education; 2) Firms selling in more-remote countries pay higher average wages to workers within each education group. Additionally, since more-efficient firms also have larger size, we should also observe a positive link 1) between firm's size and employees' average education; 2) between firm's size and average wages paid to each education group; and 3) between employees' average education and average wages paid to each education group. In the following sections, we test empirically these hypotheses.

9. There is also some empirical evidence on a positive relationship between the capital/labor ratio and average wages (see Arai, 2003). In our model, this relationship depends on the technological assumptions about the relationship between quality and physical capital. A sufficient condition for quality and the capital/labor ratio to be positively related is $\gamma_k \leq \gamma_{ES}$ (to see this, just follow the argument used to obtain [2.9] and [2.10]). Under this condition, the capital/labor ratio would be positively associated with high average wages for every education level. However, we will not pursue this issue in the empirical part of the paper since our data set does not contain information on firms' physical capital.

3. Data and Descriptive Statistics

OUR empirical analysis is based on data from the Spanish Encuesta de Estructura Salarial for 2002 (Wage Structure Survey, EES-2002). This survey contains matched employer-employee data for more than 15,000 employers and 150,000 employees. The survey is conducted by the Spanish National Institute of Statistics following a two-stage stratified sampling methodology. In the first stage, establishments with at least ten workers are stratified by economic activity, firm size and region. Agriculture and the public sector are excluded. In the second stage, workers at every establishment are randomly selected. The survey provides information about the region where the establishment is located, industry, size, collective bargaining if any, and main broad destination market for output. The main destination market attribute distinguishes between local, national, European Union and rest of the world markets. In our analysis, we exclude from the sample industries that do not have any exporting establishment (building, production and distribution of electrical energy, gas and water, education, health, social work and other social activities, and personal service activities). This leaves a sample of 11,567 establishments from 36 three-digit industries (main subsections of the National Classification of Economic Activities).

The survey also provides information on the main individual characteristics of workers randomly selected at every establishment, such as education, sex, age, years working in the current establishment, type of contract, full/part-time job, etc. In our analysis on wages, we restrict the sample to male workers with full-time jobs and indefinite contracts [10]. We also exclude workers who went through transitory labor incapacity or were included in job promotion programs. In this way, we isolate the establishment-characteristic effects on wages from other circumstances such as gender

10. Spanish legislation distinguishes between temporary (or *fixed term*) contracts and indefinite (regular) contracts. Temporary contracts were introduced to promote employment. They can be readily terminated once the contract is over and are mainly used to hire young workers in their first employment.

TABLE 3.1: Establishment characteristics: Descriptive statistics

		Distribution of establishments: Main market					Mean years of schooling	Fraction of employees with college degree	Average wage (euro per hour)
		All	Local	National	European Union	Rest of the world			
Distribution of establishments: Size	**All**	1	0.478	0.456	0.041	0.024	8.883 (2.920)	0.105 (0.20)	9.57 (6.60)
	10-49 workers	0.713	0.406	0.279	0.021	0.007	8.596 (2.847)	0.085 (0.195)	7.499 (5.049)
	50-199 workers	0.173	0.050	0.104	0.010	0.007	9.251 (2.964)	0.134 (0.223)	9.875 (6.474)
	>199 workers	0.114	0.022	0.072	0.010	0.009	10.119 (2.924)	0.188 (0.244)	12.375 (7.553)
Mean years of schooling		8.883 (2.920)	8.204 (2.630)	9.584 (3.083)	8.315 (2.271)	10.014 (2.734)			
Fraction of employees with college degree		0.105 (0.20)	0.058 (0.16)	0.155 (0.25)	0.063 (0.12)	0.171 (0.24)			
Average wage (euro per hour)		9.57 (6.60)	7.25 (4.68)	10.63 (7.29)	10.53 (4.67)	12.07 (7.97)			

Notes: Establishments' size, mean years of schooling, and the fraction of workers with a college degree are calculated for the sub-sample of 11,567 establishments in industries that have at least one exporting firm. The fraction of employees with a college degree and average education are first obtained for each establishment and then averaged across establishments. Average wages are calculated using the sub-sample of 35,602 men with full-time jobs and indefinite contracts who neither went trough transitory labor incapacity nor were they included in job promotion programs. See section 3 for other details on the sample. Standard deviations are in parenthesis.
Source: EES-2002 using the sample weights provided by the survey.

discrimination, positive discrimination policies, underemployment, etc. All this depuration brings about a sample of 35,602 workers and 9,120 establishments.

Table 3.1 reports the main descriptive statistics on establishment characteristics. As in other countries, establishments whose main market is exports are only a small fraction of the total (about 6.5%). Most establishments have less than 50 workers (71.3%) and only 11% employ 200 or more workers. Although the percentage of workers with a college degree is 10.5, only 27.6% of the establishments in the sample include at least one worker with a college degree among their surveyed employees. The percentage of workers with a college degree in this last subset of establishments is 34.2.

This suggests that the data on the fraction of college graduates should be treated as censored data. The relationship between establishment size and main output destination market shows a very strong pattern: the fraction of establishments with the smallest size is decreasing in market remoteness. The opposite occurs with the other two size groups. Establishments selling most of their production in non-local markets employ more-educated labor and a larger fraction of workers with a college degree. In particular, the fraction of college graduates in establishments exporting most of their output to countries outside the European Union (EU) is almost three times higher than in firms selling in local markets.

4. Establishment Characteristics and Employees' Education

IN this section we analyze the empirical relationship at the establishment level between main destination market for output and human capital. Our benchmark equation is the following:

$$e_j = \alpha_0 + \alpha_1 S2_j + \alpha_2 S3_j + \alpha_3 M_{Nj} + \alpha_4 M_{Ej} + \alpha_5 M_{Wj} + \alpha_6 Z_j + \nu_j, \qquad (4.1)$$

where e_j is either employees' average years of schooling in establishment j or, alternatively, the fraction of college-educated employees. The covariates of interest are dummies for size and destination market. *S2* corresponds to establishments employing between 50 and 199 workers, whereas *S3* corresponds to establishments with more than 199 workers. M_N, M_E and M_W are dummies for establishments whose main destination market for output is, respectively, the national market, the European Union (EU) market, and the rest of the world market. The reference group in estimations using all these covariates is establishments that sell most of their production in a local market and have between 10 and 49 employees. Additionally, we always include a vector *Zj* of dummies for establishment location (17 regions) and industry (36 industries). ν_j is the error term. Still, to compare results with the previous literature, we also run some estimations pulling local- and national-market establishments into a unique group of domestic-market establishments; and, similarly, pulling EU- and rest of the world-market establishments into a unique group of exports-market establishments.

Table 4.1 shows the results. Columns (1)-(3) report results using employees' average years of schooling as the left-hand-side variable and estimating the equation by weighted least squares. Column (1) corresponds to the usual specification in the literature, which only distinguishes between exporting firms and domestic-market firms (which is the reference group in this estimation). Still, there is a difference with the previous literature in that we

TABLE 4.1: Establishment characteristics and employees' education

		(1)	(2)	(3)	(4)	(5)	(6)
Size (employees)	**S2: Between 50-199**	0.252**	–0.002		0.083**	0.040**	
		(0.102)	(0.102)		(0.013)	(0.013)	
	S3: More than 199	0.201	–0.141		0.063**	0.005	
		(0.138)	(0.139)		(0.016)	(0.016)	
	S2 + S3: More than 50			–0.507**			–0.038*
				(0.159)			(0.020)
Main market	**M_X : Exports**	0.765**			0.255**		
		(0.115)			(0.022)		
	M_N : National		1.094**	0.937**		0.202**	0.176**
			(0.094)	(0.106)		(0.012)	(0.013)
	M_E : European Union		0.999**	0.823**		0.322**	0.294**
			(0.146)	(0.154)		(0.028)	(0.029)
	M_W : Rest of the world		2.106**	1.877**		0.462**	0.429**
			(0.180)	(0.192)		(0.031)	(0.032)
($M_N + M_E + M_W$) × S2				0.727**			0.106**
				(0.193)			(0.025)
($M_N + M_E + M_W$) × S3				0.614**			0.071**
				(0.207)			(0.026)
Adjusted R^2		0.275	0.266	0.268			
Pseudo R^2					0.279	0.300	0.301
Observations		11,567	11,567	11,567	11,567	11,567	11,567

Notes: In columns (1) to (3) the left-hand-side variable is average schooling years of the employees in the establishment. The estimation method is Weighted Least Squares using the sample weights provided by the survey. In columns (4) to (6) the left-hand-side variable is the fraction of college-educated employees in the establishment, and the estimation method is Maximum likelihood using a Tobit model and the sample weights provided by the survey. When the main market dummy being included is only *Exports*, the reference group is *establishments selling most of their output in the domestic market.* Otherwise, the reference group is *establishments selling most of their output in the local market.* In columns (3) and (6) we add an interaction term between non-local market firms and firm size. All estimated equations include a constant and dummies for 17 regions and 36 industries. Robust standard errors are in parenthesis. See section 3 for details on the data source and sample. ** means significant at 1% and * at 10%.

use data on employees' average education instead of the ratio between white and blue-collar workers used in previous works. Our result confirms the positive and significant effect of exporting on firm's human capital. In column (2) and (3) we use the classification of establishments across all the four main destination markets. The reference group in these two columns is local-market establishments. All destination market dummies in column (2) are positive, significant at the 1% level, and quantitatively important. National- and European-market destination coefficients are not statistically different.

Meanwhile, the difference between local- and national-market firms is as large as the difference between domestic-market firms and exporters found in the previous estimation [11].

In the case of the size effects, the two dummies become negative though not statistically significant in column (2). This suggests that there may be other reasons—different from higher efficiency—which may also give rise to a large size. In such a case, larger establishment size *per se* may not imply greater demand for more educated workers unless combined with other characteristics signaling efficiency, such as non-local destination market. We test this hypothesis in column (3) by introducing an interaction term between size and non-local destination market. The coefficients for large size conditional on selling most of their output in non-local markets are now positive and significant. Large firms employ workers with higher average schooling, only as long as they orient their production to the national or international markets. Conversely, large establishments oriented towards the local markets employ significantly less-educated workers. Coefficients for destination markets in column (3) show the same pattern as in column (2).

In columns (4)-(6) of table 4.1 we repeat the same specifications now using the fraction of college graduates in the establishment as the left-hand-side variable. Since about 70% of establishments in the sample do not include interviews to college-educated workers, least squares estimates may be inconsistent due to censured data problems. We therefore estimate a Tobit model by maximum likelihood. The qualitative results are very similar to those reported in columns (1)-(3). All destination market effects are positive and significant. Furthermore, the coefficients are now strictly increasing in the remoteness of the market. Marginal effects implied by the estimated Tobit-model coefficients in column (5) are very large. The proportion of college graduates in national-market firms is 5.6% points higher than in local-market firms. In EU-market firms, the proportion is 9% points higher. Moreover, in firms oriented towards the rest of the world markets, the proportion is 12.9% points higher than in local-market firms. To asses the importance of these effects, note from table 3.1 that the proportion of college graduates in the whole sample is 10.5%.

11. Note that the organizational changes needed for a local-market firm to expand into the national market may be as important as those needed to expand into foreign markets. Selling in the national market is likely to require a qualitatively different marketing structure and may involve a new logistic ladder between production and retailing, implying new requirements in terms of inventory, warehousing, material handling, packaging, information and transportation.

In sum, our empirical results give general support to the model's prediction that firms selling in more-distant markets will employ higher educated workers. At the same time, they also point out that the largest difference between firms does not lie between exporters and non-exporters, but between local- and national-market firms, and between exporters to the EU and exporters to the rest of the world. This is somewhat surprising since a large literature has analyzed the differences between exporters and non-exporters whereas, to our knowledge, none has documented systematic market-related differences in human capital within domestic firms or within exporting firms. The results may also be relevant for economic policy, though the partial equilibrium character of our model prevents a formal analysis of this issue. Since results in the literature on trade with heterogeneous firms show that reducing the costs of exporting increases the market share of the most efficient firms, our results suggest that policies aimed at reducing those costs would help increasing the demand for the more-educated and skilled workers. Moreover, our results suggest that facilitating firms to expand across all local markets in the country may also help these goals.

5. Establishment Characteristics and Wages

We now test the model's implications on wages. Our benchmark wage equation is based on the usual *Mincerian* equation where the log of employee i's hourly wage in establishment j, w_{ij}, is a function of his individual characteristics of education and experience. We include worker's schooling years, Y_{ij}; potential experience, PE_{ij} (level and squared), defined as the difference between employee's age and the expected age to complete his studies according to their official length; and tenure T_{ij} (level and squared), defined as the number of years working for the current employer. To this equation we add establishment's j characteristics: the two dummies for size already used, employee's average years of schooling, e_j, the three dummies for main destination market, and a vector Z_j of other controls (dummies for 36 three-digit industries and 17 regions). Thus, the benchmark equation is:

$$\begin{aligned} ln\, w_{ij} = {} & \beta_0 + \beta_1 Y_{ij} + \beta_2 PE_{ij} + \beta_3 (PE_{ij})^2 + \beta_4 T_{ij} + \beta_5 (T_{ij})^2 + \\ & + \beta_6 S2_j + \beta_7 S3_j + \beta_8 e_j + \beta_9 M_{Nj} + \beta_{10} M_{Ej} + \beta_{11} M_{Wj} + \varsigma' Z_j + u_{ij}, \end{aligned} \tag{5.1}$$

where u_{ij} is the residual.

5.1. Main results

We estimate several variants of equation (5.1) using weighted least squares and the sub-sample of men with full-time job and indefinite contracts described in section 3. Table 5.1 reports the results. Robust standard errors corrected for the clustered sampling scheme are in parenthesis. All estimated equations include the dummies for the 36 three-digit industries and the 17 Spanish regions. Specification in column (1) only includes establishment characteristics so that results can be compared with the literature that does not control for worker individual characteristics. The *exports* market destination includes all establishments whose main market is either the European

TABLE 5.1: Establishment characteristics and wages (I)

		(1)	(2)	(3)	(4)
Employee characteristics					
Years of schooling			0.054**	0.052**	0.041**
			(0.002)	(0.002)	(0.001)
Potential experience			0.024**	0.024**	0.025**
			(0.002)	(0.002)	(0.002)
(Potential experience)^2/100			–0.029**	–0.029**	–0.031**
			(0.003)	(0.003)	(0.003)
Tenure			0.013**	0.013**	0.013**
			(0.001)	(0.001)	(0.001)
(Tenure)^2/100			–0.017**	–0.018**	–0.018**
			(0.004)	(0.004)	(0.004)
Establishment characteristics					
Size	**50-199 employees**	0.200**	0.156**	0.128**	0.123**
		(0.015)	(0.013)	(0.013)	(0.013)
	More than 199 employees	0.285**	0.196**	0.167**	0.160**
		(0.022)	(0.018)	(0.018)	(0.017)
Employees' average years of schooling					0.024**
					(0.003)
Main market	**National**			0.112**	0.100**
				(0.013)	(0.013)
	Exports	0.136**	0.107**	0.193**	
		(0.020)	(0.017)	(0.019)	
	European Union				0.157**
					(0.022)
	Rest of the world				0.198**
					(0.026)
Number of workers		35,602	35,602	35,602	35,602
Number of establishments		9,120	9,120	9,120	9,120
Adjusted R^2		0.310	0.456	0.459	0.464

Notes: The left-hand-side variable is the log of the hourly wage. Estimation method is Weighted Least Squares. Specification in column (1) only includes establishment characteristics. In columns (2)-(4) we add individual worker characteristics and different sets of establishment characteristics. In columns (1) and (2) the main market for the reference group is the domestic market. Establishments in the domestic market are split into local- and national-market firms in columns (3) and (4). Thus, the main market for the reference group in these columns is the local market. All equations include a constant and dummies for 17 regions and 36 industries. Robust standard errors are in parenthesis. They are corrected for heteroskedasticity and for the clustered sampling scheme. ** means significant at 1%.

Source: EES-2002 using the sample weights provided by the survey and including only male workers. See section 3 for details on the data source and the sample.

Union (EU) or the rest of world. The reference group for the effect in this column is establishments whose main market is the domestic market (i.e, either a local market or the national market). Consistent with most of the literature, we find a positive and significant wage effect of the exports market. Since we already showed that exporters employ higher-educated workers, the wage premium reported in column (1) could be due to a labor composition effect. In the estimated equation reported in column (2) we include individual worker characteristics. The exporting wage premium is still significant. This is consistent with the results for Germany in Schank, Schnabel and Wagner (2007). However, in contrast to their very small effects we find that the exporting wage premium is above 10%. The differences in the quantitative results may be due to the differences in the type of data, estimation techniques, and the differences between the German and Spanish economies [12]. For example, Spain seems to suffer from bigger problems of relative excess supply of college graduates and over-education (see Dolado, Felgueroso and Jimeno, 2000). This phenomenon could raise wage differences between exporters and non-exporters if the over-education mismatch is higher in non-exporters.

Column (3) shows the results of splitting the non-exporting firms between firms whose main market is the local one, and firms whose main market is the national market. In comparing the results for the exporting wage premium it has to be taken into account that the reference group is now local-market firms instead of domestic-market firms. The result to be highlighted is that the wage premium paid by national-market firms with respect to local-market firms is as important as the premium paid by exporters with respect to domestic-market firms. Note that while the export wage premium has been the subject of a very large literature (Schank, Schnabel and Wagner, 2007 survey more than 20 studies carried out in the preceding twelve years), to our knowledge this is the first paper documenting a national-market wage premium with respect to local markets.

12. Schank, Schnabel and Wagner (2007) use social security payments for information on individual wages. As explained by the authors, these are censored data for one third of the white-collard workers who, according to previous studies (Bernard and Wagner, 1997) could be the group almost exclusively responsible for the exporting wage premium. Using imputed data to correct for the censoring problem, they find that an increase in the share of exported output of 10 percentage points increases the wage of a blue-collar (respectively, white-collar) employee by 0.3% (resp., 0.15%). Note that the average share of exports within total sales in exporting plants reported in the paper is 19%. These effects become less significant or even not significant at all when neither person nor plant fixed effects are included in the estimating equation (these estimations are the most similar to those in column (2) of table 5.1 in this working paper).

Finally, column (4) shows results for our preferred specification, which also splits the group of exporters into exporters to the EU and exporters to the rest of the world, and includes establishments' average education of employees. All the variables suggested by the theoretical model have the expected signs, are jointly significant at the 1% level, and have an important quantitative positive impact on wages. As predicted by our theoretical model, wages are significantly increasing in the remoteness of the firm's main market. Employees of national-market establishments obtain average wages 10.5% higher than employees in local-market establishments. This wage premium rises to 17.0 and to 21.9%, respectively, when the main market is the EU or the rest of the world [13].

The other establishment-characteristic wage premia also have an important quantitative impact. Increasing coworkers' average education by one standard deviation brings about a wage increase of 7.3%; and moving from an establishment in the 10-th percentile of the establishment distribution across employees' average education (5 schooling years), to an establishment in the 90-th percentile (13.2 schooling years), increases worker's wage by 21.8%. Establishment-size wage premia are also large. The combined effect of establishment effects can have a very important impact on wage inequality across individuals with the same education and other characteristics. For example, according to estimates in column (4), working in a large establishment whose main market is the EU and whose employees' average education is one standard deviation above education in the reference group (small local establishments) involves a 47.3% wage premium.

5.2. Robustness

In table 5.2 we report a series of robustness tests. In the specification in column (1) we estimate equation (5.1) using dummies for broad categories of education instead of years of schooling. We use a dummy for workers with completed secondary studies and another dummy for college graduates. As the measure of human capital in the establishment, we use the fraction of employees with a college degree instead of employees' average years of

13. We also estimated the impact of firm characteristics on wages using fixed establishment effects and running a two-step estimation of establishment-characteristics coefficients (see Baker and Fortin [2001] for a discussion on the relationship between one-step and two-step estimators). As expected, results were very similar. Results are available on request.

TABLE 5.2: Establishment characteristics and wages (II). Robustness using alternative measures for employee and coworkers' education, and including additional controls

		(1)	(2)	(3)
Employee characteristics				
Years of schooling			0.041**	0.041**
			(0.001)	(0.001)
High school completed		0.199**		
		(0.011)		
University degree		0.466**		
		(0.016)		
Potential experience		0.028**	0.024**	0.024**
		(0.002)	(0.002)	(0.002)
(Potential experience)^2/100		–0.038**	–0.030**	–0.030**
		(0.003)	(0.003)	(0.003)
Tenure		0.014**	0.013**	0.013**
		(0.001)	(0.001)	(0.001)
Tenure^2/100		–0.021**	–0.021**	–0.020**
		(0.004)	(0.004)	(0.004)
Establishment characteristics				
Size	**50-199 employees**	0.130**	0.128**	0.124**
		(0.013)	(0.017)	(0.017)
	More than 199 employees	0.175**	0.128**	0.109**
		(0.017)	(0.023)	(0.023)
Employees' average years of schooling			0.023**	0.023**
			(0.003)	(0.003)
Fraction of employees with university degree		0.393**		
		(0.047)		
Main market	**National**	0.091**	0.099**	0.100**
		(0.013)	(0.013)	(0.013)
	European Union	0.143**	0.155**	0.158**
		(0.021)	(0.022)	(0.022)
	Rest of the world	0.170**	0.199**	0.207**
		(0.024)	(0.026)	(0.026)
Firm-level contracting				0.074**
				(0.022)
Tenure × size 2			–0.0003	–0.0006
			(0.001)	(0.001)
Tenure × size 3			0.0025**	0.002
			(0.001)	(0.001)
Number of workers		35,602	35,602	35,602
Number of establishments		9,120	9,120	9,120
Adjusted R^2		0.485	0.464	0.478

Notes: The left-hand-side variable is the log of the hourly wage. All models include a constant and dummies for 17 regions and 36 industries. Estimation method is weighted least squares. Robust standard errors corrected for heteroscedasticity and for the clustered sampling scheme in parenthesis. The model in column (1) is the same as in column (4) of table 5.1, except that we now use dummies for broad categories of education instead of years of schooling to control for employee's education; and that we use the fraction of employees with a college degree instead of coworkers' average years of schooling. See section 3 for details on the data. ** means significant at 1%.

schooling. Results are qualitatively very similar to those in table 5.1. All coefficients reveal large quantitative effects, have the expected signs, and are significant at the 1% level.

In columns (2) and (3) we include additional controls and interactions that help assess the potential impact of alternative sources of the establishment-size wage premium. Internal labor markets have been suggested as a potential cause of higher average wages in larger firms. Large firms may provide better opportunities for internal promotion and more on-the-job training which then needs to be rewarded to reduce turnover. Hence average wages may be larger for the same level of formal education. Notice that these benefits will not be enjoyed as soon as an individual joins a given firm but as the individual continues working for the same firm. Therefore, this effect should show up as a larger payoff to tenure in larger firms. We test this hypothesis in column (2) by including interaction terms between tenure and the dummies for firm size. The interaction with the largest size turns out to be positive and statistically significant. Tenure in the largest group of establishments is about 25% more profitable than in small establishments.

It has also been suggested that workers and unions in large firms often have a strong bargaining power that is reflected in higher wages. The common mechanism used by workers and unions to exert their bargaining power in Spain is through firm-level contracting [14]. In column (3), we add a dummy for establishments with firm-level contracting. This effect is highly significant and involves an average wage increase of 7.4%. However, it does not affect the significance of any of the variables in our original model and, if any, it has a positive effect on the estimated value of the coefficients on destination markets.

5.3. Establishment-characteristics effects by education groups

Are establishment-characteristics wage effects significant for all education groups? Do their quantitative effects show any pattern across education groups? We investigate this issue by estimating equation (5.1) for each of the three major education categories: workers without completed secondary

14. In their specific analysis on firm-level contracting, Card and De la Rica (2006) point out that firm-level contracting is more likely to occur where there is (or there was) a strong union presence. Our estimate of this effect is entirely consistent with their results.

TABLE 5.3: Establishment characteristics and wages by education group

		Primary	Secondary	University
Employee characteristics				
Potential experience		0.016**	0.027**	0.061**
		(0.001)	(0.003)	(0.005)
(Potential experience)²/100		–0.020**	–0.031**	–0.001**
		(0.003)	(0.007)	(0.013)
Tenure		0.014**	0.017**	0.014**
		(0.015)	(0.003)	(0.006)
Tenure²/100		–0.023**	–0.027**	–0.034**
		(0.005)	(0.008)	(0.014)
Establishment characteristics				
Size	**50-199 employees**	0.113**	0.157**	0.178**
		(0.017)	(0.028)	(0.048)
	More than 199 employees	0.103**	0.169**	0.147**
		(0.026)	(0.035)	(0.048)
Employees' average years of schooling		0.016**	0.028**	0.044**
		(0.003)	(0.004)	(0.009)
Main market	**National**	0.050**	0.136**	0.145**
		(0.013)	(0.022)	(0.037)
	European Union	0.094**	0.201**	0.309**
		(0.022)	(0.038)	(0.076)
	Rest of the world	0.116**	0.238**	0.291**
		(0.022)	(0.038)	(0.065)
Firm-level contracting		0.100**	0.056*	0.069
		(0.024)	(0.028)	(0.039)
Tenure × size 2		0.002*	–0.004*	–0.009**
		(0.001)	(0.002)	(0.004)
Tenure × size 3		0.005**	–0.002	–0.006
		(0.001)	(0.002)	(0.005)
Number of establishments		7,466	3,966	1,856
Number of workers		21,705	9,594	4,303
Adjusted R^2		0.404	0.394	0.327

Notes: We use three different sub-samples of workers according to their education level: workers without completed secondary studies (Primary), workers with completed secondary studies (Secondary) and workers with a college degree (University). The left-hand-side variable is the log of the hourly wage. Estimation method is Weighted Least Squares. All models include a constant and dummies for 17 regions and 36 industries. Robust standard errors corrected for heteroscedasticity and for the clustered sampling scheme are in parenthesis. See section 3 for details on the data source and sample. ** means significant at 1% and * at 10%.

education, with completed secondary education, and with a college degree. We include the firm-level contracting dummy and the size-tenure interaction term in the estimating equation since we just checked their potential significance. Table 5.3 shows the results. Coefficients for all establishment characteristics are significant at the 1% level in all sub-samples and have the expected positive signs (except firm-level contracting and the size-tenure interaction terms, which are not always significant). Differences across education groups in the size of the establishment-characteristic wage effects are sizable and follow a systematic pattern. All effects are increasing in the level of education, whenever the difference across education groups is statistically significant [15]. This is consistent with our theoretical model that predicts that the sign of the relationship between establishment-characteristics wage effects and worker education should be the same for all establishment characteristics.

Results are especially sharp for the destination-market effects, which are our main interest. Coefficients are increasing in the remoteness of the main destination market for each education group, whenever the difference between coefficients is statistically significant. Note that the effects for the university education group about triple those for the primary education group. When combined with the other establishment wage effects, they can account for dramatic differences in wages, especially within college graduates. As an example, consider the establishment wage premium for a college graduate working in a medium-size firm that exports most of its production to the EU and whose employees' average education is one standard deviation above the mean. On average, this individual obtains a wage that is 110.4% higher than an individual with the same education and experience who works in a small local-market firm whose employees' average education is one standard deviation below the mean. The substantial size of destination-market wage effects and their large differences across education groups suggest that expanding globalization may play an important role in increasing inequality within and between education groups.

---

15. These results stand in contrast with those in the small literature on this issue. Battu, Belfield and Sloane (2003) analyze the establishment average-education wage premium in the United Kingdom and find that it is decreasing in the individual's education, albeit they recognize that this runs counter to their theoretical prediction. Lallemand, Plasman and Rycx (2005) analyze the firm-size wage premium and find that it is generally larger for blue-collar workers. To the extent that the blue-collard versus white-collard comparison can be related to our education-groups comparison, our results would point in the opposite direction. However, they do not control for firm-level contracting, nor for the interaction between tenure and size. These two effects are highly significant for the least educated workers and seem responsible for a large fraction of the wage premium that less-educated workers obtain in large firms. Additional results not included in the table 5.3 show that if we did not control for firm-level contracting and the tenure-size interaction, the largest firm-size premium would be attributed to the lowest education group.

6. Concluding Comments

THIS working paper builds a partial equilibrium model that provides a potential explanation for the stylized fact that exporting firms employ higher human capital and pay higher wages to employees within each education group. The channel linking human capital and wages to export activity is product quality, which is endogenously determined by firm's efficiency. More broadly, the model predicts that more-efficient firms produce higher quality, are larger, employ workers with higher measured and unmeasured skills, pay higher wages given employee's education, and sell in more and more-distant markets. The model is consistent with the most recent theoretical and empirical literature on international trade, which emphasizes firm heterogeneity and quality differentiation in describing the current patterns of trade. This literature has now documented the correlation between trade costs—or destination-market remoteness—and export quality (the Alchian-Allen effect). This working paper provides evidence showing a positive correlation between destination-market remoteness and human capital and wages. Moreover, we find that wage premia and human capital differences between local- and national-market firms are as important as wage premia and human capital differences between exporters and non-exporters. This is rather unexpected since a vast literature has analyzed the differences between exporters and non-exporters whereas, to our knowledge, none has documented destination-market related differences in wages and human capital within non-exporters.

Overall, market-remoteness wage premia are quantitatively very important and increase in worker education. This suggests that increasing globalization may raise wage inequality within and across education groups. From a policy perspective, it also suggests—as explained in the working paper—that policies reducing the costs of exporting may help increase the number of higher-education better-paid jobs.

References

Alcalá, F. (2007): "Comparative Advantage Across Goods and Product Quality", NYU [mimeo.].

— and P. J. Hernández (2006): "Las externalidades del capital humano en la empresa española", *Revista de Economía Aplicada,* XIV(41), 61-83.

Arai, M. (2003): "Wages, Profits, and Capital Intensity: Evidence from Matched Worker-Firm Data", *Journal of Labor Economics,* 21(3), 593-618.

Baker, M. and N. M. Fortin (2001): "Occupational Gender Composition and Wages in Canada, 1987-1988", *Canadian Journal of Economics,* 34, 345-376.

Baldwin, R. and J. Harrigan (2007): "Zeros, Quality and Space: Trade Theory and Trade Evidence", NBER Working Paper 13214, Cambridge, MA.

Bayard, K. and K. R. Troske (1999): "Examining the Employer-Size Wage Premium in the Manufacturing, Retail Trade, and Service Industries Using Employer-Employee Matched Data", *American Economic Review,* Papers and Proceedings, 89(2), 99-103.

Battu, H., C. R. Belfield and P. J. Sloane (2003): "Human Capital Spill-Overs within the Workplace", *Oxford Bulletin of Economics and Statistics,* 65(5), 575-594.

Bernard, A. B. and J. B. Jensen (1995): "Exporters, Jobs, and Wages in U.S. Manufacturing: 1976-1987", *Brookings Papers on Economic Activity, Microeconomics,* 67-119.

— and J. B. Jensen (1997): "Exporters, Skill Upgrading, and the Wage Gap", *Journal of International Economics,* 42, 3-31.

— and J. Wagner (1997): "Exports and Success in German Manufacturing", *Weltwirtschaftliches Archiv/Review of World Economics,* 133, 134-157.

— and J. B. Jensen (1999): "Exceptional Exporter Performance: Cause, Effect, or Both?", *Journal of International Economics,* 47, 1-25.

— J. Eaton, J. B. Jensen and S. S. Kortum (2003): "Plants and Productivity in International Trade", *American Economic Review,* 93, 1268-1290.

— J. B. Jensen, S. J. Redding and P. K. Schott (2007): "Firms in International Trade", *Journal of Economic Perspectives,* 21, 105-130.

Biscourp, P. and F. Kramarz (2007): "Employment, Skill Structure and International Trade: Firm-Level Evidence for France", *Journal of International Economics,* 72, 22-51.

Card, D. and S. de la Rica (2006): "The Effect of Firm-Level Contracts on the Structure of Wages: Evidence from Matched Employer-Employee Data", *Industrial and Labor Relations Review,* 59(4), 573-592.

Dolado, J. J., F. Felgueroso and J. F. Jimeno (2000): "Youth Labour Markets in Spain: Education, Training, and Crowding-out", *European Economic Review,* 44, 943-956.

EATON, J., S. KORTUM and F. KRAMARZ (2004): "Dissecting Trade: Firms, Industries, and Export Destinations", *American Economic Review, Papers and Proceedings,* 94, 150-154.

— S. KORTUM and F. KRAMARZ (2005): "An Anatomy of International Trade: Evidence from French Firms", University of Minnesota [mimeo.].

FALVEY, R. E. and H. KIERZKOWSKI (1987): "Product Quality, Intra–Industry Trade and (Im)perfect Competition", in H. Kierzkowski (ed.), *Protection and Competition in International Trade,* Oxford, Basil Blackwell.

FLAM, H. and E. HELPMAN (1987): "Vertical Product Differentiation and North-South Trade", *American Economic Review,* 77, 810-822.

GREENAWAY, D. and R. KNELLER (2007): "Firm Heterogeneity, Exporting and Foreign Direct Investment", *The Economic Journal,* 117, F134-F161.

HALLAK, J. C. and J. SIVADASAN (2008): "Productivity, Quality and Exporting Behavior Under Minimum Quality Requirements" [mimeo.].

HUMMELS, D. and P. KLENOW (2005): "The Variety and Quality of a Nation's Exports", *American Economic Review,* 95, 704-723.

— and A. SKIBA (2004): "Shipping the Good Apples Out? An Empirical Confirmation of the Alchian-Allen Conjecture", *Journal of Political Economy,* 112, 1384-1402.

IDSON, T. L. and W. Y. OI (1999): "Workers Are More Productive in Large Firms", *American Economic Review,* 89, 104-108.

JOHNSON, R. C. (2007): "Trade and Prices with Heterogeneous Firms", University of California-Berkeley [mimeo.].

KHANDELWAL, A. (2007): "The Long and Short (of) Quality Ladders", Columbia University [mimeo.].

LALLEMAND, T., R. PLASMAN and F. RYCX (2005): "The Establishment-Size Wage Premium: Evidence from European Countries", DULBEA Working Paper 7.RS, Université Libre de Bruxelles.

MANASSE, P. and A. TURRINI (2001): "Trade, Wages, and Superstars", *Journal of International Economics,* 54, 97-117.

MAURIN, E., D. THESMAR and M. THOENIG (2002): "Globalization and the Demand for Skill: An Export Based Channel", CEPR Discussion Paper Series 3406, London.

MELITZ, M. J. (2003): "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity", *Econometrica,* 71, 1695-1725.

MURPHY, K. M. and A. Shleifer (1997): "Quality and Trade", *Journal of Development Economics,* 53(1), 1-15.

SCHANK, T., C. SCHNABEL and J. WAGNER (2007): "Do Exporters Really Pay Higher Wages? First Evidence from German Linked Employer-employee Data", *Journal of International Economics,* 72(1), 52-74.

SCHOTT, P. (2004): "Across-Product versus Within-Product Specialization in International Trade", *Quarterly Journal of Economics,* 119, 647-678.

STOKEY, N. (1991): "The Volume and Composition of Trade between Rich and Poor Countries", *Review of Economic Studies,* 58, 63-80.

TROSKE, K. R. (1999): "Evidence on the Employer Size-Wage Premium from Worker-Establishment Matched Data", *Review of Economics and Statistics,* vol. 81(1), 15-26.

TYBOUT, J. (2003): "Plant and Firm Level Evidence on the 'New' Trade Theories", in *Handbook of International Trade,* ed. by E. K. Choi and J. Harrigan, Oxford, Basil Blackwell.

VERHOOGEN, E. A. (2008): "Trade, Quality Upgrading and Wage Inequality in the Mexican Manufacturing Sector", *Quarterly Journal of Economics,* 123, 489-530.

YEAPLE, S. (2005): "A Simple Model of Firm Heterogeneity, International Trade, and Wages", *Journal of International Economics,* 65, 1-20.

*ABOUT THE AUTHORS**

FRANCISCO ALCALÁ holds a PhD in economics from the University of Valencia. He is professor of economics at the University of Murcia and has been a visiting scholar at the universities of California-Berkeley, Harvard, Pompeu Fabra and New York (NYU). He works on growth and international trade. He has published in these fields in several Spanish and international academic journals.
E-mail: falcala@um.es

PEDRO J. HERNÁNDEZ holds a master and a PhD in economics from the Autonomous University of Barcelona. He is professor of economics at the University of Murcia. He works on gender wage discrimination, returns to education and the wage structure. He has published in several Spanish and international academic journals.
E-mail: nani@um.es

Any comments on the contents of this paper can be addressed to Francisco Alcalá at falcala@um.es.

* A previous version circulated under the title *Firm Characteristics, Labor Sorting, and Wages;* first version. We gratefully acknowledge financial support from the Spanish Science and Education Ministry (PNICDI co financed by the FEDER) under projects SEJ2005-07200 (both authors) and SEJ2005-08783-C04-02 (Pedro J. Hernández) and the *Programa de estancias en centros extranjeros* PR2006-0508 (Francisco Alcalá). Part of this research has been conducted while Francisco Alcalá was visiting the Department of Economics at NYU which he thanks for its hospitality.

Fundación **BBVA**

DOCUMENTOS DE TRABAJO

NÚMEROS PUBLICADOS

DT 01/02 *Trampa del desempleo y educación: un análisis de las relaciones entre los efectos desincentivadores de las prestaciones en el Estado del Bienestar y la educación*
Jorge Calero Martínez y Mónica Madrigal Bajo

DT 02/02 *Un instrumento de contratación externa: los vales o cheques. Análisis teórico y evidencias empíricas*
Ivan Planas Miret

DT 03/02 *Financiación capitativa, articulación entre niveles asistenciales y descentralización de las organizaciones sanitarias*
Vicente Ortún-Rubio y Guillem López-Casasnovas

DT 04/02 *La reforma del IRPF y los determinantes de la oferta laboral en la familia española*
Santiago Álvarez García y Juan Prieto Rodríguez

DT 05/02 *The Use of Correspondence Analysis in the Exploration of Health Survey Data*
Michael Greenacre

DT 01/03 *¿Quiénes se beneficiaron de la reforma del IRPF de 1999?*
José Manuel González-Páramo y José Félix Sanz Sanz

DT 02/03 *La imagen ciudadana de la Justicia*
José Juan Toharia Cortés

DT 03/03 *Para medir la calidad de la Justicia (I): Abogados*
Juan José García de la Cruz Herrero

DT 04/03 *Para medir la calidad de la Justicia (II): Procuradores*
Juan José García de la Cruz Herrero

DT 05/03 *Dilación, eficiencia y costes: ¿Cómo ayudar a que la imagen de la Justicia se corresponda mejor con la realidad?*
Santos Pastor Prieto

DT 06/03 *Integración vertical y contratación externa en los servicios generales de los hospitales españoles*
Jaume Puig-Junoy y Pol Pérez Sust

DT 07/03 *Gasto sanitario y envejecimiento de la población en España*
Namkee Ahn, Javier Alonso Meseguer y José A. Herce San Miguel

DT 01/04 *Métodos de solución de problemas de asignación de recursos sanitarios*
Helena Ramalhinho Dias Lourenço y Daniel Serra de la Figuera

DT 01/05 *Licensing of University Inventions: The Role of a Technology Transfer Office*
Inés Macho-Stadler, David Pérez-Castrillo y Reinhilde Veugelers

DT 02/05 *Estimating the Intensity of Price and Non-price Competition in Banking: An Application to the Spanish Case*
Santiago Carbó Valverde, Juan Fernández de Guevara Radoselovics, David Humphrey y Joaquín Maudos Villarroya

DT 03/05 *Sistemas de pensiones y fecundidad. Un enfoque de generaciones solapadas*
Gemma Abío Roig y Concepció Patxot Cardoner

DT 04/05 *Análisis de los factores de exclusión social*
Joan Subirats i Humet (Dir.), Ricard Gomà Carmona y Joaquim Brugué Torruella (Coords.)

DT 05/05 *Riesgos de exclusión social en las Comunidades Autónomas*
Joan Subirats i Humet (Dir.), Ricard Gomà Carmona y Joaquim Brugué Torruella (Coords.)

DT 06/05 *A Dynamic Stochastic Approach to Fisheries Management Assessment: An Application to some European Fisheries*
José M. Da-Rocha Álvarez y María-José Gutiérrez Huerta

DT 07/05 *The New Keynesian Monetary Model: Does it Show the Comovement between Output and Inflation in the U.S. and the Euro Area?*
Ramón María-Dolores Pedrero y Jesús Vázquez Pérez

DT 08/05 *The Relationship between Risk and Expected Return in Europe*
Ángel León Valle, Juan Nave Pineda y Gonzalo Rubio Irigoyen

DT 09/05 *License Allocation and Performance in Telecommunications Markets*
Roberto Burguet Verde

DT 10/05 *Procurement with Downward Sloping Demand: More Simple Economics*
Roberto Burguet Verde

DT 11/05 *Technological and Physical Obsolescence and the Timing of Adoption*
Ramón Caminal Echevarría

DT 01/06 *El efecto de la inmigración en las oportunidades de empleo de los trabajadores nacionales: Evidencia para España*
Raquel Carrasco Perea, Juan Francisco Jimeno Serrano y Ana Carolina Ortega Masagué

DT 02/06 *Inmigración y pensiones: ¿Qué sabemos?*
José Ignacio Conde-Ruiz, Juan Francisco Jimeno Serrano y Guadalupe Valera Blanes

DT 03/06 *A Survey Study of Factors Influencing Risk Taking Behavior in Real World Decisions under Uncertainty*
Manel Baucells Alibés y Cristina Rata

DT 04/06 *Measurement of Social Capital and Growth: An Economic Methodology*
Francisco Pérez García, Lorenzo Serrano Martínez, Vicente Montesinos Santalucía y Juan Fernández de Guevara Radoselovics

DT 05/06 *The Role of ICT in the Spanish Productivity Slowdown*
Matilde Mas Ivars y Javier Quesada Ibáñez

DT 06/06 *Cross-Country Comparisons of Competition and Pricing Power in European Banking*
David Humphrey, Santiago Carbó Valverde, Joaquín Maudos Villarroya y Philip Molyneux

DT 07/06 *The Design of Syndicates in Venture Capital*
Giacinta Cestone, Josh Lerner y Lucy White

DT 08/06 *Efectos de la confianza en la información contable sobre el coste de la deuda*
Belén Gill de Albornoz Noguer y Manuel Illueca Muñoz

DT 09/06 *Relaciones sociales y envejecimiento saludable*
Ángel Otero Puime, María Victoria Zunzunegui Pastor, François Béland, Ángel Rodríguez Laso y María Jesús García de Yébenes y Prous

DT 10/06 *Ciclo económico y convergencia real en la Unión Europea: Análisis de los PIB per cápita en la UE-15*
José Luis Cendejas Bueno, Juan Luis del Hoyo Bernat, Jesús Guillermo Llorente Álvarez, Manuel Monjas Barroso y Carlos Rivero Rodríguez

DT 11/06 *Esperanza de vida en España a lo largo del siglo XX: Las tablas de mortalidad del Instituto Nacional de Estadística*
Francisco José Goerlich Gisbert y Rafael Pinilla Pallejà

DT 12/06 *Convergencia y desigualdad en renta permanente y corriente: Factores determinantes*
Lorenzo Serrano Martínez

DT 13/06 *The Common Agricultural Policy and Farming in Protected Ecosystems: A Policy Analysis Matrix Approach*
Ernest Reig Martínez y Vicent Estruch Guitart

DT 14/06 *Infrastructures and New Technologies as Sources of Spanish Economic Growth*
Matilde Mas Ivars

DT 15/06 *Cumulative Dominance and Heuristic Performance in Binary Multi-Attribute Choice*
Manel Baucells Alibés, Juan Antonio Carrasco López y Robin M. Hogarth

DT 16/06 *Dynamic Mixed Duopoly: A Model Motivated by Linux versus Windows*
Ramon Casadesus-Masanell y Pankaj Ghemawat

DT 01/07 *Social Preferences, Skill Segregation and Wage Dynamics*
Antonio Cabrales Goitia, Antoni Calvó-Armengol y Nicola Pavoni

DT 02/07 *Stochastic Dominance and Cumulative Prospect Theory*
Manel Baucells Alibés y Franz H. Heukamp

DT 03/07 *Agency Revisited*
Ramon Casadesus-Masanell y Daniel F. Spulber

DT 04/07 *Social Capital and Bank Performance: An International Comparison for OECD Countries*
José Manuel Pastor Monsálvez y Emili Tortosa-Ausina

DT 05/07 *Cooperation and Cultural Transmission in a Coordination Game*
Gonzalo Olcina Vauteren y Vicente Calabuig Alcántara

DT 06/07 *The* Extended *Atkinson Family and Changes in Expenditure Distribution: Spain 1973/74 – 2003*
Francisco J. Goerlich Gisbert, María Casilda Lasso de la Vega Martínez y Ana Marta Urrutia Careaga

DT 07/07 *Análisis de la evolución de la dependencia en la tercera edad en España*
David Casado Marín

DT 08/07 *Designing Contracts for University Spin-offs*
Inés Macho-Stadler, David Pérez-Castrillo y Reinhilde Veugelers

DT 09/07 *Regional Differences in Socioeconomic Health Inequalities in Spain*
Pilar García Gómez y Ángel López Nicolás

DT 10/07 *The Evolution of Inequity in Access to Health Care in Spain: 1987-2001*
Pilar García Gómez y Ángel López Nicolás

DT 11/07 *The Economics of Credit Cards, Debit Cards and ATMs: A Survey and Some New Evidence*
Santiago Carbó-Valverde, Nadia Massoud, Francisco Rodríguez-Fernández, Anthony Saunders y Barry Scholnick

DT 12/07 *El impacto comercial de la integración europea, 1950-2000*
Luis Fernando Lanaspa Santolaria, Antonio Montañés Bernal, Marcos Sanso Frago y Fernando Sanz Gracia

DT 13/07 *Proyecciones de demanda de educación en España*
Andrés M. Alonso Fernández, Daniel Peña Sánchez de Rivera y Julio Rodríguez Puerta

DT 14/07 *Aversion to Inequality and Segregating Equilibria*
Antonio Cabrales Goitia y Antoni Calvó-Armengol

DT 15/07 *Corporate Downsizing to Rebuild Team Spirit*
Antonio Cabrales Goitia y Antoni Calvó-Armengol

DT 16/07 *Maternidad sin matrimonio: Nueva vía de formación de familias en España*
Teresa Castro Martín

DT 17/07 *Immigrant Mothers, Spanish Babies: Childbearing Patterns of Foreign Women in Spain*
Marta Roig Vila y Teresa Castro Martín

DT 18/07 *Los procesos de convergencia financiera en Europa y su relación con el ciclo económico*
José Luis Cendejas Bueno, Juan Luis del Hoyo Bernat, Jesús Guillermo Llorente Álvarez, Manuel Monjas Barroso y Carlos Rivero Rodríguez

DT 19/07 *On Capturing Rent from a Non-Renewable Resource International Monopoly: A Dynamic Game Approach*
Santiago J. Rubio Jorge

DT 20/07 *Simulación de políticas impositivas medioambientales: Un modelo de equilibrio general de la economía española*
Antonio Manresa Sánchez y Ferran Sancho Pifarré

DT 21/07 *Causas del crecimiento económico en Argentina (1990-2004): Otro caso de «tiranía de los números»*
Ariel Alberto Coremberg

DT 22/07 *Regional Financial Development and Bank Competition: Effects on Economic Growth*
Juan Fernández de Guevara Radoselovics y Joaquín Maudos Villarroya

DT 23/07 *Política fiscal e instituciones presupuestarias en los países de la reciente ampliación de la Unión Europea*
Carlos Mulas-Granados, Jorge Onrubia Fernández y Javier Salinas Jiménez

DT 24/07 *Measuring International Economic Integration: Theory and Evidence of Globalization*
Iván Arribas Fernández, Francisco Pérez García y Emili Tortosa-Ausina

DT 25/07 *Wage Inequality among Higher Education Graduates: Evidence from Europe*
José García Montalvo

DT 26/07 *Governance of the Knowledge-Intensive Firm*
Vicente Salas Fumás

DT 27/07 *Profit, Productivity and Distribution: Differences Across Organizational Form*
Emili Grifell-Tatjé y C. A. Knox Lovell

DT 28/07 *Identifying Human Capital Externalities: Theory with Applications*
Antonio Ciccone y Giovanni Peri

DT 01/08 *A Multiplicative Human Development Index*
Carmen Herrero Blanco, Ricardo Martínez Rico y Antonio Villar Notario

DT 02/08 *Real Exchange Rate Appreciation in Central and Eastern European Countries: Why the Balassa-Samuelson Effect Does Not Explain the Whole Story*
José García Solanes

DT 03/08 *Can International Environmental Cooperation Be Bought?*
Cristina Fuentes Albero y Santiago J. Rubio Jorge

DT 04/08 *On the Dynamics of Globalization*
Iván Arribas Fernández, Francisco Pérez García y Emili Tortosa-Ausina

DT 05/08 *Los motores de la aglomeración en España: Geografía versus historia*
Francisco J. Goerlich Gisbert y Matilde Mas Ivars

DT 06/08 *Sobre el tamaño de las ciudades en España: Dos reflexiones y una regularidad empírica*
Francisco J. Goerlich Gisbert y Matilde Mas Ivars

DT 07/08 *Managing Waiting Lists in a Fair Way*
Carmen Herrero

DT 08/08 *Estimación del capital social en España: Series temporales por territorios*
Francisco Pérez García, Lorenzo Serrano Martínez
y Juan Fernández de Guevara Radoselovics

DT 09/08 *Estimation of Social Capital in the World: Time Series by Country*
Francisco Pérez García, Lorenzo Serrano Martínez
y Juan Fernández de Guevara Radoselovics

DT 10/08 *Capabilities and Opportunities in Health*
Carmen Herrero y José Luis Pinto Prades

DT 11/08 *Cultural Transmission and the Evolution of Trust and Reciprocity in the Labor Market*
Gonzalo Olcina Vauteren y Vicente Calabuig Alcántara

DT 12/08 *Vertical and Horizontal Separation in the European Railway Sector: Effects on Productivity*
Pedro Cantos Sánchez, José Manuel Pastor Monsálvez y Lorenzo Serrano Martínez

DT 01/09 *How Effective Are Rewards Programs in Promoting Payment Card Usage?: Empirical Evidence*
Santiago Carbó-Valverde y José Manuel Liñares-Zegarra

DT 02/09 *Comparative Advantage Across Goods and Product Quality*
Francisco Alcalá

DT 03/09 *El transporte ferroviario de alta velocidad: Una visión económica*
Javier Campos Méndez, Ginés de Rus Mendoza e Ignacio Barrón de Angoiti

DT 04/09 *¿En qué circunstancias está justificado invertir en líneas de alta velocidad ferroviaria?*
Ginés de Rus Mendoza y Chris Nash

DT 05/09 *Openness and Geographic Neutrality: How Do They Contribute to International Banking Integration?*
Iván Arribas Fernández, Francisco Pérez García y Emili Tortosa-Ausina

Documentos de Trabajo 6

Fundación BBVA

Plaza de San Nicolás, 4
48005 Bilbao
España
Tel.: +34 94 487 52 52
Fax: +34 94 424 46 21

Paseo de Recoletos, 10
28001 Madrid
España
Tel.: +34 91 374 54 00
Fax: +34 91 374 85 22

publicaciones@fbbva.es
www.fbbva.es