Quasi-Integration in Less-than-Truckload Trucking[*]

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ABSTRACT

This work studies the organization of less-than-truckload trucking from a contractual point of view. We show that the huge number of owner-operators working in the industry hides a much less fragmented reality. Most of those owner-operators are "quasi-integrated" in higher organizational structures. This hybrid form is generally more efficient than vertical integration because, in the Spanish institutional environment, it lessens serious moral hazard problems, related mainly to the use of the vehicles, and makes it possible to reach economies of scale and density. Empirical evidence suggests that what leads organizations to vertically integrate is not the presence of such economies but hold-up problems, related to the existence of specific assets. Finally, an international comparison hints that institutional constraints are able to explain differences in the evolution of vertical integration across countries.

Key words: hold-up, hybrids, institutions, moral hazard, vertical integration, trucking industry.

JEL Classification: D23, L14, L22, L92

1. INTRODUCTION

The traditional analysis of the European trucking industry shows a very fragmented sector, with a large percentage of tiny firms and owner-operators with just one truck (Table 1 in Appendix A). Several studies of the industry consider such fragmentation as a problem (specially in Spain, one of the countries with higher fragmentation), arguing that when firms are so small they cannot reach economies of scale and density.[1] This view of the activity is actually leading in Spain to norms that reward vertical integration.[2]

Economies of scale and density are important: it is necessary to seek and contract customers (shippers) and to coordinate hauls to optimize the use of vehicles and drivers. Coordination can be improved using advanced computer network models that inform about the capacity within the system and the probability of finding subsequent loads, as well as information on costs and prices (Corsi and Grimm, 1987, p. 13). In a similar vein, high traffic density allows direct routes and more concentrated traffic flows, generating "economies of density" or "network economies" (Wang Chang and Friedlaender, 1984, p. 276), leading to a reduction of empty backhauls.[3] Finally, truckers' brand name and reputation constitute a costly and

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[1] Idea defended, among others, by Irrisarri (1987), Peña (1991), CECAM (1992, p. 31), and García Alcolea (1992). The importance of scale economies in trucking has been subject to some controversy, and part of the econometric research indicates no evidence of economies of scale. (For a review of the empirical research, see Dicer, 1971, Keeler, 1989, Allen and Liu, 1995, and McMullen and Tanaka, 1995.) However, econometric research usually does not take into account the multidimensional nature of the trucking service, so that scale economies may be grossly underestimated. (See, for example, Dicer, 1971, pp. 33-34, Kritz, 1974, p. 26, Keeler, 1989, p. 230, Phillips, 1991, p. 540, and Allen and Liu, 1995, pp. 499-500.) In fact, evidence of economies associated with size is actually found when quality is controlled. (See Harmatuk, 1992, and Allen and Liu, 1995, as well as Keeler, 1989, who does not applies the conventional cost analysis but Stigler's survivor principle.)

[2] That is the case of the *Real Decreto* 1136/1997, July 11, and the *Orden del Ministerio de Fomento* 1939/1997, July 23. Carriers can obtain new authorizations to operate heavy trucks only if (1) they have a minimum size (two vehicles) and (2) they have taken part in some process of vertical integration of very small carriers.

[3] In transport economics, it is frequently argued that such economies of density must not be confused with economies of scale. Although making that differentiation may be useful for some theoretical

valuable contractual safeguard in their relationships with customers and suppliers. Building

and preserving a reputation requires investing in advertisement, as well as training and

monitoring the labor force, activities also subject to scale economies.[4]

However, economies of scale and density do not necessarily call for conventional vertical

integration: they can be reached by means of contractual forms, as Ronald H. Coase has

already pointed out (1937). In fact, behind the "fragmentation" of the trucking industry, we

find hybrid governance structures, between the extreme forms of vertical integration and

market (Williamson, 1991), which can reach economies of scale without sacrificing as much

incentives as vertical integration. Most of the owner-operators are vertically "quasi-

integrated" in a few higher organizations.[5] Such "quasi-integration" is particularly intense in

less-than-truckload (LTL) trucking, which consists in the transportation of packages of small

and medium size.[6]

Quasi-integrated structures are able to reach economies of scales and density to the same

extent than vertically integrated firms. In both cases, an organization looks for shippers,

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purposes, it is irrelevant in our research. The reason is that from an organizational point of view, both economies of scale and density lead to the same outcome: they make more economical to centralize the production of activities subject to such economies.

[4] See the case of Leprino in "Productivity Spies. Computers Keep Eye on Workers and See if They Perform Well" (*The Wall Street Journal*, June 3rd., 1985, pp. 1 and 15).

[5] Blois' paper (1972) is the pioneer work on vertical quasi-integration, defined there as a situation where "firms are gaining the advantages of vertical integration, without assuming the risks or rigidity of ownership" (Blois, 1972, p. 253). More recently, Dietrich (1994) describes quasi-integration as "enduring relationships between legally separate economic units"). However, the term quasi-integration has been also used to describe other contractual realities (although always referred to hybrid forms). See, for example, Monteverde and Teece (1982a, b), and Masten, Meehan, and Snyder (1989), who understand (in the context of the auto industry) quasi-integration as the situation where the manufacturer subcontracts the production of a component but owns the physical asset specific to the production of such a component.

[6] In Spain, the five largest firms had 69.9 per 100 of the market in 1995 (DBK, 1995).

coordinates hauls, and produces the safeguards required in the relationship with customers. But there is a crucial difference: vertically integrated firms own the trucks they manage, and use company drivers (who are employees of the firm). On the contrary, quasi-integrated structures do not own any truck nor use company drivers. Instead of that, they subcontract owner-operators.

Research applying Transaction Cost Economics to the trucking industry is still scarce. Two particularly interesting works are Hubbard (1998) and Nickerson and Silverman (1998), who study the influence of different sources of hold-up problems on vertical integration. Hubbard (1998), using data on US trucking fleet, finds that internal procurement and long-term contracts are used to mitigate hold-up problems related to the use of specific trailers (that is, trailers for which there are few local alternative users). Nickerson and Silverman (1998), using data from the ICC on Class I and II Carriers, show that US interstate for-hire carriers choose between company drivers (that is, employees) and owner-operators to economize on transaction costs. They consider three main sources of contracting hazards: the need for timely coordination of truck movements (which is higher in less-than-truckload trucking than in truckload), the use of trucks with a very specialized drive-train configuration (that is, trucks with a thin market), and carriers´ investment in reputational capital (assuming that such an investment can create a contracting hazard that affects the way the relation between carrier and driver is organized). In this paper, which builds on our study about truckload trucking,[7] we contribute to the understanding of the industry by studying also the influence of differences in monitoring cost. Furthermore, we hint the importance of the institutional environment on the vertical integration decision by means of a comparison between Spanish

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[7] Fernández, Arruñada, and González (1998). Truckload freight is generally hauled directly from sender to receiver without going through packaging terminals.

and US trucking, as well as across European countries. Spanish firms are not responding to recent technological changes—such as the new telecommunications technologies and "just in time" distribution—by increasing vertical integration mainly because of institutional constraints. Hence, lifting those constraints seems to be a more promising way of increasing vertical integration in the industry that creating new norms that reward the integration of owner-operators.

The rest of the paper is organized as follows. The second section compares the main governance structures, studying how they solve contractual hazards and how the institutional environment influences them. We focus on quasi-integration of owner-operators and vertical integration, because they are the only two empirically relevant governance structures. We will not study a—purely hypothetical—third structure where each owner-operator would offer his services directly to shippers. Such a spot market solution is unable to reach economies of scale and density, which explains why it is not observed in reality. In the third section, and given the difficulties in testing quantitatively the superiority of one governance structure over the other one, we test our theoretical arguments showing the economic rationality of the organizational patterns observed in several representative cases and previous (descriptive) empirical studies. The paper is closed with the conclusions, where the main contributions of the paper—and their implications—are summarized.

2. COMPARISON OF THE BASIC GOVERNANCE STRUCTURES: VERTICAL INTEGRATION *VS.* QUASI-INTEGRATION

We compare the relative performance of vertical integration and quasi-integration in two areas. First, we study their effectiveness in solving the typical contractual hazards of the

activity, namely hold-up and moral hazard. Second, we analyze how institutional constraints, by modifying the relative cost of vertical and quasi-integration, influence the decision about how to organize the transaction.

2.1 Relative Performance in Resolving Contractual Hazards

In essence, quasi-integration solves moral hazard problems more efficiently than vertical integration, but the latter governance structure solves hold-up problems better than quasi-integration. Hence, the organizational decision will depend on which contractual hazards is more important.

Moral hazard is caused by the difficulties in observing and verifying the actual behavior of the driver due to the dispersion of the work. Monitoring is generally more costly in relation to the use of the vehicle and its ancillary resources (gasoline, parts, etc.) than to the transportation activity, as shown by the widespread practice of allocating each driver the same vehicle (when the driver is an employee). This way, firms try to facilitate the evaluation of the use of the trucks, even though they may be then under-utilized.[8]

Hold-up arises in the presence of specific assets, which have a greater value in their present use than in the best of all the other possible uses, the difference between the two values showing itself as a "quasi-rent". Hold-up problems arise when quasi-rents are expropriable. They can be solved or attenuated by means of vertical integration or the use of contractual safeguards such as formalized long-term contracts and reputation.[9]

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[8] This practice, identified in our survey of Spanish trucking (see Appendix B for further detail), is also common in other countries. See, for example, Joy (1984, p. 281) for Australia.

[9] The theory of specific assets was developed by Williamson (1975 and 1979) and Klein, Crawford, and Alchian (1978).

In trucking, different hold-up problems are caused by specific capital assets of a physical or human nature: The main problem of physical specificity is related to the painting and lettering of the truck with the colors and logotype of the contracting organization. The cost of painting can reach over US $4,000 when the whole truck is painted. However, sometimes is more simple and, therefore, cheaper. Other times the lettering may go on the canvas than covers the trailer in the heavier trucks, mitigating hold-up problems because the (specific) canvas can be used in many different trucks. Additionally, drivers of some firms wear uniforms, but their cost is small.

The importance of specific human capital is hard to assess because most of such assets are intangible and a by-product of the relationship between the driver and the contracting firm. First, drivers accumulate information about the routes, the specific characteristics of the customers and the vehicle, the services offered by the contracting firm, and the communication system used. Second, the continuity of the contractual relation generates mutual knowledge and trust between the contracting parties (Levintal and Fichman, 1988). Because it reduces the costs of communicating, bargaining, and solving all kinds of coordination and contractual problems (for example in relation with prices and services), trust is a capital, necessarily specific.

The nature of the typical contractual hazards of the industry allows us to understand the different properties of quasi-integration and vertical integration:

a) In the *quasi-integrated* regime, trucking firms providing transportation services to shippers

steady subcontract owner-operators. This hybrid solves moral hazard problems better than vertical integration of trucks and drivers because the self-employed driver, who owns the vehicle, receives "high-powered incentives": the compensation of the owner-operator can be completely linked to his performance in the driving task. He does not need to be motivated to optimally use the truck and its ancillary resources, because he automatically receives the economic consciences of his decisions regarding the use of such assets.[10] High-powered incentives also solve adverse selection problems because it automatically leads to the self-selection of the drivers willing to exert a high effort.[11]

In principle, a company driver (hired under a labor contract) could be paid with a piece-rate compensation system, similar to the one used with owner-operators. However, two conditions must be fulfilled. First, as the company driver is not the owner of the truck, the employer must set up a costly monitoring system in order to estimate the use of the truck, gasoline, wheels, and so on.[12] If obtaining a verifiable estimator of the use of the truck is too costly, then it is optimal to use low-powered incentives, such as basically fixed salaries. Second, the institutional environment has to allow the implementation of such a compensation scheme.

b) In the *vertical Integration* regime, trucking firms vertically integrate vehicles and drivers,

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[10] Holmström and Milgrom (1994) modelize the complementarity of different incentive systems, such as piece-rate compensation and the ownership of the assets.

[11] EC (1996, p. 71) finds that, with owner-operators, trucking firms experience a reduction in days lost by the drivers because they are ill.

[12] This monitoring is now usually implemented by means of sophisticated computerized systems. Again, the case of Leprino, a firm with 160 trucks, provides a good example (see note number 4). The case also illustrates how computerized monitoring systems have some costs that are difficult to measure, such as the demoralization of employees who do not like to be closely monitored. This may be particularly important in trucking because truck-driving traditionally has attracted very "independent" people who, in words of a Leprino's employee, "dislike having the boss always looking over [their] shoulder."

who are hired under labor contracts. This governance structure resolves hold-up problems better than quasi-integration because, in the first place, vertical integration of the trucks automatically solves the physical specificity problems. Additionally, the legal protection that the labor contract grants to the company driver reduces the risk of opportunistic behavior related to the his investments in specific human capital. In contrast, under quasi-integration hold-up problems can be solved only by means of costly safeguards, such as the use of implicit guarantees (in general, non-expropriable specific investments in reputation and "brand") and the necessarily incomplete formalization of contracts. When writing perfect contracts is prohibitively costly, the optimal way of solving hold-up problems is to allocate the residual decision rights on the vehicle (that is, its ownership) to the driver, because it is the part whose investment decisions (mostly to maintain the productivity of the asset) are more important.[13]

2.2 Influence of the Institutional Environment

So far, we have studied only the influence of contractual hazard on the organization of the industry. However, the institutional environment (labor and tax regulation) also plays an important role.[14] Labor regulation may increase the cost of vertical integration by introducing inefficient constraints to the employment relationship. First, norms increasing dismissal costs and granting more to power unions, enhances the employees' ability to appropriate the employer the value of her investments in (tangible and intangible) durable assets. Such regulations make the employer's durable assets more specific to the continuity of a particular

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[13] This is the basic idea in the incomplete contracts theory. See Hart (1995, chapters 1-4) for a detailed review.

[14] Our work is related here to the New Institutional Economics literature, which points out the influence of the institutional environment on organizational decisions. See, for example, North (1990, chapter 1 and 9) and Williamson (1993, pp. 110-116).

group of workers (Bronars and Deere, 1993). Additionally, the higher power of unions also reduces the ability of employer and employee to decide by themselves about working hours and holidays. Finally, minimum wage regulations limit the intensity of incentives: when the established minimum salary is high enough, the fix part of the compensation grows over the optimum, so that (assuming that the minimum income that the employer demands to enter the contractual relationship does not change) the variable part of the compensation will decrease.

Tax norms may also influence the organizational decision by modifying the relative costs of the different possibilities. First, high taxes favor fragmentation. The reason is that small firms and, specially, self-employees find it easier to reduce their burden of taxation (by means of tax avoidance and evasion) than larger firms.[15] Second, governmental schemes helping small firms and self-employed also favor fragmentation, because with vertical integration the benefits provided by such schemes are lost.

3. ANALYSIS OF THE ORGANIZATIONAL PATTERNS

We test our theoretical arguments about the factors influencing the organization of the industry by means of qualitative evidence, required to know with detail the problems that arise in the transactions and the adopted contracting solutions. Such evidence comes mostly from an empirical survey carried out in Spain, plus several previous empirical studies (see Appendix B for further detail in information sources). In the analysis of the evidence, it is assumed that the predominance of a governance structure in the industry has to be sustained in the long-term in its efficient adaptation to the constraints imposed by physical and contractual technology, which include problems derived from the same exchanges and from

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[15] For further detail, see OECD (1992, pp. 178-182), which provides some empirical evidence. See also Blau (1987), Pissarides and Weber (1989, p. 28), and McDonald, Dwyer, and Wendt (1994, p. 7).

the influence of the environment.

Before analyzing the contractual patterns, some technological conditions must be explained because they influence the intensity of contractual hazards and, therefore, the organizational decisions. LTL trucking includes two kinds of routes: long routes carried out with heavy trucks, and short pick-up and delivery routes carried out with light trucks and vans. First, parcels are picked up around each local terminal or warehouse with small vehicles and vans. Then, parcels are consolidated in each terminal, according to their destination. Short-distance deliveries are done again with light trucks, whereas long-distance deliveries are sent to the destination terminals by means of large vehicles. Once there, parcels are delivered again with small trucks.

3.1 Contractual Factors

a) *Quasi-integration*. The fact that quasi-integration of owner-operators is the dominant governance structure hints that moral hazard is the main problem in the industry.[16] Most of the trucking organizations work almost exclusively with owner-operators that wear uniforms and paint their trucks with the colors and name of the organization—as we have observed in the two firms object of detailed study. But the degree of quasi-integration is not the same in the long routes than in the short pick-up and delivery routes, where organizations are more

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[16] CECAM (1992, pp. 47 and 49), INE (1995, pp. 47, 52, 63, and 77), Matas, Ortega, and Prado (1995, pp. 15-18), and EC (1996, pp. 57 and 68) obtain similar conclusions for Spain. Furthermore, Barrio (1996, pp. 26-28), in a study of trucking firms with "heavy" vehicles—six tonnes or more of maximum authorized weight (*PMA*), or 3,5 tonnes or less of freight capacity—and working only inside Spain, shows that more than 67 per 100 of the owner-operators are quasi-integrated (45 per 100 work exclusively for a particular firm, and 22 per 100 do it preferentially). The percentage is greater (71 per 100) when only owner-operators dedicated to long-distance transport are considered. The situation is quite the same in most of Continental Europe (EC, 1994, pp. 16, 43, and 46-47; Bayliss and Coleman, 1994; and Lombard, 1995), the United Kingdom (Tweddle and Mackie, 1995, pp. 24-31), and in some non-European countries such as Australia (Joy, 1984, pp. 278-280).

vertically integrated. The two studied firms cover long distance transportation almost exclusively with owner-operators and, to lesser extent, small trucking firms. However, they short the pick-up and delivery routes are covered with vertically integrated vehicles and company drivers in 20 per 100 of the cases.[17]

The greater degree of quasi-integration in long routes is consistent with the higher relevance of moral hazard: it is then more important and difficult to monitor the use of the truck than in short pick-up and delivery routes. It is more important because the trucks used in the longer routes are larger and, generally, more expensive. A larger vehicle also means more numerous and expensive parts, and higher gasoline expenses. And it is more difficult because drivers in the longer routes have more discretion. Driver's discretion depends on his ability to decide about how to cover the route (speed, number of breaks, etc.) and to allege mechanical problems to justify delays. In the pick-up and delivery routes driver's discretion is lower because he has to work close to the headquarters of the firm and he has to serve the customers in his route with punctuality (i.e. there is an schedule). The degree of driver's discretion is important because gasoline consumption, wheel expenses, and the risk of mechanical breakdowns—more generally, the depreciation of the truck—depend on the way of driving. Our argument is consistent with the Holmström and Milgrom (1994, p. 989), who argue that the effectiveness of low-powered incentives inside the firm can be improved by limiting the employee's freedom to act. In our case, the employer can limit the employee's freedom to act only to the extent that she can select the contractual pattern which is consistent with the features of the route.

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[17] CECAM (1992, pp. 47 and 49), for Spain, and Joy (1984, p. 279), for Australia, also find that the use of owner-operators is higher in long distance routes than in short pick-up and delivery routes.

b) *Vertical Integration*. As expected, vertical integration is used mainly in the activities where specific assets are more important and, as we have just shown, monitoring cost are lower—pick-up and delivery routes. Knowing the complex urban routes and the regular customers improves the performance of the driver, as the common practice of allocating each driver (owner-operator or employee) always to the same route hints. Additionally, in pick-up and delivery routes, drivers are in direct contact with customers, working also as salespersons. Hence, they have to wear distinctive uniforms and be able to explain to customers the features of the increasing number of services offered by LTL organizations.

More generally, the existence of specific assets of importance also explains why quasi-integration is not as widely observed in other industries as in trucking, even when there is also a moral hazard problem related to the use of some piece of machinery or equipment which value is sensible to use. In some activities, workers may need to invest in heavily specific human capital, or the asset that they use may be very difficult to move (site specificity). Additionally, the technological separability that there is in trucking—with a one-to-one correspondence between worker and asset—it does not always exist. This condition of separability makes it easier to solve moral hazard problems, because the agency conflict is solved by making the worker the owner of the asset he uses.

Technological separability is not, however, the only constraint to the use ownership as a means to provide strong incentives. Wealth constraints and suboptimal risk allocation are frequently considered as two other important limitations.[18] However, the fact that quasi-integration is greater in the long routes, carried out with heavy trucks, than in the short pick-up and delivery routes, carried out with smaller (and less expensive) trucks, suggests that

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[18] See, for example, Brickley, Smith, and Zimmerman (1996, pp. 234-235).

none of those two factor is relevant in trucking.

As a final remark, we have to clarify that our characterization of the industry is a simplification of reality: some organization combine vertical and quasi-integration. In particular, 34.1 per 100 of the Spanish LTL dealers (called "cargo agents") also own some of the vehicles they manage.[19] Additionally, some for-hire carriers and cargo agents cooperate, sharing the same brand name in a few cases (MOPT, 1993, p.80).

3.2 Institutional Environment

The comparison between Spanish and US trucking suggests that institutional constraints play a prominent role in the organization of the industry. US trucking firms have become more vertically integrated in the last two decades, although the substantial changes in the regulation of US trucking in the late 1970s and, specially, 1980 (Motor Carrier Act) makes the analysis more difficult. Probably because a good number of severe restrictions that owner-operators had been enduring were eliminated (Peoples and Peteraf, 1995), almost all of the apparently new entrants following the deregulation were owner-operators (Boyer, 1993, p. 484). Hence, there was a steady increase in their importance in the early 1980s,[20] so that the use of owner-operators increased from 24.40 per 100 in 1977 to 29.62 per 100 in 1987. However, in the mid-1980s the number of owner-operators began to decrease, and in the 1990s is falling below the levels prior to deregulation.[21] Such trend is evidenced by the sharp decrease in the use of owner-operators, which went down to 21.98 per 100 in 1997—a 25.8 per 100 reduction

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[19] MOPT (1993, p. 85) and Metra/Seis (1985). Cargo agents that own less than five vehicles are not included.

[20] Corsi and Grimm (1987) and Peoples and Peteraf (1995).

[21] Corsi and Grimm (1989, pp. 285-286) and Boyer (1993, pp. 484-485).

in 10 years.[22] An additional piece of evidence is that the average number of vehicles per establishment in the US increased 9.78 per 100 from 1987 to 1992, as shown in Table 1 (Appendix A).

Such an increase in vertical integration is due to changes in transaction cost. First, advances in information technology allow the contracting firms to monitor the behavior of the driver more accurately and easily than ever, solving the moral hazard problem more economically.[23] Second, the growing utilization of "just-in-time" delivering systems creates new hold-up problems, increasing the attractiveness of vertical integration. When a punctual and reliable service is extremely important, the cost of non-performance is particularly high. Hence, short-term expropriable quasi-rents arise if the firm relies solely on owner-operators.[24]

On the contrary, there has been no appreciable increase in vertical integration in Spain (Table 1 in Appendix A). Technology is basically the same is the US and Europe, but there are differences in the institutional environment that can explain the divergence in the evolution of the contractual patterns. In fact, institutional constraints to the employment relationship are

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[22] Use of owner-operators estimated by the percentage of miles leased with drivers by Class I and II carries. Data from American Trucking Association (1997, 1987, and 1977). Corsi and Stowers (1991, p. 11) show a similar trend (even if the timing is not exactly the same) with a different kind of information, collected by the National Motor Freight Transport Data Base by means of interviewing drivers intercepted at random. The evolution in the use of owner-operators (percentage of the trips monitored that had owner-operators) is as follows: increased from 37 per 100 in 1978 to 41 per 100 in 1981, and then went down to 29 per 100 in 1987.

[23] Two examples illustrate this point: Leprino (see footnote number 4), and BJ Hunt, a large US firm that base drivers' remuneration on estimations of how they drive. The accuracy of computerized monitoring systems is being steadily improved by companies such as Minorplanet (see "Productivity and Technology: Now it's Much Easier to Track the Trucks," *Financial Times*, February 23, 1998).

[24] This problem is similar to the "temporal specificity", identified by Masten, Meehan, and Snyder (1991).

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maximal in Spain and minimal in the US, according to Emerson's (1988) rankings,[25] so

vertical integration is more costly in Spain. A good piece of evidence of the relevance of

regulation is that the increase of vertical integration in the US is related to the growth of firms

which use mainly company *non-union* drivers.[26]

There are also important differences between Spanish and US tax norms that may be able to

explain the greater vertical integration of US trucking firms. First, whereas the burden of

taxation in the US stays around 29 per 100 of Gross National Product (GNP) in 1980-1992, in

Spain it grows more than in any other OECD country, going from 24 to 35.8 per 100 of GNP

(a 46.6 per 100 increase) (Gago Rodríguez and Álvarez Villamarín, 1995, pp. 83-84). As

larger firms find it more difficult to reduce their burden of taxation than small firms and self-

employees, the increase in taxation has probably increased the relative cost of vertical

integration for Spanish trucking organizations. Second, in the studied period, Spain had,

among the OECD countries, one of the largest governmental schemes of financial and fiscal

help to self-employees and small firms. On the contrary, in the US they were only beginning a

demonstration project.[27] Hence, by giving benefits to self-employees, Spanish institutions

increase the relative cost of vertical integration.

So far we have explained the differences between Spain and US trucking, but Table 1 shows

that there are also differences among European countries. Again, differences in the

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[25] For a comparison between labor regulations in Spain (and other European countries) and in the US,
see also Freeman (1994), who concludes that government regulation of the workplace, centralized
wage bargaining, unionization, job stability, and non-wage labor costs are higher in Europe than in the
US.

[26] See Corsi and Grimm (1989) and Corsi and Stowers (1991). In those industries that did not have a
self-employment rate as high as trucking, European firms reacted to the increasing constraints to the
employment relationship by substituting self-employees for employees (OECD, 1992).

[27] See OECD (1992, p. 175) and OECD (1994, p. 7).

institutional environment can help to explain them (Table 2 and Graphics 1 and 2). There is a negative relationship between the decrease in the percentage of very small carriers and (1) the importance of job security provisions granted by labor norms and (2) labor disputes. Another factor that contributes to explain differences across Europe is the relative growth in the segment of quality logistic services after the birth of the European Single Market in 1986.[28] Such segment has grown more in the group of countries with a larger decrease in very small carriers (Table 2 and Graphic 3). In quality logistic services, which make an intensive use of the new technologies, reliability (rather than price) is the main factor for the customer, so that more vertical integration is required. However, in the less developed countries (such as Spain, Italy, and Greece) the trucking industry grows specially in the more traditional and simple segment, where price is the main factor for the customer. The reason is probably that trucking firms in those countries enjoy comparative advantages in costs—specially in the cost of labor.[29]

4. CONCLUSIONS

The large number of self-employed drivers with just one vehicle (owner-operators) working in less-than-truckload trucking is actually hiding a much less fragmented economic reality. Most of the owner-operators are quasi-integrated in higher organizations, which completely manage the work of the owner-operators. This hybrid form is, in general, more efficient than vertical integration of trucks and drivers because optimally solves serious moral hazard

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[28] Quality logistic service is labeled "vertical integrator" and also "vertical logistics chain director" in EC (1996, pp. 60 and 86), where it is defined as a market segment where "the company is closely located to 'its' shipper" and "the service goes far beyond transport only".

[29] Labor, which means 31 per 100 of total costs, is the main concept (MOPTMA, 1994, p. 11). Estimations for other European countries are similar (see, for example, Matas, Ortega, and Prado, 1995, p. 21).

problems, related mainly to the use of the vehicles. At the same time, the quasi-integrated organization can also reach economies of scale and density. Furthermore, empirical evidence suggests that what leads organizations to vertically integrate is not the presence of such economies but hold-up problems, related to the existence of specific assets.

Additionally, an international comparison shows a divergence in the evolution of the contractual practices. In Spain, vertical integration of trucks and the use of company drivers have not grown, in spite of technological changes that favor integration, such as advances in information technology, which make it easier to monitor the behavior of the driver, and "just-in-time" delivering systems, which aggravate temporal specificity problems. On the contrary, vertical integration has increased in the US. Such a divergence seems to be due to differences in the institutional environment. First, institutional constraints to the employment relationship are maximal in Spain and minimal in the US. Second, Spanish tax norms provide (directly and indirectly) several benefits for the self-employees and small firms that cannot be enjoyed by larger firms, but such benefits are much smaller in the US. Finally, the institutional environment also contributes to explain differences across European countries: vertical integration grows more in countries with lesser constraints to the labor relationship.

APPENDIX A: TABLES AND GRAPHICS

Table 1: Fragmentation in the Trucking Industry

Country	Percentage of firms with 1 to 5 vehicles		
	About 1990	*About 1980*	*About 1960*
Spain	98.02 (1) (1.42 veh./firm)	98.19 (i)	99.2 (a) (1.25 veh./firm)
United States	15.04 veh./establishment (2)	13.70 veh./establishment (ii)	n. a.
Other European countries:			
Italy	95.0 (3)	n. a.	1.5 veh./firm (b)
Sweden	91.0	n. a.	95.0 (c)
Denmark	83.7	89.4	n. a.
Germany	83.1 (4)	88.7	76.0 (d)
UK	83.0	87.0	85.0 (e)
France	81.6 (5)	80.0	95.6
Belgium	68.3	73.5	n. a.
Holland	56.8	64.5	48.5 (f)

Source: For Spain, information from Metra/Seis (1967, pp. 57-58), CSTT (1974, p. 10), MTTC (annual surveys, several years), and MOPT, taken from Universidad de Las Palmas de G. C. (1992, p. 62). For the US, information from US Bureau of the Census (1998, SIC 241, Table 6, 1992, SIC 241, and 1987, SIC 421). And for other European countries, from Bayliss (1986, p 171), Kritz (1974, p. 11), EC (1996, p. 57), and EC (1994, p. 44).

Notes: (1) 1992. (2) 1992. The fact that US information is referred to vehicles *per establishment*, rather than *per firm*, does not reduce the impact of the comparison. On the contrary, because each firm has one or more establishments and the number of firms is then smaller (or equal) than the number of establishments. (3) 1985. (4) Between 1 and 6 vehicles. (5) Estimation. (i) 1984, taken from the MTTC annual survey. (ii) 1987. (a) 1964. (b) 1958. (c) 1972. (d) Between 1 and 2 vehicles. (e) 1963. (f) 1 vehicle.

Table 2: Changes in Fragmentation in European Trucking

| Country	Change in percentage of firms with 1-5 vehicles (1980-1990) [a]	Ranking in terms of job security provisions [b]	Ranking in terms of labor disputes [c]	Relative growth of quality logistic services (1986-1992) [d]
1. France	+2.00%	6	7	1.0341 (3rd)
2. Italy	About 0	9	8	0.8298 (2nd)
3. Spain	-0.16 (1984-1992)	7	9	0.2870 (1st)
4. Sweden	-4.21 (1972-1990)	5	6	not available (-)
5. UK	-4.60	3	5	1.5353 (7th)
6. Germany	-6.31	4	1	1.0984 (4th)
7. Denmark	-6.38	1	4	n. a. (-)
8. Belgium	-9.54	8	3	1.2375 (5th)
9. Holland	-11.94	2	2	1.2911 (6th)

Sources:

[a] See Table 1.

[b] 1 is for the country with less job security provisions and 9 is for the country with more. Based on Bertola (1990, p. 853, Table 1). Spain does not appear in Bertola´s ranking so its position has been estimated from Tables in Emerson (1988)—the same tables that Bertola uses to build his ranking.

[c] 1 is for the country with less labor disputes and 9 is for the country with more. Based on the number of working days lost per 1.000 employes: Annual average 1988-1997 (except France: 1988-1996). Office for National Statistics (Britain), taken from *The Economist* (April 24th-30th, 1999, p. 118).
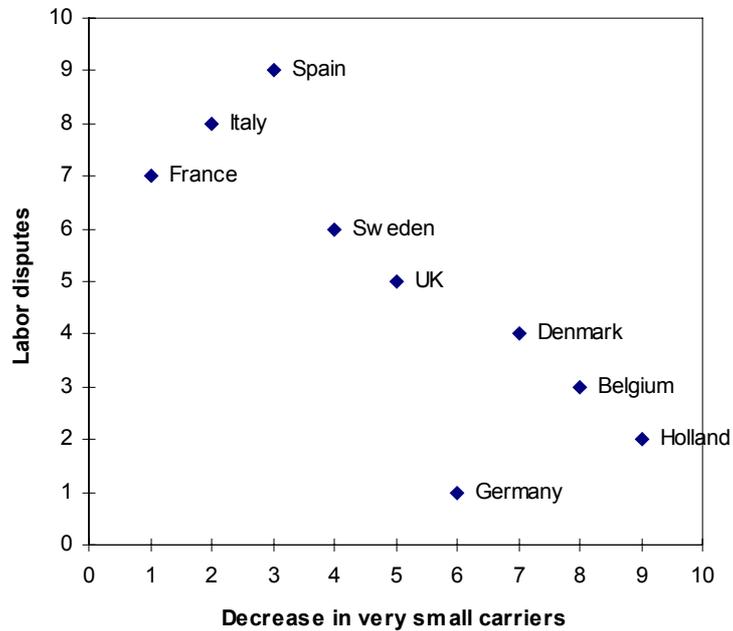
[d] EC (1996, p. 60). Ratio between index of growth in quality logistic services and index of total growth in the trucking industry.

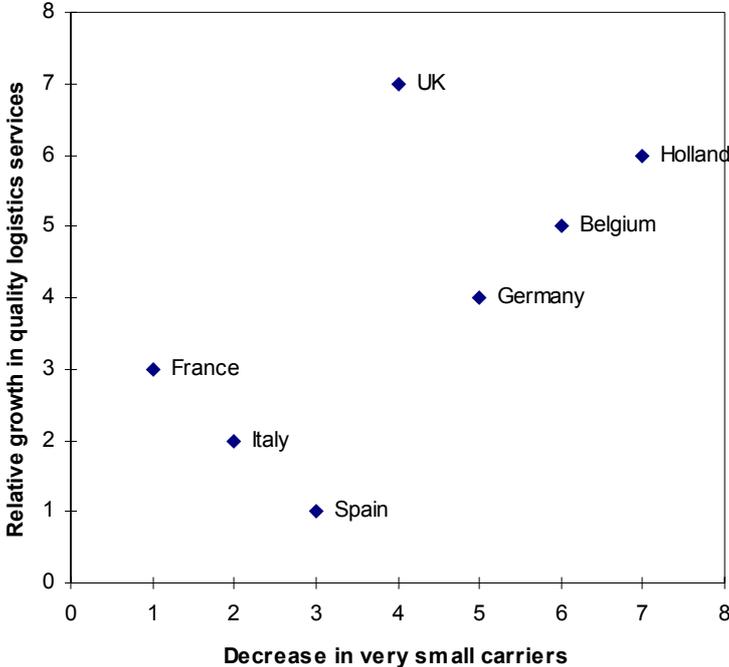**Graphic 1. Changes in fragmentation in European trucking (I): The effect of job security provisions**
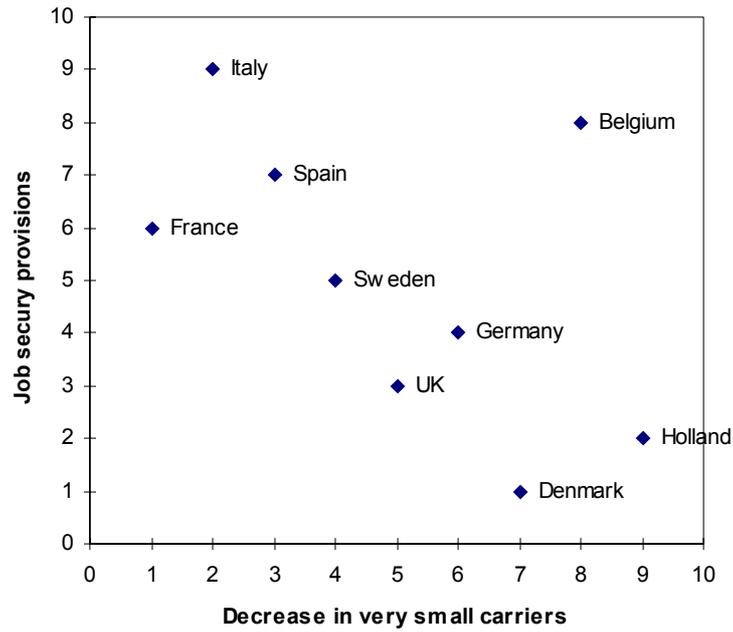
Sources: Data on Table 2.

Graphic 2. Changes in fragmentation in European trucking (II): The effect of labor disputes

Sources: Data on Table 2.

Graphic 3. Changes in fragmentation in European trucking (III): The effect of relative growth in quality logistic services

Sources: Data on Table 2.

APPENDIX B: DATA SOURCES

The primary information was obtained by means of a survey that included, first, detailed in-house study of two Spanish LTL trucking firms. Both firms were among the four with larger sales in 1997.[30] Hence, given the high concentration of sales in the activity, the collected information is pretty representative. Such data was completed and tested with nine detailed interviews with experts, plus several consultations with experts, entrepreneurs, and researchers on the industry. The survey also included various cases and interviews referred to the truckload industry (see Fernández, Arruñada, and González, 1998).

The main source of secondary information is a group of empirical studies, referred to Spain unless stated otherwise, that we cite along the paper whenever is relevant: Metra/Seis (1967 and 1985); Kritz (1974), for Europe; CSTT (1974); CECAM (1992); Universidad de Las Palmas de Gran Canaria (1992); MOPT (1993); EC (1994 and 1996), for Europe; Matas, Ortega, and Prado (1995); and Barrio (1996). Several Spanish trucking magazines have also been a useful source for specific pieces of casuistic information: *Logística & Transporte*, *Transporte Profesional*, *Cargador*, *Transporte Mundial,* and *Carga & Ruta*.

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[30] According to data published in *Logística & Transporte* (n.º 41, pp. 38-44).

REFERENCES

ALLEN, W.B and D. LIU (1995), "Service Quality and Motor Carrier Costs: An Empirical Analysis", *The Review of Economics and Statistics*, vol. 77 (3), pp. 499-509.

AMERICAN TRUCKING ASSOCIATION (1997), Financial and Operating Statistics. Motor Carrier Annual Report. Annual Summary Tables. 1997 Data, American Trucking Association.

AMERICAN TRUCKING ASSOCIATION (1987), *Financial and Operating Statistics. 1987 Motor Carrier Annual Report*, American Trucking Association.

AMERICAN TRUCKING ASSOCIATION (1977), *Financial and Operating Statistics. 1977 Motor Carrier Annual Report*, American Trucking Association.

BARRIO, A. (1996), *Estudio sobre los sistemas de captación de clientes y mercancías utilizados por los empresarios del transporte de mercancías por carretera, Madrid*, Ministerio de Fomento (Ministry of Works and Housing), Dirección General de Ferrocarriles y Transportes por Carretera.

BAYLISS, B.T. (1986), "The Structure of the Road Haulage Industry in the United Kingdom, and Optimum Scale", *Journal of Transport Economics and Policy*, vol. 20, pp. 153-172.

BAYLISS, B.T. and R.J. COLEMAN (1994), "Road Freight Transport in the Single European Market", Report of the Committee of Inquiry - July, Brussels, European Commission, Directorate General of Transport.

BERTOLA, G. (1990), "Job Security, Employment, and Wages", *European Economic Review*, vol. 34 (4), pp. 851-886.

BLAU, D.M. (1987), "A Time-Series Analysis of Self-Employment in the United States", *Journal of Political Economy*, vol. 95 (3), pp. 445-467.

BLOIS, K.J. (1972), "Vertical Quasi-Integration", *Journal of Industrial Economics*, vol. 20, pp. 253-272.

BOYER, K. (1993), "Deregulation of the Trucking Sector: Specialization, Concentration, Entry, and Financial Distress", *Southern Economic Journal*, vol. 59, pp. 481-495.

BRICKLEY, J.A., C.W. SMITH Jr., and J.L.ZIMMERMAN (1996), *Organizational Architecture: A Managerial Economics Approach*, Chicago, Irwin.

BRONARS, S.G. and D.R. DEERE (1993), "Unionization, Incomplete Contracting, and Capital Investment", *Journal of Business*, vol. 66, pp. 117-132.

COASE, R.H. (1937), "The Nature of the Firm", *Economica*, vol. 4 (16), pp. 386-405.

CONSEJERÍA DE ECONOMÍA DE LA COMUNIDAD AUTÓNOMA DE MADRID (CECAM) (Economic Counsel of the Autonomic Community of Madrid) (1992), *Los operadores del transporte y de la distribución física en la Comunidad Autónoma de Madrid*, Madrid, IMADE.

CONSEJO SUPERIOR DE TRANSPORTES TERRESTRES (CSTT) (High Board of Road Haulage) (1974), *Estructura empresarial del sector del transporte público de mercancías por carretera*, Madrid, Ministerio de Obras Públicas (Ministry of Public Works).

CORSI, T.M. and C.M. GRIMM (1987), "Changes in Owner-Operator Use, 1977-1985: Implication for Management Strategy", *Transportation Journal*, vol. 26 (3), pp. 4-16.

CORSI, T.M. and C.M. GRIMM (1989), "ATLFs: Driving Owner-Operators into the Sunset", *Journal of the Transportation Research Forum*, vol. 29, pp. 285-290.

CORSI, T M. and J.R. STOWERS (1991), "Effects of a Deregulated Environment on Motor Carrier: A Systematic, Multi-Segment Analysis", *Transportation Journal*, vol. 30, pp. 4-28.

DBK (1995), *Estudio sectores de DBK: Transporte de mercancías por carretera*, 4th edition, Madrid.

DICER, G.N. (1971), "Economies of Scale and Motor Carrier Optimum Size", *Quarterly review of Economics and Business*, vol. 11 (1), pp. 31-37.

DIETRICH, M. (1994), "The Economics of Quasi-Integration", *Review of Political Economy*, vol. 6 (1), pp. 1-18.

EMERSON, M. (1988), "Regulation or Deregulation of the Labour Market", *European Economic Review*, vol. 32, pp. 775-817.

EUROPEAN COMMISSION (CE) (1994), *Le transport routier de merchandises au sein du Marche Unique europeen*, Brussels and Luxembourg, Office for Official Publications of the European Communities.

EUROPEAN COMMISSION (CE) (1996), *The 1996 Single Market Review. Subseries II: Impact on Services. Vol. 5: Road Freight Transport*, Brussels and Luxembourg, Office for Official Publications of the European Communities.

FERNÁNDEZ, A., B. ARRUÑADA, and M. GONZÁLEZ (1998), "Contractual and Regulatory Explanations of Quasi-Integration in the Trucking Industry", Universitat Pompeu Fabra WP Series, Ref. 292.

FREEMAN, R.B., editor (1994), *Working under Different Rules*, National Bureau of Economic Research Project Report, New York, Rusell Sage Foundation.

GAGO RODRÍGUEZ and ÁLVAREZ VILLAMARÍN (1995), "Hechos y tendencias de la reforma fiscal en los países de la OCDE (1980-1990)", *Hacienda Pública Española*, 134 - 3/1995.

GARCÍA ALCOLEA, R. (1992), "El transporte de mercancías por carretera en la economía española. La reglamentación económica y la problemática actual del sector", in Ginés De Rus, director, *Economía y política del transporte: España y Europa*, Madrid, MOPT, Cívitas, pp. 63-96.

HARMATUK, D.J. (1992), "Motor Carriers Cost Function Comparisons", *Transportation Journal*, vol. 31 (4), pp. 31-46.

HART, O. (1995), *Firms, Contracts, and Financial Structure*, Oxford, Oxford University Press.

HOLMSTRÖM, B. and P.R. MILGROM (1994), "The Firm as an Incentive System", *The American Economic Review*, vol. 84 (4), pp. 972-991.

HUBBARD, T.N. (1998), "Governance Structure in the Deregulated Trucking Industry", unpublished manuscript.

INSTITUTO NACIONAL DE ESTADÍSTICA (INE) (National Institute of Statistics) (1995), *Encuesta económica de empresas de transporte de mercancías por carretera, 1992*, Madrid, INE and MOPTMA (Ministry of Public Works, Transportation, and Environment).

IRISARRI, A. (1987), "El transporte de mercancías por carretera", *Situación*, 1987/1, pp. 81-94.

JOY, S. (1984), "Unregulated Road Haulage: The Australian Experience", *Oxford Economic Papers*, vol. 16, pp. 274-285.

KEELER, T.E. (1989), "Deregulation and Scale Economies in the U.S. Trucking Industry: An Econometric Extension of the Survivor Principle", *Journal of Law and Economics*, vol. 32, pp. 229-253.

KLEIN, B., R.G. CRAWFORD, and A.A. ALCHIAN (1978), "Vertical Integration, Appropiable Rents, and the Competitive Contracting Process", *Journal of Law and Economics*, vol. 21 (2), pp. 297-326.

KRITZ, L. (1974), "Optimum Structure and Size of Road Haulage Firms. Positive and Negative Effects of Specialization", Report of the 23rd Round Table of Transport Economics, Paris, OECD.

LEVINTHAL, D.A. and M. FICHMAN (1988), "Dynamics of Interorganizational Attachments: Auditor-Client Relationships", *Administrative Science Quarterly*, vol. 33, pp. 345-369.

MASTEN, S.E., J.W. MEEHAN Jr., and E. A. SNYDER (1991), "The Costs of Organization", *Journal of Law, Economics, and Organization*, vol. 7, pp. 1-26.

MASTEN, S.E., J.W. MEEHAN Jr., and E. A. SNYDER (1989), "Vertical Integration in the U.S. Auto Industry", *Journal of Economic Behavior and Organization*, vol. 12, pp. 265-273.

MATAS, A., B. ORTEGA, and J. PRADO (1995), *Efectos de la desregulación del transporte de mercancías por carretera*, Madrid, Working paper 95-06 FEDEA.

McDONALD, F., M. DWYER, and F. WENDT (1994), "Italy´s Black Economy: Corporate Indiscretion—The Primrose Path", *Management Decision*, vol. 32 (3), pp. 49-52.

McMULLEN, B.S. and H. TANAKA (1995), "An Econometric Analysis of Differences Between Motor Carriers: Implications for Market Structure", *Quarterly Journal of Business and Economics*, vol. 34 (4), pp. 16-29.

METRA/SEIS (1967), *Estudio de la estructura de costes de transporte de mercancías: Transporte por carretera*, Madrid, Ministerio de Obras Públicas (Ministry of Public Works).

METRA/SEIS (1985), *Primera encuesta nacional de datos económicos de las empresas de transporte de mercancías por carretera con más de cinco vehículos de servicio público*, Madrid, Ministerio de Transportes, Turismo y Comunicaciones (Ministry of Transportation, Tourism, and Communications).

MINISTERIO DE OBRAS PÚBLICAS Y TRANSPORTES (MOPT) (Ministry of Public Works and Transportation) (1993), *Análisis de la estructura de la oferta y del sistema de comercialización del transporte público de mercancías por carretera*, Madrid, MOPT.

MINISTERIO DE OBRAS PÚBLICAS, TRANSPORTES Y MEDIO AMBIENTE (MOPTMA) (Ministry of Public Works, Transportation, and Environment) (1994), *Los transportes y las comunicaciones. Extracto del informe anual 1993*, Madrid, MOPTMA, Instituto de Estudios del Transporte y las Comunicaciones (Intitute of Transportation and Communications Studies).

MINISTERIO DE TRANSPORTES, TURISMO Y COMUNICACIONES (MTTC) (Ministry of Transportation, Tourism, and Communications) (1981-1990), *Los transportes, el turismo y las comunicaciones*, annual volumes 1980-1989, Madrid.

MONTEVERDE, K. and D.J. TEECE (1982a), "Supplier Switching Costs and Vertical Integration in the Automobile Industry", *Bell Journal of Economics*, vol. 13, pp. 206-213.

MONTEVERDE, K. and D.J. TEECE (1982b), "Appropriable Rents and Quasi-Vertical Integration", *Journal of Law and Economics*, vol. 25, pp. 321-328.

NICKERSON, J.A. and B.S. SILVERMAN (1998), "Integrating Competitive Strategy and Transaction Cost Economics: An Operationalization of Fit in the Interstate Trucking Industry", unpublished manuscript.

NORTH, D.C. (1990), *Institutions, Institutional Change and Economic Performance*, Cambridge University Press, Cambridge.

ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD) (1992), "Recent Developments in Self-Employment", in OECD, *Employment Outlook 1992*.

ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD) (1994), *Taxation and Small Business*, Servicio de Publicaciones, OECD, Publications Service.

PEÑA, E. (1991), "La política de transportes en la CEE", *Información Comercial Española*, 690, pp. 79-100.

PEOPLES, J. and M. PETERAF (1995), "Deregulation in the Competitive Fringe: Owner-Operators in the Trucking Industry", *Journal of Regulatory Economics*, vol. 7, pp. 27-42.

PHILLIPS, L.T. (1991), "Contractual Relationships in the Deregulated Transportation Marketplace", *Journal of Law and Economics,* vol. 34, pp. 535-564.

PISSARIDES, C. and G. WEBER (1989), "An Expenditure-Based Estimate of Britain´s Black Economy", *Journal of Public Economics*, vol. 39 (1), pp. 17-32.

TWEDDLE, G. and P.J. MACKIE (1995), *Review of the Regulation of Road Freight in the U. K.*, Madrid, Working paper 95-05 FEDEA.

UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA (1992), *Estudio sectorial del transporte y de las comunicaciones*, vol. I, parte 2: Configuración económica y organizativa del sector, Madrid, Fundesco, INEM (National Institute of Employment).

U.S. BUREAU OF THE CENSUS (1998), *Current Business Reports, BT/96. Transportation Annual Survey: 1996*, U.S. Government Printing Office, Washington, DC.

U.S. BUREAU OF THE CENSUS (1992), *1992 Census of Transportation, Communications and Utilities*, U.S. Government Printing Office, Washington, DC.

U.S. BUREAU OF THE CENSUS (1987), *1987 Census of Transportation, Communications and Utilities*, U.S. Government Printing Office, Washington, DC.

WANG CHIANG, S.J. and A.F. FRIEDLAENDER (1984), "Output Aggregation, Network Effects, and the Measurement of Trucking Technology", *The Review of Economics and Statistics*, vol. 66 (2), pp. 267-276.

WILLIAMSON, O.E. (1975), *Markets and Hierarchies: Analysis and Antitrust Implications*, New York, The Free Press.

WILLIAMSON, O.E. (1979), "Transaction Cost Economics: The Governance of Contractual Relation", *Journal of Law and Economics*, vol. 22, pp. 223-261.

WILLIAMSON, O.E. (1991), "Comparative Economic Organization: The Analysis of Discrete Structural Alternatives", *Administrative Science Quarterly*, vol. 36 (2), pp. 269-296.

WILLIAMSON, O.E. (1993), "Transaction Cost Economics and Organization Theory", *Industrial and Corporate Change*, vol. 2 (2), pp. 107- 156.