Determinants of Organizational Form: Transaction Costs and Institutions in the European Trucking Industry*

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Abstract

We explain why European trucking carriers are much smaller and rely more heavily on owner-operators (as opposed to employee drivers) than their US counterparts. Our analysis begins by ruling out differences in technology as the source of those disparities and confirms that standard hypotheses in organizational economics, which have been shown to explain the choice of organizational form in US industry, also apply in Europe. We then argue that the preference for subcontracting over vertical integration in Europe is the result of European institutions—particularly, labor regulation and tax laws—that increase the costs of vertical integration.

JEL Classification: D23, L14, L22, L92

Key words: transaction costs, governance, hybrids, transportation

1. Introduction

The organization of freight transactions has been the subject of several recent studies.[1] These studies, however, have focused exclusively on US firms and have not sought to evaluate the applicability of theories of organization to freight transactions outside the US or to explain observed differences in contracting and organization practices between countries. In trucking, for example, US carriers are much larger on average and much more likely to use employee drivers than are European carriers, who rely more heavily on "owner-operators"—independent contractors who own and drive their own trucks. Thus, whereas the average number of employees per carrier in the US was 14.7 in 1997, the average European carrier employed only 3.9 workers in 1998, with as few as 2 workers per carrier in Spain. Firms with 10 or more employees represented 26% of the market in the US compared to only 5% in the EU.[2] And while the top eight US trucking companies accumulated 12% of 1997 US market revenue, the top ten EU firms collected less than 8.5% of the industry's revenue in 1998. More striking than these differences in firm size and employment patterns, the estimated proportion of drivers who own and operate their own trucks is 22 to 30% for US carriers (with revenues greater than one million dollars) but 60 to 75% in Europe.[3]

In this paper, we seek to explain differences in firm size and contractual patterns observed in the US and European trucking industries. We begin by ruling out two potential explanations—differences in technology and transaction costs—and conclude that differences in institutional environments, especially labor and tax laws, provide the most likely explanation for the observed disparities. In section 2, we describe briefly the activities of carriers and the contractual problems and arrangements typically found in trucking, compare the two most common types of organization—hierarchy and subcontracting—and discuss how the institutional environment

affects the relative merits of these organizational forms. In section 3, we use data on trucking organization in Spain to show that the governance of freight transactions in Europe is sensitive to the same transaction cost considerations that have been shown to affect those decision in the US. Section 4 relates the observed disparities in organization to differences in the institutional environment and, especially, to differences in labor and tax regulations that raise the cost of integration in the EU. The article concludes with a summary of its contributions and implications.

2. Technology, transaction costs and governance structures

Trucking is organized everywhere around the same types of assets and transactors. Basic assets are the truck and the human capital of the driver. Transactions start when a shipper needs a cargo to be moved from one place to another. The shipper either may ship its cargo itself using an internal fleet of trucks—a so-called "private carrier"—or it may contract for this movement with a "for-hire" carrier, who specializes in supplying transportation services. For-hire carriers, in turn, either may hire company drivers to operate carrier-owned trucks or may subcontract with self-employed owner-operators who own and drive their own trucks. When working for a particular carrier, both owner-operators and company drivers perform the same tasks, including customer service if necessary.[4]

This description is common to both Europe and the US, with no significant differences in technology between these two areas. Manufacturers of trucks and control systems export their products worldwide.[5] Routes are also similar, especially with the increase in international traffic in Europe as a result of greater European integration over the last two decades. It would thus appear that trucking uses essentially homogeneous technologies in the US and Europe. Whatever

differences in technology might exist certainly seem too small to account for the substantial differences in trucking organization actually observed.[6]

American and European freight transactors also face a common set of organizational problems. On the one hand, carriers and drivers face a moral hazard problem in inducing appropriate effort and care by drivers. Shippers may inform carriers about punctuality and delivery problems, but carriers may find it difficult to monitor other dimensions of driver performance. Drivers are dispersed, and some dimensions of effort, such as fuel consumption, tire wear, mechanical breakdowns, truck care and accident avoidance, are difficult to contract over.[7]

Driver ownership of the truck—as is the case with owner-operators—addresses many of these moral hazard problems. First, owner-operators have higher-powered incentives to exert effort because their rewards are fully tied to performance both in driving and using the truck. Second, they hold both the decision rights on how the truck is used and a residual claim on their trucks' value. Thus, they bear the consequences of their decisions on non-contractible dimensions such as the use of the truck and ancillary resources such as fuel, tires and so forth, reducing moral hazard relative to using employee drivers.[8]

Using owner-operators also incurs transaction costs, of course. In addition to the potential for misallocation of exogenous risks to the relatively risk-averse party, driver ownership of trucks may expose the parties to hold-up problems in the presence of specific assets (Williamson, 1975, 1979; Klein, Crawford, and Alchian, 1978). The most obvious situation involves the use of specialized vehicles such as refrigerated vans, car carriers, and similar special-purpose trucks. In the case of trailer trucks, which can be divided into a tractor unit and a trailer, only the trailers are specialized while tractor units can generally be employed with various types of trailers. Even

though owner-operators can use their vehicles to contract with any carrier or shipper, they are likely to have more difficulty finding an alternative user for a specialized vehicle than for a general freight one. Conversely, a contracting firm in need of a specialized trailer is likely to find it harder to find a substitute operator quickly than would a shipper or carrier requiring a standard dry van. Similar short-term hold-up opportunities may also arise where efficient hauling requires highly idiosyncratic drive-train configurations. From a technical point of view, there is an optimal drive-train configuration for each kind of haul (depending on the distance and weight). An incorrect configuration can lead to a 10-20% increase in total costs.[9] Because specialized vehicles and vehicles with nonstandard drive-trains are less numerous, drivers who own and operate such vehicles, and carriers or shippers who require their services, have fewer contracting opportunities, creating a short-term appropriable quasi-rent derived from the costs that parties suffer if delays occur.[10]

Finally, hold-up problems may also arise because of intangible assets obtained as a by-product of the relationship between drivers and carriers or because of timing needs. Information about routes, customer characteristics, vehicles, services offered by carriers, and communication systems are valuable pieces of knowledge that are costly to transfer.[11] Punctuality in contractual performance may be extremely important when, for example, a carrier wants to be able to serve urgent and unforeseen orders, offering a reliable service, or when it is committed to "just-in-time" delivery schedules. The cost of non-performance is then particularly high, so that appropriable quasi-rents arise if the carrier relies solely on owner operators.

Vertical integration can be a solution to the hold-up problem. Company drivers agree on compensation and general working conditions, and the carrier decides on the shipper, hauls and destinations. In the case of physical assets, truck ownership eliminates the hold-up problem, as

shown for this industry by Hubbard (2001). For human assets and timing requirements, hierarchy is likely to provide better solutions than contracting for synchronization and designation problems, such as those needed to offer reliability of delivery in JIT services.[12]

Summing up, the choice of organizational form results from balancing two opposing forces. First, misalignment of incentives and the lack of contractibility are best solved by allocating truck ownership to the driver. This will push the optimum solution towards the market, with carriers relying more on owner-operators. Conversely, specificity and some coordination problems push in the opposite direction. Both the potential appropriation of quasi-rents and the mis-assignment of hauls among owner-operators can be attenuated through vertical integration, leading carriers to rely more on company owners. The preferred arrangement will depend on the relative strengths of these forces.

3. Employee Drivers versus Owner-Operators in Spain

To see whether truck ownership and driver status conforms to transaction cost predictions outside the US, we analyzed a sample of 262 for-hire truckload carriers consisting of the largest Spanish firms in terms of sales.[13] For our purposes, we defined the degree of vertical integration by the ratio of owned trucks to total trucks (the sum of company owned and operator-owned trucks) managed by each carrier. As our principal measure of asset specificity, we created a dummy variable, SPECIFICITY, with a value of one for firms identified as carrying cargos other than "general freight." These "non-general freight" firms include carriers that specialize in transporting cars, construction machinery or other oversized freight (requiring flatbed trailers), powders, foodstuffs or dangerous materials (shipped in refrigerated and tanker trailers). Although not all specialized assets need be specific nor all specific assets specialized, for reasons

described in the previous section, we expect a correlation between specialization and specificity in trucking. As an attempt to capture the kind of specificity associated with idiosyncratic drive-train configurations (following Nickerson and Silverman, 2003a), we also include a dummy variable, INTERNATIONAL, for firms that carry international freight (in this case, to destinations outside Spain), the argument being that hauls that traverse national borders are on average longer than within-country hauls and, following Nickerson and Silverman (2003a), require relatively atypical drive trains.

Finally, as a proxy for the difficulty of monitoring drivers' effort, we use the variable CARRIER SIZE, measured by the number of vehicles managed, based on the assumption that monitoring drivers' performance and truck use becomes more difficult as the number of trucks—and, with it, the variability of hauls and destinations—a carrier manages increases. Since employee drivers have weaker direct incentives, larger CARRIER SIZE should differentially increase the costs of integration and lead to greater reliance on owner-operators.

Descriptive statistics and the correlation matrix for the variables are contained in tables 1 and 2, respectively. Table 3 reports results for two specifications of the model. Results in the first column were obtained using ordinary least squares.[14] The results are consistent with the hypotheses; all coefficients have the expected signs, and two (SPECIFICITY and LOG(CARRIER SIZE)) are statistically significant. Because the dependent variable is a proportion and because there are a significant number of observations at the limits (84, of which 8 take a value of 0 (no integration) and 76 take a value of 1 (complete integration), we re-estimated the model as logit with grouped data (see Greene, 1997, pp. 894-896). The results, reported in the second column of Table 4, are similar to those using OLS: Vertical integration of trucks is more likely for specialized trailers and in small carriers. Using the results in column 2,

the proportion of carrier-owned trucks increases by 14 percentage points, to .79 for specialized trailers from .65 for standard vans at the mean values of the other variables. An increase in CARRIER SIZE from 20 to 91 trucks (representing the 25th and 75th percentiles), meanwhile, decreases the percentage of owned trucks from 79% to 68% (again at the mean values). Although we do not find that Spanish carriers hauling freight outside of Spain are significantly more likely to use carrier-owned trucks in our data, this may be due to the particularly tenuous nature of INTERNATIONAL as a proxy for the need for idiosyncratic drive trains that we hoped to capture.

4. Influence of the Institutional Environment

As noted earlier, the technology of trucking in developed countries is substantially the same. At the same time, the results of the preceding section show that governance form in Spanish trucking is sensitive to the type of factors shown to affect trucking organization in studies using US data (mainly asset specificity and measurement costs). Yet the proportion of owner-operators in Spain is substantially greater than in the United States—60-75% in Spain versus 22-30% in the US. Since neither technology nor firm-level organizational factors appear to explain this disparity, it makes sense to consider whether and to what extent institutional differences may be responsible for observed differences in the governance of Spanish and US trucking firms. Differences in the institutional environment may act as "shift parameters," in Williamson's (1991) terminology, that affect the relative cost of governance forms in a way that cause otherwise similar transactions to be organized differently.

Two leading candidates for that role are differences in tax and labor regulations.[15] Tax rules clearly are able to alter the relative costs of the organizational alternatives.[16] Governmental

programs seeking to help small firms and the self-employed through tax breaks directly favor fragmentation because large, vertically-integrated firms are not eligible for the benefits. In addition, taxes can promote fragmentation indirectly to the extent, for example, that small firms and, especially, self-employed workers find it easier than larger firms to reduce their tax burden by means of tax avoidance and evasion. Labor regulations can also alter the relative costs of integration and contracting in a number of ways. Regulations protecting job security, for instance, may raise the cost of hierarchy by making termination of employee drivers more difficult (Bronars and Deere, 1993; Caballero and Hammour, 1998), increasing the likelihood of judicial review and requiring more costly record keeping. Legal constraints on permissible compensation arrangements, such as the use of performance-related pay, can also affect the choice of organizational form by limiting the options for motivating employees within the firm compared to subcontractors.

This interpretation of taxation and labor law as shift parameters is consistent with the observed differences between the institutional environments of the US, Spain and other EU countries. First, important differences exist between Spanish and US tax rules. According to the OECD, Spain had one of the largest governmental schemes for subsidizing self-employed workers and small firms in the OECD countries at a time when the US was seeing only the beginning of a demonstration project (OECD, 1992, p. 175; 1994, p. 7). And whereas the burden of taxation in the US remained at around 29% of Gross Domestic Product (GDP) from 1980 to 1992, Spain's tax burden reached 35.8% of GDP in 1992, up from 24% in 1980, a 46.6% increase (Gago and Álvarez, 1995, pp. 83-84). To the extent that larger firms find it harder to reduce their burden of taxation than do small firms and self-employed workers, the growth in taxation would have tended to increase the relative cost of vertically-integrated Spanish carriers.

Differences in Spanish and US labor regulations appear to operate in the same direction. Under Spanish labor law, layoffs and dismissals are subject to regulatory or court approval and trigger high, mandatory dismissal compensation (up to 45 days per year worked with a maximum of 42 months' salary).[17] Under US labor law, by contrast, firms generally have much more discretion to terminate employees "at will." Spanish labor law is also more favorable to unions, with the result that Spanish trucking is much more heavily unionized than in the US. Finally, Spanish regulations restrict night and "weekly holiday" work, and fix a minimum of 22 days of annual leave and minimum additional pay for overtime.[18] The World Bank's *Doing Business 2004* report found that, as of 2003, Spanish employment regulations were less flexible than those of any other OECD country except Mexico and Portugal. In the report's index for employment rigidity, Spain scored 70 compared to the EU average of 50.5 and US score of 22.[19] Based on such assessments, institutional constraints on employment relations appear among the highest in Spain, with the EU as a whole in the middle and the US at the bottom, suggesting that integration costs are higher in Spain than elsewhere.[20]

The relationship between the change in owner-operator use and labor regulation in several EU countries provides additional evidence supporting our argument. Table 4 compares levels of labor regulation in nine EU countries in the mid-eighties with the percentage of carriers with fewer than six vehicles from 1980 to 1990. Since all countries have similar economic and technological development, evolution in governance forms should be similar. However, Table 4 shows that firm size has changed substantially in countries with relatively flexible labor regulations while in those with more rigid rules the change has been negligible.

The relationship between these variables is shown in the scatter plots in Figures 1 and 2. The vertical axis represents the change in owner-operator use, and the horizontal axis is, in Figure 1,

the index of job security provisions and, in Figure 2, the ranking of labor disputes. Although there are too few observations for meaningful statistical tests, the figures suggest a positive correlation between changes in the use of owner-operators and the rigidity of labor regulations. In particular, countries that are high in the rankings for job security provided by labor regulation and labor disputes (France, Italy and Spain) have changed their structures very little. Conversely, countries with more flexible regulations have moved faster towards less fragmented and larger carriers. This pattern is consistent with empirical studies of other industries that also attribute the prevalence of Spanish subcontracting to institutional constraints (González-Díaz, Arruñada and Fernández, 1998; Arruñada and Vázquez, 2003).

5. Conclusion

Substantial differences exist between US and European trucking carriers. European carriers are much smaller and use mainly owner-operators as drivers while US carriers are bigger and rely more heavily on employees to drive company-owned trucks. These differences do not appear to be the result of differences in technology, and governance choices appear to be influenced by similar factors on both continents: Our quantitative evidence suggests that carriers are more likely to own their own trucks when there are important hold-up problems related to the existence of specific assets and when monitoring drivers is relatively easy. Differences in institutional environments, particularly in labor regulation and tax systems, between the EU and US appear to be responsible for much of the difference by raising the cost of integrated organization.

Conventional economic analysis of the European trucking industry emphasizes fragmentation as a problem in itself and focuses on the large percentage of tiny carriers and owner operators with just one truck.[21] The concern that small carriers cannot reach economies of scale has led to

the calls for the adoption of policies that promote vertical integration.[22] An implication of our findings for public policy is that removing institutional impediments may be a more effective way of encouraging integration than is creating new rules rewarding the integration of owner-operators, as has been attempted in some European countries. We note, however, that the existence of economies of scale does not necessarily call for conventional vertical integration, or hierarchy. Efficiencies can instead be reached by contractual means and hybrid forms.[23] Our results hint that policies promoting vertical integration are misguided because, instead of resolving the causes of the problem, they focus on its consequences.

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Table 1. Descriptive statistics

	Description	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
INTEGRAT	Ratio of owned trucks to total trucks managed	0.72	0.28	0	1
SPECIFICITY	Dummy variable: 1 if a carrier is dedicated to specialized freight; 0, otherwise	0.53	0.50	0	1
CARRIER SIZE	Number of vehicles managed (sum of company owned and operator-owned trucks); 0, otherwise	92.7	238.98	6	3,553
INTERNATIONAL	Dummy variable: 1 if a carrier ships international freight; 0, otherwise	0.41	0.49	0	1

Table 2. Correlation matrix

	INTEGRATION	*SPECIFICITY*	*LOG(CARRIER SIZE)*	*INTERNATIONAL*
INTEGRATION	1.0000	-	-	-
SPECIFICITY	0.2263	1.0000	-	-
LOG(CARRIER SIZE)	-0.2734	-0.0249	1.0000	-
INTERNATIONAL	0.0204	-0.2078	0.0869	1.0000

Table 3. Factors explaining vertical integration, measured by the ratio of owned trucks to total trucks managed by carrier

Variable	*OLS estimation*	*Logit*
SPECIFICITY	0.134 (4.027)**	0.687 (2.268)***
INTERNATIONAL	0.053 (1.578)	0.268 (0.907)
LOG (CARRIER SIZE)	-0.073 (-4.731)**	-0.369 (-2.738)**
Constant	0.909 (13.891)**	1.943 (3.375)**
R^2	13.13	
Equation test statistic	13.00** (F[3, 258])	13.43** (χ^2[3])
Sample size	262	262

Source of data: *Logística & Transporte* (1999, vol. 53, 46-73).
Notes: *t*-statistics in parentheses; * significant at the 0.05 level; **significant at the 0.01 level.

Table 4. Changes in fragmentation in European trucking

Country	*Ranking in terms of job security provisions* [b]	*Ranking in terms of labor disputes* [c]	*Change in percentage of the number of carriers with 1-5 vehicles (1980-1990)* [a]
1. France	6	7	+2.00%
2. Italy	9	8	About 0
3. Spain	7	9	-0.16 (1984-1992)
4. Sweden	5	6	-4.21 (1972-1990)
5. UK	3	5	-4.60
6. Germany	4	1	-6.31
7. Denmark	1	4	-6.38
8. Belgium	8	3	-9.54
9. Netherlands	2	2	-11.94

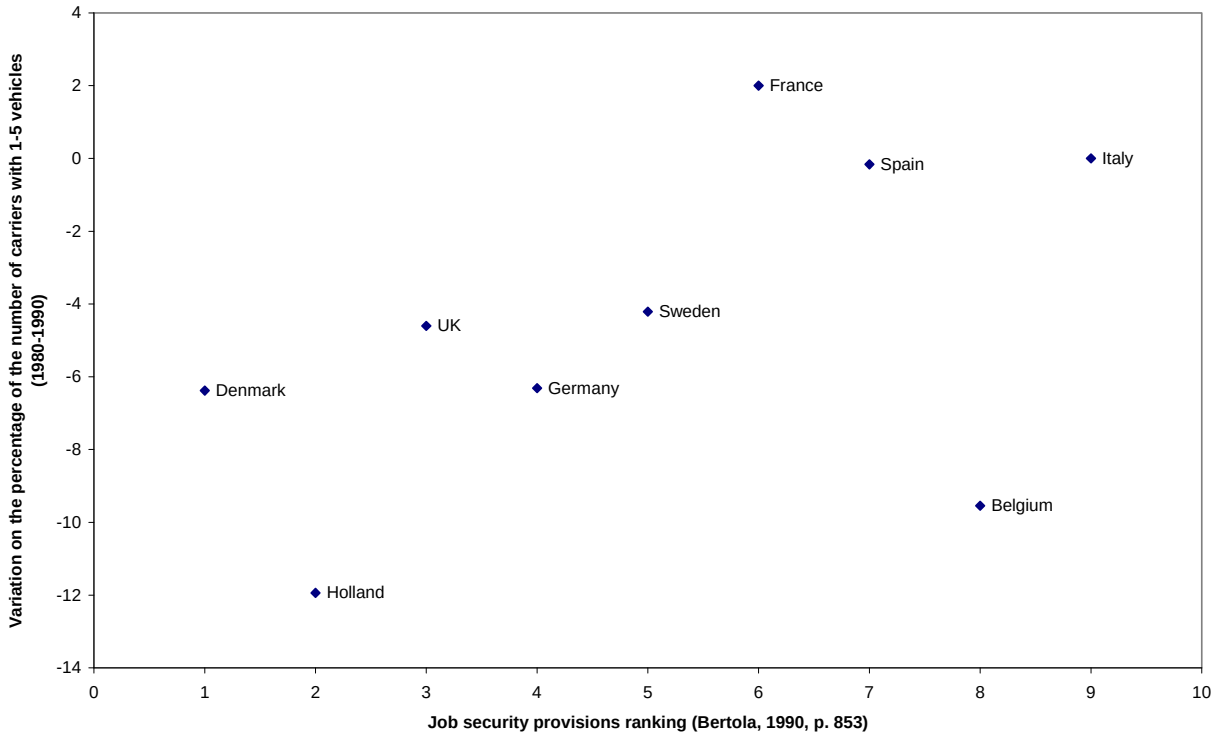
Sources:

[a] Source: For Spain, information from Metra/Seis (1967, 57-58), CSTT (1974, p. 10), MTTC (annual surveys, several years), and MOPT, taken from UPGC (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).

[b] 1 is for the country with fewest job security provisions, and 9 is for the country with most. 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) who uses the same tables as Bertola to build his ranking.

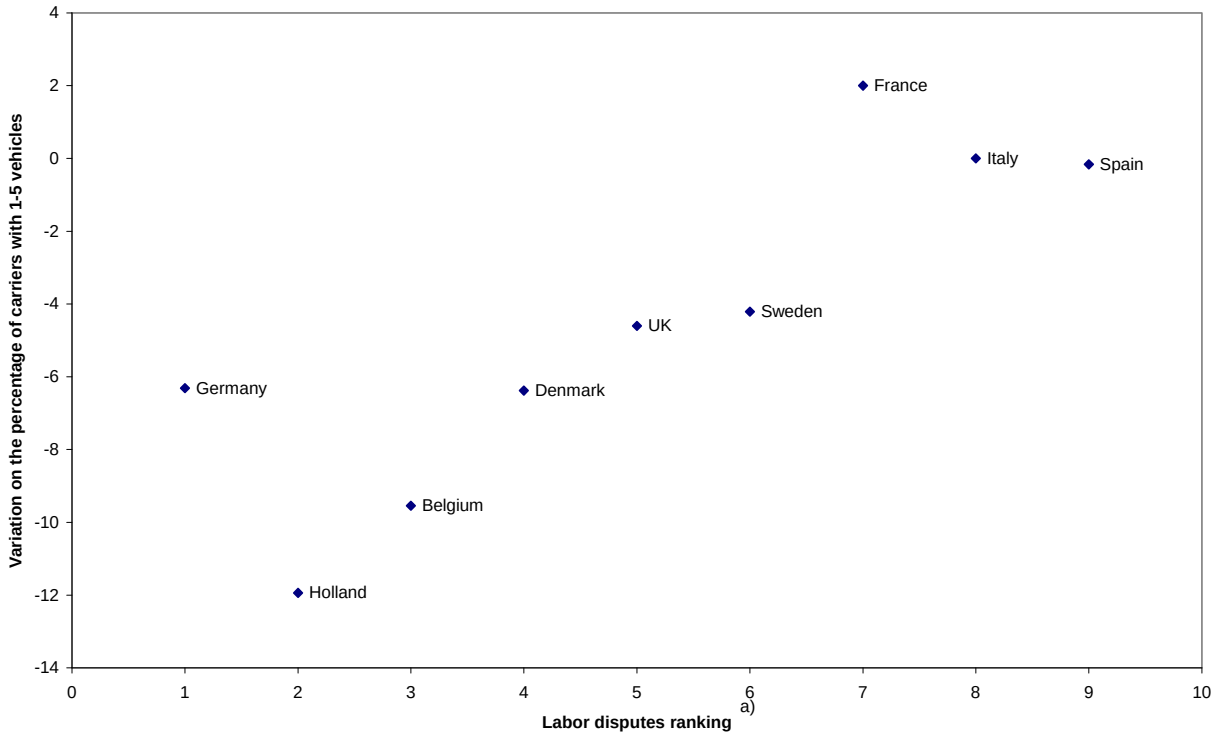
[c] 1 is for the country with fewest labor disputes, and 9 is for the country with most. Based on the number of working days lost per 1,000 employees: Annual average 1988-1997 (except France: 1988-1996). Office for National Statistics (Britain) .

Figure 1. Ranking in terms of job security provisions in relation to changes in fragmentation of small carriers



Source: Table 4.

Figure 2. Ranking in terms of labor disputes in relation to changes in fragmentation of small carriers



Source: Table 4.

Notes

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[1] Palay (1984), Phillips (1991), Pirrong (1993) explain the governance of different freight transactions based mainly on asset specificity and, to a lesser extent, uncertainty and frequency. Nickerson and Silverman (2003a) also test specificity but add coordination difficulties in their analysis of less-than-truck-load trucking. Lafontaine and Masten (2002) question the importance of specific investment and highlight the importance of costly pricing. Finally, Hubbard (2000, 2001 and 2003) and Baker and Hubbard (2003a and 2003b) show the importance of contractibility, quasi-rents, job design, coordination problems and measurement issues, understood as bargaining costs and performance assessment.

[2] Sources: for the US, Bureau of the Census (1997), for the EU, Spanish Ministerio de Fomento and Arthur Andersen (2000, p. 32).

[3] The use of different criteria leads to different numbers, but these differences do not affect our argument. See, for the US, American Trucking Association (1997) and Nickerson and Silverman (2003a, p. 92); for Europe, IRU (2001, p. 8).

[4] We focus on for-hire carriers because this is the largest activity. Almost all private carriers are small businesses that have only one or two vehicles, generally of small size. (See MTTC, 1990, UPGC, 1992, and MOPTMA, 1993, for Spanish data.) Larger manufacturers and retailers integrate only a small percentage of the vehicles they use—they generally subcontract most of them (Bossard Consultants, 1992, and CEL and Andersen Consulting, 1992, p. 95).

[5] The world's two biggest heavy-truck makers (DaimlerChrysler and Volvo) are Europeans and sell their trucks in the US. Their combined 2002 market share was 59% in the US and 47% in Spain (Fahey, 2003, and *El Mundo Motor*, 2002).

[6] This does not mean that the organization of trucking is unaffected by technology. On the contrary, as shown by Baker and Hubbard (2003a and 2003b), information technology has been applied to trucking in two waves with a different impact on organization. The first generation of devices, which were mere 'trip recorders,' allowed employers to monitor drivers more accurately and led to the increased use of company drivers and private carriers. On the contrary, the second generation devices were full-fledged on-board computers and GPS location systems, which, by facilitating coordination, led to an increase in the reliance on owner-operators and for-hire carriers. A second example of the influence of technology is the growth of just-in-time delivery systems which, by creating new hold-up problems, made vertical integration and repeated subcontracting more attractive.

[7] Moral hazard in trucking has been analyzed in detail in the literature, making further comment unnecessary. See, for example, Hubbard (2000), Lafontaine (2000), Lafontaine and Masten (2002), Nickerson and Silverman (2003a) and Baker and Hubbard (2003a and 2003b).

[8] Incentive problems also arise in connection with carriers' decisions when allocating good and bad hauls among owner-operators. These conflicts are attenuated with some contractual patterns, such as minimum guarantee miles, but seem to cause substantial bargaining costs. However, these costs do not seem highly relevant in choosing between company drivers and owner operators because they do not differ much in these two cases under the standard incentive system—they are more a consequence of compensating drivers for measured performance than of the legal form of the transaction. See Lafontaine and Masten (2002).

[9] Estimations are based on fuel efficiency data shown by Nickerson and Silverman (2003a, p. 97). Compare Lafontaine and Masten (2002, p. 5), however.

[10] The problem is related to "temporal specificity", the term used by Masten, Meehan, and Snyder (1991) to identify the costs derived from the difficulties of finding new suppliers of resources at short notice.

[11] Goodson (2000, p. 1) estimates average turnover costs for the US at $3,000 per driver. This cost is probably higher in Europe due to tighter labor regulation, especially for drivers under an employment contract.

[12] See Holmstrom and Milgrom (1991 and 1994), Milgrom and Roberts (1992) and Williamson (1991). Nickerson and Silverman (2003a) find some support to this argument in trucking.

[13] See *Logística & Transporte* (1999, vol. 53, 46-73).

[14] In a test for heteroskedasticity, we are unable to reject the null hypothesis of homoskedastic errors (Breusch-Pagan test = 5.4184).

[15] The influence of the institutional environment on organizational form has been studied recently, among other works, in González-Díaz, Arruñada and Fernández (1998), Arruñada and Vázquez (2003), Nickerson and Silverman (2003b) and Lafontaine and Oxley (2004). Additionally, many other works have analyzed the effect of labor regulation on unemployment, wages, hiring and firing patterns, unionization and so on. Recent example are Heckman and Pagés (2000), Oyer and Schaefer (2002) and Botero *et al.* (2003).

[16] OECD (1992, 178-182) provides some empirical evidence. See also Blau (1987), Pissarides and Weber (1989, p. 28), and McDonald, Dwyer and Wendt (1994, p. 7).

[17] These were firing costs over the period analyzed in the paper (1980-1990). In 1997 they were reduced to 33 days per year worked with a maximum of 24 months' salary.

[18] These substantial differences in labor regulation are well documented in the literature. For example, Emerson (1988) and Bertola (1990) showed these differences in the mid-eighties. For a comparison between labor regulations in Spain and other European countries and those 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.

[19] See World Bank (2004) as well as Botero *et al.* (2003). These indicators are analyzed in Arruñada and Vázquez (2004).

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

[21] Among others, Irrisarri (1987), Peña (1991), CECAM (1992, p. 31), and García Alcolea (1992).

[22] As, for example, in Spain, through Royal Decree 1136/1997 and Ministerial Decree 1939/1997.

[23] See, generally, Williamson (1991), and, about trucking, Fernández, Arruñada and González-Díaz (2000).