

TRANSACTIONAL ALIGNMENT AND GOVERNANCE
STRUCTURES PERFORMANCES :
APPLICATION TO THE BRITISH RAILWAY INDUSTRY.

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(Very preliminary draft. Do not quote)

1. Introduction

In 1993, the vertically integrated monopoly of British Rail was replaced by a web of contractual relationships. The vertical and horizontal unbundling of the former monolithic structure and the privatization of the various rail businesses were expected to bring competitive pressures and thus enhance service quality and reduce costs.

The purpose of this article is to evaluate whether these objectives have been achieved by analyzing the consequences of the rail industry restructuring on the performances of operating companies (TOCs).

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_ We are particularly indebted to M. Davis and S. Nicholls (SRA), R. Kemp (ALSTOM), R. Sellick (Interfleet Technology Ltd), T. Stubbs (Porterbrook Leasing Company) and G. Yarrow (Oxford University) who helped us to collect data and provided useful comments. The usual disclaimer applies.

One of the major hypothesis of transaction cost economics (TCE) is that the performances of an organizational form depend on the alignment of this structure with the characteristics of its transactions (Williamson, 1985). In other words, a governance structure will be efficient in the sense that it minimizes its transaction costs if it is adapted to the attributes of its transactions. Thus, transactions subject to significant contractual hazards will be managed more efficiently by an integrated structure whereas transactions not subject to such hazards will be better organized by a market structure. Therefore the alignment hypothesis suggests that performances of a structure properly aligned to the characteristics of its transactions will be superior to performances of a misaligned one.

In this paper, we propose a test of this alignment hypothesis applied to the British railways industry case and more precisely to the contractual relationships between rolling stock owners and passenger train operating companies. The two questions we therefore explore are : Did the choice of the design of rolling stock contracts rely on TCE predictions ? What are the implications on financial and qualitative performances of a deviation from TCE logic ?

To realize this econometric test, we have built an original database since it gathers information of official and confidential reports published by the rail regulatory agencies and the operating companies as well as information collected from interviews with the various actors of the new railway system.

After a brief description of the new structure of the rail industry in Great Britain (section 2), we develop our analytical framework, based on transaction cost economics hypothesis (section 3). At last, section 4 presents our data and the results of our econometric tests. Our results show that contract duration was partly chosen according to TCE principles and that a transactional misalignment has implications on firms performances.

2. The British railway reform

General structure

The restructuring and privatisation of British Rail (BR) was the last in a series of utilities reforms launched by the Conservatives between 1979 and 1997. The 1992 White Paper “New Opportunities for the Railways” defined a plan for reform which was implemented by the 1993 Railways Act. The objectives of the reform were to “see better use made of the railways, greater responsiveness to the customer, and a higher quality service and a better value for money for the public who travel by rail”¹. In order to reach these goals of service quality enhancement and cost reduction, the government decided to split the former monolithic structure and to isolate each rail business: infrastructure, passenger train service operation and rolling stock ownership². Furthermore, to bring the “management skills, flair and entrepreneurial spirit of the private sector”³ in the rail industry, all these activities were privatised and competition was introduced at all levels, except infrastructure ownership. Thus, the new railway structure is now made of almost 100 companies among which Railtrack is the private owner of all rail infrastructure, 25 train operating companies (TOCs) operate designated passenger train services on a franchise basis, and 3 rolling stock companies (ROSCOs) own and lease out passenger trains to the TOCs. At last, these companies, which coordinate by contracts, are regulated by 2 regulatory bodies, the Strategic Rail Authority (SRA) and the Office of the Rail Regulator (ORR).

¹ *New Opportunities for the Railways.*

² This categorisation is rough because we preferred not to go into details useless to our analysis.

³ *New Opportunities for the Railways.*

Definition of transactions

Provision of passenger train services involves four main transactions :

- Infrastructure transactions : to run trains, TOCs have to buy track access rights to Railtrack ;
- Rolling stock transactions : TOCs also need to lease rolling stock to ROSCOs ;
- Rolling stock light maintenance transactions : these transactions are monitored by the TOCs themselves ;
- Rolling stock heavy maintenance transactions : the ROSCOs are responsible for the heavy maintenance of trains.

Some characteristics of infrastructure transactions (specificity and frequency) determine the characteristics of rolling stock transactions. Indeed, technical features of rail infrastructure (gauge, electric supply mode, signalling systems) impose constraints on rolling stock. Thus, when TOCs operate on technically specific tracks, the trains they lease must be adapted to these features and are consequently highly specific⁴ as well. Infrastructure transactions and rolling stock transactions have then the same level of assets specificity.

As for frequency, it is clear that the frequency of infrastructure transactions (number of track access rights needed) affects the frequency of rolling stock transactions (number of trains leased). On the contrary, the level of uncertainty of these transactions is different. Since Railtrack and the ROSCOs do not evolve in the same environment, the uncertainty surrounding their behaviour (endogenous uncertainty) differs. Indeed, Railtrack is a regulated monopoly whereas ROSCOs are competitors not subject to direct regulation.

⁴ More on this later.

However, since we are mostly interested in the incidence of assets specificity on contractual choice and firms performances, we assimilate infrastructure transactions and rolling stock transactions in order to focus on rolling stock transactions in our study.

As already mentioned, rolling stock transactions are monitored by leasing agreements signed between TOCs and ROSCOs. We could not have access to the rolling stock leasing contracts but we were told by trains leasing companies that a good approximation of the duration of these contracts would be the length of TOCs franchise agreements⁵. Table 1 summarizes the distribution of contractual length among the 25 train operating franchisees.

Table 1. Distribution of contractual length

Contract duration (in months)	Number of observations
60	1
84<-<87	13
90	4
120	2
180	5

To create a market structure and foster competition regulation agencies designed short-term contracts at the time of the reform. Indeed, the franchise agreements signed by the TOCs vary between 5 to 15 years⁶, and the rolling stock leasing contracts between the TOCs and the ROSCOs are of 8 years in average⁷. Consequently, the contracts agreed by these companies are

⁵ These contracts, signed between the TOCs and the SRA, are public and can be consulted.

⁶ Source : Office of the Passenger RAil Franchising (OPRAF, the former SRA).

⁷ Source : Interviews with Rolling Stock leasing Companies (ROSCOs).

generally shorter than the physical lifetime of the rolling stock (30 years)⁸. But the problem is not per se the gap in duration⁹; it is the fact that leasing contracts do not match the features of rolling stock and in particular their high level of specificity. Indeed, in Great Britain the rolling stock is line-specific and consequently locomotives and multiple units are not interchangeable¹⁰. Moreover, not only are investments in British trains physically specific but they are also heavy dedicated investments into expensive equipment. The specificity of rolling stock assets is then both physical and dedicated.

At last, our analysis of organizational choice and firm performances must also take into account rolling stock maintenance transactions. Indeed, train maintenance is essential to service quality. If light maintenance (e.g. cleaning, replacing windows and seats) improves trains comfort and thus sends a signal of increased quality to consumers as well as to regulators, heavy maintenance (e.g. repairing trains engines) has a much bigger impact on passengers trains service quality since it clearly influences rolling stock reliability and punctuality.

The 1993 reform introduced a vertical separation between trains heavy maintenance, light maintenance and service operation. The first year of the reform, the heavy maintenance of a high proportion of the fleet was insured by the ROSCOs (or their subcontractors). But, trains heavy maintenance requires investments in durable equipment (depots and maintenance facilities) as well as investments in staff training. And, very quickly, TOCs have reintegrated the heavy maintenance activity (Table 2).

⁸ An example provided by Ljungqvist and Holt (1998 :11) reveals that the average lease period under contract for Angel Trains (one of the 3 ROSCOs) is around five years, while the average remaining lifetime of its rolling stock is 17 years, leaving around 12 years of residual risk.

⁹ Indeed, this exists in many leasing industries, e.g., car rental.

¹⁰ For details on this, see Ménard and Yvrande 2001, pp 5-6.

Table 2. The monitoring of heavy maintenance transactions

Year	% of the fleet for which heavy maintenance is integrated (insured by TOCs)¹¹
1996-1997	19,6%
1997-1998	22,6%
1998-1999	28%
1999-2000	32,4%

3. Our analytical framework

The “ empirical success story ” of TCE lies on cross-sectional studies which show that firms chose the governance structure of their transactions according to transaction cost principles. In other words, these empirical researches¹² investigate the degree to which organisational forms and contractual design are aligned to transaction features (specificity, uncertainty and frequency) and thus the degree to which they minimize transaction costs. The results of these studies show strong support for TCE predictions as regard governance structure choice. However, there is less evidence on the performance implications of TCE. Indeed, the consequences on firms performances of the alignment hypothesis have not been tested very much (Silverman, Nickerson and Freeman, 1997 ; Ménard, Saussier, 2001 ; Mayer, 2000 ; Sampson, 2000). Consequently, as Joskow writes (1991 : 81-82), we do not “ know how much we lose by going from the best to the next best [organizational arrangement] ”.

On the other hand, there are very few empirical and theoretical works on the reform of British Rail (Affuso & Newbery, 2000). Since the restructuring of the railway industry is very complex, a large part of the literature on this subject is dedicated to the description of the reform and of the new structure (Preston & Root, 1999, Freeman & Shaw, 2000).

¹¹ Data provided by engineers of the Interfleet Technology Group.

In order to investigate the determinants of contractual length and the resulting performances of British rail operators, we develop propositions based on the hard core of transaction costs economics i.e. the hypothesis that a governance structure have better performances if it fits the specificity of the transaction it supports.

Proposition 1 : The more a TOC requires technically specific rolling stock to operate passenger trains services, the longer its rolling stock leasing contracts.

Indeed, TCE predict that the existence of specific-relationship assets creates a bilateral dependence which increases the risk of opportunistic behaviour. In such a situation, safeguards must be implemented and contracts become increasingly complex and costly. That is why, for a high level of assets specificity, the advantages of a hierarchical structure prevail : TCE advocates to chose an integrated governance structure because its capacity to adapt to contingencies while securing a relationship characterized by a high level of dependency largely compensates the lost in incentives. On the other hand, operating transactions through a market structure is preferred for a low level of assets specificity, since bureaucratic costs of the firm are high while markets provide powerful incentives and allow economies of aggregation.

Yet, despite the high level of rolling stock assets specificity, the initiators of the British rail reform chose a market type structure, as described above, thus creating a discrepancy between the contractual design (and particularly the duration of the contracts imposed) and the initial characteristics of the transactions they are supposed to monitor. TCE suggests that in this situation of misalignment between a contract and its accompanying governance mechanisms on

¹² See Shelanski and Klein (1995) and Boerner and Macher (2000) for a review of this literature.

one hand, and the characteristics of the transaction at stake on the other hand, transaction costs are not minimized. The governance structure imposed by the regulator is thus inefficient and the performances of firms whose transactions are not properly aligned to their features are affected. The Williamson's misalignment hypothesis indeed suggests that proper alignment of transactions enhances performances (Williamson, 1985 : 22-23). A firm whose transactions are aligned to their characteristics will then enjoy better performances than a firm who does not adhere to transaction cost principles. Our second proposition is thus the following :

Proposition 2 : The more misaligned rolling stock transactions of a firm, the worse its performances.

This second proposition is loose since performances of utilities providers like TOCs include several different dimensions. Schematically, one must distinguish financial performances and quality performances.

The few empirical studies investigating the misalignment hypothesis analyze the impact of alignment on financial performances of firms, measured by profit margins (Mayer, 2000), or firms survival (Silverman and al., 1997). In our paper, we focus on costs involved by train service operation i.e. operating costs borne by TOCs¹³. In the database we had access to, operating costs refer to the sum of wages, auditors' remuneration, rolling stock lease charges, track access charges and property rental. In other words, operating costs include all costs except depreciation costs and interests. Considering that auditors' remuneration corresponds to transaction costs, and that a part of TOCs' employees (and consequently a part of the wages paid by TOCs) are

¹³ Since available data on operating profit margin are incomplete, we had to focus on costs.

responsible for the monitoring of the various contracts signed by TOCs, we assume that operating costs correspond to the sum of transaction costs and production costs borne by TOCs. Therefore, we are able to sharpen our second proposition.

Proposition 2.1 : The more misaligned rolling stock transactions of a TOC, the higher its operating costs (production costs + transaction costs).

A major issue in utilities reforms concerns service quality. If the link between transactional alignment and financial performances (in our case, cost reduction) has been proved to be accurate, it seems more difficult to establish a relationship between transactional alignment and qualitative efficiency. Indeed, it is far from obvious that a firm minimizing the sum of its production costs and transaction costs provides a better service than a firm whose transactions are misaligned.

On the one hand, it is often assumed that there exists an adverse effect between quality and production costs i.e. that it is not possible to improve quality and reduce costs at the same time (Hart, Shleifer, Vishny, 1997). Intuitively, it is indeed easy to conceive that quality depends, at least partly, on financial constraints, and therefore that firms able to bear high production costs provide better services than companies obliged to economize on costs. Therefore, one can isolate the effect on qualitative performances of an increase in production costs. However, on the other hand, the impact of transaction costs on quality seems more difficult to evaluate. One can consider that the transaction costs a misaligned firm must bear to adapt its contracts to contingencies, negotiate new clauses or implement safeguards limiting risks of opportunistic behaviours are “ useful ” expenditure if they actually increase contracts adaptability and reduce

risks of opportunism, thus improving quality. Indeed, it seems realistic that a TOC succeeding in negotiating investments in new trains (supposed to be more reliable than old ones) with its rolling stock lessors or managing to reach agreements that define more clearly ROSCOs liabilities and settle detailed compensations schemes in case of trains failures will improve its qualitative performances. Therefore the transaction costs granted by this TOC can allow better passenger train service quality. But, one can conversely imagine that a firm makes the same financial effort vainly i.e. that despite the transaction costs it lays out to reduce contractual incompleteness, it does not manage to do so and its co-contractors can still adopt opportunistic behaviours that can be prejudicial to quality. In this case, high transactional expenditure do not allow to improve qualitative performances. Therefore, the effect of transaction costs on service quality is ambiguous since it depends on the level of endogenous uncertainty of transactions and on the capacity of firms to delimit contingencies and to negotiate with their partners.

Consequently, the cumulated effect of production costs and transaction costs on qualitative indicators remains indeterminate. If transactional expenditure actually permits to improve contractual completeness, thus reducing risks of opportunism, then a firm that does not minimize the sum of its production and transaction costs (i.e. a misaligned firm) can improve its qualitative performances. But, if a firm's transaction costs have no effect (or a negative effect) on its cocontractors' opportunistic behaviours and thus on its qualitative performances, we cannot determine the impact of misalignment on service quality.

These syllogisms lead us to a second version of proposition 2.

Proposition 2.2 : The more misaligned rolling stock transactions of a company, the better its qualitative performances, if the company has negotiating power.

Lastly, another goal of our analysis is to evaluate how far vertical integration of heavy maintenance transactions influences qualitative performances of TOCs. Because of the size and type of investments required for trains heavy maintenance (see above), opportunistic behaviours are expected to occur. The solution advocated by TCE in the presence of such risks is to integrate heavy maintenance transactions.

Proposition 3 : The more a TOC integrates heavy maintenance transactions, the better its qualitative performances.

4. Data and empirical analysis

Test 1

The first step in our study consists in investigating the determinants of rolling stock leasing contracts duration. As already mentioned, the British rail reform imposed a contractual design to actors of the new structure. Therefore, we are unable to verify whether firms have selected their governance structure consistent with transaction cost arguments as it is done in many empirical tests (Sampson, 2000).

However, we can analyze the determinants of the regulator's choices, and the first question we would like to answer is the following : on which basis was the franchise contracts duration determined ? Was there a logic behind the choice of contractual length made by the regulator ?

Classical TCE hypothesis recommend that transactions requiring high levels of dedicated investments are managed by long term contracts. Indeed, to be incited to invest in heavy durable investments, firms must be insured that they will recoup their expenditure. In our case study, we

can expect that franchises requiring renewal or refurbishment of their rolling stock, e.g. high amounts of investments, were given longer contracts. In other words, the more franchisees must commit in investing, the longer their franchise agreement.

A corollary to this assumption relates to the age of the rolling stock fleet. A franchise inheriting an old trains fleet will probably have to invest in a near future in order to renew its fleet. Consequently, longer contracts are expected to be set for franchisees whose rolling stock fleet is old.

At last, the level of physical specificity of rolling stock assets is also intended to have an impact on contracts duration. As said above, British trains are not homogeneous. Diesel trains must be distinguished from electric ones, and among this latter category, one must separate alternative current trains from direct current trains. Indeed, each type of train is adapted to the part of the network it runs on and only a small proportion of the entire fleet (8%) is “ compatible with both the overhead-powered and the third-rail systems used in different parts of the country ”¹⁴. Hence, trains are not interchangeable i.e. each type of train can not operate on different tracks. The technical specificity of British trains should be taken into account in the design of franchise contracts. More precisely, TOCs inheriting highly technically specific assets should have longer contracts than franchisees operating a more redeployable fleet (for instance dual voltage or diesel multiple units).

To test these assumptions, we used official data provided by the SRA¹⁵ and the ORR¹⁶ as well as information contained in rolling stock fleet books¹⁷. Our data set consists of all 25 franchises (passenger TOCs) from the start of their operation (financial year 1996-1997) until the end of the

¹⁴ National Audit Office (1998).

¹⁵ SRA Annual Reports 1997, 1998, 1999, 2000.

¹⁶ ORR, Review of the Rolling Stock Market, February 1998.

last recorded financial year (1999-2000). For this first test, we only use data of the first year of operation i.e. 1996-1997. For each franchise, we know the duration of its contract in months (DUR) ; the level of investments in rolling stock renewal and refurbishment required in £m (INV), which is our proxy of dedicated investments specificity ; the average age of its fleet in years (AGE) and the number of interchangeable trains (LSPE)¹⁸ and specific trains (HSPE) it operates, which corresponds to our proxies of technical specificity of rolling stock assets. The results of our test¹⁹ are the following :

Table 3. Determinants of franchise contracts duration.²⁰

Dependent variable : DUR	
Independent variables	Coefficient
INV	0,182*** (4,823)
AGE	3,072* (1,843)
AGE ²	-0,054** (-2,121)
LSPE	-0,089* (-1,880)
HSPE	-0,009 (-0,754)
Constant	71,409*** (3,394)
<i>R²=0,7196</i> <i>Adjusted R²=0,6458</i> <i>Number of observations : 25</i>	

The results of this very simple regression suggest that the regulator did not choose the length of contracts in a completely arbitrary way. Indeed, almost all our assumptions seem to be confirmed,

¹⁷ British Railways Rolling Stock Guidebooks 1997, 1998, 1999, 2000.

¹⁸ Interchangeable trains refer to diesel multiple units and dual voltage trains i.e. rolling stock with a low level of technical specificity.

¹⁹ For this test and the following ones, we use the OLS method of estimation, but the TOBIT method give similar results.

²⁰ *** p<0,01 ; ** p<0,05 ; * p<0,10.

except the one dealing with highly specific assets. It seems indeed that the regulator did not take into account the presence of highly specific rolling stock assets when he determines contractual length. This omission could be a source of transactional misalignment.

We also could bring to the fore the existence of a non linear effect of the variable AGE, indicating that the average age of the fleet has a positive but decreasing effect on the duration of contracts.

Test 2.1

In the second step of our analysis, we intend to test our “ misalignment hypothesis ” i.e. to verify whether a mismatch between contract length and assets specificity has negative implications on firms costs performances (proposition 2.1) and positive impact on qualitative efficiency (proposition 2.2). In parallel, we intend to test the effect of vertical integration on service quality (proposition 3).

To do these tests, we first had to construct a misalignment variable.

The observations of the entire population (25 TOCs) for the 4 available periods (1996-1997, 1997-1998, 1998-1999 and 1999-2000) allowed us to repeat test 1 for each period. In other words, for each financial year, we estimated the impact of the independent variables used for test 1 on contract duration. Then, we built a misalignment variable as follows :

$$\text{MISALIGN} = \text{Absolute value of } (DUR_{\text{obs}} - DUR_{\text{theo}}),$$

with DUR_{obs} the observed duration of contracts and DUR_{theo} the theoretical duration of contracts i.e. the duration estimated by the model.

The MISALIGN variable thus measures the difference in absolute terms between the “ real ” contractual length and the duration predicted by the theory. For example, if a rolling stock leasing

contract has a predicted length of 120 months but the regulator set a duration of 85 months, then MISALIGN will be Absolute Value of $(85-120) = 35$. The lower the value of MISALIGN, the more aligned the duration of contracts according to TCE.

Of course, the length of contracts does not change from one year to another. On the other hand, independent variables (amount of investments, age of the fleet, size of interchangeable or specific fleet) vary. Therefore, it can sound irrelevant to estimate the effect of variables chosen in 1999, for instance, on the duration of contracts determined in 1997. But, this method is just a step to help us to construct a misalignment variable. Indeed, if the observed duration of contracts does not vary from one period to another, transactional characteristics do. Therefore, theoretical duration changes and so does the misalignment level of contracts.

We are now able to test proposition 2.1. To do so, we use the operating costs per train kilometre²¹ (OPCOST) as the dependent variable of our regression. Of course the important independent variable is MISALIGN, as constructed above. We also add a variable measuring the degree of vertical integration of trains heavy maintenance (INTEG) i.e. the percentage of a TOC's fleet for which heavy maintenance is integrated that is to say insured by the TOC itself. On the other hand, to isolate the effect of assets specificity on costs, we introduce the same variables LSPE and HSPE as those used in regression 1 (table 3). At last, we control the effect of the demand for train services by incorporating PASSKM²², INTERCIT and COMUT²³ in our regression.

²¹ Source : TAS Rail Industry Monitor 2000.

²² PASSKM measures the number of passenger trains (in millions) and is the usual indicator of demand in transport economics. It is calculated by multiplying the number of passengers carried by the average distance of a passenger journey.

²³ There are three categories of train service activity : intercity, comuter and regional services. For each one, we created a 0/1 dummy variable. Therefore, the variable INTERCIT takes the value 1 when the TOC is an intercity operator and 0 otherwise ; the variable COMUT takes the value 1 when the TOC provides comuter services and 0 otherwise ; and the variable REG takes the value 1 when the TOC is a regional operator.

Table 4. Impact of misalignment on costs performances

Dependent variable : OPCOST	
Independent variables	Coefficient
MISALIGN	0,040** (1,904)
INTEGT	0,794 (0,655)
LSPE	-0,013*** (-3,875)
HSPE	-0,003*** (-3,398)
PASSKM	0,002*** (5,281)
INTERCIT	4,074*** (3,834)
COMUT	0,554 (0,751)
Constant	9,912*** (9,091)
$R^2=0,7606$ $Adjusted R^2=0,7356$ <i>Number of observations=75</i>	

Our results substantiate proposition 2.1 since MISALIGN has a positive effect on operating costs. The more misaligned the duration of a firm's contract, the higher its operating costs and the worse its financial performances. This is consistent with the basic TCE hypothesis that a misaligned governance structure does not minimize the sum of its transaction costs and production costs. Nevertheless, the impact of misalignment on operating costs per train kilometre is relatively low ; a misalignment of 15 months²⁴ increases operating costs by £ 0,6 per train kilometre while the average operating costs per train kilometre are £ 13. This may be due to the fact that operating costs actually do not incorporate all the transaction costs that TOCs must bear.

²⁴ The average estimated misalignment is 15,7 months.

And this is consistent with the fact that vertical integration of rolling stock heavy maintenance by TOCs has no influence on their operating costs. The INTEG variable is indeed non significant and one can think that the transaction costs vertical integration allows to save are not included in our measure of total costs, i.e. OPCOST.

On the other hand, the composition of a TOC's fleet determines the level of its costs. Indeed, a company operating interchangeable trains bears lower operating costs than a TOC using highly specific rolling stocks. The more a TOC invests in standard trains²⁵, the more it aligns the specificity of its rolling stock transactions to the duration of its contract and thereby the more it minimizes the sum of its transaction costs and production costs.

Lastly, the demand for passenger train services, measured by PASSKM, has a positive impact on operating costs. When demand for passenger services increases, operating costs rise. Furthermore, INTERCIT and COMUT allow us to differentiate the effect of each of the two factors composing demand, i.e. the number of passengers carried and the average distance of a passenger journey. Indeed, one can consider that INTERCIT captures the effect of distance since intercity operators provide long distance services (in comparison to regional companies). On the other hand, COMUT isolates the effect of the number of passenger since commuter operators carry more passengers than other operators (and particularly regional operators). Our results show that, in the variable PASSKM, it is actually the distance which increases operating costs whereas the number of passengers carried has no impact on them.

²⁵ The rolling stock assets are actually acquired on TOCs' order by the ROSCOs, who then lease the assets to the TOCs for the entire duration of their contracts. Thereby, TOCs repay the investment.

Tests 2.2 & 3

To test propositions 2.2 and 3, we had to choose a performance indicator of service quality. There are several ones but, according to the regulator and to consumers²⁶ one of the most crucial indicator of quality is trains punctuality. Thus we have chosen, as a proxy of qualitative performance, the punctuality indicator as it is reported by the SRA²⁷. This indicator measures the percentage of trains that arrived within five minutes of timetabled time²⁸ and is our dependent variable (PUNCT).

The independent variables of this regression are MISALIGN (as described above), OPCOST (operating costs per train kilometre in £) and INTEG (percentage of a TOC's fleet for which heavy maintenance is integrated).

To capture the effect of rolling stock technical specificity on quality we incorporate the variables LSPE (lowly specific assets) and HSPE (highly specific assets).

At last, we introduce the same control variables as in regression 2 on the demand for train services (number of passengers trains in millions, PASSKM) and its components (INTERCIT and COMUT).

Results of our regression are provided in table 5.

²⁶ According to National Passenger Surveys, the top five factors which are of most importance to passengers are, in decreasing order, the overall opinion of journey, the punctuality/reliability of services, the frequency of trains, the value for money and the quality of information about train times and platforms provided.

²⁷ In its annual reports.

²⁸ To read our results more easily, we have expressed punctuality in points. Thus, for a punctuality rate of 90%, for instance, the value of PUNCT we reported in the database is 90.

**Table 5. Impact of misalignment and heavy maintenance integration
on qualitative performances**

Dependent variable : PUNCT	
Independent/Control variables	Coefficient
MISALIGN	0,0669*** (2,456)
OPCOST	-0,0492 (-0,335)
INTEG	4,0248*** (2,757)
HSPE	-0,0002 (-0,127)
LSPE	0,0036 (0,784)
PASSKM	-0.0012*** (-2.349)
INTERCIT	-3.3018*** (-2.344)
COMUT	-1.2132 (-1.365)
Constant	92.0683*** (47.073)
$R^2=0,5358$ $Adjusted R^2=0,4796$ <i>Number of observations=75</i>	

These results support some of our hypothesis.

First, our results show a clear impact of MISALIGN. The more misaligned the duration of a TOC's contract, the better the punctuality of its trains services. Indeed, a misalignment of 10 months improves the punctuality indicator by 0,6 point This supports proposition 2.2 and indicates that TOCs spending a lot to reduce the incompleteness of their rolling stock leasing contracts and the resulting risks of opportunistic behaviours from the ROSCOs succeeds in doing so and consequently ameliorate their qualitative performances. Transaction costs have thus a positive impact on quality.

On the other hand, operating costs per train kilometre (OPCOST) are not a significant variable in our model. Assuming that these costs incorporate both production and transaction costs, as explained above, this result, combined with the previous one (positive impact of transaction costs on punctuality), suggests that the effect of production costs on punctuality remains indeterminable. If the sum of production costs and transaction costs has no clear influence on qualitative performances while the isolated effect of transaction costs on punctuality is positive, then production costs do not always have the same effect on quality. An increase in production costs sometimes improves qualitative performances and sometimes deteriorates them so that it is impossible to know how quality varies when production costs rise. Indeed, if one easily admits that a raise of production costs (for instance a raise of drivers' wages) induces better service quality, in the British rail utilities case one can also find some production costs deteriorating qualitative performances. A detailed analysis of the distribution of operating costs reveals that production costs borne by TOCs include track access charges paid to Railtrack (the infrastructure monopoly) and rolling stock lease charges paid to the ROSCOs (the trains lessors). These charges, which compose a substantial part of the revenue of Railtrack and the ROSCOs, are mainly fixed²⁹ in the sense that they do not depend on the quality of the goods and services provided by Railtrack or the ROSCOs. A largely developed consequence of this situation (Rail Privatisation News, May 29 1997 ; Baritaud & Lévêque, 1998 ; Grant, 2000) is a lack of incentive to invest in infrastructure for Railtrack and in rolling stock for the ROSCOs. Since their income is guaranteed whatever their level of investment, these companies are not incited to improve or at least stabilize the quality of rail infrastructure and rolling stock. Consequently, the network

²⁹ According to Buehler, Schmutzler and Benz (2000, p.4), “ over 90% of Railtrack's access revenues are fixed ”. As for ROSCOs' revenues, a report by the National Audit Office (1998), explains that rolling stock lease prices were

deteriorates and the fleet gets older and thus less reliable, which means, for TOCs, poor service quality (the more TOCs pay high fixed charges, the more they insure a rent to their co-contractors who then adopt opportunistic behaviours prejudicial to service quality), and illustrates that some production costs can have a negative effect on service quality.

Second, TOCs that have integrated the heavy maintenance activity have better punctuality performances³⁰. This confirms proposition 3 and indicates that, in the presence of highly specific investments (maintenance equipment, technical know how), vertical integration can be an appropriate solution to avoid risks of opportunism and allow quicker adaptations to contingencies. Moreover, the non significance of the variables HSPE and LSPE points at that punctuality is not linked to trains technical specificity but rather to the way heavy maintenance transactions are monitored.

At last, PASSKM is significant and its coefficient shows that the demand for passenger train services has a negative impact on punctuality. The more passengers kilometres, the worse the punctuality. Furthermore, we can isolate the effect on punctuality of an increase of the number of passengers from the effect on punctuality of a lengthening of the average journey. As our results on the variables INTERCIT and COMUT indicate, it is the average distance of passenger journeys which influences the level of qualitative performances and not the frequency of trains. To be a commuter operator, i.e. to provide high frequency services, rather than a regional company, is not indeed an explanatory factor of quality. On the contrary, to provide intercity services, i.e. to offer longer distance services than regional operators do, has a clear negative impact on punctuality.

pushed at a relatively high level by the regulator in the initial lease contracts in order to attract investors in ROSCOs through the perspective of a high and rapid rate of return.

5. Conclusion

Very few empirical works have analyzed the “Williamson’s misalignment hypothesis” that a discriminating alignment of governance with transactions improves performances. Moreover, to our knowledge, there is only one available econometric study investigating the consequences of the British Rail reform (Affuso & Newbery, 2000).

This article proposes to fill this gap by providing an econometric test of the misalignment hypothesis applied to the contractual relationships between train operating companies (TOCs) and rolling stock lessors (ROSCOs). The original database we use allows us to address two main issues : Was there a transaction costs economics logic behind the choice of contractual length ? What are the consequences on performances of a deviation from TCE predictions ?

Even though our paper is still exploratory, with more data to incorporate in future works, our results are stimulating. Whereas most of the commentators of the British rail reform assert that the choice of the duration of contracts made by the regulator was groundless, we have found that the choice of contractual length have partly relied on a TCE reasoning. Nevertheless, there is a distortion between what was chosen and what the theory advocates. Our results support the idea that this theoretical mismatch has consequences on firms performances. On the one hand, the misalignment increases firms’ costs, thereby deteriorating their financial performances. On the other hand, it positively influences firms’ qualitative performances. Further work is to be done particularly in the collection of reliable data on operating costs and in the introduction of other quality performances indicators. We therefore expect more results.

³⁰ Indeed, a TOC that insures the heavy maintenance of 100% of its rolling stock fleet increases its punctuality

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