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## **Allocation Of Residual Income Rights Under Internal Governance Empirical Results from the Hungarian Trucking Industry**

### **Abstract**

The paper offers a property rights and monitoring cost explanation for the allocation of residual income rights between the carriers and truck drivers under internal governance. First, by applying property rights theory, we argue that the structure of residual income rights depends on the importance of noncontractible (intangible) assets of the truck driver to generate a residual surplus. The more important the truck driver's intangible knowledge assets, the more residual income rights should be transferred to him. In addition, we controlled for the monitoring costs as an additional explanatory variable of the allocation of residual income rights. According to agency theory, the higher the variable proportion of the driver's income, the higher the monitoring costs. These hypotheses were tested by using data from the Hungarian trucking industry. The empirical results are supportive of the hypotheses.

### **Keywords:**

Governance Structure, Contract Design, Ownership Structure, Intangible Assets, Residual Income Rights, Monitoring Costs.

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## 1. Introduction

In previous years a large number of researchers in organizational economics examined the governance structure between carriers and drivers in the trucking industry (Hubbard 1999; Baker & Hubbard 2000; 2003; Fernandez et al. 2000; Lafontaine & Masten 2001; Nickerson & Silverman 1998, 2002). They tried to answer the question if the truck driver should be an independent owner-operator (market governance) or a company driver (internal governance). However, they do not investigate the allocation of residual income rights (i.e., the mix between the fixed and variable incomes of the drivers) under a given governance structure. Starting from this gap in the literature, the objective of our paper is to develop a property rights and monitoring cost explanation of the allocation of residual income rights between the carrier and the truck driver under internal governance.

According to property rights theory (Barzel 1997; 2000; Hart & Moore 1990), the allocation of residual income rights in the contractual relation between the truck driver and the carrier depends on the importance of driver's intangible assets to generate a residual surplus. The carrier faces the problem of maximizing the residual income when it is at least partly dependent on noncontractible assets of the driver. If the assets of the truck driver represent proprietary knowledge that cannot be easily specified, the contract provisions are incomplete. The present article focuses on a property rights explanation of the residual income rights in contractual relations in the Hungarian trucking industry by emphasizing the role of the driver's intangible assets as determinant of his fraction of residual income rights. The core idea is that the proper structure of residual income rights creates incentives to invest in the use of his intangible knowledge assets. We develop the hypothesis that the driver's fraction of residual income rights (measured by the variable proportion of his total income) depends on the importance of his knowledge assets to generate an *ex post* surplus. In addition, we controlled for the monitoring costs as an additional explanatory variable of the allocation of residual income rights. According to agency theory, the higher the variable proportion of the driver's income, the higher the monitoring costs. These hypotheses were tested by using data from the Hungarian trucking industry.

The paper is organized as follows: Section two reviews the recent literature concerning the allocation of ownership rights in the trucking industry. In section three we develop the property rights and monitoring cost explanations for the structure of residual income rights in contractual relations. Finally, we test the hypotheses that the structure of residual income rights depends on the importance of the driver's intangible assets and the extent of monitoring costs. Both hypotheses are supported by empirical results in the Hungarian trucking sector.

## 2. Related Literature

Recent literature on the allocation of residual income rights in the trucking industry focuses on the explanation of company drivers versus independent owner-operators by applying transaction cost, strategic positioning and property rights reasoning. Nickerson and Silverman (1998, 2002) integrate in their studies Porters' competitive framework (Porter 1980, 1985, 1996) of strategic positioning and Williamsons' transaction cost economics (Williamson 1985) in order to explain the existence of different organizational forms – in particular, different types of employment relations in the trucking industry. According to Nickerson and Silverman, a firm's strategic positioning choice has far-reaching implications for the profile of assets it needs to assemble and the hazards to which these assets are exposed. The asset profile forms the basis of a firm's ability to attract and serve particular types of customers. Thus carriers choose organizational structures – in particular the use of

company drivers or independent owner-operators – to economize on transaction costs. In addition, Fernández, Arrunada and González (2000) argue that drivers accumulate knowledge about routes, specific characteristics of customers, the vehicles, the services offered by the contracting firm and the communication system used. They predict that a carrier is more likely to employ company drivers, as opposed to independent owner operators, as the degree of carrier-specific knowledge increases. Furthermore, based on Hart and Moore's approach, Hubbard (1999), Baker and Hubbard (2000) argue that the ownership patterns in trucking result from the non-contractibility of specific assets. Owner-operators are residual claimants who invest more in specific assets to generate a residual surplus through the use of their trucks. Thus, owner-operators are used for hauls where non-contractible decisions that affect the *ex post* surplus are important. In addition, in the late 1980s the adoption of on-board-computers improved the contractibility of decisions and thus led to less independent contracting and larger firms in the trucking industry (Baker & Hubbard 2003).

More recently, Lafontaine and Masten (2001) argue that vehicle ownership, which defines a driver's status as an owner operator or company driver, varies mostly with driver characteristics. Driver ownership of trucks does appear to be a function of driver wealth and experience (years driving trucks), marital status, and non-driving family income. They find that truck ownership is not related to vehicle types (as trucks are prototypical non-specific assets) but, rather, depends on individual driver characteristics such as experience and access to other income.

In sum, these studies offer different explanations of the ownership structure between the carriers and the drivers (as independent owner-operator or company driver). However, they do not investigate the specific allocation of residual income rights (the mix of fixed and variable income of the drivers) under a given governance structure. Starting from this gap, we answer the question how the residual income rights are allocated between the carrier and the driver under internal governance. Based on James' arguments, this is a first step in contract research to differentiate between the efficiency effects of contract provisions under a given governance structure from the efficiency effects of different governance structures (James 2000).

### **3. Theory Development**

#### **3.1. Property Rights View**

According to property rights theory, the asset characteristics relevant for the determination of residual income rights in contractual relations are their degree of intangibility (Brynjolffson 1994; Hart & Moore 1990; Hart 1995). Applied to the trucking industry, our property rights view focuses on the explanation of the allocation of residual income rights between the carrier and the truck driver under internal governance by emphasizing the role of the driver's intangible assets as determinant of the variable fraction of the driver's income (residual income rights).

What are the intangible assets of the drivers in the trucking industry? The driver's intangible assets refer to his "knowledge of the particular circumstances" (Hayek 1945, 524) concerning loading, unloading and handling the goods, as well as his knowledge of the routes and the customer characteristics that have an important non-contractible (tacit) component (Fernandez et al. 2000; Baker & Hubbard 2000; Lazaric & Marengo 2000; Teece 2000). How are the residual income rights allocated between the carrier and the driver? The distribution of residual income rights depends on the importance of intangible assets to create a residual surplus. If the driver's intangible assets are high, he should have a relatively high variable fraction of his total income; and if the driver's intangible knowledge assets are low, he

should have a relatively large fixed fraction of his total income. Therefore, given the intangible assets of the driver, the carrier transfers a fraction of residual income rights to the truck driver to increase the driver's incentive to efficiently use his specific knowledge. Hence the carrier's residual income rights are diluted by the payment of a mix of fixed and variable component of income, and the driver's residual income rights are strengthened by the variable component of his total income. The property rights view of the allocation of residual income rights between the driver and the carrier can be stated by the following proposition: The more important the driver's intangible assets to generating any residual surplus are, the more residual income rights should be transferred to him. The following testable hypothesis can be derived from this approach:

H1: The driver's proportion of residual income rights is positively related to the extent of his intangible assets.

### **3.2. Monitoring Cost View**

According to agency theory (Jensen & Meckling 1976; Tirole 1988; Lyons 1996), asymmetric information and opportunism result in high agency costs. The carrier has two possibilities to reduce its agency costs: on the one hand, to reduce the residual loss by increasing monitoring activities and, on the other hand, by allocating a higher fraction of residual income to the driver. The higher the monitoring costs of the carrier due to environmental and behavioural uncertainty, the more residual income rights should be transferred to the driver, and the higher the variable fraction of the driver's income is. This proposition is consistent with research results in the franchise literature (Brickley & Dark 1987; Norton 1988; Lafontaine 1992; Lafontaine & Slade 1998). The following testable hypothesis can be derived from this view:

H2: The driver's proportion of residual income rights is positively related to the extent of monitoring costs.

## **4. Empirical Analysis**

### **4.1. Data Collection**

The empirical setting for testing these hypotheses is the trucking industry in Hungary. A questionnaire was used to collect the data from a sample of 120 Hungarian truck drivers at the Austrian-Hungarian border in Sopron and Nickelsdorf. The data set was collected in July and August 2002. The questionnaire took approximately 15 minutes on the average to complete. We received 60 completed and usable responses. To trace non-response bias, it was investigated whether the results obtained from analysis are driven by differences between the group of respondents and the group of non-respondents. Non-response bias was measured by comparing two groups of responders (Armstrong & Overton 1977). The non-responding group includes drivers who completed the questionnaire three weeks after the first group. No significant differences emerged between the two groups of respondents.

### **4.2. Measurement**

To test our property rights and monitoring cost hypotheses four groups of variables are important: residual income rights, intangible assets of the driver, monitoring costs and firm size as a control variable.

*Residual Income of the Driver:*

The driver's residual income is measured by the variable proportion of his total income. According to our data the average variable proportion of the driver's income is 56 %.

#### *Intangible Assets*

The driver's intangible assets refer to the specific knowledge of loading, driving routes, handling, customer characteristics and time management during the transportation that cannot be easily specified in contract provisions. We used a five-item scale to measure the driver's intangible knowledge assets (see appendix). The five-item measure was extracted by employing factor analysis (Churchill 1995). The reliability of this scale was assessed by Cronbach's alpha (0,86) which exceeds the generally agreed upon limit of 0,6 for exploratory research (Hair et al. 1998).

#### *Monitoring Costs*

The indicator of monitoring costs represents the difficulty of performance and behaviour monitoring of the carrier during the transportation. The monitoring costs (MC) are higher for the greater the distance (DIS) between the destinations, the more days (DAYS) the transportation requires, and the greater the number of different destinations (DES) is. Similar measures are used in empirical franchise research (see Brickley et al. 1991; Lafontaine & Slade 1998). Hence MC are measured as follows:  $MC = DIS * DAYS * DES$ .

#### *Firm Size as Control Variable*

We use the total number of trucks as a proxy for the firm size of the carrier resulting in economies of scale of coordination and monitoring. The larger the total number of trucks, the larger the coordination and monitoring capacity of the firm, the more easily the carrier can centrally control the drivers, and the lower is the propensity to transfer residual income rights to the truck drivers.

### **4.3. Results**

Table 1 presents descriptive data for the sample and table 2 shows the correlations between the independent variables.

**Table 1:****Descriptive Statistics**

	Minimum	Maximum	Mean	Standard Deviation
Percentage of Fixed to Total Income of the Driver	0	100	44,07	29,88
Specific Treatment at the Loading	1	7	5,68	1,78
Specific Treatment at the Unloading	1	7	5,64	1,76
Specific Treatment at the Transport	1	7	5,34	1,94
Specific Treatment at the Cooling of the Freight	1	7	3,92	3,04
Specific Experience of the Driver at the Handling of the Freight	1	7	6,13	1,43
Number of Trucks of the Carrier	1	50	8,43	9,49
Duration of Transportation in Days	,3	15,0	3,732	2,891
Length of the Carriage in Kilometre	120	30000	3155,18	4936,46
Number of Different Destinations per Carriage	1	6	2,13	1,14

**Table 2:**

**Correlations between Independent Variables**

	INV	MC	SIZE
INV	1,000	-,139	,438
MC	-,139	1,000	-,089
SIZE	,438	-,089	1,000

To test the hypotheses we carry out a regression analysis with the driver’s variable proportion of income (VAR) as the independent variable. We conducted OLS and ordinal regression analysis (Greene 2000). Under ordinal regression, we divided VAR into five groups: (0-20; 20 – 40; 40 – 60; 60 – 80; 80 – 100 as variable proportion of the driver’s income). The explanatory variables refer to intangible assets (INT), monitoring costs (MC), and firm size (SIZE) as the control variable. Based on the property rights hypothesis, the driver’s fraction of residual income rights varies positively with his intangible knowledge assets. Further, the greater VAR, the higher the monitoring costs; hence, the coefficient of INT and MC have a positive sign. On the other hand, due to economies of coordination, the coefficient of SIZE is negative. In table 2 the correlations between the independent variables are summarized. We find colinearity indication for the correlations between the number of trucks and the indicator of intangible knowledge assets (0,438). Hence we estimated the regression model both with and without the number of trucks-intangible assets interaction. The model demonstrated a high degree of stability without any significant changes in the coefficients. Furthermore, heteroscedasticity tests do not show any heteroscedasticity indication.

The data provide support for the property rights hypothesis and weak support for the monitoring cost hypothesis (see table 3a, 3b). First, consistent with the property rights hypothesis, the coefficient of the driver’s knowledge assets is negative and significant indicating that the drivers’ intangible know-how results in a higher proportion of residual income rights. Further, the coefficient of monitoring costs is negative and slightly significant ( $p < 0,1$ ) indicating that higher monitoring costs result in a higher fraction of residual income of the driver. In addition, the coefficient of the SIZE is positive but only slightly significant under OLS regression indicating that a higher coordination capacity enables the carrier to exercise control by setting-up monitoring devices.

Dependent Variable: VAR	
Independent Variables	Coefficients
Intercept	43,149** (8,392)
INT (intangible knowledge assets)	
MC (monitoring costs)	+0,614*** (5,702)
SIZE (number of trucks)	
<b>Modell Statistics:</b>	+0,334*
N = 55	(0,00)
F = 3,751	
R <sup>2</sup> = 0,372	
	-0,357* (0,626)

\*\* P < 0,01; \*P < 0,1; values in parentheses are standard errors.

**Table 3a: OLS Regression Results**

Dependent Variable: VAR	
Independent Variables	Coefficients
Threshold Constants	+ 1,492** (0,724) + 493 (0,641) + 0,871* (0,66) -1,583** (0,722)
INT (intangible assets)	+1,13** (0,463)
MC (monitoring costs)	+9,866E-06* (0,00)
SIZE (number of trucks)	-7,42E-02 (0,052)
<b>Model Statistics:</b> N = 55 Model Chi-square = 9,955 -2 Log likelihood = 68,469 Nagelkerke R Square = 0,343	

\*\*\* P < 0,01; \*\*P < 0,05; \*P < 0,1; values in parentheses are standard errors.

**Table 3b: Ordinal Regression Results**

#### **4.4. Discussion**

This paper develops a property rights view of the allocation of residual income rights in contractual relations between the truck driver and the carrier under internal governance by emphasizing the driver's intangible knowledge assets as explanatory variables. This study presents the first empirical evidence from the Hungarian trucking industry that the allocation of residual income rights between the truck drivers and the carriers can be explained by the importance of the driver's intangible assets to generate residual surplus. The more important the driver's intangible knowledge assets, the higher his fraction of residual income rights. We argued that depending on the degree of contractibility of assets, the contract terms have to include low- and high-powered incentive provisions to improve the driver's efforts to efficiently use his assets. These results are compatible with the multi-task view of Holmström and Milgrom (1991, 1994) because the driver has to complete several tasks with different degrees of contractibility. In addition, the data also slightly support the monitoring cost hypothesis: The higher the carrier's costs of monitoring the performance and behaviour of the driver, the more the driver's incentive must be strengthened by increasing this fraction of residual income rights.

Based on James' view of the interdependence between contract and governance (James 2000), in future research we will compare the incentive effects of contract provisions between internal and market governance in the trucking industry. In addition, we intend to investigate the relationship between residual income and residual decision rights under different governance structures. Complementarities and substitutabilities may exist between the residual income and residual decision rights. Under complementarity, the transfer of residual decision rights increases the efficiency effect of residual income rights (Brickley et. al 1995; Arora & Gambardella 1990; Arrunada et al. 2001). This is more probable if the driver is an independent owner-operator. On the other hand, if the contractual relation is governed by an employment contract, residual decision and residual income rights may be substitutes because, under fiat, a certain incentive effect of the governance structure may result either from the allocation of high-powered incentives or the transfer of residual decision rights to the driver. In this case, the more residual income rights are assigned to the driver, the less residual decision rights must be allocated to him. Consequently, as James (2000) argued, the incentive effect of contract provisions is not independent of the underlying governance structure. This interdependence between contract provisions and governance structure is still an unsolved problem in transaction cost theory (Williamson 1985; 2002).

#### **5. Concluding Remarks**

The paper offers a property rights and monitoring cost explanation for the allocation of residual income rights between the driver and the carrier under an internal governance structure. We have argued that the structure of residual income rights depends on the importance of the driver's intangible assets to generate a residual surplus and the extent of monitoring costs. The more important the driver's intangible assets and the higher the carrier's monitoring costs, the more residual income rights are transferred to the driver, and the higher the variable proportion of his total income is. These hypotheses were tested by using data from contractual relations between truck drivers and carriers in the Hungarian trucking industry.

This study also has managerial implications. Carriers can benefit from improving their monitoring capabilities to reduce agency costs (Baker & Hubbard 2003) and from a deeper understanding of the relationship between the characteristics of the driver's knowledge assets

and their impact on the extent of any residual surplus generated in the contractual relation. The most important message is: The more critical the driver's intangible assets to increase the residual surplus are, the higher driver's variable fraction of his total income should be.

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## **APPENDIX: MEASURES OF VARIABLES**

### **Percentage of the Variable Income to the Total Income of the Driver (VAR)**

#### **Monitoring Costs (MC)**

$$MC = DIS * DAYS * DES$$

DIS = Length of the Carriage in Kilometre

DAYS = Duration of a Carriage in Days

DES = Number of Different Destinations per Carriage

#### **Driver's Intangible Assets:**

**INT** (Five item-scale).

The driver has to evaluate the specific treatment of the freight on a 7-point scale (1 – no specific treatment; 7 – very high specific treatment; Cronbach alpha = 0,86)

1. Specific Treatment of the Freight at the Loading  
(Factor Loading: 0,971)
2. Specific Treatment of the Freight at the Unloading  
(Factor Loading: 0,95)
3. Specific Treatment of the Freight at the Transportation  
(Factor Loading: 0,806)
4. Specific Treatment of the Freight at the Cooling  
(Factor Loading: 0,818)
5. Specific Experience with the Handling of the Freight  
(Factor Loading: 0,465)