T E C H N I C A L

R E P O R T

0421

BARGAINING POWERS AND MARKET SEGMENTATION IN FREIGHT TRANSPORT

M. MOUCHART and M. VANDRESSE

I A P S T A T I S T I C S

N E T W O R K

INTERUNIVERSITY ATTRACTION POLE

http://www.stat.ucl.ac.be/IAP

Bargaining powers and market segmentation in freight transport *

Michel Mouchart[a] and Marie Vandresse[a]

[a]*Institut de statistique, Université catholique de Louvain, Louvain-la-Neuve,Belgium.*

September 10, 2004

Abstract

Freight transport market is characterized by heterogeneities of the provided services and of the firms. Moreover, agents on this market typically bargain simultaneously on a price-attributes basis rather than on a price-quantity basis. The presence of heterogeneity leads to develop an empirical model of market imperfection and the presence of a bargaining based simultaneously on the price and the attributes of the transport leads to develop a model without exogeneity assumption. As a consequence, the proposed model is based on the estimation of the joint distribution of the price and the attributes of the transport rather than on the expectation of the price conditional to the attributes. The model proposes an empirical measure of market imperfection and bargaining powers of the agents and examines the sensitivity of the results to the choice of the attributes and, in order to detect potential market segmentation, to the selection of the data.

Keywords: freight transport, imperfect competition, bargaining power, market segmentation.

*The research underlying this paper is performed within the framework of the second Scientific Support Plan for a sustainable Development Policy (SPSP II) for the account of the Belgian State, Prime Minister's Office - Federal Science Policy Office (contract:CP/17/361). Financial support from the IAP research network nr P5/24 of the Belgian Government (Belgian Science Policy) is also acknowledged. The computations have been made by means of an adaptation of a program on DEA written in R (http://cran.r-project.org/) by Paul Wilson; Paul's open cooperation is gratefully acknowledged. Comments by M. Beuthe, D. Henderson, Seok-Oh Jeong, J. Thisse and E. Van De Voorde are gratefully acknowledged.

1 Introduction

1.1 Objective of the paper

The econometric analysis of freight transport data has to face a bunch of specific difficulties. Considering freight transport as a sector of services, a first difficulty is raised by the heterogeneity of the services associated to particular contracts. Indeed, there are not only differences in distance but also in speed and in the nature of the freight: differences in density (weight or volume), in fragility, in value, in conditioning, *etc.*

Secondly, the are different degrees of substitutability for the transporting instruments: a same driver may conduct different vehicules, containers may be more or less specific for a given good in bulk transport (for instance, a same container may not transport milk and petrol), a same tractor may tow different trailers, alternative modes may be more or less available for a given flow *etc.*

Thirdly, the institutional aspects of the market (*i.e.* the meeting of supply and demand) are complex. Many contracts are established for a one-way trip and a different contract is bargained for the return trip; more generally, one may suspect that the behaviour of the supply side depends on the expected rate of utilization of the transport mode for the complete round-trip. On the demand side, there may be more or less possibilities of outsourcing part or all of the transport needs. Also the contracts may be established on a one-shot basis or on longer term agreements. The criteria for agreeing on the terms of a contract are typically complex. Essentially, a price is agreed upon for a bunch of attributes, some of which are standardized and observable, such as distance, speed or weight (or volume), but other ones are not observable although known to be highly relevant for concluding a contract, such as commercial fidelity, mutual confidence among the contractors, *etc.*

From an economic point of view, these specificities are potential sources for perfect competition not to prevail in the freight transport market (on the issue of perfect competition, see *e.g.* Gabszewics and Thisse(1999)). Once there is an agreement that "the freight transport market is anything but perfect", a next question is to evaluate how much imperfect is competition and eventually how strong or weak is the bargaining power of each agent. Providing an empirical measure of imperfect competition and of bargaining power is the main object of this paper.

A case study makes use of the data provinding, for each contract of a representative sample, the price $y^{(i)}$ and a vector $z^{(i)}$ of attributes of the transaction i. These attributes are assumed to be a source of cost for the supply and a source of satisfaction for the demand. Thus, we assume that each element of $z^{(i)}$ is measured in units such that the partial derivatives of the demand utility function and of the supply cost function with respect to those elements are strictly positive.

By focusing the analysis on price and charateristics of the service rather than on the price and quantity, we opt for an hedonic approach, with one crucial difference with respect to the specification proposed notably by Griliches (1971) and Rosen (1974). In their model, Griliches and Rosen assume that the attributes of the goods or the services are exogeneously determined.

This is reflected by estimating the conditional expectation of the price given the attributes. However, in many sectors, and particularly in freight transport, the bargaining, or the decision process, is based on the price and the attributes simultaneously. In this context, modeling the joint distribution of the price and the attributes seems more suitable.

Mouchart and Vandresse (2003) gives a more detailed exposition of the economic analysis sketched above. Mouchart and Vandresse (2004) reports some preliminary results of the empirical analysis. The proper object of this paper is to present a more systematic account of our data analysis, but focussing the attention on specific issues. Once it is recognized that several (many) attributes of the contracts are not observable, a first issue is to investigate how far are the proposed empirical measures sensitive to the choice of the attributes. In other words, we want to evaluate whether or not a particular attribute is significant for the contracting agents. Our concern on this issue is considered at two levels: for each contract, we want to evaluate and to suggest an economic interpretation for the changes of the empirical measures associated to alternative choices of the coordinates and, at the global level, we want to compare the empirical distributions of these measures and to test the hypothesis that a given attribute, or coordinate, is actually significant.

Another issue regards the selection of the observations and the specification of the population of interest. More specifically, we first examine whether some specific data points are outlying and/or particularly influential for the final results. This issue is indeed crucial not only because the small size sample (here, n=91) makes the role of the outliers potentially dramatic, but also because of the presence of possible market segmentation. In this prespective, we question the homogeneity of the population of interest in a more systematic way.

The order of exposition is as follows. The rest of this introductory section provides a short description of the data base. Section 2 summarizes the economic analysis underlying the econometric estimation and sketches the estimation procedure. Section 3 exposes the case study in the field of freight transport. We first give the estimation of the basic quantities of interest, in the form of point estimation. Next, we focus the attention on the estimation of the bargaining powers and discusses the sensitivity to the selection of the attributes and the selection of the data, both from an influential (or outlying) data point of view and from a given description of the population of interest point of view. The paper is completed by some concluding remarks. An appendix completes the presentation and presents empirical results at the level of individual contracts, leaving in the main sections summaries of distributions only.

1.2 The Data Base

The data are taken from a pilot survey of Belgian firms active in freight transport (this survey does not cover maritime nor air transport). Those data are gathered by face-to-face interviews during which the interviewee is asked to describe a typical contract (for details see Beuthe *et al.* 2003). From those interviews, we obtain, for each contract i, a price of the transport (EUR/ton $\times$ km), denoted $y^{(i)}$, and a vector $z^{(i)}$ of three attributes, namely the reliability, *i.e.* the percentage of time the goods are delivered within the required time, the time, *i.e.* the door to door transport time, including loading and unloading and the flexibility, *i.e.* the percentage of time that unexpected demands are met by the carrier. As the coordinates of the attributes have to be specified in such a way that the partial derivatives of the demand utility function and the supply cost function are stricIty positive, the time is transformed into the speed (distance/time).

A contract i is characterized by a vector $x^{(i)} = (y^{(i)}, z^{(i)'})'$ and the data may be assembled in matrix form as follows:

$$X = [x^{(i)'}] = [y^{(i)} \quad z^{(i)'}] = [y \quad Z] \tag{1}$$

where $X : n \times (1+k), \quad y : n \times 1, \quad Z : n \times k$, $n = 91$, the number of observations and $k = 3$, the number of attributes. In Figure 1 we summarize the data by means of the box-plots of the 4 variables. The first four rows of Table 2 give the mean, median, standard deviation and extreme values of these variables.

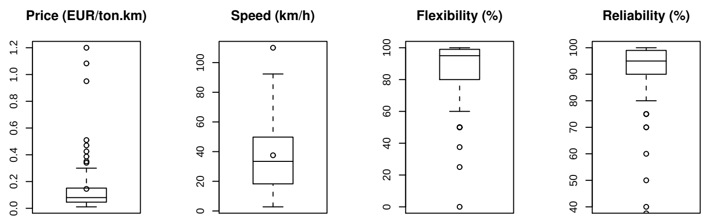

Figure 1: The box-plots of the variables ($n = 91$)

2 Economic background and estimation method

This section summarizes the main ideas exposed more completely in Mouchart and Vandresse (2003). As the presence of bargaining powers is the consequence of market imperfection, we construct first a measure of this imperfection from wich we deduce and analyse the bargaining powers.

The notion of market is represented by a set, $\mathcal{C}$, of feasible contracts $x \in I\!R_+^{1+k}$ where $\mathcal{C}$ is assumed to be convex and compact. Furthermore, we assume that the contract set enjoys the property of *Free Disposability*; heuristically, that each side (demand or supply) would consider as acceptable any contract at least as favourable as another feasible one but that the market is made of contracts acceptable for both sides. More precisely, for a given set $\mathcal{C}$ of feasible contracts, one may define $\mathcal{C}_{[DFD]}$, the demand free disposable envelope, as follows:

$\mathcal{C}_{[DFD]} = \{(y', z') \in I\!R_+^{1+k} \mid \exists (y, z) \in \mathcal{C} \text{ such that } y \geq y' \text{and } z \leq z'\}$

i.e. the set of contracts at least as acceptable for the demand as the contracts in $\mathcal{C}$. Similarly, one may define $\mathcal{C}_{[SFD]}$, the supply free disposable envelope, as follows:

$\mathcal{C}_{[SFD]} = \{(y', z') \in I\!R_+^{1+k} \mid \exists (y, z) \in \mathcal{C} \text{ such that } y \leq y' \text{and } z \geq z'\}$

Note that $\mathcal{C}_{[DFD]}$ and $\mathcal{C}_{[SFD]}$ are unbounded (indeed $(y, z) \in \mathcal{C} \Rightarrow \lim_{z \to \infty}(y, z) \in \mathcal{C}_{[DFD]}$ *and* $\lim_{y \to \infty}(y, z) \in \mathcal{C}_{[SFD]}$) and contain therefore contracts that are not feasible for the market. Hence, the following definition: The set $\mathcal{C}$ of feasible contracts displays the property of *free disposability* if $\mathcal{C} = \mathcal{C}_{[DFD]} \cap \mathcal{C}_{[SFD]}$.

The observed data, $x^{(i)}$, are interpreted as a sample of the market and $\mathcal{C}$ as the support of the sampling distribution. $\mathcal{C}$ is estimated by the smallest set, $\hat{\mathcal{C}}$, that contains the observations and satisfies the three assumptions mentioned just above.

In order to measure the market imperfection, two bids functions are defined; the demand bid function, or maximum willingness to pay, $P^*(z)$, representing the maximum that the demand side agrees to pay for the set of attributes z (the upper frontier of $\mathcal{C}$) and the supply bid function, or minimum willingness to sell, $P_*(z)$, representing the minimum price the supply side agrees to sell for the set of attributes z (the lower frontier of $\mathcal{C}$). Figure 2 represents the demand and supply bid functions in the two dimensional case (*i.e.* one attribute z and the price y); each observed contract is represented by a cross.

If the market were perfect, both bid functions would collapse into a unique contract curve, in particular under the action of free entry. On the contrary, more the market is imperfect, more the distance $(P^*(z) - P_*(z))$ between the two bid functions is important (we will eventually observe different prices for a same set of attributes). Note that we are more interested in price variation for a given set of attributes than in attributes variation for a given price. Thus, in Figure 2, the market imperfection is represented by the vertical distance between the two bids functions.

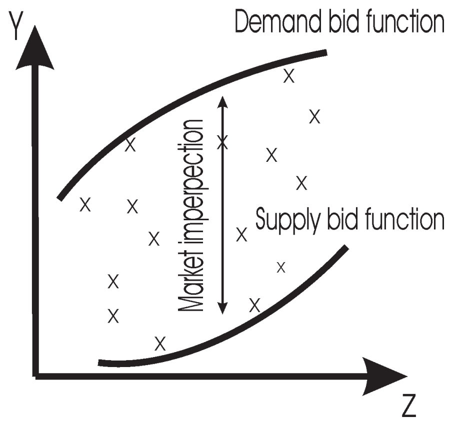

Figure 2: The market imperfection

Let us now deduce, from the measure of market imperfection, a measure of the bargaining power of each agent. Let us define the demand surplus of the contract $x = (y, z) \in \mathcal{C}$ as the difference $P^*(z) - y$ and the supply surplus by the difference $y - P_*(z)$ (Figure 3). The bargaining power of each agent involved in the contract is defined as:

$$\begin{aligned}\pi_D(y,z) &= \text{demand bargaining power} = \frac{\text{surplus of the demand}}{\text{market imperfection}} \\ &= \frac{P^*(z) - y}{P^*(z) - P_*(z)} \end{aligned} \tag{2}$$

$$\pi_S(y,z) = \text{supply bargaining power} = \frac{\text{surplus of the supply}}{\text{market imperfection}}$$

$$= \frac{y - P_*(z)}{P^*(z) - P_*(z)} = 1 - \pi_D(y, z) \tag{3}$$

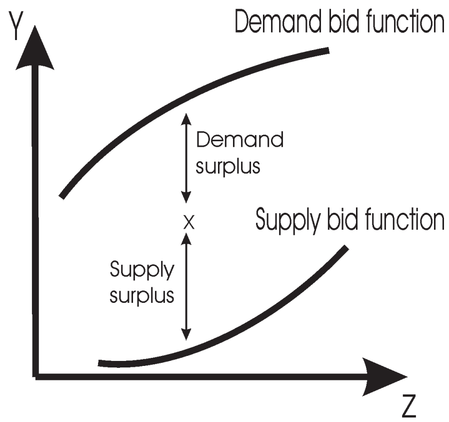

Figure 3: The demand and supply surpluses

Remark: Under perfect competition, the classical microeconomic theory defines the surpluses in the price $\times$ quantity space through the area enclosed between the demand and the supply curves and limited by the equilibrium price, under the assumption that the market in equilibrium operates only at that price. In the present context, there is no market equilibrium price but only a set of feasible contracts that can possibly be interpreted as agents equilibrium. Furthermore, we define the surpluses in the price $\times$ attributes space: the surpluses are defined, pointwise, for each feasible contract, as a distance to each bid functions.

The two bid functions, $P_*(z)$ and $P^*(z)$, are estimated through the upper and lower frontiers of the convex free disposable closure of $\hat{\mathcal{C}}$, the set of observed contracts:

$$\hat{P}_*(z) = \min\{y \mid (y, z) \in \hat{\mathcal{C}}\} \tag{4}$$

$$\hat{P}^*(z) = \max\{y \mid (y, z) \in \hat{\mathcal{C}}\} \tag{5}$$

Estimation of the two bid functions is made operational by defining, for a given contract $(y, z) \in \hat{\mathcal{C}}$, a *demand price multiplier* (resp. *supply price multiplier*) as a factor of dilatation (resp. of contraction) that would bring y up to the frontier $P^*(z)$ (resp. $P_*(z)$):

$$\alpha : \hat{\mathcal{C}} \to [1, \infty) \qquad \alpha(y, z) = \max\{a \mid ay \leq \hat{P}^*(z)\} \tag{6}$$

$$\beta : \hat{\mathcal{C}} \to (0, 1] \qquad \beta(y, z) = \min\{b \mid by \geq \hat{P}_*(z)\} \tag{7}$$

The frontiers are characterized by the efficient contracts for which $\alpha = 1$ or $\beta = 1$, respectively. Once those efficient contracts have been empirically identified, the demand and supply bid functions are constructed by linear interpolation.

For each observed contract, $x^{(i)}$, the value of the functions $\alpha(y^{(i)}, z^{(i)})$ and $\beta(y^{(i)}, z^{(i)})$ may be estimated by linear programming, namely :

$$\hat{\alpha}(y^{(i)}, z^{(i)}) = \sup\{a \mid \exists \gamma \in S_{[n-1]} : ay^{(i)} \leq y'\gamma, Z'\gamma \leq z^{(i)}\} \tag{8}$$

$$\hat{\beta}(y^{(i)}, z^{(i)}) = \inf\{b \mid \exists \gamma \in S_{[n-1]} : by^{(i)} \geq y'\gamma, Z'\gamma \geq z^{(i)}\} \tag{9}$$

where y and Z have been defined in equation (1) and $S_{[n-1]}$ is the (n-1)-dimensional simplex, namely $S_{[n-1]} = \{\gamma \in \mathbb{R}^n_+ \mid \sum_{i=1}^n \gamma_i = 1\}$.

Once α and β have been estimated for each contract $x^{(i)}$, the market imperfection and the bargaining powers associated to each contract $x^{(i)}$ can be estimated as follows :

$$\hat{I}(y^{(i)}, z^{(i)}) = [\hat{\alpha}(y^{(i)}, z^{(i)}) - \hat{\beta}(y^{(i)}, z^{(i)})] \times y^{(i)} \tag{10}$$

$$\hat{\pi}_D(y^{(i)}, z^{(i)}) = \frac{\hat{\alpha}(y^{(i)}, z^{(i)}) - 1}{\hat{\alpha}(y_i, z_i) - \hat{\beta}(y^{(i)}, z^{(i)})} \tag{11}$$

$$\hat{\pi}_S(y^{(i)}, z^{(i)}) = \frac{1 - \hat{\beta}(y^{(i)}, z^{(i)})}{\hat{\alpha}(y^{(i)}, z^{(i)}) - \hat{\beta}(y^{(i)}, z^{(i)})} \tag{12}$$

Thus, the market imperfection, $\hat{I}(y, z)$, is measured in the same unit as the price, namely y, whereas the bargaining powers, $\hat{\pi}_d$ and $\hat{\pi}_S$, are unit free-coefficients.

3 A Case Study on Freight Transport Data

3.1 Introduction

In this case study, we first estimate the market imperfection and the bargaining powers of each observed contract, $x^{(i)}$, for the data described in section 1.2. Next we focus the attention on two crucial issues: the sensitivity of the numerical results with respect to the choice of the attributes and with respect to particular observations. Our main concern is to achieve a deeper economic understanding of the underlying concepts of market, market imperfection and bargaining power. Thus, in particular because of space limitation, the statistical issue of sampling fluctuation is rather reserved for a further work still in progress.

Clearly, the coefficient $\hat{\alpha}(y^{(i)}, z^{(i)})$ and $\hat{\beta}(y^{(i)}, z^{(i)})$ depend on the coordinates considered in z. So, we evaluate the impact of deleting these coordinates on the individual values of $\hat{\alpha}(y^{(i)}, z^{(i)})$ and $\hat{\beta}(y^{(i)}, z^{(i)})$ and, as a consequence, on the market imperfection and the bargaining powers. We also examine whether such a change may be explained by some economic factors. Thereafter, we evaluate the effect of such deletion on the distribution of $\hat{\alpha}(y^{(i)}, z^{(i)})$ and $\hat{\beta}(y^{(i)}, z^{(i)})$. These two complementary analyses are performed with the hope of evaluating the economic role of a particular attribute for the contract negotiation.

Given the modest sample size, the second issue of concern is the definition of the population of interest. Outlying observations might influence dramatically the evaluation of $\hat{\alpha}(y^{(i)}, z^{(i)})$ and $\hat{\beta}(y^{(i)}, z^{(i)})$. Thus, we examine the sensitivity of the estimation to different selections of the data with the hope of pinpointing a concept of population of interest, economically more relevant than the simple fact of accepting an interview.

3.2 A first estimation

For each observed contract $x^{(i)}$, we start by estimating, from (8) and (9), $\hat{\alpha}(y^{(i)}, z^{(i)})$ and $\hat{\beta}(y^{(i)}, z^{(i)})$, from which we deduce, through (10), (11) and (12), the market imperfection $\hat{I}(y^{(i)}, z^{(i)})$

	mean	median	st.dev.	min	max
$1/\hat{\alpha}$	0,21	0,11	0,26	0,01	1,00
$\hat{\beta}$	0,33	0,28	0,31	0,01	1,00
$\hat{I}$	0,85	0,96	0,29	0,01	1,18
$\hat{\pi_D}$	0,82	0,93	0,27	0,00	1,00
$\hat{\pi_S}$	0,17	0,06	0,27	0,00	1,00

Table 1: First Results: Summary statistics ($n = 91$)

and the two bargaining powers, $\hat{\pi}_D(y_i^{(i)}, z^{(i)})$ and $\hat{\pi}_S(y^{(i)}, z^{(i)})$. Note that instead of α we actually estimate $1/\alpha$, valued in (0,1], similarly to β.

The estimations, for each contract, of β, $1/\alpha$, I, π_D and π_S are given in Table 10 (see Appendix) and summarized in Table 1 through the mean, the median, the standard deviation, the minimum and the maximum of all those estimated values. Figure 4 provides the box-plots of the market imperfection and the bargaining powers.

The mean of the market imperfections is around 0,85 EUR/ton $\times$ km. This mean is rather high in view of the distribution of the prices with mean = 0,15 and standard deviation = 0,08 (see Table 2). As observed in the box-plot of the price (Figure 1), only 10 (out of 91) observations lie above (approx.) 0,3 EUR / ton $\times$ km. Those observations may be suspected to strongly influence the measure of market imperfection. By deleting those interviews, high market imperfections might decrease drastically. Deleting observations should however be justified: This is the subject of a later section. Concerning the bargaining powers, 50% of the contracts is represented by a demand (resp. supply) bargaining power higher (resp. lower) than 0,9 (resp. 0,1). This finding suggests that freight transport in Belgium be dominated by the demand side.

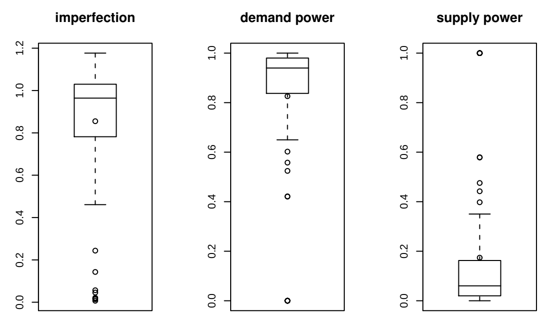

Figure 4: Imperfections and bargaining powers ($n = 91$)

3.3 Sensitivity of the bargaining powers to the selection of the attributes

3.3.1 Method

Whether a particular attribute has, or not, a prominent role in the i^{th} contract bargaining is an important issue from a industrial organisation point of view. One method for assessing the influence of each attribute consists in comparing the two bid functions, one based on all the attributes, coded in the vector z, the other one based on all those attributes but one. In this way, we can analyse and compare the imperfection and the bargaining powers when 3 or 2 attributes are taken into account.

More specifically, let us partition the vector z into $z = (z_j, z_{\backslash\{j\}})$, where $z_{\backslash\{j\}}$ is the subvector obtained by deleting the j^{th} coordinate from z. If the j^{th} attribute is not particularly important in the negociation of the contracts, one may suspect that $P_j^*(z_{\backslash\{j\}})$ (resp. $P_{j*}(z_{\backslash\{j\}})$) will be close to $P^*(z)$ (resp. $P_*(z)$), and as a consequence, $I_j(z_{\backslash\{j\}})$, $\pi_{D,j}(y, z_{\backslash\{j\}})$ and $\pi_{S,j}(y, z_{\backslash\{j\}})$ will be close to $I(z)$, $\pi_D(y,z)$ and $\pi_S(y,z)$. On the contrary, if the attribute z_j has some importance in the negociation of the contract, we would expect to observe significantly different bid functions and then, different measures of imperfection and of bargaining powers.

When evaluating the multipliers, deleting one of the attributes means deleting one of the restrictions on the optimization problem (equations (8) and (9)), and eventually improving the optimal value relative to the complete set of attributes. Thus, if we write $\hat{\alpha}_j(y^{(i)}, z^{(i)}{}_{\backslash\{j\}})$ and $\hat{\beta}_j(y^{(i)}, z^{(i)}{}_{\backslash\{j\}})$ for the demand and supply multipliers obtained when deleting the j^{th} coordinate, we always have:

$$\hat{\alpha}_j(y^{(i)}, z^{(i)}{}_{\backslash\{j\}}) \geq \hat{\alpha}(y^{(i)}, z^{(i)}) \text{ and } \hat{\beta}_j(y^{(i)}, z^{(i)}{}_{\backslash\{j\}}) \leq \hat{\beta}(y^{(i)}, z^{(i)}) \tag{13}$$

Relation (13) implies that $\hat{\alpha}_j - \hat{\beta}_j \geq \hat{\alpha} - \hat{\beta}$, *i.e.* the measure of imperfection (equation (10)) never decreases when deleting the j^{th} attribute. The effect on the demand and supply bargaining powers is not determinate because deleting the j^{th} coordinate increases both the numerator and the denominator in equation (11) and (12).

The analysis proceeds in two steps. We first present the results at the level of individual contracts and propose an economic interpretation of the empirical findings. Next, we examine the distribution of the individual differences and propose a test of the hypothesis that the j^{th} coordinate has no effect on the evaluation of the bargaining powers.

3.3.2 Sensitivity of individual results

Empirical findings

Let us first examine how the performances (α and β) of each contract are affected when a particular attribute j is deleted. The different modifications, for each contract, are reproduced in Table 11 (see Appendix) whereas Table 2 gives some summary statistics of the results. Reading Table 2 is made easier by providing, in the first 4 lines, the numerical characteristics of the distribution of the variables, corresponding to the box-plots of Figure 1. Table 3 summarizes the more salient features of Table 11. Indeed, when looking at the vector of differences $da_{\backslash\{j\}} =$

$[1/\hat{\alpha}(y^{(i)}, z^{(i)}) - 1/\hat{\alpha}_j(y^{(i)}, z^{(i)}{}_{\backslash\{j\}})]$ and $db_{\backslash\{j\}} = [\hat{\beta}(y^{(i)}, z^{(i)}) - \hat{\beta}_j(y^{(i)}, z^{(i)}{}_{\backslash\{j\}})]$, we observe that $da^{(i)}_{\backslash\{j\}}$ is often substantially greater than 0 for a relatively small value of the attribute z_j and $db^{(i)}_{\backslash\{j\}}$ is often substantially greater than 0 for a relatively high value of the attribute z_j. Otherwise, $da^{(i)}_{\backslash\{j\}}$ and $db^{(i)}_{\backslash\{j\}}$ are close to 0. Furthermore, most of the variation in the price multipliers are observed for the supply price multipliers. This might be explained by the fact that Tables 1 and 10 show that more contracts are located near the supply bid function. The variations of the supply price multiplier are eventually more substantial than the variations in the demand price multiplier.

	mean	median	std.dev.	min	max
cost	0,15	0,08	0,20	0,01	1,20
speed	37,53	33,43	23,03	2,78	110,00
flexibility	88,20	95,00	17,27	0,00	100,00
reliability	92,36	95,00	10,85	40,00	100,00
$da_{\backslash\{speed\}}$	0,04	0,01	0,13	0,00	0,97
$da_{\backslash\{flex\}}$	0,01	0,00	0,08	0,00	0,72
$da_{\backslash\{rel\}}$	0,04	0,00	0,15	0,00	0,94
$db_{\backslash\{speed\}}$	0,20	0,08	0,28	0,00	0,97
$db_{\backslash\{flex\}}$	0,02	0,00	0,09	0,00	0,60
$db_{\backslash\{rel\}}$	0,06	0,00	0,18	0,00	0,92
$d\pi_{D,\backslash\{speed\}}$	-0,01	0,00	0,14	-0,98	0,35
$d\pi_{D,\backslash\{flex\}}$	-0,01	0,00	0,09	-0,82	0,05
$d\pi_{D,\backslash\{rel\}}$	-0,03	0,00	0,16	-0,98	0,33

Table 2: Variation of the multipliers and bargaining powers: summary statistics ($n = 91$)

Defining the vectors $d\pi_{D,\backslash\{j\}} = [\pi_D(y^{(i)}, z^{(i)}) - \pi_{Dj}(y^{(i)}, z^{(i)}{}_{\backslash\{j\}})]$ and $d\pi_{S,\backslash\{j\}} = [\pi_S(y^{(i)}, z^{(i)}) - \pi_{Sj}(y^{(i)}, z^{(i)}{}_{\backslash\{j\}})]$, we observe (Table 3) that the demand bargaining power increases substantially for contract with a lower level of the deleted attribute ;as the sum of the bargaining powers equals 1, we consequently observe a substantial decrease of the supply bargaining. Similarly, the demand bargaining power decreases for contract with an upper level of the deleted attribute. The inverse is observed for the supply bargaining power.

z_j	$da_{\backslash\{j\}}$	$db_{\backslash\{j\}}$	$d\pi_{D,\backslash\{j\}}$	$d\pi_{S,\backslash\{j\}}$
low	> 0	≈ 0	< 0	> 0
high	≈ 0	> 0	> 0	< 0

Table 3: Typical variation of the multipliers and bargaining powers ($n = 91$)

Economic interpretation

When the j^{th} attribute is deleted from the analysis, a contract $x^{(i)} = (y^{(i)}, z^{(i)})$, with $z^{(i)} = (z^{(i)}_j, z^{(i)}_{\backslash\{j\}})$, a high level of $z^{(i)}_j$ and a given price $y^{(i)}$, will be compared not only with the same contracts as when the j^{th} coordinate is not deleted (*i.e.* those for which $z = z^{(i)}$) but also with contracts where $z_j \neq z_j^{(i)}$ but with $z_{\setminus\{j\}} = z_{\setminus\{j\}}^{(i)}$. Because each attribute is cost and demand satisfaction increasing, on may expect that some contracts with a same level of $z_{\setminus\{j\}}$ have a lower price, because their value of z_j was not high. In this case, on may expect that $db_{\setminus\{j\}}$ be substantially positive. However, one may also expect that on the upper frontier, there will be no systematic increase of the highest price for the given level of $z_{\setminus\{j\}}$. Therefore, the effect on $da_{\setminus\{j\}}$ may be expected to be weak. For those reasons, π_S may be expected to increase and π_D to decrease. As the correlation between the cost and the attributes is positive, but low (Table 4) the effects on π_S and π_D may be expected to be rather systematic in sign but weak in order of magnitude.

	reliability	flexibility	speed
cost	0.142	0.139	0.144

Table 4: Correlation between the cost and the attributes ($n = 91$)

Using a similar argument suggests that contracts with a low level of z_j are likely, when the analysis is repeated without the j^{th} coordinate, to exhibit a weak effect on $db_{\setminus\{j\}}^{(i)}$, a positive effect on $da_{\setminus\{j\}}^{(i)}$ and therefore a decrease of π_S and an increase of π_D.

Table 3 reveals however that $db_{\setminus\{speed\}}$ is substantially higher in average, median and standard deviation than the other five variations of the multipliers. This suggests that overlooking the speed in the relevant attribute has strikingly different effect on the estimated efficiency of each contract. As for each attribute, the effect on β is often more substantial for contracts involving a high value of the speed (roughly, speed higher than 40 km/h but this is far from systematic). These facts suggest that, when bargaining contracts characterized by a high speed, the supply side has more possibilities of claiming a price overload, whereas for lower value of the speed contracts tend to be established as if speed were not an important attribute (*i.e.* no price discount for a lower speed.

3.3.3 Test of hypothesis

The empirical findings, at the level of individual contracts, have interest for their general pattern but are not amenable to formal statistical tests, in particular because of a sample size which is small in view to the curse of dimensionality usually met with non parametric methods (see, in particular, Kneip *et al.* 1998). This fact motivates to also develop a more global approach and to look to the distribution of the individual differences $da_{\setminus\{j\}}^{(i)}$ and $db_{\setminus\{j\}}^{(i)}$.

The test statistic to be proposed is based on Simar and Wilson (1998,2001) and calibrated by bootstrapping in the framework of a statistical model adapted to the present situation. More specifically, we rely on a statistical model characterized by the following assumptions.

Assumption 1: The contracts $x^1...x^n$ are viewed as the realization of an *i.i.d.* sample from a continuously differentiable distribution, on $\mathbb{R}_+^4$, with support equal to $\mathcal{C}$.

Assumption 2: (as in section 2) $\mathcal{C}$ is convex, compact, free disposable and, $\forall z \in \mathbb{R}_+^3 : y = 0 \Rightarrow (y, z) \notin \mathcal{C}$

Deleted attribute	β : value of the statistic (S)	β p-value		$1/\alpha$: value of the statistic (S)	$1/\alpha$ p-value
Speed	0,38	0,50		0,12	0,35
Flexibility	0,02	0,49		0,05	0,42
Reliability	0,08	0,50		0,09	0,38

Table 5: Test for the importance of the attributes (on $\hat{\beta}$ and on $\hat{\alpha}$, $n = 91$)

Assumption 3: The functions α^{-1} and β, defined in (6) and (7) and valued in (0,1] are continuous in $\mathcal{C}$.

The hypotheses to be tested are non parametric as they bear, for instance, on α_j and α understood as functionals defined on the set of distributions of (y, z). These hypotheses may indeed be written as:

$$H_0 : \alpha_j(y, z_{\setminus\{j\}}) = \alpha(y, z) \qquad H_1 : \alpha_j(y, z_{\setminus\{j\}}) > \alpha(y, z)$$

$$AND$$

$$H_0 : \beta_j(y, z_{\setminus\{j\}}) = \beta(y, z) \qquad H_1 : \beta_j(y, z_{\setminus\{j\}}) < \beta(y, z)$$

So, the idea is to test whether the difference (if any) between the multipliers in the restricted and unrestricted models is significant.

Adapting Simar and Wilson (2001) to the two frontiers case, we make use of the following test statistic:

$$S = \frac{1}{n}\sum_{i=1}^{n}(1 - \hat{\lambda}_j^{(i),k}) \in (0, 1] \quad \text{k}= \alpha, \beta \tag{14}$$

where:

$$\hat{\lambda}_j^{(i),\beta} = \frac{\hat{\beta}_j(y^{(i)}, z^{(i)}_{\setminus\{j\}})}{\hat{\beta}(y^{(i)}, z^{(i)})} \in (0, 1] \qquad \text{and} \qquad \hat{\lambda}_j^{(i),\alpha} = \frac{\hat{\alpha}(y^{(i)}, z^{(i)})}{\hat{\alpha}_j(y^{(i)}, z^{(i)}_{\setminus\{j\}})} \in (0, 1]$$

Under H_0, $\hat{\lambda}_j^{(i),k}$ tends to take values close to 1 whereas under H_1, $\hat{\lambda}_j^{(i),k}$ tends to take values close to 0. Thus the critical region of S corresponds to large values of the test statistic (close to 1); and the test is performed at the (conventional) level of 0,05. The p-value is obtained by a bootstrap methodology proposed in Efron and Tibshirani (1993, chapter 16) and developed in Simar and Wilson (1998). Table 5 gives the values of the statistic S and its associated p-values. As all the p-values are higher than 0,05 no statistical difference between the restricted and unrestricted models seems to be significant (the corresponding bid functions are not significantly different). This test therefore failed to detect an attribute likely to play a significant role in the bargaining power.

This conclusion may be conforted by looking at the correlations between the bargaining powers and the price and the attributes. Table 6 shows that the price variable is the most correlated variable with the bargaining power. Thus, the bargaining powers are mainly associated to the price level. One explanation could be that the available attributes inserted in the model are insufficient to explain the behaviour of the agents in their decision making. Unavailable or unobservable attributes might better account for the market imperfection and, as a consequence, for the bargaining power associated to each agent.

	price	reliability	flexibility	speed
π_D	-0.55	0.35	0.45	0.26

Table 6: Correlation between π_D and z_j or y ($n = 91$)

3.4 Market segmentation: an empirical approach

3.4.1 Introduction

A basic issue in econometric modeling concerns the definition of the population of interest. This concern is even more substantial in a context of frontier analysis where the results might be strongly influenced by some specific data.

As mentionned in the introduction, one feature of freight transport is a subtle combination of use-specific and multiple use transport devices: think of the separation (both technical and economical) of trailers and tractors, of tank for specific liquids *etc.* Therefore, narrowly specified markets are likely to be subjected to considerable spill over effects among markets, a feature difficult to model from a structural point of view. Furthermore, distinguishing a large number of small submarkets would lead to not estimable models unless the sample size were large enough to cover each segment. Moreover, at the level of observable attributes, market segmentation might be also due to overlooking the influence of unobservable attributes. From this point of view a segment would aggregate contracts likely to be more homogenous with respect to latent characteristics. Thus prior to modeling market segmentation, carefully scrutinizing data may lead to potentially useful hypotheses.

In this section we envisage a more exploratory approach and try to identify different segments of the market by examining the sensitivity of the individual estimates with respect to different data selection procedures. In such a context, a first hypothesis to be tested is whether freight transported exclusively by road corresponds to a specific sub-market. If it were so, it might be due to a bunch of latent attributes specific to the road. If it is not so, it could mean that preferences (of the demand and the supply) do not bear on the mode itself but on the manifest attributes only.

As mentioned before, the price distribution displays some outlying values (see figure 1). A natural question would be to analyze whether such contracts belong to a particular sub-market too, or on the contrary, whether they reflect particularly high values of the manifest attributes. For this purpose, we compare the estimates obtained by the complete sample and those obtained on the basis of subsamples of interest.

Finally, we propose an exploratory method aimed at detecting potential market segmentation. Instead of starting with specific economic hypotheses with predetermined interpretation of the empirical findings, this method leaves to the empirical findings a more substantial space for interpretation.

Examining these questions is the subject of this section.

3.4.2 The case of pure road mode

If the pure road transport, in the one hand, and all modes on the other hand, are considered as two segmented markets, the analysis should be made separately, for each market. As there are not enough observations for contracts which do not concern pure road transport, we compare the results for the set of observations involving pure road transport only with the results related to the complete sample. First of all, by looking at the box-plots of the variables (Figure 5), we observe that the distributions are not quite different from the one observed when all modes of transport are considered (compare with Figure 1). One may therefore expect that the market imperfection and the bargaining powers would not be much affected by the segmentation of the market. This fact is confirmed by Figure 6. The mean of the imperfection is again around 0,85 EUR/ton $\times$ km and 50% of the contracts are characterized by a demand (resp. supply) bargaining power higher (resp. lower) than 0,9 (0,1). The results are very similar to those obtained in section 3.2. A reasonable conclusion from this result is that the few observations on all modes of transport except road do not seem to have been generated by a different process. From an economic point of view, this could suggest that the agents are not willing to pay for the mode of transport itself, but for its attributes.

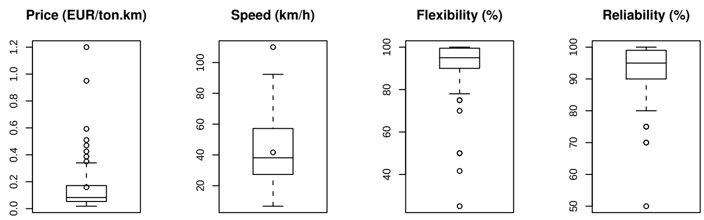

Figure 5: The box-plots of the variables ($n = 72$)

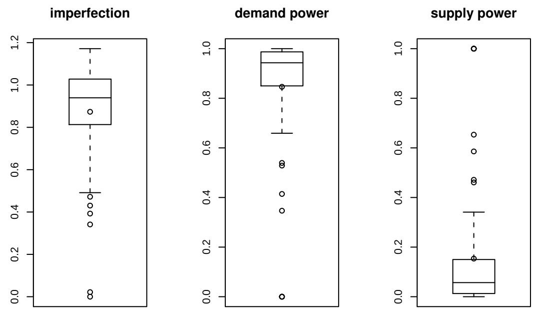

Figure 6: Imperfections and bargaining powers ($n = 72$)

	mean	median	st.dev.
$\overline{1/\hat{\alpha}_{\setminus i}}$	0,20	0,21	0,005
$\overline{\hat{\beta}_{\setminus i}}$	0,38	0,38	0,008

Table 7: Influential observations ($n = 91$)

3.4.3 Detecting influential observations

As a first step, a sensitivity analysis by deleting successively one observation at a time and measuring the mean of the price multipliers has been executed. One objective of such an analysis is the detection of influential observations. Table 12 (see Appendix) gives the means of the demand and supply multipliers when deleting the contract i, namely $\overline{\beta_{\setminus i}}$ and $1/\overline{\alpha}_{\setminus i}$. Visual inspection shows that the means stay relatively stable when deleting one observation at a time. Table 7 confirms this observation by showing low values of the standard deviation (of the means). This suggests that the procedure has failed to pinpoint influential, or outlying, observations, neither at an individual level nor at a global level.

Although the procedure of deleting successively one observation at a time may be repeated for the case of multiple outliers, we rather examine the specificity of each contract in order to find groups of influential observations or to detect potential segments of the market. In Figure 1, some contracts are associated with seemingly outlying prices. Looking more carefully to the specificity of each of those contracts, it can be seen that those contracts represent a transport for retail trade (3 contracts) or for goods which are dangerous (1 contract), or with a high added value (1 contract). The complete database includes only 6 cases of retail trade. So, there are good reasons to perform the analysis without the contracts concerning retail trade, or characterized by dangerous good. Indeed, those contracts could be considered as issued from a particular segment of the market.

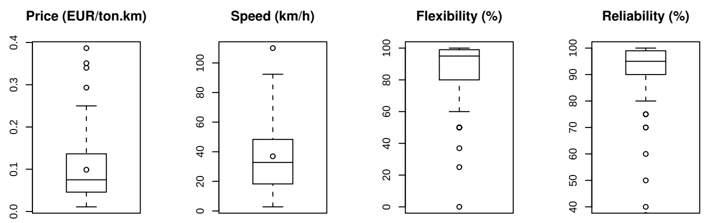

Figure 7: The box-plots of the variables, without specific contracts ($n = 83$)

Leaving aside those contracts, the market imperfection considerably decreases. Table 8 gives the summary statistics for the demand and supply multipliers with the full sample (α and β) and with the new sample ($\alpha_{\setminus I}$ and $\beta_{\setminus I}$). The individual results are given in Table 13 (see Appendix). Figure 7 shows that, in the reduced sample (n = 83), the maximum observed cost of transport is 0,38 EUR/ton $\times$ km. In Figure 8, we see that the effect on the market imperfection is dramatic. The mean of the market imperfection decreases to around 0,25 EUR/ton $\times$ km (instead of 0,85 EUR/ton $\times$ km with the complete sample) and the mean of the demand

	mean	median	st.dev .	min	max
$1/\hat{\alpha}$	0,21	0,11	0,26	0,01	1,00
$1/\hat{\alpha}_{\setminus I}$	0,42	0,29	0,30	0,04	1,00
$\hat{\beta}$	0,38	0,28	0,31	0,01	1,00
$\hat{\beta}_{\setminus I}$	0,40	0,30	0,30	0,05	1,00

Table 8: Sample without oultying data: Summary Statistics ($n = 83$)

(resp. supply) bargaining power has markedly decreased (resp. increased) (from 0,80 to 0,65 for the demand and from 0,20 to 0,35 for the supply). Thus, putting aside retail transport and transport of dangerous goods provides us with quite a different picture: the unexpectedly high (average) imperfect competition observed with the complete sample may be viewed as a result of pooling together different markets. In other words, this analysis suggests an empirical way for distinguishing different segments of a market, leaving for a further economic analysis the task of explaining , or modeling, the reasons why those segments actually stands for different economic environments.

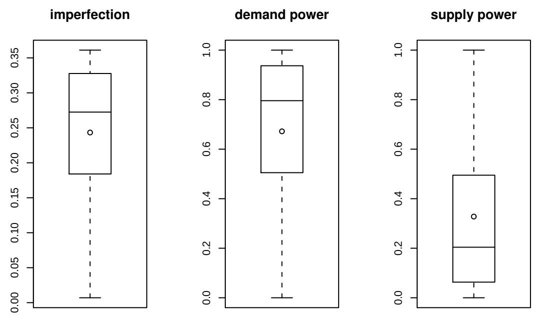

Figure 8: Imperfections and bargaining powers without specific contracts ($n = 83$)

3.4.4 Frontiers peeling

Whether the set of contracts which lies on the demand or the supply bid functions could be considered as part of a particular segment is a natural question. For example, contracts on the demand bid function could represent market for precious goods, as medicines or jewels. Similarly, the contracts on the supply bid function can be part of a market for basic goods, as sand or stones. Sand or stones require less attention during the transport than medicines or jewels. This kind of attribute is not easily measurable and not available in this data base.

In order to detect such a possible market segmentation, the idea would be to compare the price multipliers (and consequently the imperfection and bargaining powers) when all contracts are taken into account and when all, except the efficient contracts detected in the first run, are taken into account. A substantial difference in the price mutlipliers and then on the market imperfection would suggest a possible market segmentation.

In Table 9, we present some summary statistics for the estimations of the price multipliers,

	mean	median	st.dev.	min	max
$1/\hat{\alpha}$	0,34	0,21	0,29	0,04	1,00
$\hat{\beta}$	0,41	0,45	0,32	0,05	1,00
$\hat{I}$	0,33	0,36	0,11	0,003	0,48
$\hat{\pi_D}$	0,73	0,88	0,32	0,00	1,00
$\hat{\pi_S}$	0,26	0,11	0,32	0,00	1,00

Table 9: Peeling the frontier: Summary statistics ($n = 76$)

the imperfection and the bargaining powers based on a subsample including only the contracts which did not lie on one of the two bid functions; from Table 10 in Appendix: contracts with one of the multipliers equal to 1 are those on the frontiers. A closer look to Table 9 and Table 1 and reveals how the distributions are affected by deleting the observations on the frontiers. The effect on $1/\alpha$ and on β are similar on the averages (roughly, an increase of 50 %) whereas the effect on the medians displays a substantial decrease on the asymmetry (as measured by the difference between median and average). The effect on the level of the standard deviation is minor but more substantial on the coefficients of variation that decrease once the frontiers have been peeled. The effect on the market imperfection is still more marked: a substantial decrease on the average (from 0,87 to 0,33 EUR/ton $\times km$), on the asymmetry and on the dispersion. As far as the bargaining powers are concerned, a minor effect on the asymmetry and on the dispersion but a better balance between the supply and demand bargaining powers are observed.

From an economic point of view, these facts suggest that the 19 contracts on the frontiers might reflect differences in competitive environment: a further analysis should re-examine the answer in the interviews in order to evaluate differences of economic environment, *i.e.* differences of *market* segment and/or to assess possible differences of bargaining powers, *i.e.* differences of *agents* characteristics. Moreover, the slightly higher effect on β (than on $1/\alpha$) and the lower difference on the two bargaining powers comes from the fact that, in the complete sample, there were more contracts close to the lower frontier, $P_*(z)$, than to the upper frontier, $P^*(z)$.

4 Conclusion

This paper experiments, in the case of freight transport, an economic and econometric analysis sketched in Mouchart and Vandresse (2003). One may imagine many reasons why a specific market would not be perfectly competitive. In an hedonic approach, attention is focused on the "price $\times$ attributes" space rather than on the "price $\times$ quantity" space. In this paper we concentrate the attention on the idea that the observed imperfection be signaled by a non unicity of the observed price corresponding to a given set of atttributes. From a point of view of heterogeneity, as often met in microeconometrics, that non-unicity of the observed price may be interpreted as a randomization due to unobserved attributes.

We start by estimating the market imperfection and the bargaining powers of the agents on the basis of a complete sample. As a first result, we obtain some indication on the order of magnitude of imperfection and on the relative bargaining powers of the demand and supply sides. We next focus the analysis on the importance of each attribute in the bargaining process. The economic implication of these empirical findings points toward the difficulty of observing the actually relevant attributes of the contracts. Finally, we explore the possibility of detecting potential market segmentation and found not significant results for the pure road transport but noticeable results for retail freight and dangerous goods; moreover we found that frontier peeling provides promising avenues.

From the interviews we got the feeling that transport contracts are bargained simultaneously on price and attributes: this feature makes disentangling supply and demand from the available data quite problematic. Therefore no exogeneity assumption would be suitable. For that reason, the approach of this paper is based on properties of the joint distribution of the price and the attributes rather than on the properties of some conditional distribution. This is thus in contrast with the usual hedonic regression of price on attributes.

The approach developed in this paper is liable to be used in a wide range of application, because perfect competition may be viewed as a limit concept of economic analysis. Thus, in the labor market, wage bargaining is notably characterized by an imperfect information on the attributes of the workers and on the needs of the firms. Polachek and Yoon (1987,1996) have developed models somewhat similar to the model presented above; differences are worth of interest. Their model is a parametric (our is non parametric), stochastic (our is not stochastic) two sided (as our) frontier model. Furthermore the economic context is different but not too far from our: they consider a potential earning (for worker i in firm f at time t) that would prevail if both worker and employer had perfect information and model imperfect information by agent specific fixed and random effects. Apart from a difference of data structure, Polachek and Yoon develop a regression model with a component error structure with unbounded (mixed) distribution whereas this paper focuses on the (assumedly compact) support of a joint distribution without any exogeneity assumption. The difference of exogeneity assumptions is rooted on the idea that wage bargaining is operated under the worker and firms attributes considered as given whereas transport bargaining operates simultaneously on price and attributes.

From a statistical viewpoint, as the specified model belongs to non parametric frontier models, robustness and sensitivity are crucial issues, particularly for not too large samples. This issue has been taken into account by investigating the robustness of the final results, to the choice of the attributes and to the selection of the data.

From a methodological point of view, the approach developed in this paper as follows: instead of first building a structural model of market imperfection we first focus on observing facts possibly bound to market imperfection and next provide an economic analysis of the empirical findings. At the end of the investigation we hope to have achieved a better economic understanding of imperfect competition and bargaining power in a specific market. Along with other similar analyses, one will progressively pave the way toward a structural modeling of imperfect competition. Such an approach may be viewed as accumulating economic knowledge in the framework of a continuous interaction between facts and theory. A more structural approach starts with specifying a structural model and, after estimating, decides to confirm or to dismiss the model according to the empirical findings. In contrast, we start with a minimal amount of assumptions, listed in section 2 and endeavor at a deeper economic understanding of the observed facts, starting by examining the results of a first estimation (section 3.2 and 3.3) and proceeding by scrutinizing and interpreting the sensitivity of these preliminary results. The empirical findings of this paper suggest that freight transport, in Belgium, is characterized by such an amount of (factual) complexities and heterogeneities that a structural model based on some "stylised facts" typically used for models of market imperfection is not likely to extract a reliable information from the available data. The economic interpretation of our empirical findings provides a first step toward a better understanding of the way market is operating and points to next steps based on future interviews designed on the basis of this work viewed as a first run.

As a final remark, the main contribution of the paper may be viewed as an exploration for a new way of approaching market imperfection with systematic feedbacks between observing and modeling. The case study has suggested the power and the flexibility of such an approach.

Reference

Beuthe M., Bouffioux Ch., De Maeyer J., Santamaria G., Vandaele E., Vandresse M., 2003, A multi-criteria analysis of stated preferences among freight transport alternatives, paper presented at the ERSA Congress, University of JYVÄSKYLÄ, August 2003.

Bickel P.J. and Freedman D.A., 1981, Some asymptotic theory for the bootstrap, *Annals of Statistics*, 9, 1196-1217.

Charnes A., Cooper W.W. and Rhodes E. , 1981, Evaluating program and managerial efficiency : an application of data envelopment analysis to program follow through, *Management Science*, 27, 668-697.

Efron B., 1979, Bootstrap methods: another look at the Jackknife, *Annals of Statistics*, 7, 1-26.

Efron B. and Tibshirani R.J., 1993, *An introduction to the Bootstrap*, London: Chapman and Hall.

Gabszewicz J. and Thisse J., 1999, *Microeconomic theories of imperfect competition*, Cheltenham, Edward Elgar, Classics in Economics.

Griliches Z., 1971, *Price indices and quality change*, Cambridge: Harvard University Press.

Kneip A., Park B.u. and Simar L., 1998, A note on the convergence of nonparametric DEA estimators for production efficiency scores, *Econometric theory*, 14, 783-793.

Mouchart M. and Vandresse M., 2003, A Measure of market imperfection by frontier analysis, Discussion Paper 0329, Institut de statistique, UCL, Louvain-la-Neuve (B).

MOUCHART M. AND VANDRESSE M., 2004, An hedonic approach of the imperfect market of freight transport by frontier analysis, Paper presented at the 10^{th} World Congress of Transport Research 2004, Istanbul, Turkey.

POLACHEK S.W. AND YOON B.J., 1987, A two-tiered earnings frontier estimation of employer and employee information in the labor market, *The Review of Economics and Statistics*, 69:2, 296-302.

POLACHEK S.W. AND YOON B.J., 1996, Panel estimates of a two-tiered earnings frontier, *Journal of applied econometrics*, 11, 169-178.

ROSEN S., 1974, Hedonic prices and implicit markets: product differentiation in pure competition, *Journal of Political Economy*, 82, 34-55.

SIMAR L. AND WILSON P., 1998, Sensitivity analysis of efficiency scores: how to bootstrap in nonparametric frontier models, *Management Science*, 44, 1, January.

SIMAR L. AND WILSON P., 2001. Testing restrictions in nonparametric efficiency models, *Communications in statistics*, **30**, 159-184.

SIMAR L. AND WILSON P., 2003, Efficiency analysis: the statistical approach, Unpublished Lecture Notes, Institut de statistique, UCL, Louvain-la-Neuve (B).

Appendix : Individual Results

First Results

Interview	$1/\hat{\alpha}$	$\hat{\beta}$	$\hat{I}$	$\hat{\pi}_D$	$\hat{\pi}_S$		Interview	$1/\hat{\alpha}$	$\hat{\beta}$	$\hat{I}$	$\hat{\pi}_D$	$\hat{\pi}_S$
1	0,08	0,26	0,94	0,94	0,06		47	0,03	0,46	0,93	0,98	0,01
2	0,09	0,23	0,79	0,92	0,07		48	0,11	0,21	1,10	0,91	0,09
3	1,00	0,52	0,02	0,00	1,00		49	0,02	0,80	0,81	0,99	0,00
4	0,04	0,40	1,01	0,97	0,02		50	1,00	0,44	0,01	0,00	1,00
5	0,16	0,15	0,97	0,85	0,14		51	0,16	0,09	0,71	0,85	0,15
6	0,32	0,07	0,46	0,69	0,30		52	0,46	0,07	0,99	0,55	0,44
7	0,11	0,65	0,14	0,95	0,04		53	0,15	0,47	1,09	0,91	0,09
8	0,05	1,00	1,09	1,00	0,00		54	0,09	0,22	1,15	0,93	0,07
9	0,35	1,00	0,77	1,00	0,00		55	0,03	1,00	1,17	1,00	0,00
10	0,08	0,24	1,03	0,94	0,06		56	0,08	0,31	0,64	0,94	0,05
11	0,14	0,15	1,08	0,87	0,12		57	0,14	0,19	1,02	0,88	0,12
12	0,04	0,58	1,15	0,98	0,02		58	0,15	0,71	0,62	0,95	0,05
13	0,07	0,39	0,90	0,95	0,05		59	0,04	0,60	0,76	0,98	0,02
14	0,24	0,07	1,03	0,77	0,23		60	0,05	0,65	0,98	0,98	0,02
15	0,17	0,09	0,99	0,84	0,15		61	0,08	0,88	0,68	0,99	0,01
16	0,06	0,22	0,99	0,95	0,05		62	1,00	0,34	0,02	0,00	1,00
17	0,33	0,05	1,00	0,67	0,32		63	0,06	0,24	1,01	0,95	0,05
18	0,12	0,10	1,00	0,89	0,11		64	0,05	0,38	1,13	0,96	0,03
19	0,04	0,46	1,05	0,97	0,02		65	0,16	0,12	1,06	0,85	0,14
20	0,04	0,49	1,08	0,98	0,02		66	0,17	0,23	1,06	0,86	0,14
21	0,20	0,10	0,53	0,81	0,19		67	0,02	0,47	0,98	0,98	0,01
22	0,13	0,09	0,90	0,87	0,12		68	0,24	1,00	0,91	1,00	0,00
23	0,05	0,65	1,05	0,98	0,02		69	0,29	1,00	0,84	0,99	0,00
24	0,41	0,04	0,73	0,60	0,40		70	0,07	0,33	1,08	0,95	0,04
25	1,00	0,02	1,18	0,00	1,00		71	0,06	0,30	0,89	0,95	0,04
26	1,00	0,01	0,94	0,00	1,00		72	0,23	0,07	0,92	0,78	0,22
27	0,11	1,00	1,02	1,00	0,00		73	0,09	0,32	0,99	0,93	0,06
28	0,04	0,40	1,12	0,97	0,03		74	0,48	0,41	0,05	0,64	0,35
29	0,32	0,08	0,77	0,70	0,30		75	0,01	1,00	0,99	1,00	0,00
30	0,08	0,28	0,96	0,93	0,06		76	0,02	0,77	0,84	0,99	0,00
31	0,08	1,00	0,94	0,99	0,01		77	0,06	0,24	0,73	0,95	0,05
32	0,11	1,00	0,61	0,99	0,00		78	0,09	0,13	0,99	0,92	0,08
33	0,48	0,03	1,04	0,52	0,48		79	1,00	0,03	1,05	0,00	1,00
34	0,04	0,70	0,99	0,98	0,01		80	0,08	0,19	0,74	0,93	0,06
35	0,13	0,09	0,92	0,88	0,12		81	0,07	0,30	0,62	0,94	0,05
36	1,00	0,61	0,01	0,00	1,00		82	0,10	0,47	0,79	0,94	0,05
37	0,12	0,59	1,06	0,94	0,06		83	0,65	0,25	0,06	0,42	0,58
38	0,06	1,00	1,03	1,00	0,00		84	0,60	0,07	0,24	0,42	0,58
39	0,08	0,19	1,05	0,93	0,07		85	0,09	0,22	1,07	0,92	0,07

40	0,30	0,13	0,47	0,72	0,27		86	0,04	0,42	0,81	0,97	0,02
41	0,18	0,06	0,96	0,82	0,17		87	0,06	1,00	1,13	1,00	0,00
42	0,05	0,24	0,98	0,96	0,04		88	0,04	1,00	0,98	1,00	0,00
43	0,16	0,08	0,91	0,84	0,15		89	0,36	0,08	1,03	0,65	0,35
44	0,13	0,09	0,96	0,87	0,12		90	0,11	0,17	0,92	0,90	0,09
45	0,05	0,24	0,89	0,96	0,04		91	0,05	0,44	0,88	0,97	0,03
46	0,20	0,08	0,84	0,80	0,19							

Table 10: First Results: individual estimations ($n = 91$)

Importance of the attributes

interview	cost	speed	flex,	rel,	$da_{\setminus\{speed\}}$	$da_{\setminus\{flex\}}$	$da_{\setminus\{rel\}}$	$db_{\setminus\{speed\}}$	$db_{\setminus\{flex\}}$	$db_{\setminus\{rel\}}$	$d\pi_{D\setminus\{speed\}}$	$d\pi_{D\setminus\{flex\}}$	$d\pi_{D\setminus\{rel\}}$
1	0,0750	40,00	80,00	98,00	0,01	0,01	0,00	0,11	0,00	0,00	0,00	-0,01	0,00
2	0,0750	33,88	96,00	82,00	0,00	0,00	0,02	0,08	0,00	0,00	0,00	0,00	-0,01
3	0,0380	41,29	50,00	40,00	0,00	0,00	0,94	0,23	0,00	0,00	0,00	0,00	-0,97
4	0,0400	31,25	95,00	95,00	0,00	0,00	0,00	0,13	0,00	0,00	0,01	0,00	0,00
5	0,1600	50,00	80,00	95,00	0,01	0,02	0,00	0,08	0,00	0,00	0,00	-0,02	0,00
6	0,1500	16,67	70,00	70,00	0,08	0,00	0,11	0,00	0,00	0,00	-0,07	0,00	-0,11
7	0,0170	7,35	80,00	80,00	0,09	0,00	0,08	0,00	0,00	0,00	-0,03	0,00	-0,03
8	0,0580	41,50	100,00	100,00	0,00	0,00	0,00	0,81	0,00	0,59	0,04	0,00	0,03
9	0,4250	62,00	100,00	100,00	0,00	0,00	0,00	0,97	0,00	0,92	0,35	0,00	0,33
10	0,0800	39,09	90,00	98,00	0,01	0,01	0,00	0,10	0,00	0,00	0,00	-0,01	0,00
11	0,1530	48,00	90,00	99,00	0,01	0,01	0,00	0,08	0,00	0,00	0,01	-0,01	0,00
12	0,0527	68,88	99,00	98,00	0,00	0,00	0,00	0,37	0,00	0,00	0,02	0,00	0,00
13	0,0690	60,00	95,00	85,00	0,00	0,00	0,01	0,23	0,00	0,00	0,01	0,00	-0,01
14	0,2500	33,43	95,00	95,00	0,02	0,00	0,00	0,03	0,00	0,00	-0,01	0,00	-0,01
15	0,1660	27,08	95,00	95,00	0,02	0,01	0,01	0,02	0,00	0,00	-0,01	0,00	0,00
16	0,0600	22,22	100,00	95,00	0,01	0,00	0,00	0,04	0,01	0,00	-0,01	0,00	0,00
17	0,3400	35,00	90,00	97,00	0,03	0,02	0,00	0,02	0,00	0,00	-0,02	-0,02	0,00
18	0,1200	20,00	100,00	99,00	0,02	0,00	0,00	0,01	0,00	0,00	-0,02	0,00	0,00
19	0,0400	37,50	95,00	95,00	0,00	0,00	0,00	0,19	0,00	0,00	0,01	0,00	0,00
20	0,0400	40,00	95,00	98,00	0,01	0,00	0,00	0,21	0,00	0,00	0,00	0,00	0,00
21	0,1100	17,53	50,00	95,00	0,04	0,09	0,00	0,00	0,00	0,00	-0,03	-0,09	-0,01
22	0,1200	10,79	95,00	95,00	0,02	0,00	0,00	0,00	0,00	0,00	-0,02	0,00	0,00

23	0,0538	32,14	100,00	99,90	0,01	0,00	0,00	0,45	0,08	0,30	0,02	0,00	0,01
24	0,3000	8,33	99,00	99,00	0,16	0,00	0,00	0,00	0,00	0,00	-0,16	0,00	0,00
25	1,2000	50,00	99,00	99,00	0,00	0,00	0,00	0,01	0,00	0,00	0,00	0,00	0,00
26	0,9500	10,00	100,00	95,00	0,15	0,00	0,00	0,00	0,00	0,00	-0,15	0,00	0,00
27	0,1215	86,00	90,00	99,50	0,00	0,01	0,00	0,91	0,00	0,52	0,10	0,00	0,06
28	0,0500	40,84	99,00	99,00	0,00	0,00	0,00	0,18	0,00	0,00	0,00	0,00	0,00
29	0,2500	41,00	80,00	80,00	0,01	0,01	0,06	0,04	0,00	0,00	0,00	0,00	-0,06
30	0,0800	38,75	100,00	90,00	0,00	0,00	0,01	0,14	0,04	0,00	0,01	0,00	-0,01
31	0,0800	72,67	100,00	90,00	0,00	0,00	0,01	0,86	0,60	0,00	0,07	0,05	0,00
32	0,0760	46,78	50,00	100,00	0,00	0,05	0,00	0,86	0,00	0,71	0,10	0,00	0,08
33	0,5100	27,75	99,00	99,00	0,05	0,00	0,00	0,01	0,00	0,00	-0,05	-0,01	0,00
34	0,0410	64,67	95,00	90,00	0,00	0,00	0,01	0,43	0,00	0,00	0,02	0,00	0,00
35	0,1200	13,72	95,00	95,00	0,02	0,01	0,00	0,00	0,00	0,00	-0,02	-0,01	0,00
36	0,0180	13,50	25,00	50,00	0,00	0,00	0,94	0,00	0,00	0,00	0,00	0,00	-0,98
37	0,1430	83,33	90,00	98,50	0,00	0,00	0,00	0,51	0,00	0,24	0,06	-0,01	0,03
38	0,0650	92,33	85,00	95,00	0,00	0,00	0,00	0,83	0,00	0,00	0,05	0,00	0,00
39	0,0854	31,60	97,00	99,00	0,01	0,00	0,00	0,06	0,00	0,00	0,00	-0,01	0,00
40	0,1500	42,00	50,00	70,00	0,00	0,06	0,08	0,06	0,00	0,00	0,02	-0,05	-0,07
41	0,1770	14,02	100,00	100,00	0,03	0,00	0,00	0,00	0,00	0,00	-0,03	0,00	0,00
42	0,0468	16,92	100,00	98,00	0,01	0,00	0,00	0,00	0,00	0,00	-0,01	0,00	0,00
43	0,1500	21,02	90,00	95,00	0,02	0,01	0,00	0,01	0,00	0,00	-0,02	-0,01	0,00
44	0,1300	20,94	95,00	98,00	0,02	0,00	0,00	0,01	0,00	0,00	-0,02	0,00	0,00
45	0,0460	13,01	100,00	92,00	0,01	0,00	0,00	0,00	0,00	0,00	-0,01	0,00	0,00
46	0,1730	24,20	80,00	95,00	0,04	0,03	0,00	0,02	0,00	0,00	-0,03	-0,03	0,00

47	0,0239	16,05	95,00	95,00	0,01	0,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00
48	0,1200	55,33	98,00	95,00	0,00	0,00	0,01	0,12	0,00	0,00	0,01	0,00	-0,01
49	0,0138	17,36	80,00	99,00	0,01	0,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00
50	0,0250	3,23	0,00	99,00	0,00	0,72	0,00	0,00	0,00	0,00	0,00	-0,82	0,00
51	0,1170	14,46	75,00	90,00	0,04	0,03	0,01	0,00	0,00	0,00	-0,04	-0,03	-0,01
52	0,4700	72,80	95,00	90,00	0,00	0,00	0,06	0,05	0,00	0,00	0,01	0,00	-0,06
53	0,1800	71,32	95,00	99,50	0,00	0,00	0,00	0,41	0,01	0,30	0,06	0,00	0,04
54	0,1020	48,67	98,00	98,00	0,00	0,00	0,00	0,11	0,00	0,00	0,01	0,00	0,00
55	0,0320	72,95	99,00	99,00	0,00	0,00	0,00	0,66	0,00	0,00	0,02	0,00	0,00
56	0,0500	29,50	90,00	75,00	0,01	0,00	0,03	0,09	0,00	0,00	0,00	0,00	-0,01
57	0,1500	26,71	99,00	100,00	0,02	0,00	0,00	0,12	0,00	0,09	0,00	0,00	0,01
58	0,0999	45,17	50,00	100,00	0,00	0,06	0,00	0,60	0,00	0,50	0,08	-0,02	0,07
59	0,0300	36,28	90,00	80,00	0,00	0,00	0,01	0,23	0,00	0,00	0,00	0,00	-0,01
60	0,0460	49,56	80,00	99,50	0,01	0,01	0,00	0,41	0,00	0,15	0,01	-0,01	0,00
61	0,0556	76,00	98,00	75,00	0,00	0,00	0,03	0,68	0,21	0,00	0,05	0,02	0,00
62	0,0350	2,78	90,00	95,00	0,97	0,00	0,00	0,00	0,00	0,00	-0,98	0,00	0,00
63	0,0632	28,56	95,00	98,00	0,01	0,00	0,00	0,07	0,00	0,00	-0,01	0,00	0,00
64	0,0600	48,93	95,00	99,00	0,00	0,00	0,00	0,20	0,00	0,00	0,01	0,00	0,00
65	0,1700	41,00	98,00	95,00	0,01	0,00	0,01	0,06	0,00	0,00	0,00	0,00	-0,01
66	0,1900	34,57	100,00	100,00	0,01	0,00	0,00	0,17	0,00	0,12	0,01	0,00	0,02
67	0,0236	16,96	100,00	100,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
68	0,2932	59,00	100,00	100,00	0,00	0,00	0,00	0,96	0,00	0,89	0,24	0,00	0,22
69	0,3510	110,0	98,00	99,00	0,00	0,00	0,00	0,97	0,00	0,00	0,29	0,00	0,00
70	0,0720	52,00	90,00	95,00	0,00	0,01	0,01	0,18	0,00	0,00	0,02	0,00	0,00

71	0,0560	32,78	78,00	99,00	0,01	0,01	0,00	0,10	0,00	0,00	0,00	0,00	0,00
72	0,2180	29,21	98,00	90,00	0,02	0,00	0,02	0,02	0,00	0,00	-0,02	0,00	-0,03
73	0,0900	65,00	90,00	90,00	0,00	0,00	0,01	0,20	0,00	0,00	0,02	0,00	-0,01
74	0,0270	3,06	75,00	100,00	0,45	0,08	0,00	0,00	0,00	0,00	-0,33	-0,07	0,00
75	0,0110	17,80	100,00	100,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
76	0,0160	21,31	85,00	90,00	0,00	0,00	0,00	0,08	0,00	0,00	0,01	0,00	0,00
77	0,0463	8,40	95,00	95,00	0,02	0,00	0,00	0,00	0,00	0,00	-0,02	0,00	0,00
78	0,0880	18,75	99,00	99,00	0,02	0,00	0,00	0,00	0,00	0,00	-0,01	0,00	0,00
79	1,0830	67,67	80,00	95,00	0,00	0,03	0,00	0,02	0,00	0,00	0,00	-0,04	0,00
80	0,0580	12,71	80,00	90,00	0,02	0,01	0,01	0,00	0,00	0,00	-0,01	-0,01	0,00
81	0,0455	25,21	80,00	75,00	0,01	0,00	0,02	0,06	0,00	0,00	0,00	0,00	-0,01
82	0,0790	76,00	90,00	80,00	0,00	0,00	0,03	0,33	0,00	0,00	0,03	0,00	-0,01
83	0,0438	6,67	80,00	80,00	0,60	0,00	0,57	0,00	0,00	0,00	-0,54	0,00	-0,52
84	0,1520	16,25	60,00	60,00	0,23	0,00	0,36	0,00	0,00	0,00	-0,23	0,00	-0,36
85	0,0977	31,98	100,00	98,00	0,01	0,00	0,00	0,11	0,05	0,03	0,00	0,01	0,00
86	0,0348	27,56	75,00	95,00	0,01	0,01	0,00	0,10	0,00	0,00	0,00	0,00	0,00
87	0,0700	71,11	100,00	99,00	0,00	0,00	0,00	0,84	0,55	0,10	0,05	0,03	0,01
88	0,0387	68,89	100,00	90,00	0,00	0,00	0,01	0,72	0,21	0,00	0,03	0,01	0,00
89	0,3867	27,56	100,00	100,00	0,04	0,00	0,00	0,05	0,00	0,04	-0,03	0,00	0,00
90	0,0995	27,92	100,00	90,00	0,01	0,00	0,02	0,06	0,02	0,00	0,00	0,00	-0,01
91	0,0460	41,67	95,00	85,00	0,00	0,00	0,01	0,20	0,00	0,00	0,01	0,00	-0,01

Table 11: Importance of the attributes ($n = 91$)

Influential observations

Interview	average of $1/\hat{\alpha}_{\setminus i}$	average of $\hat{\beta}_{\setminus i}$		**interview**	average of $1/\hat{\alpha}_{\setminus i}$	average of $\hat{\beta}_{\setminus i}$
1	0,210	0,386		47	0,210	0,384
2	0,210	0,386		48	0,210	0,387
3	0,201	0,383		49	0,211	0,380
4	0,210	0,385		50	0,209	0,384
5	0,209	0,387		51	0,209	0,388
6	0,207	0,388		52	0,206	0,388
7	0,210	0,382		53	0,209	0,384
8	0,210	0,393		54	0,210	0,387
9	0,207	0,378		55	0,210	0,419
10	0,210	0,386		56	0,210	0,386
11	0,209	0,387		57	0,209	0,387
12	0,210	0,383		58	0,209	0,381
13	0,210	0,385		59	0,210	0,382
14	0,208	0,388		60	0,210	0,382
15	0,209	0,388		61	0,210	0,379
16	0,210	0,387		62	0,210	0,385
17	0,207	0,388		63	0,210	0,386
18	0,209	0,388		64	0,210	0,385
19	0,210	0,384		65	0,209	0,388
20	0,210	0,384		66	0,209	0,386
21	0,209	0,388		67	0,211	0,384
22	0,209	0,388		68	0,208	0,378
23	0,210	0,382		69	0,208	0,379
24	0,206	0,389		70	0,210	0,385
25	0,205	0,389		71	0,210	0,386
26	0,254	0,389		72	0,208	0,388
27	0,210	0,384		73	0,210	0,385
28	0,210	0,385		74	0,205	0,384
29	0,207	0,388		75	0,211	0,454
30	0,210	0,386		76	0,211	0,380
31	0,210	0,378		77	0,210	0,386
32	0,210	0,381		78	0,210	0,388
33	0,205	0,389		79	0,201	0,389
34	0,210	0,381		80	0,210	0,387
35	0,209	0,388		81	0,210	0,386

36	0,211	0,382		82	0,210	0,384
37	0,209	0,382		83	0,204	0,386
38	0,210	0,383		84	0,204	0,388
39	0,210	0,387		85	0,210	0,387
40	0,207	0,387		86	0,210	0,384
41	0,209	0,388		87	0,210	0,379
42	0,210	0,386		88	0,210	0,381
43	0,209	0,388		89	0,207	0,388
44	0,209	0,388		90	0,210	0,387
45	0,210	0,386		91	0,210	0,384
46	0,209	0,388				

Table 12: Influential observations: average of the multipliers when deleting observation i

The choice of the observations

Interview	$1/\hat{\alpha}_{\backslash I}$	$1/\hat{\alpha}$	$1/\hat{\alpha} - 1/\hat{\alpha}_{\backslash I}$		$\hat{\beta}_{\backslash I}$	$\hat{\beta}$	$\hat{\beta} - \hat{\beta}_{\backslash I}$
1	0,24	0,08	-0,16		0,26	0,26	0,00
2	0,26	0,09	-0,17		0,23	0,23	0,00
3	0,99	1,00	0,01		0,52	0,52	0,00
4	0,11	0,04	-0,07		0,40	0,40	0,00
5	0,52	0,16	-0,36		0,15	0,15	0,00
6	0,84	0,32	-0,52		0,07	0,07	0,00
7	0,29	0,11	-0,18		0,65	0,65	0,00
8	0,14	0,05	-0,09		1,00	1,00	0,00
10	0,23	0,08	-0,15		0,24	0,24	0,00
11	0,43	0,14	-0,29		0,15	0,15	0,00
12	0,14	0,04	-0,10		0,58	0,58	0,00
13	0,23	0,07	-0,16		0,39	0,39	0,00
14	0,69	0,24	-0,45		0,07	0,07	0,00
15	0,46	0,17	-0,30		0,09	0,09	0,00
16	0,19	0,06	-0,13		0,22	0,22	0,00
17	0,98	0,33	-0,65		0,05	0,05	0,00
18	0,43	0,12	-0,31		0,10	0,10	0,00
19	0,11	0,04	-0,07		0,46	0,46	0,00
20	0,10	0,04	-0,06		0,49	0,49	0,00
21	0,55	0,20	-0,35		0,10	0,10	0,00
22	0,83	0,13	-0,70		0,09	0,09	0,00

23	0,13	0,05	-0,08		0,65	0,65	0,00
27	0,34	0,11	-0,23		1,00	1,00	0,00
28	0,13	0,04	-0,09		0,40	0,40	0,00
29	0,92	0,32	-0,60		0,08	0,08	0,00
30	0,24	0,08	-0,16		0,28	0,28	0,00
31	0,24	0,08	-0,16		1,00	1,00	0,00
32	0,36	0,11	-0,25		1,00	1,00	0,00
34	0,12	0,04	-0,08		0,70	0,70	0,00
35	0,65	0,13	-0,52		0,09	0,09	0,00
36	1,00	1,00	0,00		0,61	0,61	0,00
37	0,41	0,12	-0,29		0,59	0,59	0,00
38	0,20	0,06	-0,14		1,00	1,00	0,00
39	0,22	0,08	-0,14		0,19	0,19	0,00
40	0,99	0,30	-0,69		0,13	0,13	0,00
41	0,91	0,18	-0,73		0,06	0,06	0,00
42	0,19	0,05	-0,14		0,24	0,24	0,00
43	0,52	0,16	-0,36		0,08	0,08	0,00
44	0,44	0,13	-0,31		0,09	0,09	0,00
45	0,27	0,05	-0,22		0,24	0,24	0,00
46	0,56	0,20	-0,36		0,08	0,08	0,00
47	0,11	0,03	-0,09		0,46	0,46	0,00
48	0,33	0,11	-0,22		0,21	0,21	0,00
49	0,05	0,02	-0,03		0,80	0,80	0,00
50	1,00	1,00	0,00		0,44	0,44	0,00
51	0,64	0,16	-0,48		0,09	0,09	0,00
53	0,48	0,15	-0,33		0,47	0,47	0,00
54	0,27	0,09	-0,18		0,22	0,22	0,00
55	0,08	0,03	-0,05		1,00	1,00	0,00
56	0,20	0,08	-0,12		0,31	0,31	0,00
57	0,40	0,14	-0,26		0,19	0,19	0,00
58	0,48	0,15	-0,34		0,71	0,71	0,00
59	0,11	0,04	-0,07		0,60	0,60	0,00
60	0,14	0,05	-0,10		0,65	0,65	0,00
61	0,23	0,08	-0,15		0,88	0,88	0,00
62	1,00	1,00	0,00		0,34	0,34	0,00
63	0,17	0,06	-0,11		0,24	0,24	0,00
64	0,16	0,05	-0,11		0,38	0,38	0,00
65	0,47	0,16	-0,31		0,12	0,12	0,00

66	0,49	0,17	-0,32		0,23	0,23	0,00
67	0,10	0,02	-0,08		0,47	0,47	0,00
68	0,75	0,24	-0,51		1,00	1,00	0,00
69	0,92	0,29	-0,63		1,00	1,00	0,00
71	0,18	0,06	-0,12		0,30	0,30	0,00
72	0,66	0,23	-0,43		0,07	0,07	0,00
73	0,27	0,09	-0,18		0,32	0,32	0,00
74	0,79	0,48	-0,31		0,41	0,41	0,00
75	0,04	0,01	-0,03		1,00	1,00	0,00
76	0,05	0,02	-0,03		0,77	0,77	0,00
77	0,41	0,06	-0,35		0,24	0,24	0,00
78	0,33	0,09	-0,24		0,13	0,13	0,00
80	0,36	0,08	-0,28		0,19	0,19	0,00
81	0,18	0,07	-0,11		0,30	0,30	0,00
82	0,29	0,10	-0,20		0,47	0,47	0,00
83	1,00	0,65	-0,35		0,25	0,25	0,00
84	0,99	0,60	-0,39		0,07	0,07	0,00
85	0,26	0,09	-0,17		0,22	0,22	0,00
86	0,12	0,04	-0,08		0,42	0,42	0,00
87	0,18	0,06	-0,12		1,00	1,00	0,00
88	0,11	0,04	-0,07		1,00	1,00	0,00
89	1,00	0,36	-0,64		0,08	0,08	0,00
90	0,30	0,11	-0,19		0,17	0,17	0,00
91	0,15	0,05	-0,10		0,44	0,44	0,00

Table 13: Sample without outlying data: individual results ($n = 83$)