DEPARTEMENT BEDRIJFSECONOMIE

AN EMPIRICAL ANALYSIS OF STRATEGIC PRICE SETTING IN THE BELGIAN LEASING MARKET

by

Reinhilde VEUGELERS
Cynthia VAN HULLE
Eddy DURINCK
Eddy LAVEREN

WORKING PAPER
95-224
December 1995

D/1995/2263/21

AN EMPIRICAL ANALYSIS OF STRATEGIC PRICE SETTING IN THE BELGIAN LEASING MARKET

by

Reinhilde Veugelers and Cynthia Van Hulle
Associate Professor Full Professor
K.U.Leuven K.U.Leuven

and

Eddy Durinck and Eddy Laveren
Full Professor Associate Professor
UFSIAntwerpen UFSIAntwerpen

Abstract

A study of the quarterly standard leasing rates for financial mid-sized lease contracts for 16 companies over a 6 year period provides evidence for leasing companies to tie to the NSCI, the market leader in investment credits, a substitute for leasing. This tying behavior is further shown to be company and time specific. Particularly in times of thin margins, incumbent firms tie significantly stronger than entrants. No significant evidence was found for the impact of multi-market contact as well as the entry of new firms.

° The authors would like to thank Dhr Vervaet for providing valuable information and comments.

AN EMPIRICAL ANALYSIS OF STRATEGIC PRICE SETTING IN THE BELGIAN LEASING MARKET

1. INTRODUCTION

Recent developments in game theoretic models of cooperation have allowed to finetune circumstances that facilitate stable collusion within an industry and at the same time generate projections about the likelihood, duration and intensity of price wars. However, the empirical use of this wealth of models is limited because of the multiplicity of results generated accross and even within models. Usually it is only with very detailed information on market structure and firm's conduct that equilibria can be pinned down empirically. Examples of such studies include Porter's railway cartel (1983), Slade's retail gasoline stations (1987), Iwand & Rosenbaum's cement industry (1991), Bresnahan's automobile industry (1987). All of these studies are closely guided by the non-cooperative game theoretic models. A number of other empirical studies describe price collusion and wars, such as Suslow (1988) and Fraas & Greer (1977).

This paper reports an empirical study of the strategic pricing behaviour in the financial leasing market in Belgium. An analysis of this market is interesting for several reasons. First, as discussed in the paper, European leasing markets have many characteristics in common. Second, after a long period with relatively few players, the market witnessed the entry of new participants during the sample period. Hence the impact of market entry on collusive behavior can be tested. Third, given that throughout Europe, many leasing firms are affiliates of banks, the leasing market offers nice opportunities for tests of multi-market contact [1].

The finance literature comprises a vast number of articles on leasing. However it concentrates on the valuation of leasing contracts and attempts to find out the quantitative and qualitative advantages of leasing above other financing techniques.[2] Instead of

---

1. Also on the level of the banking market, Belgium has many points in common with other European countries like France, The Netherlands, Spain, Denmark, Sweden.
2. Most empirical studies in this context are based on questionnaire surveys of the opinion of financial managers on, among others, the importance of various factors influencing the lease or purchase decision and the relationship between the volume of leasing activity

considering financial variables, this study analyses the strategic interaction of the pricing decisions of leasing firms. The evidence indicates that the leasing market is fairly transparant and competitive. Multi-market contacts seem to be limited, except for the mechanism which leasing companies use to avoid or end price wars. In particular, in times of thin margins in the leasing market, leasing companies tie to one of the market leaders in the banking market, i.e. the NSCI. Although the NSCI is only a marginal supplier of leasing contracts, it is the leader in the market for investment loans. This type of loans is not only a traditional bank product but also a substitute for leasing. Through tying to a market leader in a substitute product, leasing firms avoid and/or stop price wars. No evidence of any other coordination is found. In accordance with the theoretical predictions, the largest companies show the strongest tying behaviour, as well as the smaller firms that have been active in the market for a long time, while new entrants tie less strongly.

For the remainder, this paper is organised as follows: in section 2 we give a short overview of the main theories on price wars; in section 3 we describe the Belgian leasing and banking market, at least as far as the latter market affects the former; section 4 describes the sample, while section 5 contains the empirical analysis. Section 6 offers some conclusions.

2. THEORIES ON COOPERATION AND PRICE WARS

Most models in industrial organisation study the stability of cooperation in a non cooperative setting where firms have imperfect information. In these models price wars serve as punishment to a unilateral deviation from the collusive price, where the punishment serves to prevent cheating in the first place (Green-Porter (1984), Abreu et al. (1986)). Once a collusive price has been established, the likelihood of subsequent cheating and hence price wars depend

---

and various financial variables (see for example Smith and Wakeman (1985), Mukherjee (1991)). Because of the lack of an easily accessible data base, only a limited number of empirical studies are based on an analysis of specific leasing contracts . These studies are concerned with the valuation of financial lease contracts as a function of financial variables like beta-risk of the lease return and bankruptcy risk (see Miller and Upton (1976), McConnell and Schallheim (1983)).

upon the net gains of such an unilateral deviation. These gains are determined by several factors: the profitability of a unilateral price decrease or refusal to follow a price increase; the probability of detection in case of cheating and the likelihood and severity of punishment. In addition, the time preference matters given that punishment profits are only realised once detection has occurred.

Industry and firm characteristics that influence the trade-off between cooperation and cheating, help to determine if and when price wars, as breakdowns of tacit cooperation, will occur [3]. Declining demand is often indicated as a circumstance in which it is more difficult to maintain price discipline. In times of low profits the disciplinary force of punishment is less effective. Furthermore in markets with low transparancy, unexpected slumps in demand may be mistakingly interpreted as cheating, so that subsequent retaliation causes a breakdown of collusion.

A similar source of breakdown is an increase in the number of firms through entry (e.g. Stigler (1964)). For one thing, as it reduces incumbents' demand, it makes collusion less rewarding relative to cheating, while at the same time punishment may be triggered when entry as the source of a negative demand shock is uncertain. It is more difficult to establish cooperation among more members and - as an increase in the number of participants may reduce market transparancy - assess whether or not a member has been cheating. Furthermore an increase in the number of participants usually goes hand in hand with an increase in heterogeneity. Small entrants are typically harder to keep in line as they have more to gain from cheating and are less likely to be detected if they do. In addition, deviation by a small competitor normally has less effect on the other firms in the industry as compared to the impact of a deviation by a big firm. Hence there is less incentive to retaliate when a small firm cheats. All of the preceding implies that entry is closely linked to solving the problem of coordination.

Multi-market contact may help to maintain price discipline. Retaliation is likely to come from big diversified firms that, next to a deep purse, can retaliate across markets. Although cheating can likewise occur in more markets, Bernheim & Whinston (1989)

---

3. A second type of models that explain price wars are the so-called learning models (Slade (1989)). In these models, price wars are triggered to gather information on industry conditions.

demonstrate that pooling will effectively facilitate cooperation, at least if the markets are not identical. When markets are linked, the effect of multi-market contact on the stability of cooperation is less clearcut and will depend on the specific demand and cost interdependencies that prevail between markets.

By pinpointing relevant characteristics, such as (unexpected) negative demand shocks caused by e.g. entry and firm heterogeneity in size and diversification, this theoretical framework provides a usefull guidance for explaining price patterns, not only with respect to the occurrence of price wars, but also the duration and strength of these wars. Precisely on the latter, the theoretical predications are less clearcut, ranging from an infinite reversion to non-cooperative levels in Green & Porter (1984) and short but more severe punishments in Abreu et al. (1986), over longer periods depending on the size of the offense in the learning models (Slade (1989)). However, by concentrating on mechanisms to enforce the stability of cooperation, these models fail to tackle the important question on how to establish the desirable cooperative outcome in the first place, a problem that is enhanced when firms are heterogeneous, the conditions in the market are unstable and uncertain and when agreements cannot be overt, due to legal restrictions for example. In such circumstances, firms must devise ways of signalling the need to change prices. A recognized price leader can arise, establishing a so-called collusive price leadership (cf. Markham (1951)), or alternatively, the price of an important input or any other relevant mechanism can be used as a focal point. Given that price leaders run the risk of not being followed and hence losing profits, if the other industry members price adaptively, firm characteristics such as size dominance or diversification are first criteria for selecting price leaders.

In the following section we discuss the institutional setting of the Belgian leasing market, focusing on those characteristics that may help understanding the mechanisms that enforce stability of possible cooperation, as well as elements that may affect the choice of price leaders or focal points.

3. CHARACTERISTICS OF THE LEASING AND BANKING INDUSTRY

3.1 The Belgian leasing industry

A lease is an agreement giving to another party the right to use an asset for a specified period in exchange for a periodic payment referred to as the lease payment or rent. The party legally owning the asset is referred to as lessor and the party having the use of the asset as lessee. There are two main forms of leasing: the capital or financial lease and the operating lease. An operating lease is usually for a term less than the asset's useful life and is cancellable. Operating leases are heterogeneous products because they normally include a multitude of services provided by the leasing company. A financial lease usually has a lease term extending to the economic life of the asset and is not cancellable. At the end of the contract the lessee has an option to purchase the asset. Normally the option price is so low (1 to 5% of the original purchase price) that it is exercised. As financial leases do not include services from the lessor, these contracts are much more homogeneous. From the lessee's perspective a financial lease is similar to a long term financing arrangement of the leased good and hence competes with a long term debt contract as an alternative financing device. Consequently rent on a financial lease includes the lessor's cost of financing the asset, a markup for the operating costs of the lease business and a profit margin. Financial leasing is the most established and, at least during the period of examination, the most important form of leasing.[4] Therefore, and also because of the earlier mentionned heterogeneity of operating leases, the empirical analysis only concerns financial leases.

Because of its similarity with long term debt contracts, typical players in the financial lease market are subsidiaries of financial institutions. However the fast growth of leasing during the eighties (about 20% yearly growth in volume in Europe), has also lured producers of investment goods into the leasing market (i.e. the captives). In terms of volume the most important classes of goods being leased are cars, computers, trucks and machines; hence the bulk of leasing customers are companies and other professionals.

---

4. See Vervaet and Boon (1993).

To operate in Belgium, leasing companies need an authorization of the Minister of Economic Affairs. The most active leasing companies are members of the Belgian Association of Lease Companies (BALC). Practitionners estimate these member-companies to capture about 90 to 95 % of the total financial leasing market. Data on growth (of membership) is contained in table A of the appendix. The increase in the number of BALC members indicates that the growth of the volume in leasing activity has gone hand in hand with an increasing number of competitors. Table C is adapted from Vervaet & Boon (1993) and contains market share data (i.e. relative size of estimated financial leasing portfolios) for most BALC-members mainly specialized in financial leases. Table C indicates that a few groups of large companies (notably Locabel, Eurolease and Fidisco) capture almost half of the market share of BALC members although none of these groups separately has a market share sufficiently large to dominate the market. As such no clear dominant firm is present that could act as price leader. The remaining share is distributed over many small companies, usually representing less than 1 % of the leasing portfolio of BALC members. With only 3 BALC members that have non-bank parents, representing 6.4% of the financial leasing market, virtually all of the parents of leasing companies are banks [5], reflecting the fact that financial leasing is relatively close to the traditional activities of financial institutions and hence is a natural type of diversification activity. Consequently, strategic behaviour in the leasing market may be linked with behaviour in the banking sector, implying that multi-market contact may be important for the interpretation of the empirical data.

Practitioners consider the Belgian leasing market to be very similar to the leasing market in other European countries, in terms of growth (21.5 % average yearly growth during the eigthies), the type of goods being leased, the competitive conditions[6] and the type of players (i.e. financial institutions diversifying into the leasing market).

---

5. The three largest leasing companies are affiliates of the three largest commercial banks: Locabel with parent bank BBL, Eurolease with parent bank GB and Fidisco with parent bank KB.
6. See Vervaet and Boon (1993).

3.2. The Belgian Banking Market

As in many other European countries, the Belgian banking industry used to be characterized by the dominance of a few large institutions. In the early seventies, the financial institutions set up a cartel agreement with the support of the government. The agreement assigned to each large institution or group of firms price leadership over a particular financial product. It covered all of the classical lending and borrowing products like savings accounts, short term and long term investment loans, and mortgage loans. Non-traditional products, such as leasing, were not yet important at that time and were not included in the agreement.[7] European governments generally refrained from stimulating competition in the seventies, because of the idea that competition could destabilize the banking sector and with it the whole financial system. Over time, these agreements have been eroded by increasing international competition, while, under the pressure of the Antitrust regulation, explicit cartel agreements have been abolished. The Belgian cartel agreement was officially abandoned in 1990. However, according to practitionners, this event did not have much impact, as competition had already been eroding the cartel since the early eigthies.[8] Nevertheless at critical moments the classical market leaders still seem to play an important role. In particular, as in the past, financial institutions only occasionally adjust interest rates on classical lending and borrowing products to a change in the general level of interest rates. In periods of rising interest rates, the financial press abundantly reports on the following type of behavior: none of the financial institutions, especially not the larger ones, wants to be the first to raise its rates, waiting untill finally the "old" market leader raises its rates, after which the other banks are quick to follow.[9] The flow of pricing information is further enhanced by the fact that the larger institutions are linked onto a system of on-line information on the prices of their products.

---

7. See for example Dombrecht and Plasschaert (1992), pp 178-193 for more details about the Belgian cartel.
8. See Dombrecht and Plasschaert (1992), p 182.
9. This phenomenon is well documented in the press for the classical lending and borrowing products because the customer base for many of these products are the consumers at large. See for example the Financieel Economische Tijd, June 3, 1994.

The on-line information system at times also includes information on leasing rates as several banks sell the leasing products of their affiliates through their branches. As only a relatively limited group of professional customers is concerned, the press does not report on adjustments in leasing rates. In fact no systematic information about the processes underlaying these adjustments is available. Even among professionals there is no agreement on how this process evolves. The most important issue of disagreement is the importance of the NSCI. The NSCI is a public financial institution which, in terms of market share, has never been an important player in the financial leasing market. In fact, it is not even a member of BALC. However the NSCI has traditionally played a prominent role in the market for investment loans, and in the cartel agreement had been assigned price leadership over this substitute product for financial leasing. Also noteworthy is the fact that the NSCI adjusts its leasing rates perfectly in line with its rates on investment loans (see table 1). Bearing in mind the observed behaviour in the banking market, we investigate whether or not and how leasing companies in their pricing decisions use the traditional price leadership of the NSCI in investment loans as a focal point for tying to the NSCI. More generally, the fact that leasing companies typically are affiliates of banks, raises the issue of the impact of multi-market contact on pricing decisions in the leasing market. In the next sections we tackle these problems in several steps. After a description of the data, we investigate whether or not there is evidence of any form of tying in the pricing of financial leasing products and which tying mechanism is used. Next the behaviour of different classes of companies is analyzed separately. Following industrial organisation theories, we investigate whether, in case of tying, larger and well established firms are more likely to apply the tying mechanism in their pricing decisions as compared to small companies and new entrants, who are typically price adapters. In addition, we test whether or not small subsidiaries of large banks through multi- market contact behave differently as compared to small leasing companies that have no link with institutions that had a leading role in the banking market cartel. Making use of the results from the previous steps, we construct a direct test of the hypothesis that tying may occur only

temporarily, in times of small and decreasing margins, and by specific companies. Finally, we also check whether or not behaviour in pre entry periods differs from that in post entry periods.

4. DATA DESCRIPTION

Standard leasing coefficients are available for 16 leasing companies and the NSCI, for the period covering the last quarter of 1984 through the end of 1990. These 16 leasing companies are all BALC members. Their names, identity and type of parent company, are given in table B of the appendix. This table also indicates whether or not the parent company has played a prominent role in the banking cartel and its last column indicates whether or not the leasing company was active before 1985. As table C shows, our sample contains the major leasing groups and represents 56 % of the market share of the BALC-members.

Leasing rates are not expressed as an interest percentage but as a periodical (mostly monthly) leasing coefficient lc. To extract the cost of leasing as a yearly interest rate L, the following equation has to be solved for the equivalent periodical interest rate Lp:

$$100 = \sum_{t=0}^{N-1} \frac{lc}{(1+Lp)^t} + \frac{R}{(1+Lp)^N}$$

with R the exercise price of the purchase option and N the number of periodical payments.

The yearly interest rate L then satisfies: $L = (1+Lp)^p - 1$ with p the number of periods within 1 year.

Preceding equations imply that L is an internal rate of return. It is the simplest measure that permits comparison with interest rates and a comparison accross leasing companies as it takes into account differences in periodicities and in option values. It also includes all additional charges (i.e. administrative costs, invoicing costs, commissions) but still has to be increased by a value added tax. However as this tax is homogeneous over all leasing contracts, it cannot disturb comparisons of leasing rates. After conversion of the leasing coefficients into leasing rates, these rates are organised into quarterly company data by assigning the leasing rate a particular company charged at the beginning of a quarter to that

quarter. To make the sample homogeneous, we have only considered leasing contracts with a five year term for industrial equipment with an underlaying purchase value of about BEF 1 million. [10]

Table 1 shows per year, the number of firms for which the data are available for the full year. In terms of age of the sample companies, there are two clear subcategories: in a majority of cases, those active before 85 already have a history of 20 years at the beginning of our sample period; all the others have started up their activities during our sample period. [11] Table 1 also shows that like the NSCI, lessors limit the number of rate adjustments. As the NSCI's leasing rate changes occur synchroneous with the NSCI's adjustments in the rate charged on investment loans, at least on the score of adjustment frequency, the leasing market compares to the market for investment loans. Table 1 contains further descriptive summary statistics on the NSCI's rates on investment loans and its leasing rates, the yield on 5-year government bonds, and finally the mean of the quarterly leasing rates (not including the NSCI). From the table it is clear that leasing rates command a premium over the rate on investment loans, indicating that financial leasing and investment loans are close but not perfect substitutes. Furthermore, although, over time, our sample includes more and more new entrants, at least at first sight, no important systematic changes seem to occur in the average leasing premium over either the NSCI's leasing rate or investment loan rate, nor over the yield on government bonds.

The interest rate on government bonds is included as it closely reflects the financing cost of a leasing firm's portfolio, at least if the leasing firm matches the maturity of its leasing contracts with the maturity of its borrowing. According to practitionners all

---

10. On purpose we have limited ourselves to contracts of BEF 1 million: for these contracts leasing companies typically offer standard rates and hence a reasonable homogeneous sample could be constructed. In particular, some companies treat contracts with values below BEF 1 million as only marginal products; for values above BEF 1 million, some companies use the standard contract rates only as a basis for negotiations.

11. However of the first category, not all companies had kept track of their leasing rates until the beginning of 1985: for 1 company we obtained data as of the second quarter of 1985 and for another one as of the third quarter of 86. All other increases in the number of sample firms are due to new entrants after 85; from those we obtained data as of the start of their operations.

leasing companies in Belgium normally are able to borrow long term at a premium of .25 % to .5 % above the yield on government bonds. Except for the NSCI that clearly finances itself through long term loans, the balance sheets of the other 16 leasing companies show a large fraction of short term financing. Practitionners claim that, although leasing companies generally carry much short term debt on their balance sheets, they hedge the maturity mismatch between sources and uses of funds, through swaps or floating rate agreements. Hence, because in financial markets, the cost of long term borrowing is very close to the cost of short term financing hedged by long term hedge instruments, the cost factor affecting leasing would be the yield on government bonds (plus a small premium), rather than the short term interest rate. Indeed the empirical analysis supports the view that changes in leasing rates are not related to changes in the interbank rates, at least when changes in interest rates on government bonds are included, cf. infra.

Information that is unfortunately not available and technically very difficult to obtain on the company level is a measure of market size, such as number or value of contracts. This clearly limits the empirical analysis, as collusive price levels or type of behavior cannot be assessed directly.

5. EMPIRICAL ANALYSIS

In the first subsection we investigate the sample for evidence of tying and market power. We find that tying to the NSCI is the only observable source of coordination. In the second subsection we analyse the nature of this tying behaviour in more detail and evaluate the interaction with possible changes in behaviour due to entry.

5.1. Tying and market power in the leasing market

To analyse tying behaviour in the sample data we construct two tying variables: one measuring the tying w.r.t. the NSCI and one general tying variable that should pick up any other form of coordination. To get clean results we filter these variables for covariance; however comparable results were obtained without filtering. The base case

regressions of subsection 5.1. have also been rerun with semester data. The results proved to be similar to those on quarterly data and hence are not reported.

As first tying variable w.r.t. the NSCI we constructed ResDNL, the residual of the OLS regression of the change in the NSCI's quarterly leasing rate DNL on a change in the yield on government bonds DG and the change in the yield on government bonds one period lagged DG(-1).

$$DNL = \underset{(.047)^{ns}}{0.016} + \underset{(.156)}{0.554}\ DG + \underset{(.158)}{0.665}\ DG(-1) + ResDNL \qquad (1)$$

$R^2\ adj = .625$

Between brackets are standard errors.
^{ns}= not significant. Unless otherwise specified, the level of significance used throughout the analysis is 5%.

Both the contemporaneous change in cost DG and the lagged change DG(-1) significantly affect the NSCI's rate changes. No evidence of predictability of DG on the basis of past changes could be found, supporting a random walk for DG [12]. Hence, there is no concern for autocorrelation between DG and DG(-1) and no need to sort out the impact of expected and unexpected changes in DG. Higher lags for DG gave no significant effects.

As second and 'general' tying variable we use the residual from the pooled cross-sectional time series regression:

$$DALi = \underset{(.015)^{ns}}{0.006} + \underset{(.039)}{0.207}\ DG + \underset{(.046)}{0.215}\ DG(-1) + \underset{(.046)}{0.719}\ ResDNL + ResDALi \qquad (2)$$

$R^2\ adj = .863$

with: DALi = the quarterly change in the average leasing rates excluding company i and the NSCI, $ALi = \Sigma_{jNEi} Lj/(n-1)$. From its construction it is clear that the variable ResDALi measures any linear tying between leasing firms other than the tying with the

12. The robustness of the lack of autocorrelation in the DG-series was checked on an augmented time series of quarterly changes in government yields: we extended the DG-time series with data of 83, 84, 91 and 92, resulting in

$$G = \underset{(.45)}{0.3} + \underset{(.047)}{0.954}\ G(-1) \qquad R^2\ adj = .906 \qquad DW=1.586$$

NSCI. Note that the use of DNL rather than ResDNL leaves identical results for ResDALi.

To test simultaneously for tying with the NSCI, for general tying and for the impact of cost changes, we run the following pooled cross-sectional time series regression of DL, the change in individual leasing firm's quarterly leasing rates.

$$DL = \underset{(.036)^{ns}}{.024} + \underset{(.077)}{.599}\, DG + \underset{(.077)}{.669}\, DG(-1) + \underset{(.113)}{.698}\, ResDNL + \underset{(.176)}{.345}\, ResDALi + \hat{e}$$

$$R^2\ adj = .504 \qquad (3a)$$

Both the contemporeneous and lagged change in the yield on government bonds, as well as both tying variables are significant. However, as we calculate correlation coefficients between quarterly changes in leasing rates for individual companies and ResDALi, we find that only one company ties (but strongly so) to this latter variable. In fact all the explanatory power of ResDALi depends on the behaviour of this single firm (i.c. HSA). If this firm is deleted from the sample, only ResDNL remains significant and the explanatory power of the regression improves. [13]

$$DL = \underset{(.036)^{ns}}{.038} + \underset{(.078)}{.578}\, DG + \underset{(.078)}{.676}\, DG(-1) + \underset{(.115)}{.768}\, ResDNL + \underset{(.174)^{ns}}{.198}\, ResDALi + \hat{e}$$

$$R^2\ adj = .53 \qquad (3b)$$

According to practitionners, HSA is a special case: its focus would be on products other than those concerning leasing, leaving it a marginal player in the leasing market. Continuing along the same lines, we investigate which group of companies is responsible for tying to the NSCI. Therefore, for the firms for which more than 6 quarters of data are available, we check the significance of the correlation between DL and ResDNL. We then group the firms with significant correlation and rerun for these companies regression (3a) A similar exercise is performed for all firms not included in the preceding regression (except HSA). Five firms prove to be responsible for the significance of the tying with the NSCI: Fidisco,

---

13. To confirm the results, redoing regression (3a) for HSA only, results in an unsignificant coefficient for ResDNL and a significant coefficient for ResDALi(=2.647(.764))

Eurolease, Locabel, Van Breda and MFC. Except for HSA, this set of firms corresponds exactly to the set of sample companies present in the leasing market before 1985 and comprises all of the incumbent firms. These firms represent a market share of 49.1%, see table B. We tested further for the homogeneity of this block of five firms as compared to the other companies in the sample by transferring some firms of the former "tying" group to the second group and vice versa, each time rerunning regression 3a. For the tying group the explanatory power of the regression reaches its maximum for the original split of the sample. An incumbent dummy is constructed, INC which takes the value 1 for these 5 firms and 0 else (excl. HSA).

INC=1
(Fidisco, Eurolease, Locabel, Van Breda and MFC)

$$DL = \text{n.s.} + \underset{(.081)}{.615}\ DG + \underset{(.082)}{.700}\ DG(-1) + \underset{(.114)}{.978}\ ResDNL + \underset{(.171)^{ns}}{.223}\ ResDALi + \hat{e}$$

$$R^{2\ adj} = .68 \qquad (3c)$$

INC=0

$$DL = \text{n.s.} + \underset{(.187)}{.529}\ DG + \underset{(.283)}{.837}\ DG(-1) + \underset{(.320)^{ns}}{.214}\ ResDNL + \underset{(.480)^{ns}}{.023}\ ResDALi + \hat{e}$$

$$R^{2\ adj} = .25 \qquad (3d)$$

A comparison of lines 3c and 3d clearly shows that there is no significant difference between the two groups of firms in terms of behaviour w.r.t. cost changes. Nor the incumbents, nor the entrants have a significant coefficient for ResDALi. In addition for the entrants, the coefficient for ResDNL is not significant, while incumbents's changes in leasing rates are significantly influenced by ResDNL. As a check, equation 3a was rerun on the two groups while including on the tying variables dummies measuring the additional effect of a firm belonging to the "tying" group.

$$DL = \text{n.s.} + \underset{(.077)}{.563}\ DG + \underset{(.081)}{.717}\ DG(-1) + \underset{(.199)^{ns}}{.331}\ ResDNL + \underset{(.332)^{ns}}{.107}\ ResDALi + \hat{e}$$

$$+ \{\ INC * (\underset{(.243)}{.646}\ ResDNL + \underset{(.396)^{ns}}{.115}\ ResDALi)\}$$

$$R^{2\,adj} = .54 \qquad (3e)$$

Predictably, only the ResDNL-dummy turned out to be significant. Hence, only incumbents significantly tie to the NSCI, which is the only tying mechanism detected in the leasing market.

As already indicated supra, all the firms in the sample, including the small entrants, -with the exeption of two smaller, young companies- are affiliated with the banking sector and as such face multi-market contact. The results from regression (3e) indicate that there are significant differences in tying behavior within this group of multi-market players. To test the impact of multi-market contact into further detail, all companies were split up according to whether or not they or their parent firm had a leading role in the banking cartel. Following table C, a dummy INDEP is constructed that takes the value of 1 if the company is independent and the value of 0 if links with the bank cartel exist. Again HSA is excluded.

$$DL = \text{n.s.} + \underset{(.078)}{.578}\, DG + \underset{(.079)}{.692}\, DG(-1) + \underset{(.151)}{.842}\, ResDNL + \underset{(.233)^{ns}}{.341}\, ResDALi + \hat{e}$$

$$+ \{\, INDEP * (\underset{(.231)^{ns}}{-.188}\, ResDNL - \underset{(.355)^{ns}}{.341}\, ResDALi)\}$$

$$R^{2\,adj} = .53 \qquad (3f)$$

Running regression (3f), we find no apparent difference in behaviour for the INDEP group, as compared to leasing firms linked to the bank cartel. Also the independent companies tie significantly to the NSCI, but this is solely due to one company, Van Breda, which is not connected with the former banking cartel, but is an incumbent firm that ties strongly to the NSCI. Deleting this firm from the independent group leaves no significant tying, a result very similar to what was found with respect to the entrants in equation (3d).

INDEP=1 excluding Van Breda

$$DL = \text{n.s.} + \underset{(.210)}{.452}\, DG + \underset{(.309)}{.740}\, DG(-1) + \underset{(.345)^{ns}}{.084}\, ResDNL + \underset{(.514)^{ns}}{.135}\, ResDALi + \hat{e}$$

$$R^{2\ adj} = .25 \qquad (3g)$$

Hence, in the leasing market it does not seem to matter whether or not the sample firm or its parent firm plays or played a leading role in the banking market. The only link in strategic behaviour between the two markets seems to be the tying with the NSCI by the well

established leasing companies. Given however that the incumbents are all affilliates of banks that - with the exception of VanBreda- played a leading role in the bank cartel, the incumbent and multi-market characteristic are correlated. However, the data most clearly support that the large and well established firms behave differently from the small entrants.

Before we turn to a more detailed analysis of the tying to the NSCI, the impact of cost changes are analyzed into more detail. First is the importance of the lagged value for DG. One explanation for the significance of the lagged effect could be related to adjustment costs, leading companies to minimize price changes, resulting in sticky prices. Alternatively, market power arguments could be responsible for the significance of the lagged DG value. In this case, we would expect an increase in costs to be followed by a quick and strong adjustment of DL; but a decrease in DG would involve only a slow and partial adjustment of DL. To check this, we delete HSA from the sample and split the data into two subsets, one including the observations from those quarters in which the interest rate on government bonds is rising, $DG \geq 0$, and the other subset including those observations for which $DG < 0$. Then we run the following modified equation (3) across the two subsets, while deleting the insignificant ResDALi variable :

$$\begin{aligned} DL = n.s. + &\{.568\ DG + .653\ DG(-1) + .776\ ResDNL\} * DUMr \\ &\quad (.155) \qquad (.111) \qquad (.175) \\ &\{.658\ DG + .646\ DG(-1) + .599\ ResDNL\} * (1-DUMr) + \hat{e} \\ &\quad (.159) \qquad (.125) \qquad (.172) \end{aligned} \tag{4}$$

with DUMr = 1 if $DG \geq 0$ and 0 otherwise

If market power would be at the heart of the significance of the lagged DG variable, we would expect the coefficient of DG to be higher when $DG \geq 0$ than when $DG < 0$, while the opposite holds for the coefficient of DG(-1). The results are not consistent with this hypothesis: the coefficients for neither DG nor DG(-1) are significantly different across both regimes. However these findings are consistent with the alternative hypothesis of companies maintaining sticky prices to reduce adjustment costs.

A second cost effect is the influence of the short term (i.e. 3-months) interbank rate. In the previous section it was argued that, although leasing companies have a large fraction of short-term financing, they hedge the maturity mismatch, leaving only the changes in the yield on government bonds as relevant cost factors. To test this, the change in the 3-month interbank rate, DI, is included in the base regression (3), as well as a lagged variable DI(-1), while again dropping ResDALi.

$$DL = ns + \underset{(.081)}{.603}\, DG + \underset{(.097)}{.731}\, DG(-1) - \underset{(.051)^{ns}}{.009}\, DI - \underset{(.054)^{ns}}{.064}\, DI(-1) + \underset{(.115)}{.706}\, ResDNL + \hat{e}$$

$$R^2_{adj} = .49 \qquad (5)$$

None of the variables measuring the change in the interbank rate are significant. Note that the coefficients of the other variables are only affected marginally by the inclusion of the interbank rate. Equation (5) supports the earlier mentionned hypothesis that leasing firms fully hedge movements in short term interest rates; hence the change in the yield on government bonds is the better measure of (financing) cost changes.

5.2. Tying to the NSCI: a solution to narrow profit margins ?

In section 3 we formulated the hypothesis that leasing companies possibly use the increase in the NSCI's leasing rates as an alibi to raise their rates too, especially in periods of thin margins. The game-theoretic non-cooperative models on the other hand suggest that in periods of unexpected low margins breakdowns of coordination are more likely. To test this we proceed in three steps. First we check whether or not the tying behaviour of individual leasing companies is different depending on the size of the margins, more specifically whether tying is stronger/weaker with low margins. Second, tying to the NSCI when margins are low is only helpful if, at such times, the NSCI has a tendency to increase its rate on investment loans and hence also its leasing rates. So we test if periods in which leasing margins of individual firms are low are followed by periods in which the NSCI raises its rates. Third, to confirm the findings of the preceding two steps we check whether or not tying behaviour changes over time and whether or not these changes coincide with changes in

leasing margins, i.e. if the hypothesis is correct, tying in periods of small margins should be high. As, in this third step, we use the timing of entry in our sample as break points, we test simultaneously for possible structural changes in behaviour due to entry.

To test whether or not a leasing company tends to tie more or less strongly to the NSCI when it has a low margin, we rerun equation (3e) with the incumbent dummy on the tying variables, as a three regime (switching) regression:

DUMh = 1 if margin of leasing firm in period (-1) is high; else 0;
DUMl = 1 if margin of leasing firm in period (-1) is low; else 0;
DUMm = 1 if margin of leasing firm is neither high nor low in period (-1); else 0;

Following previous results, we define the margin as the difference between a firm's leasing rate and the yield on government bonds. We identify a low margin to be the level where leasing firms are just able to cover marginal costs. According to practitionners this level would be about 2 to 2.5 % relative to the yield on government bonds. In particular, leasing firms would be able to borrow at .25 to .5 % above the yield on government bonds; direct administrative expenses would minimally require a margin of .75 to 1 % above borrowing costs and about 1 % margin would be needed to recoup losses on bankruptcies. The results reported in (6) presume a low margin to be 2.5% or below (a margin of 2 % or below leaves too little observations in this class). Identifying what constitutes a high margin is much more difficult. Approaching the problem in a pragmatic way, we have tried several margins ranging from 3 to 4 % in steps of .25 %. We report the results for a 3% margin as it produces a decent distribution of data points over regimes and produces the best explanatory power. However the results with the other margins only differ marginally. The ResDALi variable is deleted to economize on variables. Given the definition of the dummies, DG(-1) is excluded.

$$
\begin{aligned}
DL = {} & .637 - .727\ DUMh - .558\ DUMm + DG^{*}(.530\ DUMh + .554\ DUMm - .049\ DUMl) \\
& (.108)\ (.119) \qquad (.130) \qquad\quad (.112) \qquad (.141) \qquad (.301)^{ns} \\
& + ResDNL^{*}(.188\ DUMh - .428\ DUMm + 1.725\ DUMl) + \\
& \qquad\quad (.354)^{ns} \qquad (.355)^{ns} \qquad (.389) \\
& + INC^{*}ResDNL^{*}(.584\ DUMh + 1.087\ DUMm + 1.288\ DUMl) + \hat{e} \qquad (6) \\
& \qquad\quad (.384)^{ns} \qquad (.598)^{ns} \qquad (.063) \\
& \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad R^{2}{}^{adj} = .53
\end{aligned}
$$

In times of high margins, none of the two groups of companies ties significantly to the NSCI. When margins are in the middle only the incumbents marginally link their behaviour to the NSCI (significance at 7%). However when margins are low, both groups of firms tie to the NSCI, but the incumbents' tying coefficient is significantly larger. The higher correlation of the "tying" group in equation (3e) is to a large extend due to the stronger link in times of lower rates. Furthermore the evidence indicates that, as firms focus strongly on the behaviour of the NSCI when their margins are thin, a change in the yield on government bonds does not have a direct impact on their price setting. However, in times of "normal" and high profit margins, the focus shifts from the behaviour of the NSCI to the yield on government bonds.

To test whether or not tying to the NSCI at thin margins is helpful to raise prices, we count the number of times the NSCI raised, left unchanged or decreased its rates when in the preceding quarter firms had a margin, L(-1) - G(-1), of 2.5 % or below. We repeat this calculation for margins higher than 2.5 %. In line with the hypothesised relationship between tying and margins, relatively more increases in the NSCI rate occur following low margins: DNL>0 for 40% of the observations, as compared to normal or high margins, where DNL>0 occurs in only 16 % of the observations, a result that is significantly confirmed by a Chi-square test (α=.07 %).

Finally as a test of the impact of entry and as a further check on the preceding findings, we compare the behaviour of the five tying firms before and after entry. Following previous results, tying to the NSCI could be tighter after entry if entry results in a larger number of lower margins. On the other hand, an increase in the number of firms, certainly when it is unexpected, is typically considered to threaten the stability of coordination. There are seven quarters in which entry occurs within our sample: the second

quarter of 87 (2 firms), the third quarter of 88 (1 firm), every quarter of 89 (each time 1 firm), the second quarter of 90 (1 firm). We do not analyse the last of these entry dates because the number of observations in the period after this date is too limited. A time dummy, T, is constructed that takes on the value of 1 before entry; else O. For each of the six other dates, we run the following modified version of equation (3):

DL = ns+ b DG + c DG(-1) + d ResDNL + T*(e DG + f DG(-1) + g ResDNL).

Hence, if behaviour changes after entry, we should observe significant coefficients for e, f and especially the tying coefficient g. We run this regression separately for the group of five "tying" firms and the others (excluding HSA). None of the entry dates produced a difference in tying coefficients. The best results are obtained for the third quarter of 88, which are reported for the incumbents in equation (7):

(INC=1)

$$DL = n.s. + \underset{(.126)}{.709}\,DG + \underset{(.154)}{1.062}\,DG(-1) + \underset{(.220)}{.813}\,ResDNL$$

$$R^{2\,adj} = .70$$

$$+T*(\underset{(.179)^{ns}}{-.106}\,DG - \underset{(.210)}{.629}\,DG(-1) + \underset{(.261)^{ns}}{.089}\,ResDNL) + \hat{e} \qquad (7)$$

Interesting to note is that the lagged coefficient for changes in government bonds, reflecting sticky prices, is significantly lower in the pre-entry period. The positive but insignificant coefficient for a different tying after entry, indicates that entry of new firms did not significantly affect the tying mechanism of the incumbents. To further check the impact of entry, we investigated for the incumbent firms whether or not a significant change in the relative number of low margins occurred after a specific entry date. For each of the dates, we count the number of quarters in which a firm had a low margin (i.e. 2.5 % or below). We do this counting once for the periods before a particular entry date, and once for the periods after this entry date. We also repeat this procedure for the "normal" and high margins. We find that for the reported third quarter of 88, there are no significant differences in number of smaller margins (i.e. 2.5 % or below) than before entry. This may explain why, despite the significantly higher tying effect at times of lower

margins found in (6), no negative coefficient for T*ResDNL could be detected in (7). In addition, the unsignificant impact of entry may be an indication that most entry was expected by the incumbent firms.

6. CONCLUSIONS

A study of the quarterly standard leasing rates for financial mid-sized lease contracts for 16 companies over a 6 year period provides evidence for leasing companies to tie to the NSCI, a marginal supplier of leasing contracts, but a market leader in investment credits, a substitute for leasing. No other tying behavior could be detected. This tying behavior is further shown to be company and time specific. The largest companies show the strongest tying behavior, together with the smaller companies that have been active for a long time, while no significant tying for non-incumbents prevails. Evidence for an impact of multi-market contact, besides the tying to the NSCI, is not very strong. No significant differences prevail wether or not sample firms or their parents played a leading role in the banking market. The tying behavior was found to be most strong in periods of low margins, when incumbents and to a lesser extent even entrants tie to the NSCI, while in times of high margins, none of the two groups of companies seem to tie significantly to the NSCI. The significantly larger increases in NSCI rates that can be detected following periods of low margins support the use of the NSCI's leasing rates as an alibi to raise rates in periods of thin margins. No significant evidence was found for the impact of entry of new firms on the frequency of low margins and the tying mechanism of the incumbents.

Although a number of interesting results could be detected, the limits of this study are obvious, given the restricted data set. Incorporating missing information on demand would allow to distinguish attempts to, through a tying mechanism, move to the collusive phase, from attempts to use such a mechanism to maintain coordination. Such information would also allow, in line with previous empirical studies, to analyse the impact of business cycles and (un)expected shocks in demand. Supplementing the data set with more recent observations would allow to better study the impact of

entry, given that most of the entry occurred in the last quarters of the data period examined.

REFERENCES

Abreu, D., D. Pearce & E. Stachetti, 1986, Optimal Cartel Equilibria with Imperfect Monitoring, Journal of Economic Theory, 31, 251-269.

Bernheim, B. & M. Whinston, 1990, Multimarket Contact and Collusive Behavior, Rand Journal of Economics, 21, 1-26.

Bresnahan, T., 1987, Competition and Collusion in the American Automobile Industry: the 1955 Price War, Journal of Industrial Economics, Special Issue: the Empirical Renaissance in Industrial Economics, 4, 457-482

Dombrecht, M. & S. Plasschaert, 1992, Het Financiewezen in België, Ufsia Universitaire Reeks Economie, MIM, Deurne.

Green, E. & R. Porter, 1984, Non-cooperative Collusion under Imperfect Price Information, Econometrica, 52, 87-100.

Fraas, A. & D. Greer, 1977, Market Structure and Price Collusion: an Empirical Analysis, Journal of Industrial Economics, 26, 21-44.

Iwand, T. & D. Rosenbaum, 1991, Pricing Strategies in Supergames with Capacity Constraints: Some Evidence from the US Portland Cement Industry, International Journal of Industrial Organisation, 9, 497-511.

Markham, J., 1951, The Nature and Significance of Price Leadership, American Economic Review, 41, 891-905.

McConnell, J. & J. Schallheim, 1983, Valuation of Asset Leasing Contracts, Journal of Financial Economics, 12, 237-261.

Miller, M. & C. Upton, 1976, Leasing, buying and the cost of captial services, Journal of Finance, 31, 3, 761-786.

Mukherjee, T., 1991, A Survey of Corporate Leasing Analysis, Financial Management, 20, 96-107.

Porter, R., 1983, A Study of Cartel Stability: The Joint Executive Committee 1880-1886, The Bell Journal of Economics, 14, 301-314.

Slade, M., 1987, Interfirm Rivalry in a Repeated Game: an Empirical Test of Tacit Collusion, Journal of Industrial Economics, 35, 499-516.

Slade, M., 1990, Strategic Pricing Models and Interpretation of Price-War Data, European Economic Review, 34, 524-537.

Stigler, G., 1964, A Theory of Oligopoly, Journal of Political Economy, 72, 44-61.

Vervaet A., & R. Boon, 1993, De Leasingmarkt in België (1989-1991): De ontnuchtering, Bank- en Financiewezen, 2, 53-76.

Smith, C. & L. Wakeman, 1985, Determinants of Corporate Leasing Policy, Journal of Finance, 895-908.

Suslow, V., 1988, Stability in International Cartels: An Empirical Survey, Hoover Institute Working Paper, Stanford University.

APPENDIX

Table A:
Growth membership of Belgian Association of Lease Companies (BALC) period 1985-1990

Year	no of members	% growth of new contracts
1985	34	20%
1986	36	23%
1987	45	37%
1988	52	27%
1989	61	39%
1990	65	18%

Source: Vervaet & Boon (1993) and BALC

Table B:
Sample companies and their parent firms

Sample	Parent	Type	Cartel player	pre 85
NSCI	NSCI	bank	yes	yes
HBK	HBK	bank	no	no
Fidulease NV	ING	bank	no	no
Cred Com Lease	Cred Com	bank	yes	no
NMB lease Belg	NMB lease NV	leasing cy	no	no
Colease	Josi	insurance cy	no	no
Synerlease Belg	Indosuez	bank	no	no
UFB Ace leasing	ASLK	bank	yes	no
BR-lease	Bank v Roeselare	bank	no	no
Credishop	Caisse priv banque	bank	no	no
Westkrediet	Westkrediet	bank	no	no
MFC	Anhyp	bank	yes	yes
HSA	KB	bank	yes	yes
Bank v Breda	Bank v Breda	bank	no	yes
Locabel	BBL	bank	yes	yes
Fidisco	KB	bank	yes	yes
Eurolease	GB	bank	yes	yes

Table C:
Relative market share of BALC-members active in financial leasing
1992

		NUMBER OF COMPANIES	MARKET SHARE
Sample companies		17	56.3%
of which	Eurolease		22.4%
	Locabel		15.8%
	Fidisco		6.1%
	Van Breda		4.3%
	MFC		0.5%
	Small Cies		7.2%
	(Fidulease, Cred Com Lease, Colease, Synerlease, UFB, BRLease, Credishop; missing observations for HBK, NMB, HSA, NSCI, Westkrediet [14])		
Non-Sample companies		20	43.7%
of which	Cera Lease		6.6%
	SogenaLease		5.9%
	ES Finance		4.1%

Source: Vervaet & Boon (1993) updated in Boon (1994)

14. Our sample contains a few companies not taken up in the study from which we adapted table C. The study aimed at giving details about market share on the basis of information from the financial statements. However such specific information is not always available (mostly because marginal players have not set up a separate subsidiary for their leasing activities so that they do not have to report detailed information about the volume of their leasing activities). However, this study, conducted by practitionners, would include all important companies and virtually all of the market share of BALC-members.

Table 1:
Quarterly leasing returns and other interest rates applicable in the years 1985 through 1990

Quarter	NSCI IC	NSCI L	G	AL	N
1984.4	12.75	15.40	11.71	15.87	4
1985.1	12.50	15.16	11.64	15.46	4
1985.2	12.00	14.70	10.70	15.00	5
1985.3	11.75	14.46	10.78	15.00	5
1985.4	10.75	13.53	10.04	14.24	5
1986.1	10.00	12.82	9.03	13.42	5
1986.2	8.25	11.18	8.50	12.09	6
1986.3	8.25	11.18	8.06	12.09	6
1986.4	8.25	11.18	8.32	12.09	6
1987.1	8.75	11.65	8.07	12.33	6
1987.2	8.75	11.65	8.09	12.20	7
1987.3	8.75	11.65	8.31	12.08	7
1987.4	8.75	11.65	8.27	12.04	8
1988.1	8.50	11.42	7.78	110.9	8
1988.2	8.50	11.42	7.96	11.05	8
1988.3	8.50	11.42	8.13	11.01	9
1988.4	8.50	11.42	8.13	11.01	9
1989.1	9.00	11.89	8.53	11.15	10
1989.2	9.00	11.89	8.40	11.21	10
1989.3	9.00	11.89	8.60	11.39	11
1989.4	9.75	12.59	9.67	12.09	13
1990.1	11.25	13.99	9.91	13.57	15
1990.2	11.25	13.99	9.80	13.64	16
1990.3	11.00	13.76	10.43	13.69	16
1990.4	11.00	13.76	9.99	13.88	16

NSCI IC	nominal interest rate of the NSCI for investment credits
NSCI L	full return of five-year leasing contracts of the NSCI for investments of 1 to 2 million BEF
G	return on government securities with a remaining term of more than 5 years.
AL	average full return of five-year leasing contracts for industrial equipment with a value of about 1 mio BEF
N	number of companies (excl NSCI) for which data are available in quarter of reference