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Abstract

In this paper, I investigate whether improving the traditional SCP model gives additional insights in the existence of market power in the Dutch banking market. I first improve the measurement of market structure. Then, I introduce a simple Cournot-model, which results in a more flexible measure of market power for different market structures. Finally, I include the Efficiency hypothesis and modify it to more accurately test it jointly with the market power tests. Theoretically speaking, the Cournot model provides a better test for the existence of market power than the SCP model. Likewise, explicitly correcting for and including efficiency results in a more correct test of the Efficiency hypothesis. Empirical results confirm that the introduced improvements based on the Cournot models are the only ones resulting in tests that are consistent with the underlying models. Evidence from the Cournot model suggests that we cannot reject the existence of market power, although its impact on performance may be small. It also formalizes the need for additional research into the importance of strategic interaction among banks.

Key words: SCP hypothesis, Efficiency hypothesis, X-efficiency, Cournot
JEL classification: G21, L11, L22.

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1 Introduction

The concentration in Europe’s banking markets has been a popular subject of academic and mainstream analysis. This popularity has been fueled both by the high levels of concentration in many of these markets and by the fact that banks play a crucial intermediary role. The general tendency has been to raise concern over the possible existence of market power and the resulting potential damage to consumers.\footnote{See Economic Research Ltd. (1997) and Cecchini (1988).} Empirical evidence however has been widely divergent. The use of different hypotheses, proxies and datasets has made it nearly impossible to compare empirical results. Now that we appear to be at the brink of another round of consolidation, an account of the progress made so far in measuring market power is timely.

In what follows, I will investigate to what extent past methodological developments have enabled us to come up with better measures of market power. I emphasize reliability and consistency over accuracy and focus on empirical applications, starting with a basic model and introducing a number of advances. In doing so, my aim is to develop an accurate test for the null hypothesis that market power exists.

The resulting string of successive models is tested empirically using data on the Dutch banking market over the period 1992-1998. The Netherlands has the highest banking market concentration in the European Union, with the market share of the three largest banks summing to more than 85%.\footnote{Measured by deposits or balance sheet total. See also table 1.} The sample period starts with the creation of the Single Market for Financial Services and ends before the introduction of the euro. As such, it provides a good case for testing whether market power is a driving force behind bank performance.

The remainder of this paper continues as follows. In section 2, I start with a short overview of different types of market power models. Purpose of this overview is not to be exhaustive, but rather to put the methodological and empirical exercises that follow into perspective. I focus on the SCP model and present a series of improvements to this model. In section 3, I discuss some of the key features of the Dutch banking market. I summarize the conclusions of other, comparable market power studies of the Dutch banking market. The data are presented in section 4, and section 5 describes the empirical results. I conclude in section 6.

2 Theory

I start with a short elaboration on different types of market power models. I lay out arguments in favor of a particular set of models and introduce its
prime representative: the model that tests the Structure- Conduct-Performance (SCP) hypothesis. First, I show how the model can be modified to include nonlinearity between market structure and market power. Next, I provide a more formal underpinning for this type of model and in doing so I further explore the above-mentioned nonlinearity by specifying the relationship between market share and market power. Then, I introduce a competing Efficiency hypothesis. Finally, I present a modification to simultaneously test both hypotheses.

2.1 Literature

I conveniently group market power models in two distinct sets. The first set consists of structural models, the second set consists of reduced form models. Important examples of structural models include the Monti-Klein model (Klein (1971)) of monopolistic competition and the Salop model (Salop (1979)) of spatial competition. These models and the new industrial organization (NEIO) models that have been developed since have the advantage of providing accurate and direct measures of market power. Their major drawback is the fact that – as is the case with many of the NEIO models – they are able to do so mostly in theory and hardly in practice. Data and estimation problems prevent clean tests of these models, as is best witnessed by the fact that the empirical literature in this field cannot possibly keep up with theoretical advances.

Reduced form models at best provide close proxies for market power, albeit at the cost of reduced theoretical underpinning and empirical finesse. They enjoy a continuing popularity, spearheaded by the SCP model and (recently) the Panzar-Rosse model. Within the group of reduced form models, a distinction can be made between those models that rely on market prices and those models that rely on other proxies for market power. Market prices feature most prominently in the Panzar-Rosse model, where they are used to estimate the sum of the (factor) price elasticities of reduced-form revenues. The fact that this model is broadly embedded in Bertrand-type oligopoly models, is clear from its features. The model has, compared to many other reduced-form models, a solid theoretical underpinning. Its dependence on prices means it is not biased by any nonlinearities between market structure and market power. However, the fact that price information is notoriously scarce and unreliable for banking markets is the most important drawback to applying the Panzar-Rosse framework. In addition, it completely abstracts from product differentiation, and it assumes a long-run equilibrium, zero profits at the market level and a flat marginal cost curve. Finally, with quantity precommitments it easily re-

3 For an overview, see Freixas and Rochet (1998).
4 See Molyneux et al. (1997) and Bikker and Haaf (2002a) for an overview. See Bikker and Haaf (2002b) for an empirical application to European banking markets.
5 A related, popular model was developed by Breshanan (1982). For an empirical application to European banking markets see Bikker (2003).
sults in Cournot type outcomes. Summing up, the Panzar-Rosse model has its advantages, but it is far from ideal for testing market power on banking markets, particularly given its dependence on price information.

The most popular reduced-form model that does not require price information is the SCP model. Although without a strong explicit micro foundation, SCP models have the potential to capture any type and size of market power as long as it affects market structure. In addition, SCP models can incorporate nonlinear average cost curves (which have been proven to exist in banking). On the downside, they provide relatively rough measures of market power and traditionally have trouble handling the fact that market power can be nonlinear in market structure.

In what follows, I further explore the SCP model and related models. I do so for a number of reasons. First, as has been mentioned, the absence of reliable price information burdens other types of models. Second, I will show that some of the drawbacks of traditional SCP models can be corrected for. Third, in opting for the SCP model I can introduce a series of different but related models, which allows me to analyze whether any advances have been made. Fourth, there exists a long and broad literature related to SCP models, and I aim to provide a framework for interpreting this body of work. In doing so, I do not follow chronology, but rather try to describe developments in a logical order that facilitates comparison.

2.2 SCP model

SCP models are loosely based on Chamberlin’s oligopoly theory (Chamberlin (1933)) and seek to explain firm performance through market structure conditions, such as number and size distribution of firms and entry condition in the market. The SCP hypothesis explains the performance of firms by the structure of the market and is based on the premise that a more concentrated market indicates higher market power and consequently better performance.

The basic SCP model can be formulated as follows (where \( t \) is time):

\[
P_t = f (M_t, D_t, C_t)
\]  

where \( P \) is a performance measure, \( M \) a (set of) market structure variable(s), \( D \) a (set of) demand variable(s) and \( C \) a set of firm/product-specific control

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6 On a more theoretical level, in its most basic form it can lead to the same 2-player competitiveness that burdens many (simple) Bertrand models.

7 See Berger and Humphrey (1991) for evidence on average costs in banking and Heggestad and Mingo (1976) on SCP models and nonlinear average cost curves.

8 For an introduction see chapter 4 of Molyneux et al. (1997).

9 See Molyneux et al. (1997), p. 97.
variables such as cost variables.

A number of traditional concentration ratios have been used as market structure variables. Many of these however suffer from the fact that they suppose that the relationship between market power and market structure is linear.\footnote{An additional issue that falls beyond the scope of this paper, is the 'Quiet Life' hypothesis, which postulates that banks may use market power to lower the variance of returns (see Berger and Hannan (1993)).} An example is the $C_3$ ratio that is used in the first specification in table 3. The most common way to overcome this problem is by using the Hirschman-Herfindahl index, where for market share $a_i$: $HH = \sum(a_i^2)$. This measure is less arbitrary and gives extra weight to those banks that dominate the market.\footnote{Important to keep in mind here is the claim by Bikker and Haaf (2002) that “it is [still] possible to find corresponding measures of concentration for every summary measure of concentration” (p. 57).}

The second specification in table 3 therefore uses this concentration measure.

2.3 Cournot Model

The SCP model tested above became subject to criticism. For example, the market structure measures used seem to assume that all banks benefit equally from a high market concentration. This idea runs counter to much of the theoretical literature that identifies strategic group behavior and more elegantly translates asymmetric market structures into performance differences. In this section, I develop a market power model that is based on a dynamic Cournot model by Cowling (1976), Cowling and Waterson (1976) and based on Stigler (1964). The model by Cowling describes a relationship between industry performance and market concentration, both over time (intra-industry) and between industries (inter-industry). I modify his model slightly to get a relationship between firm performance and market share. This modification will make it easier to accommodate asymmetric market structures, differences in cost structures and collusive behavior.

The model derived here is based on a straightforward extension of a Cournot oligopoly model. I first develop the case with profit maximization by collusive Cournot oligopolists. Next, I show how equilibrium conditions from this model can also be used to test more extreme models, namely perfect competition and myopic oligopoly behavior (the classic Cournot model).

I start by defining profit $\Pi_i$, output $X_i$, price $p$, firm-specific variable cost $c_i$
and firm-specific fixed cost $F_i$. Firm $i$ then maximizes:

$$\Pi_i = pX_i - c_i (X_i) - F_i$$

s.t. $p = f \left( \sum_{i=1}^{N} X_i \right) = f (X)$

where $f()$ is the inverse market demand and $N$ the number of firms. Profit is maximized if:

$$\frac{d\Pi_i}{dX_i} = p + X_i f' (X) \frac{dX}{dX_i} - c_i' (X_i) = 0$$

where

$$\frac{dX}{dX_i} = 1 + \frac{d \sum_{j \neq i} X_j}{dX_i} = 1 + \lambda_i$$

and $\lambda_i$ is known as the conjectural variation of firm $i$’s output.\(^{12}\) Multiplying by $X_i$ gives:

$$pX_i - c_i' (X_i) X_i = -(X_i)^2 f' (X) (1 + \lambda_i)$$

Dividing both sides by $pX_i$ and rearranging gives:

$$\frac{pX_i - c_i' (X_i) X_i}{pX_i} = -\frac{X_i f' (X) X}{p} (1 + \lambda_i)$$

Marginal costs, $c_i' X_i$, are constant but can differ from bank to bank. Revenue is denoted by $pX_i$. The left-hand side of the above equation therefore contains the ratio of profit $[\Pi_i]$ plus firm-specific fixed costs $[F_i]$ to revenue $[R_i]$. The right-hand side of the above formula can be broken down in three parts. First, $(X_i/X)$ is firm $i$’s market share, with $0 < MS \leq 1$. Second, $f'(X)X/p$ is the inverse of the market price elasticity of demand, $1/\eta_D$. Since the main prices for banks in the context of this analysis are interest rates, I will refer to $\eta_D$ as the interest elasticity of demand. Finally, $1 + \lambda_i$ measures firm $i$’s expectations about the reactions of its rivals $dX/dX_i$, with $-1 \leq \lambda_i \leq 1$. A Cournot oligopoly implies a value of 1 for $(1 + \lambda_i)$, i.e. $\lambda_i = 0$. On the other hand a value of $\lambda_i = -1$ implies perfect competition. For the collusive oligopolist $\lambda_i > 0$. Simplifying further gives:\(^{13}\)

$$\frac{\Pi_i + F_i}{R_i} = \left(-\frac{1}{\eta_D}\right) * (MS_i) * (1 + \lambda_i)$$

\(^{12}\)A high $\lambda_i$ means a firm has a high awareness of its interdependence with other firms.

\(^{13}\)Cowling and Waterson (1976) sum over $N$ firms to find: $(\Pi + F)/R = -(H/\eta_D) (1 + \mu)$, where $H = \sum (X_i/X)^2$, i.e. the Hirschman-Herfindahl index, and $0 < H = 1$. Profits, fixed costs and returns are now summed for the whole industry, and $\mu = (\sum \lambda_i X_i) / (\Sigma X_i^2)$.
There are two problems associated with using this equilibrium condition as a basis for estimating an SCP model. First, I do not have a precise measurement of $\eta_D$, the interest elasticity of demand. Secondly, I do not have a measure for the conjectural variation $\lambda_i$.

To solve these two problems I have to make two additional assumptions. The first is that $\eta_D$, the price elasticity of demand is constant. If not, then the interpretation of a coefficient for $MS_i$ - in the absence of a proxy for $\eta_D$ - could be biased by changes in the interest elasticity of demand over time. In the context of this paper, the above assumption requires a relatively constant interest elasticity of $M_2$.\footnote{I consider this the most appropriate monetary aggregate in the light of this paper since it includes deposits.} A clear advantage here is the relatively short sample period of 7 years, during which no major crisis has occurred that would have changed the interest elasticity of demand. In addition, the assumption of a constant interest elasticity of demand is supported by empirical research for the Netherlands.\footnote{See for instance Fase and Winder (1993), who analyze the demand for money for the Netherlands in 1970-1988 and consider "the residual variation, which reflects the noise rather than the degree of misspecification, as a measure of stability" (p. 486). For $M_2$ money demand equations they find the Netherlands has the smallest standard error residual (0.12) of all EC countries.}

The second assumption concerns the individual firm’s conjectural variation $\lambda_i$, the extent to which it expects other firms to react to a change in output. Here, I have two options. As a first option, if I can assume $\lambda_i$ is constant and equal across firms it drops out of the above equation and I am left with a straightforward performance-market share relationship. The time period considered here is again an argument in favor of this assumption; as reported before, in the period 1992-1998 the number of competitors in the Dutch banking market is relatively stable and relative sizes vary very little over time. Not surprisingly, this is also the equilibrium condition for the myopic Cournot oligopolist, who is ignorant of the impact of his actions on his competitors and therefore not prone to collusive behavior.

The second option is that, under the presumption of collusive behavior, I formalize the relationship between $\lambda_i$ and $MS_i$. Following Stigler (1964), I can show that an increase in market share $MS_i$ is expected to increase awareness $\lambda_i$ and thereby lead to more collusive behavior [for proof, see the appendix]. Although this still leaves me without a direct measure of $\lambda_i$, it does allow me to capture its impact through $MS_i$. After all, the collusive oligopolist realizes a more than proportionate increase in performance as a result of an increase in market share. Alternatively, the penalty for not behaving collusively increases with market size.
Summing up and taking $\eta_D$ to be constant and $\lambda_i$ closely linked with $MS_i$, I have now developed a basic relationship between performance and structure that is consistent with a dynamic Cournot equilibrium.\textsuperscript{16} The basic equation (without control variables) is then:

$$\ln \left( \frac{\Pi_i + F_i}{R_i} \right) = \beta_0 + \beta_1 \ln \left( (1 + \lambda_i) \ast MS_i \right) + \varepsilon \tag{7}$$

The model now amounts to interpreting the combined impact of $\lambda_{i,t}$ and $MS_{i,t}$ on performance. In two extreme cases, interpretation of the coefficient $\hat{\beta}_1$ is straightforward. The Cournot oligopoly prediction is $\hat{\beta}_1 = 1$, since $\lambda_{i,t} = 0$ and impact of $MS_{i,t}$ is exactly proportional. If collusive behavior exists, $\lambda_{i,t} > 0$ and the impact of market share is more than proportional, the prediction for $\hat{\beta}_1 > 1$. Finally, in case of perfect competition an increase in market share has no impact on performance and since $\lambda_{i,t} = -1$, this means $\hat{\beta}_1 = 0$. The model therefore becomes:

$$\ln \left( \frac{\Pi_{i,t} + F_{i,t}}{R_{i,t}} \right) = \beta_0 + \beta_1 \ln \left( MS_{i,t} \right) + \varepsilon \tag{8}$$

Therefore, in interpreting the coefficient $\beta_1$, I will focus on its sign and significance rather than its magnitude.

Finally, as argued by Cowling (1976), firms could need time to adjust to the new competitive situation and the impact of an increase in market share on performance may therefore involve a lag. I therefore again include a specification with an additional one-year lag:

$$\ln \left( \frac{\Pi_{i,t} + F_{i,t}}{R_{i,t}} \right) = \beta_0 + \beta_1 \ln \left( MS_{i,t-1} \right) + \varepsilon \tag{9}$$

Of course, this Cournot model does not measure exactly the same relationship as the SCP model. Whereas the latter concentrates on the impact of market structure, the former focuses on individual banks’ market share. However, in doing so it more accurately captures asymmetric market structures, differences in cost structures and collusive behavior.

2.4 The Efficiency Hypothesis

An important critique of both the above Cournot model and the traditional SCP model is the fact that both consider market power to be the only explanation for differences in market share. The Efficiency hypothesis has been developed as an important alternative explanation. In this section, I critically review the way Efficiency hypothesis can be tested against the market power hypothesis. In addition, I provide an alternative test of the Efficiency hypothesis.

\textsuperscript{16} As explained, for the collusive oligopoly I assume a $\lambda_i$ that is not constant but unmeasurable - except through $MS_i$. 

8
The Efficiency hypothesis attributes differences in performance to differences in efficiency (Goldberg and Rai (1996), Smirlock (1985)). According to the Efficiency hypothesis, both high market share and good performance result from high efficiency. Tests aimed at setting off both hypotheses against each other tend to suffer from identification problems, since the same market structure variable behaves similarly for both cases.

Thus, whereas according to the traditional SCP hypothesis and the above Cournot model a high market concentration is an explanatory variable for above average performance, within the Efficiency hypothesis it is seen as, at most, the result of a higher efficiency. Testing the Efficiency hypothesis against the SCP hypothesis therefore generally involves including both market shares and a market structure variable in the estimated equations. The premise is that if the Efficiency hypothesis holds, once individual banks’ market share is controlled for, overall market concentration does not explain profits (cf. Demsetz (1973)).

There are several problems with this method. First, there is no consensus with respect to the market structure variable. More fundamentally, whereas the importance of the Efficiency hypothesis itself in SCP studies is beyond doubt, identification problems are predominant in tests of both hypothesis at the same time. Most importantly, the variable market share at once proxies for market power - as does the market structure variable - and for efficiency. The market structure variable is an aggregate measure that only changes over time. The market share variable, however, differs from firm to firm and over time. The identification problems resulting from using both types of variables are demonstrated in table 3, where neither market concentration ($C_3$ and $HH$ respectively) nor market share ($MS$) are significant. In addition, both carry a negative sign.  

Although recognized here as well as an important explanatory power in banking, this conclusion is perhaps too easy. It is important to remember that the Efficiency hypothesis assumes that (a high) market share results from (a high) efficiency. In the empirical models by Berger and Hannan (1993) and Molyneux (2000) however, both market share and efficiency are included as explanatory variables for bank profit. Clearly, this is not a clean test of the Efficiency hypothesis.

I therefore suggest a more appropriate test including firm-specific efficiency measures. In order to do so, I take a two-step procedure. First, I regress

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17 In the next sections, I use 201 observations on bank efficiency from chapter 4 of Bos (2002). In order to get comparable results, the same observations are used here.  
18 The modification I suggest is explained for the Cournot model and therefore in loglinear form. I have also applied it (without taking logarithms) to the traditional
\( MS_{i,t} \) on an efficiency measure. As evidenced by the discussion in Berger and Humphrey (1997), X-efficiency is generally found to dominate scale efficiency in banking. Cost X-efficiency \([CE]\) measures how close a bank’s costs, conditional upon its output, input prices and equity level, are to the costs a fully efficient bank would incur under the same conditions. As such, I consider it the best efficiency measure to use in my two step approach.\(^{19}\) I therefore use cost efficiency:

\[
\ln MS_{i,t} = \gamma_{0,t} + \gamma_1 \ln CE_{i,t} + \varepsilon
\]

I then estimate equation 8, but replace \( MS_{i,t} \) with \( MS(CE)_{i,t} \) — the residuals of the above equation. This efficiency measure \( MS(CE) \) is by definition orthogonal on \( CE \). The Cournot equation then reads:

\[
\ln \left( \frac{(\Pi_{i,t} + F_{i,t})}{R_{i,t}} \right) = \beta_0 + \beta_1 \ln \left( MS(CE)_{i,t} \right) + \beta_2 \ln CE_{i,t} + \varepsilon
\]

Now, I effectively control for the Efficiency hypothesis. I can compare both hypotheses by comparing the results from estimating equation 8 with those of estimating equation 11. If the market power hypothesis holds, \( \hat{\beta}_1 \) is significant and positive in both specifications. On the other hand, if \( \hat{\beta}_1 \) is positive and significant when estimating equation 8, but zero or positive and significant when estimating equation 11, this is evidence in favor of the Efficiency hypothesis.

3 The Dutch Banking Market

The Dutch banking market is dominated by three large banks (ABN AMRO, ING, Rabobank), who together share roughly 80% of the Dutch banking market. Molyneux (2000), in an overview of financial restructuring in the European Union, cites deregulation and technological change as “lowering entry barriers and making markets more contestable” [p. 1]. This supports his claim that “there is little evidence to suggest that market structure and bank size strongly influence performance” [p. 2]. Combined, these statements raise two important questions. First, to what extent is there indeed such a thing as a Dutch banking market? Second, to what extent do results from the literature depend on the way market power has been measured for the Dutch banking market?

3.1 Market Definition

To be sure, the answer to the second question depends on the answer to the first question. If it turns out market power studies have been using the wrong market definitions, then their results will always be biased.\(^{SCP model.}\)

\(^{19}\)I also considered using profit X-efficiency, but this does not really solve the problem, since - to the extent that a bank with market power can maximize profits without minimizing costs - it basically captures the same effect as \( MS \).
Studies that focus specifically on the Netherlands are scarce. In general, however, the observation in the literature that deregulation and technological change have led to more contestable banking markets lacks convincing empirical support.

Huizinga (1998) describes the entry of foreign banks in the Dutch banking market. At the end of the 1980s and the beginning of the 1990s, a number of foreign banks entered the market or significantly expanded their presence on the Dutch banking market. For some (mostly German) banks, their presence on the Dutch banking market was clearly an attempt to get a foothold in the market. Other banks (mostly Asian and American) merely started branches that have a banking license but are aimed at servicing existing clients abroad. The presence of both groups of foreign banks on the Dutch banking market has increased during the 1990s, but in total is still marginal.\(^{20}\)

For the European Union as a whole, Molyneux (2000) finds that “[T]he only systems where foreign banks are strongly involved in domestic banking activities are Belgium, the Netherlands and Portugal” [p. 4]. However, in the remainder of his analysis, Molyneux focuses on increases in the number of branches. In the Netherlands, the number of branches is very stable in the period under review, after an initial decline following the creation of ABN AMRO and ING Group respectively: 7,518 in 1992 compared to 7,219 in 1996. In short, whereas there has been an increase in the involvement of foreign banks in the Netherlands, this has not led to an increase in the total number of branches.\(^{21}\) This is confirmed by Hassan et al. (2000), who examine bank cross-border performance in Europe. Their findings show that bank performance is still predominantly ‘national’, with only modest revenue and profits from cross-border activities.

Finally, note that the concern over market power and the impact its abuse has on consumers is traditionally the highest for consumer loans, deposits, mortgages and other, similar products for which switching costs and search costs are (relatively) high. Indeed, for the Netherlands, Fase (1997) finds that cross-border substitutability between domestic and foreign deposits is almost

\(^{20}\)Included in the analysis in this paper are only those banks that try to compete with other banks in a broad range of services. This group consists of commercial banks with a banking license that offer loans and deposits to both commercial and private clients. This was checked through a telephone survey.

\(^{21}\)Branching networks are excluded from my empirical analysis. Accurate data on branching networks are not available in IBCA/BankScope. However, in the Netherlands the three large banks are the only banks that have established truly national branching networks. The small(er) general banks have at most regional networks that are occasionally quite extensive (e.g. SNS bank). The specialized banks have very small networks.
non-existent. He estimates cross-border substitutability for the period 1984-1994 and, using $M_2$ as a denominator for the share of cross-border deposits find a substitution elasticity of 0.22 (and standard error of 0.07).

Summing up, the Dutch (retail) banking market, in particular the market for deposits, is still confined to a large extent by its national borders.

### 3.2 Market Power

In order to answer the second question, I first describe some characteristics and developments of the structure of the Dutch banking market. Next, I briefly summarize some empirical evidence with respect to the (non-)existence of market power in the Dutch banking market.

In the beginning of the 1990s, the Dutch banking market experienced a rapid consolidation phase as a result of a series of mega-mergers that created ABN AMRO and ING. In 1990, the Fortis Conglomerate was set up in the Netherlands and Belgium as a much looser form of the same principle. As a consequence, the Netherlands currently has the highest market concentration of all EU countries, with the market share of the three largest banks in the market for deposits summing to more than 85% in 1998.

Although this number suggests otherwise, there is little evidence in the literature to suggest that there is indeed market power in the Dutch banking market. Canals (1994) and Molyneux et al. (1997) include a descriptive analysis of European banking markets. Interestingly, although he does not include the Netherlands, Canals (1994) hints at possible signs of market power in banking markets (Germany, Italy) less concentrated than the Netherlands. Molyneux et al. (1997) also cite a range of European SCP studies, but find that the results are far from conclusive. Importantly though, in many cases evidence of market power disappears when the SCP hypothesis is tested against the Efficiency hypothesis. Molyneux and Forbes (1995) and Altunbas and Molyneux (1994) confirm this in an empirical analysis of European banking markets. However, Molyneux and Thornton (1992) already suggested that the link between market share and profitability is a lot stronger than the link between market structure and profitability. This idea is especially interesting given the observation in Molyneux et al. (1997) that scale economies are very small in European banking.

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22 The ABN AMRO merger took place in 1990. ING Group was formed in 1989 through a merger of NMB and Postbank with Dutch insurance company Internationale Nederlanden. In 1991, Bank Mees en Hope and Pierson merged to form MeesPierson (effective in 1992). Summing up, 1993 is the first full year after the three mega-mergers took place.
Goldberg and Rai (1996) and Economic Research Ltd. (1997) also use the SCP model and find similar results. Using a different setup however, Van der Vennet (1994, 1996) analyzes the impact of concentration, mergers, efficiency and entry barriers on European bank profitability. In line with the above, evidence of a significant impact from a decrease in entry barriers is absent. Mergers however, do seem to have some influence on bank profitability. In a more direct test of market power, Bikker and Groeneveld (2000) test the Ross-Panzar H-statistic and also find evidence of (limited) market power.

Concluding, evidence of market power is mixed, but it does appear to depend on the method in which market power is tested. In addition, inclusion of the Efficiency hypothesis alters results rather drastically.

4 Data

I use the IBCA data provided through BankScope. Taking care of overlap due to holding companies and eliminating non-bank financial intermediaries (e.g. ABN AMRO Lease Holding), I am left with approximately 60 banks. For every year, I include only those firms for which all variables are available. This leaves me with an unbalanced panel of 7 years. Important to note is that coverage of the market is never below 95%.

As can be seen from table 1, the number of banks included increases slightly before decreasing again. This is the combined effect of several things. First, for later years data availability increases and thereby it becomes possible to include more banks for which I have good data. Second, as observed by de Leeuw (1996), next to an influx of foreign banks there was also an increase in the demand for banking licenses as more financial institutions started roaming in the field of commercial banks. To the extent that these institutions effectively started supplying loans and demanding deposits, this is reflected in the data. Finally, there is the net effect of entry and exit. Important to note is that for all years, market coverage is over 95%.

For the SCP model, I use the two market structure variables introduced in section 2: the $C_3$ ratio and $HH$, the Hirschman-Herfindahl index. Both are based on deposits. For the Cournot model, I use a market share variable $MS$, also based on total deposits.

$C_3$ is sum of the (percentage) market share of the Dutch banking market of the three largest banks, $HH$ is the Hirschman-Herfindahl index, and $MS$ is the percentage market share. All three variables are based upon total deposits held at a bank. The $C_3$ ratio remains relatively stable over the entire period, but expands slightly in 1997/1998, amongst other through growth of ABN AMRO and ING Group. The Hirschman-Herfindahl index mostly follows this trend, but - as can be seen in table 1 and figure 1 more prominently captures the entry
of small foreign players through a marked decrease in 1993. Finally, market share \( MS \) follows the same trends. As becomes clear from table 1, small players are very small indeed on the Dutch banking market, with market shares of 0.006% in 1998.\(^{23}\)

<table>
<thead>
<tr>
<th>Year</th>
<th>( N )</th>
<th>( C_3 )</th>
<th>( HH )</th>
<th>( MS )</th>
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<tbody>
<tr>
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<td>Maximum</td>
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<td>0.8625</td>
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</table>

Table 1: Structure Dutch Banking Market

For performance measurement there is a wide range of variables used in the literature. No agreement exists as to which measures are superior.\(^{24}\) Performance measures range from purely financial measures such as profits, return on equity \([R.O.E.]\), and return on assets \([R.O.A.]\) to more eclectic measures such as market share stability, expenses and the number of bank employees. Most SCP studies use either \( R.O.E. \) or \( R.O.A. \). I will do the same, and opt for \( R.O.A. \) since it is invariant to (changes in) a bank’s risk appetite.\(^{25}\)

As a performance measure in the Cournot model I use a markup derived from the model. It consists of total revenue minus variable costs as a ratio over total revenue, which is in turn equal to profits (\( P \)) plus fixed costs (\( F \)) over revenue (\( R \)). It is included in table 2 as \( PFR \). In order to assess the robustness of the analyses, I also estimated nested versions of both the SCP and the Cournot model. The estimations reported in table 3 includes both market share and market structure variables. Other combinations, however, did not qualitatively change the conclusions in this chapter and are therefore not reported.\(^{26}\)

\(^{23}\) Note that both \( C_3 \), \( HH \) and \( MS \) do not change much when based on a different variable such as total assets or loans. Bikker and Haaf (2002) use a Lorenz curve to describe the “size inequality of the banks in the Dutch banking sector” [p. 32]. Their analysis is based on total assets, but the main conclusions stay the same. Interesting in this respect is the big difference between the largest small banks and the top three banks in the Netherlands. This highly skewed size distribution is hard to capture by many market structure variables used in traditional SCP models.

\(^{24}\) See Molyneux et al. 1997 (chapter 4 and appendix I), Gilbert (1984), Heggestad (1979) and Berger (1995) for overviews of SCP studies of banking markets.

\(^{25}\) Note that ceteris paribus, if market power is present, \( R.O.E. \) (which is more closely watched by the market) and \( R.O.A. \) should yield the same results. In fact, using \( R.O.E. \) instead of \( R.O.A. \) does not significantly alter the results.

\(^{26}\) I also estimated the Cournot model with \( R.O.A. \) as a dependent variable, and the SCP model with \( PFR \) as a dependent variable. The results are robust in both
Table 2: Descriptives

<table>
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<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std.Dev.</th>
<th>Skew</th>
<th>Kurtosis</th>
<th>Min.</th>
<th>Max.</th>
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<td>PFR</td>
<td>0.9305</td>
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<td>-1.44</td>
<td>8.05</td>
<td>0.2</td>
<td>1.37</td>
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<tr>
<td>R.O.A.</td>
<td>0.0062</td>
<td>0.0079</td>
<td>4.54</td>
<td>33.36</td>
<td>-0.009</td>
<td>0.081</td>
<td>351</td>
</tr>
<tr>
<td>MS</td>
<td>0.0198</td>
<td>0.0675</td>
<td>4.62</td>
<td>24.99</td>
<td>0</td>
<td>0.496</td>
<td>351</td>
</tr>
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<td>C3</td>
<td>0.7884</td>
<td>0.0359</td>
<td>1.03</td>
<td>2.71</td>
<td>0.752</td>
<td>0.863</td>
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<td>HH</td>
<td>0.2444</td>
<td>0.0308</td>
<td>0.85</td>
<td>2.77</td>
<td>0.21</td>
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<td>RISK</td>
<td>0.5025</td>
<td>0.2488</td>
<td>0.05</td>
<td>2.33</td>
<td>0.001</td>
<td>0.984</td>
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<td>LIQUIDITY</td>
<td>0.3264</td>
<td>0.2201</td>
<td>0.46</td>
<td>2.43</td>
<td>0.001</td>
<td>0.88</td>
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<td>COST</td>
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<td>0.2188</td>
<td>-0.41</td>
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<td>0.067</td>
<td>1.4</td>
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<tr>
<td>MARKET</td>
<td>0.5709</td>
<td>0.1204</td>
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<td>2.64</td>
<td>0.359</td>
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<tr>
<td>CE</td>
<td>1.3496</td>
<td>0.591</td>
<td>3.99</td>
<td>22.68</td>
<td>1.003</td>
<td>5.66</td>
<td>201</td>
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</table>

For all models, I include the same mix of the most popular control variables (see Molyneux et al. (1997), ch. 4 and appendix I). I purposely restrict the number of control variables included to avoid high correlation between different control variables which would render the interpretation of the model overly complicated. For each of the specification I checked whether including respectively excluding them altered sign or significance of the other variables. The set of variables as described below is highly robust and the explanatory variables as such are not highly correlated. For comparison purposes, I report the same set of control variables for all estimations, even if for some specifications control variables are highly insignificant.

Differences in risk attitude are usually controlled for using either loans over assets or equity over assets. The former is expected to have a positive sign, the latter a negative sign. I include a variable $RISK$ that is defined as total net loans as a percentage of total assets. I expect it to carry a positive sign, reflecting a higher return to a more risky position. I also include $LIQUIDITY$, liquid assets as a percentage of total assets. It is expected to have a negative coefficient, as banks trade off liquidity for profitability. Finally, I include $COST$, the ratio of total operating expenses over total operating income. Of course, it is expected to have a negative coefficient.

I use the sum of demand deposits as a proxy for total demand.

27 The discussion whether or not this is the best risk measure is beyond the scope of this paper. It captures the exposure of banks to some extent. More refined measures using e.g. risk-weighted assets should be considered superior. They have however been largely absent from the literature discussed here (also for reasons of data availability).

28 The opposite is the case in the so-called 'quiet life hypothesis', that assumes banks trade off (some of) their monopoly rents against a lower risk (Molyneux et al. (1997), pp. 117-118).

29 I have also estimated the SCP-models with GNP, but this variable was never
size is therefore measured by $MARKET$, total deposits in billions of guilders, measured in constant prices. It is expected to carry a negative sign if there is potential competition from both existing competitors and possible entrants. On the other hand, if the market is less contestable, an increase in its size leads to a positive expected effect on performance.

Estimated cost X-efficiency was taken from Bos (2002). In the first step, I regress the logarithm of a bank’s market share on its cost X-efficiency estimate:

$$\ln MS_{i,t} = 0.038 - 0.007 \ln CE_{i,t} + \varepsilon,$$

where $\varepsilon$ is included in table 3 as $MS(CE)$. Matching these efficiency results with the sample data used so far results in a further decrease of the number of observations to 201 (market coverage is still very high and the decrease is proportional per year).

5 Results

In table 3, from left to right, I introduce the different models in the same order as they were discussed in section 2. All models were estimated both with and without a lag. Since they do not differ significantly from the non-lagged specifications, estimations with lags are not reported in this and the following sections. I note that accounting practices themselves already lead to a lag; bank profit is a flow variable, whereas the independent variables, including market structure (and market share) are stock variables that change little from year to year. Both specifications are estimated both with simple OLS and as fixed effects models. Since the fixed effects results do not differ, they are not reported here. The period 1992-1998 is relatively stable, and relatively short. It is therefore not surprising that none of the fixed effects differed significantly from the intercept in the OLS model. In addition, coefficients for all variables were highly similar. I focus therefore on the OLS specifications. In discussing the estimation results, I focus on the market structure variables. Subsequently, I briefly elaborate on the control variables.

In the first column, I start by estimating the traditional SCP model. Contrary to expectations, the concentration ratio $C_3$ carries a negative sign. The specification with the Hirschman-Herfindahl index ($HH$) as a market structure variable tells the same story. For both specifications, overall fit of the model is good considering the small number of control variables and what is practice in the literature. As is also common in market power studies of the Dutch banking market, no evidence of market power is found.

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30 To minimize possible problems with heteroskedasticity, all models in this paper are estimated using weighted least squares with total assets as weights.
31 These results are available upon request from the author.
32 Given the way the market concentration measures are constructed, the variance in e.g. $C_3$ may of course simply be white noise. This constitutes an additional,
Table 3: Results

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<th>Cournot</th>
<th>Market power and efficiency</th>
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<td>MS &gt; 0</td>
<td>C3 &gt; 0 &amp; HH &gt; 0 &amp; MS = 0</td>
</tr>
<tr>
<td></td>
<td>MS(CE) &gt; 0 &amp; CE = 0</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>b (se)</td>
<td>b (se)</td>
<td>b (se)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.016 (0.003)</td>
<td>0.013 (0.002)</td>
<td>-0.068 (0.003)</td>
</tr>
<tr>
<td></td>
<td>0.017 (0.003)</td>
<td>0.013 (0.002)</td>
<td>0.017 (0.004)</td>
</tr>
<tr>
<td>HH</td>
<td>-0.007 (0.004)</td>
<td>-0.006 (0.004)</td>
<td>-0.006 (0.004)</td>
</tr>
<tr>
<td>C3</td>
<td>-0.008 (0.004)</td>
<td>-0.008 (0.005)</td>
<td>-0.008 (0.005)</td>
</tr>
<tr>
<td>MS</td>
<td>0.006 (0.002)</td>
<td>-0.001 (0.001)</td>
<td>-0.001 (0.001)</td>
</tr>
<tr>
<td>MS(CE)</td>
<td>-0.001 (0.001)</td>
<td>-0.001 (0.001)</td>
<td>0.007 (0.003)</td>
</tr>
<tr>
<td>CE</td>
<td>0.000 (0.000)</td>
<td>0.000 (0.000)</td>
<td>0.020 (0.015)</td>
</tr>
<tr>
<td>Risk</td>
<td>-0.007 (0.001)</td>
<td>-0.007 (0.001)</td>
<td>-0.013 (0.013)</td>
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<tr>
<td>Liquidity</td>
<td>-0.009 (0.005)</td>
<td>-0.039 (0.005)</td>
<td>0.001 (0.001)</td>
</tr>
<tr>
<td>Cost</td>
<td>0.000 (0.000)</td>
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<td>0.001 (0.001)</td>
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<tr>
<td>Market</td>
<td>0.002 (0.001)</td>
<td>0.083 (0.002)</td>
<td>0.001 (0.001)</td>
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</table>

R^2adj. 0.287 0.288 0.284 0.319 0.317 0.316 0.314 0.348
Obs. 351 351 351 201 201 201 201 201

In the third column, the Cournot model has a fit is similar to that of the SCP model. Again, estimating a fixed effects model does not change results. The coefficient $\beta_1$ for market share variable $MS$, although not very large, is highly significant. Since I find that $0 < \beta_1 < 1$, I cannot reject the hypothesis that there is no market power. Concluding, the Cournot model appears to be provide rather different evidence than the traditional SCP model. From this model I cannot reject the hypothesis that there is (some) market power in the Dutch banking market.

Columns 4 and 5 contain the estimation results for the SCP model with the traditional test for the Efficiency hypothesis. Columns 6 and 7 show the modified test results. Signs for both specifications and tests are similar. Results of the specification with $C_3$ as a market structure variable and $HH$ as a market structure variable differ very little. This once again confirms the observation empirical drawback of traditional SCP models.

Of course, I also estimated the Cournot model with ROA as a dependent variable. These results did not qualitatively differ from those reported here.
that empirically there does not appear to be a dominant market structure variable. Contradictory to expectation, the market share variable $MS$ is positive but insignificant as are the market structure variables.

In the final column, testing the Efficiency hypothesis with the Cournot model shows somewhat different results. The coefficient for $MS(CE)$, which is orthogonal to efficiency, is positive and significant. Although somewhat larger in magnitude the coefficient for cost efficiency is marginally insignificant. This would seem to be evidence in favor of the existence of market power. Taken as such, these results confirm the results from the Cournot model estimated before and suggest that there is evidence of some market power on the Dutch banking market.

The control variables appear to be rather robust to different specifications. $RISK$ carries an unexpected, negative and significant coefficient. The only exception is the Cournot model with a modified Efficiency hypothesis, where increasing $RISK$ has positive but insignificant effect. As explained above it is composed of the ratio of net loans over total assets. Although quite common in the literature as a risk measure, it apparently fails to capture the effects of increases in risk-taking on profits. $LIQUIDITY$ is always negative and significant, indicating that banks pay for higher liquidity by lower profits. The effect is less for the Cournot model, possibly due to the fact that the dependent variable here only consists of the markup and not total profits. The coefficient for the $COST$ variable is close to zero and never significant. This is in line with much of the empirical literature that tends to find weak links between bank performance and cost ratios. Finally, the variable $MARKET$ is only significant in the Cournot specifications, where it is positive. This results confirms earlier remarks that the Dutch (deposit) market is not very contestable. Admittedly, though the results for $MARKET$ are perhaps handicapped by the fact that in a static setting it is expected to capture a dynamic effect. However, additional estimations (results not included here) for this model specified in growth terms did not change its sign or significance however.

Overall, the control variables carry the expected sign in most cases. Importantly, the Cournot model with the modified Efficiency hypothesis is the only specification where all the variables carry the expected sign. In addition, it has the highest fit and results in significant coefficients (except for the $COST$ variable).

---

34 Correlation with $LIQUIDITY$, which is also a ratio over total assets is very low.
35 Note that this is different from the link between efficiency and performance.
36 It also did not change the rest of the conclusions.
6 Conclusion

In this paper, I investigated whether improving the traditional SCP model gives us additional insights in the existence of market power in the Dutch banking market. I first improved the measurement of market structure. Then, I introduced a simple Cournot-model, which better enabled me to measure market power for different market structures. Finally, I included the Efficiency hypothesis and modified it to more accurately test it jointly with the market power tests.

Theoretically speaking the Cournot model provides a better test for the existence of market power than the SCP model. Likewise, explicitly correcting for and including efficiency allows for a more correct test of the Efficiency hypothesis. Empirical results confirm this observation. The introduced improvements based on the Cournot models are the only ones resulting in tests that are consistent with the underlying models. In addition, the Cournot model with the modified Efficiency hypothesis has the highest fit and is the only specification where all the control variables also carry the expected sign.

Concluding, the analysis presented here formalizes the doubt that is often expressed with respect to market power tests. Evidence from the Cournot model suggests that we cannot reject the existence of market power, although its impact on performance may be small. It also underlines the need for additional research into measuring strategic interaction and revives the need for additional explanations of differences in bank performance.

References


Appendix: The Stigler Approach

In this appendix I show that, under the presumption that collusive behavior de facto exists, the extent to which banks will engage in collusive behavior is directly and positively related to their market share. An increase in market share \( MS_i \) leads to an increase in awareness \( l_i \), and thereby to collusive behavior.\(^{37}\)

To prove this, I start with Stigler’s rule that the (pricing) behavior of firms must be inferred from the way their customers react. The assumption then is that ”[T]here is no competitive price-cutting if there are no shifts of buyers among sellers” (Stigler (1964), p. 48). Thus, the higher the loyalty of customers, the less likely a bank is to behave collusively. Intuitively, the higher customer loyalty is, the less a bank has to gain by cutting prices: it does not have to do it to keep its old customers and it does not expect to gain a lot of new customers. In terms of the dynamic Cournot model, the lower

\(^{37}\)On a market level, the notion that concentration ”facilitates collusion between firms and increases industry-wide profits” (Tirole (1993), p. 222) is widely accepted.
the conjectural variation \( I_i \), the more likely the bank is to engage in collusive behavior.

In line with Stigler (1964), a bank targets three groups of customers. First, it wants its share of the growth of new customers \( C_n \). Second, it wants to retain as many of its old customers as possible \( C_r \). Third, it wants growth through the other banks’ old customers \( C_o \). Let \( N_n \) = number of new customers, \( N_o \) = the total number of old buyers in the market. Also, let \( n^i_o \) = the number of old customers for bank \( i \). The probability of repeat purchases is denoted \( p \), and \( MS_i \) is bank \( i \)’s market share.

The expected number of customers for each group is given by:

\[
E(C^n_i) = MS_i \times N_n \tag{12a}
\]

\[
E(C^r_i) = p \times MS_i \times N_o \tag{12b}
\]

\[
E(C^o_i) = (1 - p) \times MS_i \times (N_o - n^o_i) \tag{12c}
\]

For each group the cost of cheating (i.e. not behaving collusively) is given by the variance of the expected number of customers. The higher this variance, the more likely a bank is to show collusive behavior. For each set of customers, variances are given by:

\[
var(C^n_i) = [N_n \times MS_i \times (1 - MS_i)] \tag{13a}
\]

\[
var(C^r_i) = [N_o \times p \times MS_i \times ((1 - p) \times MS_i)] \tag{13b}
\]

\[
var(C^o_i) = [(N_o - n^o_i) \times (((1 - p) \times MS_i) \times (1 - (1 - p) \times MS_i))] \tag{13c}
\]

As explained, an increase in market share \( (MS_i) \) leads to more collusive behavior if \( d\text{var}(\cdot)/dMS_i > 0 \). This requires:

\[
\frac{d\text{var}(C^n_i)}{dMS_i} = N_n - (2 \times N_n \times MS_i) > 0 \tag{14a}
\]

\[
\frac{d\text{var}(C^r_i)}{dMS_i} = pN_o - (2 \times N_o \times p^2 \times MS_i) > 0 \tag{14b}
\]

\[
\frac{d\text{var}(C^o_i)}{dMS_i} = \left( (1 - p) \left( N_o - n^o_i \right) \right) - 
\left( 2 \times (1 - p) \times MS_i \right) > 0 \tag{14c}
\]

---

38 Where \( \sum_{i=1}^{N} X_i = X = f(N_0) \).

39 Where \( MS_i = X_i / \sum_{i=1}^{N} X \).

40 A bank expects a consumer to become either customer (with expectations dependent on its current market share) or not. Thus, for the binomial mean \( \mu = n \times p \), variance is \( n \times \pi(1 - \pi) \).
Equations 14a and 14c hold if $MS_i < 0.5$. As can be seen in table 2, the maximum market share held by a bank in the Dutch banking market over the period 1991-1998 is 0.45, so this is the case. Equation 14 holds if $p > 2p^2 * MS_i$. Since $MS_i < 0.5$, this condition is also satisfied.

Since $C_{ni}$, $C_i$ and $C_o$ are disjoint subsets of the whole customer population (i.e. there is no overlap), I can simply add up their variances, which under the above mentioned conditions are larger than zero. Summing up therefore, an increase in market share $MS_i$ leads to an increase in awareness $\lambda_i$ and thereby to more collusive behavior.
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