Applied Economics Letters ›
Volume 24, 2017 - Issue 15

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The Lerner index and revenue maximization

Laura Spierdijk & Michalis Zaouras

Pages 1075-1079 | Published online: 10 Nov 2016

Cite this article https://doi.org/10.1080/13504851.2016.1254333 Check for updates

ABSTRACT

Based on profit-maximizing behaviour, the usual interpretation of the Lerner index is that a zero value reflects competitive behaviour, while a positive value is associated with market power. We investigate to what extent the usual interpretation of the Lerner index remains valid in a setting where firms do not pursue profit maximization, but instead maximize revenues subject to a minimum-profit constraint. We show that a positive Lerner index still indicates market power, but that the magnitude of a positive Lerner index can no longer be used to determine how much market power there is. Furtherm t the presence ative. We discuss t

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I. Introduction

Because the degree of competition among the firms in a sector or industry has important welfare implications for both consumers and firms (e.g. Bikker 2004), the assessment of firms' market power is the topic of many theoretical and empirical studies in the economic literature.

Measures of market power often rely on the assumption of profit-maximizing behaviour (e.g. Hay and Liu 1997; Shaffer 2004; Boone 2008; Bikker, Shaffer, and Spierdijk 2012). However, Baumol (1958) already argued that firms in oligopolistic markets are more likely to maximize revenues subject to a minimum-profit constraint rather than to pursue profit maximization; a theory for which the early literature found some empirical evidence (e.g. Amihud and Kamin 1979; Winn and Shoenhair 1988). More recently, Segerson and Squires (1995) argued that the appropriate short-run behavioural assumption for a multi-product firm is revenue maximization. Other alternative pricing strategies that have been considered in the literature are limit pricing (Milgrom and Roberts 1982) and constant mark-up pricing (Rosse and Panzar 1977).

A widely used measure of market power is the Lerner index, whose theoretical and historical foundation has been extensively discussed in the literature (e.g. Landes and Posner 1981; Elzinga and Mills 2011; Giocoli 2012). The Lerner index compares a firm's output price with its associated marginal costs, where marginal cost pricing is referred to as the 'social optimum that is reached in perfect competition' (Lerner 1934, 168). The standard interpretation of the Lerner index is that a zero value reflects competitive behaviour, while a positive value is associated with market power. However, this interpretation is directly derived from profit-maximizing behaviour, as we will see later.

This leads to the fundamental question to what extent the usual interpretation of the Lerner index remains valid in a setting where firms do not pursue profit maximization. As argue to provide a meani st that in which th pretation is no lo stark implic t test whether interpret Maudos

The goal of this study is to investigate whether the interpretation of the Lerner index as a measure of market power is robust to deviations from the profit-maximization paradigm. We focus on revenue maximization as alternative pricing strategy because of two reasons. First, its empirical relevance has already been pointed out by, e.g., Segerson and Squires (1995). Second, revenue maximization subject to a minimum-profit constraint encompasses several limiting cases, including sales maximization subject to a break-even constraint, and even profit maximization. This makes it a convenient and fairly general framework to analyse.

Our main results are as follows. When firms maximize revenues subject to a minimum-profit constraint, we can safely conclude that they possess market power when the Lerner index is significantly positive. However, we can no longer use the magnitude of the Lerner index to determine how much market power they have. Furthermore, additional information would be required to draw conclusions about the presence or absence of market power when the Lerner index is zero or negative. In particular, without such information, we can no longer conclude that a zero Lerner index implies the absence of market power. We show that statistical tests for profit maximization (Varian 1984; Love and Shumway 1994) can contribute to a correct interpretation of the Lerner index.

II. The Lerner index under profit maximization

We consider a profit-maximizing firm with a single-output production technology. Let denote the inverse demand function satisfying for . Furthermore, let denote total production costs as a function of output, with corresponding marginal cost function for . The Lerner index is defined as a firm's relative mark-up of the output price over marginal cost, given the firm's output level :

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Lerner (1934, 170) suggested that the relative difference between the observed price and marginal cost can always be used to assess a firm's market power, even in the absence of profit maximization. This suggestion has been adopted by the empirical literature in many fields of study, where the Lerner index is widely viewed as a standard tool to assess a firm's market power regardless of the firm's objective function.

However, the equality in does no longer hold in the absence of profit maximization. Consequently, in such a scenario, the Lerner index may become zero or even negative in the presence of market power. We will investigate the implications for the interpretation of the Lerner index in the next section.

III. The Lerner index under revenue maximization

We assume that a firm maximizes revenues subject to a minimum-profit constraint (Baumol 1958; Kafoglis and Bushnell 1970). This section characterizes the optimal output of a revenue maximizing firm and considers the measurement of market power by means of the Lerner index.

Characterization of optimal output

We assume that the following conditions hold, for :

Assumption 1

(i) .

(ii) for .

(iii) for .

(iv) The level and maximu

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The necessary conditions for an optimal solution are summarized below, which is an extension of Kafoglis and Bushnell (1970) because it includes the cases that and .

Result 1 Under Assumptions 1 (i) – (v), if there is a solution to the firm's optimization problem, it must satisfy and the following first-order condition:

(4)

for the Kuhn–Tucker multiplier .

Proof: The Kuhn–Tucker conditions for the firm's optimal output are

(5)

(6)

(7)

(8)

(9)

Because , we must have . We can rewrite Condition (5) as

(10)

Case 1: If , Equation (10) implies that . To show that is possible, assume that and . To prove that is a solution such that , we have to verify feasibility and optimality. Evidently, . Furthermore, Equation (10) is satisfied for and because under profit maximization. It is straightforward to verify that also competitive behaviour (,) yields a solution with . Case 2: If , then we must have because of Equation (10) and . With , Condition (7) implies that the minimum-profit constraint is not binding. Because and , this case thus excludes profit maximization and competitive behaviour for which . □

An implication of Result 1 is that and for .

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can arise under uncompetitive conditions. Using a similar continuity argument as Bikker, Shaffer, and Spierdijk (2012), it follows that is also possible under uncompetitive conditions. The online appendix with supplementary material provides specific examples to illustrate that , and are indeed possible under uncompetitive conditions, and that under competitive conditions.

Empirical implications

The main implication of our results is that, under revenue maximization subject to a minimum-profit constraint, we can only use the Lerner index as a one-sided test for market power in the following sense. Given an empirical estimate of L (denoted), we distinguish two cases. If statistical tests show that is significantly positive, we conclude that there is market power. However, we can no longer use the magnitude of a positive Lerner index to determine how much market power there is. This happens because the Lerner index' competitive benchmark value is no longer 0 (instead, non-positive values may arise in competitive cases). If is not significantly different from 0 or significantly negative, we can draw no conclusions about the degree of market power since can occur under both competitive and uncompetitive conditions. Additional information would be required in this case. In both cases, statistical tests for profit maximization (Varian 1984; Love and Shumway 1994) can contribute to a correct interpretation of the Lerner index; see Table 1.

Table 1. Conclusions on the basis of L and the outcome of a profit maximization test.

Display Table

Acknowledgment

Laura Spierdijk gratefully acknowledges financial support by a Vidi grant (452.11.007) in the Vernieuwingsimpuls-program of the Netherlands Organization for Scientific Research.

Disclosure statement

No potential conflict of interest was reported by the authors.

Supplemental material

The supplemental data for this article can be accessed here.

Additional information

Funding

Laura Spierdijk gratefully acknowledges financial support by the Vidi grant [452.11.007] in the Vernieuwingsimpuls-program of the Netherlands Organization for Scientific Research.

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