

EUROPEAN UNIVERSITY INSTITUTE, FLORENCE

DEPARTMENT OF ECONOMICS

EUI WORKING PAPER No. 89/385

**Product Differentiation and Market  
Performance in Oligopoly**

STEPHEN MARTIN

BADIA FIESOLANA, SAN DOMENICO (FI)

All rights reserved.  
No part of this paper may be reproduced in any form  
without permission of the author



© Stephen Martin  
Printed in Italy in May 1989  
European University Institute  
Badia Fiesolana  
– 50016 San Domenico (FI) –  
Italy

Product Differentiation and Market Performance in Oligopoly

Stephen Martin

Department of Economics

European University Institute

March 1989

ABSTRACT: Noncooperative collusion is more likely to be sustainable, all else equal, the greater the degree of product differentiation. In the presence of product differentiation, market share is biased downward as an index of market power; I analyze the extent of the bias. The impact of product differentiation on market performance in the long run depends on whether firms set prices or quantities and on the extent to which market size increases as product differentiation increases.

JEL Classification Numbers: 022, 611

Responsibility for errors is my own.



## I. Introduction<sup>1</sup>

Product differentiation, as described by Chamberlin [1933, p. 56], is ubiquitous:

A general class of product is differentiated if any significant basis exists for distinguishing the goods (or services) of one seller from those of another. Such a basis may be real or fancied, so long as it is of any importance whatever to buyers, and leads to a preference for one variety over another. ...

Differentiation may be based upon certain characteristics of the product itself, such as exclusive patented features; trade-marks; trade names; peculiarities of the package or container, if any; or singularity in quality, design, color, or style. It may also exist with respect to the conditions surrounding its sale. In retail trade... these conditions include such factors as the convenience of the seller's location, the general tone or character of his establishment, efficiency, and all the personal links which attach his customers either to himself or to those employed by him. In so far as these and other intangible factors vary from seller to seller, the "product" in each case is different...

In view of the ubiquity of product differentiation, it behooves economists to understand the implications of product differentiation for market performance.<sup>2</sup> In this paper, I examine the implications of product differentiation for certain aspects of market performance in the short run and in the long run.

I show that for a given number of firms, increases in product differentiation increase the likelihood that noncooperative collusion will be sustainable, all else equal. Second, I show that for a fixed number of firms, market share is biased downward, as an index of market power, in the presence of product differentiation, and indicate the extent of the bias.

1. Material in Section III appeared in Martin [1988c]. An alternative approach to the material treated in Section IV appeared in Martin [1985].

2. For a recent survey of the literature on product differentiation, see Ireland [1987].

Third, I show that in the long run the impact of product differentiation on market performance depends on the extent to which market size increases as product differentiation increases.

## II. Product Differentiation and Non-cooperative Collusion

### A. Modeling Product Differentiation

It is natural to approach product differentiation by generalizing a model of homogeneous-product oligopoly. An obvious starting point (Spence [1976a]; Carruth [1978]; Waterson [1983]; Deneckere [1983]; Majerus [1988]), is the Cournot model of quantity-setting oligopoly with standardized products.

Suppose  $n$  firms operate in a market with linear inverse demand curve

$$(1) \quad p = a - bQ = a - b(q_1 + q_2 + \dots + q_n).$$

Then a unit of output of any variety is a perfect substitute for a unit of output of any other variety. If each firm operates with constant average and marginal cost  $c$  a natural measure of market size is

$$(2) \quad S = \frac{a - c}{b},$$

the quantity which would be demanded if price were equal to marginal cost.

In contrast to (1), if varieties of a product group are differentiated, they are imperfect substitutes. Each variety has its own inverse demand curve. Sale of an additional unit of other varieties should have a smaller effect on  $p_i$  than sale of additional unit of variety  $i$ . These intuitive relationships can be captured by modifying the inverse demand curve (3) to a system of inverse demand curves

$$(3) \quad p_i = a - b(q_i + \theta \sum_{j \neq i}^n q_j) = a - b[q_i + (n-1)\theta \bar{q}_{-i}] \quad , i = 1, 2, \dots, n.$$

where  $p_i$  is the price of variety  $i$ ,  $q_i$  is output of variety  $i$ ,  $\bar{q}_{-i}$  is the average output of all other firms, and  $\theta$  is a product differentiation parameter which converts units of output of other varieties into an "equivalent" number of units of output of variety  $i$ .

Let  $0 \leq \theta \leq 1$ .  $\theta = 1$  corresponds to the homogeneous product case, while products are completely differentiated if  $\theta = 0$ .<sup>3</sup>

Provided that all prices are nonnegative,<sup>4</sup> the demand curve

3.  $\theta < 0$  would model complementary goods. In the most general case, one could specify a parameter  $\theta_{ij}$  as the coefficient of variety  $j$  in variety  $i$ 's inverse demand equation. This is sensible for empirical work (Martin 1988b) but too general for analytical tractability. In such a model,  $\theta_{ij} > 1$  could be interpreted as case in which variety  $j$  were of higher quality than variety  $i$ .

4. The case in which the nonnegativity constraint applies is discussed shortly.

for variety  $i$  implied by (3) is<sup>5,6</sup>

$$(4) \quad q_i = \frac{1}{1 + \frac{1}{(n-1)\theta}} \frac{1}{b} \left\{ a - \left[ p_i + \frac{n\theta}{1 - \theta} (p_i - \bar{p}) \right] \right\}$$

where  $\bar{p} = \frac{1}{n} \sum_{j=1}^n p_j$  is the industry-average price. Thus demand for variety

$i$  is inversely related to its own price and to the excess of its own price over the industry average price.

It is convenient to use reaction curves to illustrate single-period Nash equilibrium, joint profit maximization, and the temptation to depart from a noncooperative joint-profit-maximizing configuration.

#### B. Non-cooperative Single-period Equilibrium

##### Quantity-Setting Firms

The inverse demand curve (3) gives the price of variety  $i$  when all prices are nonnegative. When this condition is met, the equation of firm  $i$ 's reaction curve is

#### 5. Write the system of inverse demand equations as

$$p = aJ - b[(1 - \theta)I + \theta JJ']q$$

where  $J$  is an  $n \times 1$  column vector of ones and  $I$  the  $n \times n$  identity matrix. The inverse of the matrix in brackets on the right is

$$\frac{1}{1 - \theta} \left[ I - \frac{\theta}{1 + (n-1)\theta} JJ' \right]$$

and the solution for the demand equations follows.

#### 6. Written in this form, the demand curve is strikingly similar to those of the Shubik [1980, p. 89]

$$q_i = \frac{1}{n} \left\{ \alpha - \beta \left[ p_i + \frac{1}{n} (p_i - \bar{p}) \right] \right\}.$$

By introducing the constant  $\frac{1}{n}$ , Shubik maintains a constant market size as the number of varieties changes.

$$(5) \quad 2q_i + \theta \sum_{\substack{j=1 \\ j \neq i}}^n q_j = S, \quad i = 1, 2, \dots, n$$

For graphical purposes, it is convenient to condense the equations of the inverse demand curves and reaction curves from  $n$  arguments to 2. Supposing that all firms except firm 1 set a common output and price, the condensed inverse demand curves are

$$(6a) \quad p_1 = a - b[q_1 + (n-1)\theta q_{-1}]$$

$$(6b) \quad p_{-1} = a - b\{[1 + (n-2)\theta]q_{-1} + \theta q_1\},$$

where the subscript 1 refers to firm 1 and the subscript -1 refers to the common value of output or price for all other firms. From (6a) and (6b), the regions in which  $p_1$  and  $p_{-1}$  are nonnegative are

$$(7a) \quad S + \frac{c}{b} \geq q_1 + (n-1)\theta q_{-1}$$

and

$$(7b) \quad S + \frac{c}{b} \geq [1 + (n-2)\theta]q_{-1} + \theta q_1$$

respectively.

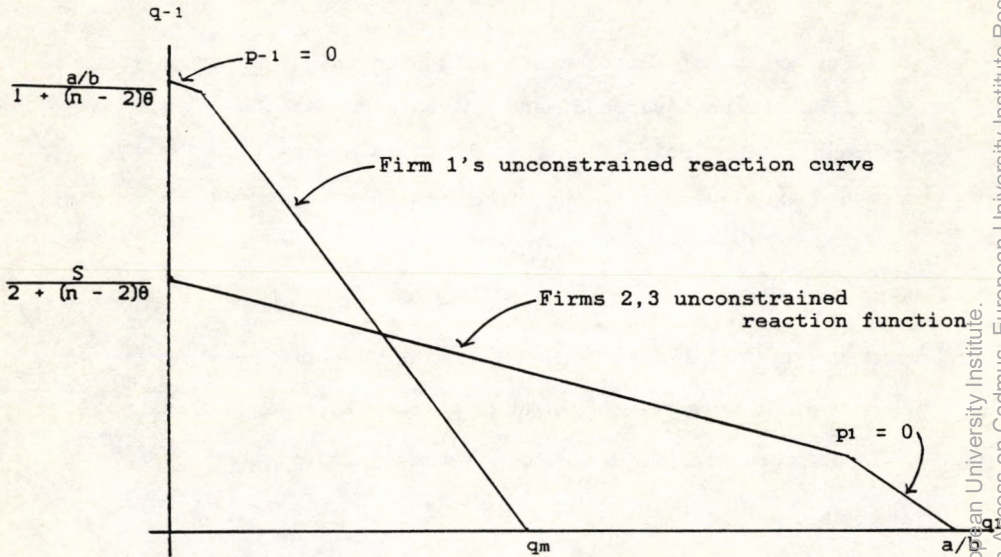
From (6), the equations of the condensed reaction functions, provided all prices are nonnegative, are

$$(8a) \quad 2q_1 + (n-1)\theta q_{-1} = S$$

$$(8b) \quad \theta q_1 + [2 + (n-2)\theta]q_{-1} = S.$$

The reaction curves and borders of the nonnegative price regions are graphed in Figure 1. For concreteness, consider firm 1's output decision. As  $q_{-1}$  rises from 0, firm 1's profit-maximizing output falls, moving along (8a). When  $q_{-1}$  reaches

Figure 1: Quantity Reaction Curves



Notes: drawn for three firms,  $a = 10$ ,  $b = c = 1$ ,  $\theta = \frac{3}{4}$

the intersection of (8a) and the border of (7b), firm 1 is no longer able to move along (8a); to do so would make  $p_1$  negative. As  $q_1$  rises from this point, firm 1 is constrained to move along the border of (7b). Corresponding to this kink in firm 1's reaction curve is a kink in firm 1's residual demand curve.<sup>7</sup> In like manner, there is a kink in the condensed reaction curve of all other firms, at the where further movement along the unconstrained reaction curve would make  $p_1$  negative.

7. Deneckere [1984]; Majerus [1988]. For simplicity, I suppose in this section of the paper that fixed costs are zero. If not, firms may shut down either along the unconstrained reaction curve or along the price-negativity constraint. If fixed costs are sufficiently large, a symmetric equilibrium may fail to exist.

The symmetric single-period Nash equilibrium occurs at the intersection of the two kinked reaction curves. Equilibrium values are (Carruth [1978]; Majerus [1988])

$$(9) \quad p_{nq} - c = \frac{bS}{2 + (n-1)\theta} \quad q_{nq} = \frac{S}{2 + (n-1)\theta} \quad \pi_{nq} = b \left[ \frac{S}{2 + (n-1)\theta} \right]^2.$$

#### Price-Setting Firms

From equation (4), when all quantities are nonnegative in the flexible-size model, the equation of firm  $i$ 's price reaction curve is

$$(10) \quad 2[1 + (n-2)\theta](p_i - c) = (1-\theta)bS + (n-1)\theta(\bar{p}_{-1} - c).$$

Condensing demand curves to two arguments, the regions in which quantities are nonpositive are given by

$$(11a) \quad [1 + (n-2)\theta](p_i - c) \geq (1-\theta)bS + (n-1)\theta(p_{-1} - c)$$

$$(11b) \quad p_{-1} - c \geq (1-\theta)bS + \theta(p_i - c).$$

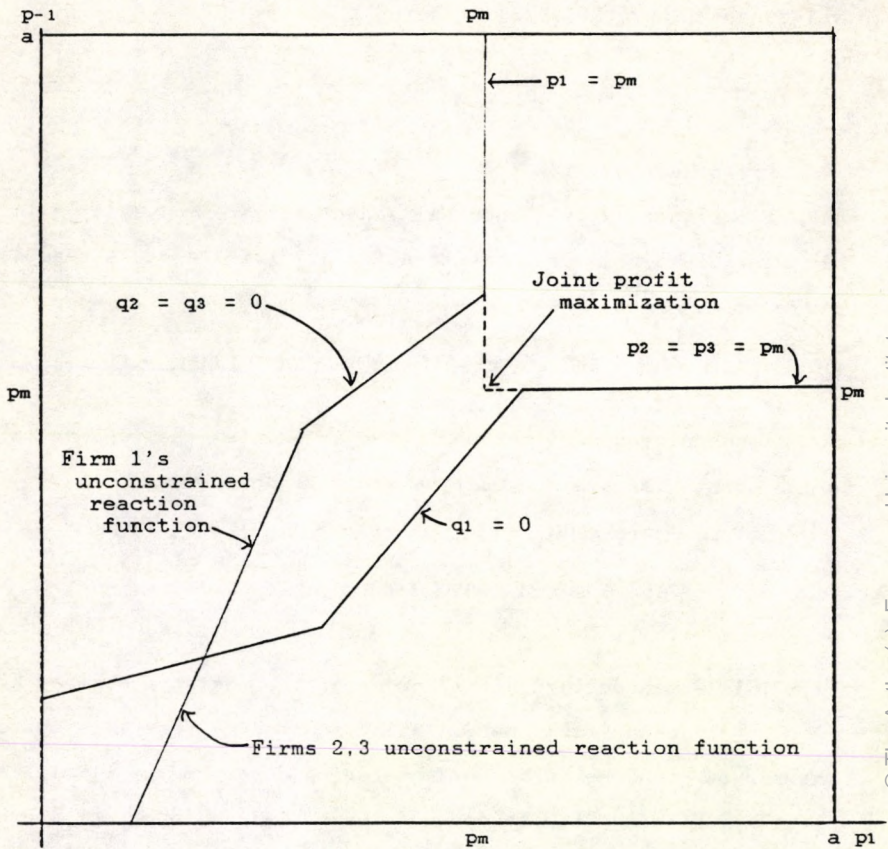
Firm 1 is a monopolist on the border of the region described by (11b). All other firms have a joint monopoly - firm 1 is out of the market - on the border of the region described by (11a). As might be expected, the borders of these regions intersect where  $p_1 = p_{-1} = a$ , the prices which make all quantities demanded equal to zero.

The equations of the condensed reaction functions, provided quantities are nonnegative, are

$$(12a) \quad 2[1 + (n-2)\theta](p_i - c) = (1-\theta)bS + (n-1)\theta(p_{-1} - c)$$

$$(12b) \quad [2 + (n-2)\theta](p_{-1} - c) = (1-\theta)bS + \theta(p_i - c).$$

Figure 2: Price Reaction Curves



Notes: drawn for three firms,  $a = 10$ ,  $b = c = 1$ ,  $\theta = \frac{3}{4}$

The unconstrained reaction curves and monopoly lines are graphed in Figure 2. For interpretation, consider the price decision of firm 1. As  $p_1$  rises from zero, firm 1's profit-maximizing price rises along its unconstrained reaction curve. When  $p_1$  reaches the level at which the unconstrained reaction curve intersects the  $q_1 = 0$  line, firm 1 becomes a monopolist.

From this point, firm 1 cannot move along its unconstrained reaction curve; to do so would require  $q_{-1}$  to become negative. Nor can firm 1 charge the monopoly price, which would move the market back into the region in which  $q_{-1}$  is positive. From the intersection of the two lines, firm 1's profit-maximizing course is to raise price along the  $q_{-1} = 0$  line, until  $p_1$  equals the monopoly price. If  $p_{-1}$  were to rise from this point (although  $q_{-1}$  would remain fixed at zero) firm 1's profit-maximizing price would remain the monopoly price. There are thus two kinks in firm 1's reaction curve, the first when output of all other firms falls to zero and the second when firm 1's constrained profit-maximizing price reaches the monopoly price. The condensed reaction curve of all other firms has a similar shape.

The symmetric single-period equilibrium occurs at the intersection of the two kinked reaction curves. Equilibrium values are (Majerus [1988])

$$(13) \quad p_{nb} - c = \frac{(1 - \theta)bS}{2 + (n - 3)\theta} \quad q_{nb} = \frac{1 + (n - 2)\theta}{1 + (n - 1)\theta} \frac{S}{2 + (n - 3)\theta}$$

$$\pi_{nb} = (1 - \theta)b \frac{1 + (n - 2)\theta}{1 + (n - 1)\theta} \left[ \frac{S}{2 + (n - 3)\theta} \right]^2$$

### C. Joint-Profit Maximization

The joint-profit maximizing configuration is

$$(14) \quad p_{j\pi m} - c = \frac{1}{2}bS \quad q_{j\pi m} = \frac{1}{1 + (n - 1)\theta} \frac{S}{2}$$

$$\pi_{j\pi m} = \frac{b}{1 + (n - 1)\theta} \left( \frac{S}{2} \right)^2$$

From equation (3), equilibrium output of all varieties is equivalent to an output of

$$(15) \quad q_1 + \theta \sum_{\substack{j=1 \\ j \neq 1}}^n q_j = [1 + (n - 1)\theta] q_{j\pi m} = \frac{S}{2}$$

units of variety  $i$ . But this is monopoly output in a market with standardized products. When products are differentiated, joint profits are maximized if the equivalent output of each variety equals the standardized-product monopoly level of output.

In Figure 1, the joint-profit maximizing output pair lies on a  $45^\circ$  line through the origin, closer to the origin than the single-period Nash-Cournot output pair. In Figure 2, the joint-profit maximizing price pair lies on a  $45^\circ$  line through the origin, at the intersection of the two monopoly price lines, farther from the origin than the single-period Nash-Bertrand price pair.

#### D. Product Differentiation and the Stability of Noncooperative Collusion<sup>8</sup>

I examine here the impact of product differentiation on the stability of noncooperative collusion supported by trigger strategies of the kind analyzed by Friedman [1971]. In a repeated game, firms are tempted to cheat from a single-period joint-profit maximizing configuration. The benefit from cheating is the one-period gain in profit. If cheating occurs, other firms revert to the noncooperative Nash equilibrium. The cost of cheating is therefore the difference between the present-discounted values of the joint-profit maximizing and Nash equilibrium income streams.<sup>9</sup> The cost of straying from the

8. Allowing for differences in notation, the stability conditions reported here are functionally equivalent to those of Majerus [1988], who writes the stability conditions in terms of the discount factor rather than the inverse of the interest rate. Majerus does not investigate the sensitivity of the stability condition to changes in the degree of product differentiation.

9. There are, of course, other strategies which may support noncooperatively collusive equilibria; see Friedman [1986] and Segerstrom [1988].

joint-profit maximizing configuration will exceed the benefit - and noncooperative collusion will be stable - if

$$(19) \quad \frac{1}{r} \geq \frac{\pi_{i, \text{cheat}} - \pi_{i, j\pi m}}{\pi_{i, j\pi m} - \pi_{i, \text{nash}}}$$

where  $r$  is the interest rate used to discount future income.

#### Quantity-Setting Firms

In the quantity-setting model, firm 1's individual profit-maximizing output, if all other firms produce the joint-profit maximizing output, is given by firm 1's unconstrained reaction curve. Firm 1's resulting price, output, and profit are

$$(17) \quad p_{q, ch} - c = \frac{2 + (n-1)\theta}{1 + (n-1)\theta} \frac{bS}{4} \quad q_{q, ch} = \frac{2 + (n-1)\theta}{1 + (n-1)\theta} \frac{S}{4}$$

$$\pi_{q, ch} = b \left[ \frac{2 + (n-1)\theta}{1 + (n-1)\theta} \frac{S}{4} \right]^2 .$$

Substituting (9), (14), and (17) in (16), noncooperative collusion can be supported by reversion to the Nash-Cournot equilibrium if

$$(18) \quad \frac{1}{r} \geq \frac{1}{4} \frac{[2 + (n-1)\theta]^2}{1 + (n-1)\theta} .$$

The derivative of the fraction on the right with respect to  $\theta$  is

$$(19) \quad \frac{\partial}{\partial \theta} [2 + (n-1)\theta] \left[ \frac{n-1}{1 + (n-1)\theta} \right]^2 > 0 .$$

As product differentiation increases,  $\theta$  falls, and the right-hand side of (18) becomes smaller. It follows that for a given interest rate and number of firms, noncooperative collusion is more like to be stable - inequality (18) is more likely to be met - the greater the degree of product differentiation.

### Price-Setting Firms

If all other firms set the joint-profit maximizing price, firm 1 will maximize its individual profit by lowering price along its reaction curve. This may mean setting a price along the unconstrained reaction curve, or it may mean setting a price along the  $q_{-1} = 0$  line. A defecting firm 1 will fall back on the  $q_{-1} = 0$  line if the joint-profit maximizing price is greater than the vertical-axis coordinate of the first kink in its reaction curve. Otherwise, it will defect to the unconstrained reaction curve.

Defection to the unconstrained reaction curve

If firm 1 sets price along its unconstrained reaction curve, while all other firms set the joint-profit maximizing price, its single-period price, output, and profit are

$$(20) \quad p_{p, \text{ch}, \text{rf}} - c = \frac{2 + (n-3)\theta}{1 + (n-2)\theta} \frac{bS}{4} \quad q_{p, \text{ch}, \text{rf}} = \frac{2 + (n-3)\theta}{1 + (n-1)\theta} \frac{1}{1-\theta} \frac{S}{4}$$

$$\pi_{p, \text{ch}, \text{rf}} = \frac{b}{1-\theta} \frac{\left\{ [2 + (n-3)\theta] \frac{S}{4} \right\}^2}{[1 + (n-1)\theta][1 + (n-2)\theta]}$$

Substituting (13), (14), and (20) in (16), noncooperative collusion can be supported by reversion to the Nash-Bertrand equilibrium if

$$(21) \quad \frac{1}{r} \geq \frac{1}{4} \frac{1}{1-\theta} \frac{[2 + (n-3)\theta]^2}{1 + (n-2)\theta}$$

The derivative of the term on the right in (21) with respect to  $\theta$  is

$$(22) \quad [2 + (n-3)\theta] \frac{\theta}{4} \left\{ \frac{n-1}{(1-\theta)[1 + (n-2)\theta]} \right\}^2 > 0.$$

Once again, decreases in  $\theta$  make it more likely that the stability condition will be met.

Defection to the rival-shutdown curve

A defecting firm 1 will set price along the rival shutdown line if

$$(23) \quad \left( \theta - \frac{n-3}{3n-5} \right)^2 \geq \frac{n^2-1}{(3n-5)^2}$$

As  $n$  goes to infinity, (23) approaches, from above, the condition

$\theta \geq 2/3$ . Thus if a defecting firm falls back to the rival shutdown line,  $\theta$  is greater than  $2/3$ .

If all other firms set the joint-profit maximizing price, and firm 1 prices along the  $q_1 = 0$  line, its price, output, and single-period profit are

$$(24) \quad p_{p, ch, rsd} - c = \frac{2\theta - 1}{\theta} \frac{bS}{2} \quad q_{p, ch, rsd} = \frac{S}{2\theta}$$

$$\pi_{p, ch, rsd} = (2\theta - 1)b \left( \frac{S}{2\theta} \right)^2,$$

where the fact that  $\theta > \frac{2}{3}$  ensures that price is greater than marginal cost and economic profit is positive.

In this case, noncooperative collusion will be supported if

$$(25) \quad \frac{1}{T} \geq \frac{[(2n-3)\theta^2 - (n-3)\theta - 1][2 + (n-3)\theta]^2}{(n-1)^2\theta^4}$$

The derivative of the right-hand side of (25) with respect to  $\theta$  is

$$(26) \quad \frac{[2 + (n-3)\theta]\{[n^2 - 14n + 21]\theta^2 + 8(n-3)\theta + 8\}}{(n-1)^2\theta^5}$$

(26) is generally of ambiguous sign, although positive for  $n \geq 5$ . For  $n < 5$ , (26) is positive for  $\theta$  near  $\frac{2}{3}$ , but becomes negative as  $\theta$  approaches 1.

In price-setting oligopoly, increases in product differentiation increase the likelihood that noncooperative collusion will be stable, provided rivals would remain in operation after defection. Even if defection would induce rivals to shut down, increases in product differentiation make stability more likely if there are five or more firms (and perhaps with fewer firms, if  $\theta$  is not too much greater than  $\frac{2}{3}$ ).

#### Interpretation

The traditional industrial organization analysis of product differentiation and collusion is that product differentiation makes collusion more difficult, all else equal. In the presence of product differentiation, cartel members will have to agree on price differences, not just a single collusive price level. Anecdotal and episodic real-world evidence is consistent with this analysis (Martin [1989]).

Combined with the results presented above, the traditional analysis suggests that product differentiation affects the reaching and the sustaining of collusive configurations in fundamentally different ways. Product differentiation reduces the incremental profit to be had by departing from a joint-profit maximizing configuration, because product differentiation insulates rivals' markets and reduces the extent to which a single firm can lure rivals' customers into its own market. Although product differentiation makes it harder to achieve a collusive configuration, once such a configuration is reached, product differentiation makes it more likely to be sustained.

### III. Market Share as an Index of Market Power in the Presence of Product Differentiation

#### A. Policy Background

In policy decisions, market share is commonly employed as an index of market or monopoly power. This is clearly the case with U.S. antitrust policy, from the earliest decisions to the present.

In the **U.S. Steel** case, a majority of the Supreme Court pointed to a decline in market share as a factor in the conclusion that U.S. Steel was not guilty of monopolization with the meaning of Section 2 of the Sherman Antitrust Act.<sup>10</sup> The role of market share in Section 2 cases is emphasized by Judge Hand's oft-quoted **Alcoa** guideline that<sup>11</sup>

That percentage [ninety] is enough to constitute a monopoly; it is doubtful whether sixty or sixty-four percent would be enough; and certainly thirty-three percent is not.

Market share likewise plays an important role the treatment of mergers under the Celler-Kefauver Act. **Brown Shoe's**<sup>12</sup> is on the post-merger market shares in various local geographic markets. The designation of market share as the critical element in the diagnosis of market power under Section 7 of the Clayton Act is made explicit in **Philadelphia National Bank**:<sup>13</sup>

10. **U.S. v. United States Steel Corporation**, 251 U.S. 417 (1920), p. 439, footnote 1 (quoting Judge Woolley's District Court opinion).

11. **U.S. v. Aluminum Company of America**, 148 F. 2d 416 (2d Cir. 1945), p. 424.

12. **Brown Shoe Co., Inc. v. U.S.**, 370 U.S. 294 (1962); see pp. 342-344.

13. **U.S. v. Philadelphia National Bank** 374 U.S. 321 (1963), pp. 362-363.

We noted in **Brown Shoe**...that "[t]he dominant theme pervading congressional consideration of the 1950 amendments [to § 7] was a fear of what was considered to be a rising tide of economic concentration in the American economy." This intense congressional concern with the trend toward concentration warrants dispensing, in certain cases, with elaborate proof of market structure, market behavior, or probable anticompetitive effects. Specifically, we think that a merger which produces a firm controlling an undue percentage share of the relevant market, and results in a significant increase in the concentration of firms in the market, is so inherently likely to lessen competition substantially that it must be enjoined in the absence of evidence clearly showing that the market is not likely to have such an anticompetitive effects.

Market share holds a similarly central role in the analysis of market power under other U.S. antitrust statutes. Thus, from a recent decision involving an allegation of tying in violation of Section 1 of the Sherman Act:<sup>14</sup>

Seventy per cent of the patients residing in Jefferson Parish enter hospitals other than East Jefferson. ... Thus East Jefferson's "dominance" over persons residing in Jefferson Parish is far from overwhelming. The fact that substantial majority of the parish's residents elect not to enter East Jefferson means that the geographic data does not establish the kind of dominant market position that obviates the need for further inquiry into actual competitive conditions.

Market share has thus assumed the primary - one might even say dominant - position in the analysis of market power under the U.S. antitrust laws.

#### B. Related Topics

The central role of market share in the analysis of market power under the antitrust laws has lent great importance to the process of market definition. A variety of ad hoc standards have

14. *Jefferson Parish Hospital District No. 2 v. Hyde*, 104 S.Ct. 1551 (1984), p. 1566. A footnote, omitted here, cites decisions in which market shares similar to those involved in **Jefferson Parish** were taken to indicate the likely absence of anticompetitive conduct.

been used for market definition,<sup>15</sup> and economic approaches, incorporated in recent Department of Justice Merger Guidelines, have also been suggested (Boyer [1979]). So long as market share is the primary index of market power in antitrust cases, market definition is critical to the process and the result. But the argument made below - that market share is biased downward as an index of market power in the presence of product differentiation - holds even if product and geographic markets are satisfactorily defined. I therefore leave aside the question of market definition.

Economists have also debated the sufficiency of market share as an index of market power.<sup>16</sup> Economists agree that factors other than market share ought in principle to be incorporated in the analysis of market power, but disagree on the competence of courts to evaluate entry conditions and the force of potential competition. This is an important debate, and one to which in the end the analysis presented here may have some relevance. For this analysis, I examine the use of market share as an index of market power, holding all other factors constant.

15. See Elzinga, Kenneth G. and Hogarty, Thomas F. [1973, 1978].

16. See Landes, William M. and Posner, Richard A. "Market Power in Antitrust Cases," [1981], and four comments in the June 1982 issue of the *Harvard Law Review*, particularly Schmalensee's [1982, pp. 1799-1800] discussion of product differentiation. See also Areeda, Phillip and Turner, Donald F. [1980].

C. Market Share and Market Power  
Standardized Products<sup>17</sup>

With demand curve (1), the quantity supplied to the market can be written<sup>18</sup>

$$(27) \quad Q = q_1 + Q_{-1}$$

with  $q_1$  the quantity supplied by firm 1 and  $Q_{-1}$  the total quantity supplied by all other firms. Because the slope of the inverse demand curve is  $-b$ , the price elasticity of demand at any point along the demand curve is

$$(28) \quad \epsilon_{Qp} = \frac{p}{bQ}$$

The demand curve is

$$(29) \quad Q = q_1 + Q_{-1} = \frac{a - p}{b}$$

and it is this total quantity,  $q_1 + Q_{-1}$ , which is used to compute the market shares of individual firms at any price  $p$ .

Firm 1's conjectural marginal revenue is

$$(30) \quad MR_1 = p - b(q_1 + \alpha Q_{-1})$$

where

$$(31) \quad \alpha = \frac{q_1}{Q_{-1}} \frac{\partial Q_{-1}}{\partial q_1}$$

is firm 1's expected elasticity of other firms' output with respect to firm 1's output. To maximize profit, firm 1 will select an output which equates its marginal cost to its conjectural marginal revenue, so that

17. See Clarke and Davies [1982].

18. Neither linearity of the demand curve nor the assumption of constant marginal cost is essential to the results which follow.

$$(32) \quad p - b(q_1 + \alpha Q_{-1}) = c_1 \quad .$$

Substituting (28), this becomes the familiar<sup>19</sup>

$$(33) \quad \frac{p - c_1}{p} = \frac{\alpha + (1 - \alpha)s_1}{\epsilon_{qp}}$$

Market share  $s_1$  is

$$(34) \quad s_1 = \frac{q_1}{q_1 + Q_{-1}}$$

In this model, the firm-specific degree of market power is a function of market share, conjectural variations, and the price elasticity of demand.

#### Differentiated Products

Now let inverse demand be given by equation (3), so that it refers to the variety produced by firm 1 alone, for which the varieties produced by other firms are only imperfect substitutes.

For  $\theta$  between zero and 1, other varieties are equivalent to something less than one unit of variety 1. Although firm 1 produces but one of a number of differentiated and competing varieties, the demand curve (3) is formally equivalent to that faced by a firm producing a standardized product in a market with effective demand

$$(35) \quad Q(\theta) = q_1 + \theta Q_{-1} = \frac{a - p_1}{b}$$

The price elasticity of effective demand at any point on this demand curve is

19. For functionally equivalent expressions which give the firm-specific degree of market power in terms of market share and cross-price elasticities of demand, see Landes and Posner [1981, equation (3)], and Ordover, Sykes and Willig [1982].

$$(36) \quad \epsilon_{Q(\theta)p} = \frac{p}{bQ(\theta)}$$

With this inverse demand curve, firm 1's marginal revenue is

$$(37) \quad MR_1 = p - b[q_1 + \alpha Q(\theta)_{-1}]$$

and by equating firm 1's marginal cost to its conjectural marginal revenue, firm 1's degree of market power is seen to be

$$(38) \quad \frac{p_1 - c_1}{p_1} = \frac{\alpha + (1 - \alpha)s_1(\theta)}{\epsilon_{Q(\theta)p}}$$

where firm 1's market share is defined in terms of the effective output with which variety 1 competes:

$$(39) \quad s_1(\theta) = \frac{q_1}{q_1 + \theta Q_{-1}}$$

Equation (39) has implications similar to those of equation (33). Market share is an index of the degree of market power, albeit an incomplete index. But an additional implication of (38) is that market share should be measured relative to the portion of the market with which a differentiated product effectively competes, not the entire market.<sup>20</sup>

If market share is measured with respect to the entire market rather than the portion of the market with which a variety competes, effective market share - the market share which is relevant for the assessment of market power - will be understated. The extent of the understatement will depend on the magnitude of  $\theta$  - on the extent of product differentiation.

20. It is tempting to pursue the development of models of oligopoly and product differentiation in which market share is defined in terms of revenue rather than quantity or equivalent quantity terms. For an attempt, see Clarke, Davies, and Waterson [1984]. Their equation (7) is an expression for the firm-specific degree of market power. It has the implication that the degree of market power falls as market share rises.

Table 1:  $s(\theta)$  For Various Values of  $s$  and  $\theta$ 

$s$	.1	.2	.3	.4	.5	.6	.7	.8	.9
.9	.11	.22	.32	.43	.53	.63	.72	.82	.91
.8	.12	.24	.35	.45	.56	.65	.74	.83	.92
.7	.14	.26	.38	.49	.59	.68	.77	.85	.93
.6	.16	.29	.42	.53	.63	.71	.80	.87	.94
.5	.18	.33	.46	.57	.67	.75	.82	.89	.95
.4	.21	.38	.52	.63	.71	.79	.85	.91	.96
.3	.27	.45	.59	.69	.77	.83	.89	.93	.97
.2	.35	.56	.68	.77	.83	.88	.92	.95	.98
.1	.53	.71	.81	.86	.91	.94	.96	.98	.99

Note: table shows value of  $s(\theta)$  for various combinations of  $s$  (columns) and  $\theta$  (rows).

Table 1 illustrates the relationship between market share and effective market share for varying degrees of product differentiation. The nine columns of Table 1 have market share increase, by ten-percentage point increments, from 10 to 90 per cent. The nine rows of Table 1 have  $\theta$  decrease, by decrements of one-tenth, from .9 (nearly complete standardization) to .1 (nearly complete differentiation).

Effective market share rises, all else equal, as product differentiation increases - as  $\theta$  falls. It is apparent that even firms with low market shares can have quite high effective market shares - and therefore, high degrees of market power - if product differentiation is sufficiently great. A firm with a market share of as little as 10 per cent will have an effective

market share of over 50 per cent if  $\theta = .1$ . Firms with moderate market shares (10 to 30 per cent) will have effective market shares which are quite high if product differentiation is great ( $\theta$  in the .4 to .1 range). Firms with intermediate market shares (40 to 60 per cent) will have quite high effective market shares in the presence of even moderate product differentiation ( $\theta$  in the .7 to .4 range).

#### D. Implications for the Use of Market Share as an Index of Market Power

Courts have recognized that market power is a complex phenomenon, reflecting many aspects of market structure and firm conduct. But courts have focused on market share as an index of market power as a way of clarifying policy and simplifying antitrust proceedings. The policy implication of the analysis presented above is that market share will systematically understate the likelihood of market power, all else equal, in the presence of product differentiation.

It is sometimes suggested that geographic markets should be defined very broadly [Landes and Posner, 1981, p. 963]:

...if a distant seller has some sales in a local market, all its sales, wherever made, should be considered a part of that local market for purposes of computing the market share of a local seller.

But location of supplier is a recognized basis for differentiation (Chamberlin [1933, p. 56, quoted above]). Unless products are absolutely standardized and transportation costs are minimal, such an inclusive approach to market definition will substantially understate effective market share, because it will include in the total market units of output which do not really compete for local sales.

If market share is to serve as a reliable index of market power, courts should examine "practical indicia" of the extent of product differentiation - the nature and extent of advertising and non-advertising sales efforts and product-differentiating research and development. Where practical indicia suggest the importance of product differentiation, courts might follow one of two alternative approaches. Markets might be defined broadly, in which case courts should conclude that market power is likely for market shares substantially lower than would be the case if products were standardized. Alternatively, markets could be defined quite narrowly, with a finding of market power only if market share is high in a narrowly defined market. In any event, the mechanical calculation of market shares without evaluation of the extent of product differentiation will result in a false certainty which will often fail to find market power when market power is likely.

#### IV. Product Differentiation and Long-Run Market Performance

##### A. Product Differentiation and Market Size

Equation (4) gives demand for variety  $i$ , given product differentiation, when all prices are positive. In symmetric equilibrium,  $p_i = \bar{p}$ , and the price-deviation term on the right in (4) disappears. As product differentiation increases,  $\theta$  goes to zero, the fraction outside the braces on the right in (4) goes to one, and the demand curve for variety  $i$  (written for convenience in inverse form) approaches

$$(40) \quad p_i = a - bq_i.$$

But this is identical in form to the inverse demand curve of the standardized product model - equation (1). As product

differentiation increases in the linear demand model of product differentiation, each variety inherits a market fully as large as the entire standardized-product market.

For some classes of differentiated products, it may well be the case that market size increases as product differentiation increases. This will be the case when the introduction of differentiated varieties attracts mainly new consumers into the market. Examples might be rock music and classical music, or Harlequin romances and paperback science fiction novels. For other classes of differentiated products, however, total market size is likely to be more or less fixed, regardless of the extent of product differentiation. The market for breakfast cereals, for example, may increase somewhat as the number of brands of breakfast cereal increases, but surely not in a one-to-one ratio.

It is interesting, therefore, to examine the impact of product differentiation on market performance for the case in which market size is fixed as the number of varieties increases. From (4), if demand for variety in the flexible market case is scaled down by  $\frac{1 + (n-1)\theta}{n}$ , so that demand for variety  $i$  is

$$(41) \quad q_i^* = \frac{1}{n} \frac{1}{b} \left\{ a - \left[ p_i + \frac{n\theta}{1-\theta} (p_i - \bar{p}) \right] \right\},$$

we will have  $nq^* = S$  if  $p_i = c$  for all  $i$ .

Thus for demand curves of the form (41), market size is constant in the sense that total quantity demanded, at a price equal to marginal cost, is constant as the degree of product differentiation changes. As will appear presently, when market size is constant in this way, optimal net social welfare in the

fixed-market case is identical to that of the standardized-product linear demand model. For demand curves of the form (41), market size is constant in the sense that optimal market performance does not change as the degree of product differentiation changes.

Demand in the fixed-market size model is a proportionally scaled-down version of demand in the flexible-market size model. In the absence of fixed costs, price reaction curves are identical in the two models, and quantity-reaction curves differ by the proportionality factor. Reaction curves will differ in the presence of fixed costs, since shutdown regions will differ in the two models. For a fixed number of firms, equilibrium prices are the same in both models, while equilibrium outputs and profits differ by the proportionality factor. Structure-performance relationships which depend on ratios of output or on profit are therefore unaffected by the market-size product differentiation relationship, when it takes the proportional form modeled here. This includes the previous discussions of stability of noncooperative collusion and the use of market share as an index of market power. The product differentiation-market size relationship, however, has implications for market performance in the long run.

# B. Short-run/Long-run Equilibrium with Standardized Products<sup>21</sup>

Let the firm cost function be

$$(42) \quad C(q) = F + cq \quad .$$

The short-run (given  $n$ ) quantity-setting configuration with standardized products is

$$(43) \quad q_{qs}^{sr} = \frac{S}{n+1} \quad p_{qs}^{sr} = c + \frac{bS}{n+1}$$

The short-run profit or loss of a single firm is

$$(44) \quad \pi_{qs}^{sr} = (p_{qs}^{sr} - c)q_{qs}^{sr} - F = b\left(\frac{S}{n+1}\right)^2 - F \quad .$$

In the absence of entry barriers and entry-detering behavior, entry should force firm profit to zero in the long run. The long-run quantity-setting standardized product equilibrium is

$$(45) \quad q_{qs}^{lr} = \sqrt{\frac{F}{b}} \quad p_{qs}^{lr} = c + \sqrt{bF} \quad n_{qs}^{lr} = \frac{S}{q_{qs}^{lr}} - 1 \quad .$$

As the cost function (42) exhibits economies of scale for all  $q$ , the optimal configuration is to have a single plant produce  $S$  units of output.<sup>22</sup> Optimal and long-run quantity-setting market equilibrium net social welfare are

21. These results are well known, and are presented for comparison with the product-differentiation model. For more complete discussions, see Shubik [1980, pp. 50-67]; Friedman [1983, Chapter 2]; Martin [1988a, pp. 104-117; and Tirole [1988, pp. 218-221.

22. If  $F$  is so great that  $n_{qs}^{lr}$  in (45) is less than 1, it is not profitable to produce the product. If  $F$  is so large that  $NSW_s^{op}$  in (46) is negative, it is not optimal to produce the product. Similar qualifications apply to the product differentiation models discussed below.

$$(46) \quad NSW_s^{op} = \frac{1}{2}bS^2 - F \quad \text{and} \quad NSW_{qs}^{lr} = \frac{1}{2}b \left( S - \sqrt{\frac{F}{b}} \right)^2$$

respectively.

### C. Product Differentiation/Quantity-Setting Firms Flexible Market Size

The long-run quantity-setting equilibrium values are

$$(47) \quad q_{qd}^{lr} = \sqrt{\frac{F}{b}} \quad p_{qd}^{lr} = c + \sqrt{bF} \quad n_{qd}^{lr} = 1 + \frac{1}{\theta} \left( \frac{S}{q_{qd}^{lr}} - 2 \right)$$

Comparing (45) and (47), long-run equilibrium price and quantity are the same in this model and the quantity-setting model with standardized products. The relation between the long-run equilibrium number of varieties with and without product differentiation is

$$(48) \quad n_{qd}^{lr} - 1 = \frac{1}{\theta} \left( n_{qs}^{lr} - 1 \right)$$

The equilibrium number of varieties with product differentiation

is inversely related to  $\theta$ , and rises as product differentiation increases.

In symmetric equilibrium, net social welfare in the  $n$ -variety linear product differentiation model is<sup>23</sup>

$$(49) \quad NSW_{qd}^{sr} = n \left\{ bq \left[ S - \frac{1 + (n-1)\theta}{2} q \right] - F \right\}$$

Maximizing (49) with respect to  $n$  and  $q$ , one obtains the optimal values for the product-differentiation model:

23. (49) is obtained by summing incremental net welfare due to each variety, then imposing symmetry. See specifically Spence [1976a,b] and Carruth [1978], and more generally Wildman [1984].

$$(50) \quad q_{op,d} = \sqrt{\frac{2}{1-\theta} \frac{F}{b}} \quad n_{op,d} = 1 + \frac{1}{\theta} \left( \frac{S}{q_{op}} - 1 \right)$$

Comparing (47) and (50), it is evident that long-run quantity-setting market output per variety is always less than optimal output per variety. The long-run quantity-setting market number of varieties may be greater or less than the optimal number of varieties (Spence [1976a]; Mankiw and Whinston [1986]).

#### Fixed Market Size

With demand curves (41), the short-run market equilibrium values are

$$(51) \quad q_{qd}^{*,sr} = \frac{1 + (n-1)\theta}{2 + (n-1)\theta} \frac{S}{n} \quad p_{qd}^{*,sr} = c + \frac{bS}{2 + (n-1)\theta}$$

The long-run number of firms, which makes profit-per variety zero, is a solution of the cubic equation

$$(52) \quad n^3 + \frac{2(2-\theta)}{\theta} n^2 + \frac{(2-\theta)^2 - \theta \sigma_q^2}{\theta^2} n - \frac{(1-\theta)\sigma_q^2}{\theta^2} = 0$$

where  $\sigma_q^2 = \frac{bS^2}{F}$ . Although not in general susceptible to analytic

solution, (52) can be solved numerically. (51) can then be used to evaluate the long-run equilibrium output and price.

When market size is invariant to the degree of product differentiation, net social welfare is

$$(53) \quad NSW^*(n,q) = bnq \left( S - \frac{1}{2} nq \right) - nF.$$

It follows immediately from (53) that<sup>24</sup>

24. Substitute  $Q = nq$  in (53) to reparameterize  $NSW^*$  as a function of  $Q$  and  $n$ . The result is maximized when  $Q = S$ , and is a negative function of  $n$ .  $n$  should thus be made as small as possible, which is 1.

$$(54) \quad q_{op}^* = S \quad n_{op}^* = 1$$

In the fixed market size product differentiation model it is optimal to product a single variety product the amount of that variety which would clear the market at a price equal to marginal cost (provided fixed cost is sufficiently small so that it is optimal to produce at all).

By taking a demand curve which is a weighted-average of the fixed- and flexible-market size demand curves, one obtains a model in which market size, and the optimal number of varieties, expands as the degree of product differentiation increases, but less rapidly than in the flexible-market size model. The analysis which follows focuses on the polar cases.

#### Relative Market Performance<sup>25</sup>

Given the functional forms of the demand and cost functions market performance depends on fixed cost and the degree of product differentiation. Increases in fixed cost tend to reduce the equilibrium number of varieties, while increases in the degree of product differentiation tend to increase the equilibrium number of varieties.

Here I examine the relative market performance - net social welfare in long-run equilibrium as a fraction of optimal net social welfare - for different levels of fixed cost and product differentiation. (47), (49) and (50) generate results for the flexible market size model and (51), (52) and (54) for the fixed market size model.

25. The BASIC computer programs which produce the numerical results reported here are available on request.

Table 2: Variable/Fixed Market Size Relative Market Performance, Quantity-setting oligopoly

F =	1	2.5	5.0	7.5	10
$\theta$					
0.99	0.82/0.81	0.73/0.72	0.65/0.64	0.60/0.59	0.56/0.56
0.75	0.90/0.78	0.84/0.70	0.76/0.60	0.70/0.55	0.64/0.52
0.50	0.94/0.74	0.89/0.63	0.84/0.54	0.78/0.50	0.73/0.47
0.25	0.96/0.66	0.93/0.53	0.88/0.45	0.83/0.42	0.77/0.41
0.01	0.97/0.30	0.95/0.29	0.90/0.29	0.84/0.31	0.76/0.33

Notes: intercept is 10, slope is - 1, marginal cost is 1; fixed cost and degree of product differentiation vary as indicated.

Relative market performance equals long-run equilibrium net social welfare as a fraction of optimal net social welfare. First number gives relative market performance in variable market size model, second number gives relative market performance in fixed market size model.

It is evident that the impact of product differentiation on market performance depends critically on whether or not market size increases as the degree of product differentiation increases. When market size rises with product differentiation, the market works well when  $\theta$  and  $F$  are small (toward the lower left-hand corner of Table 2). When  $F$  and  $\theta$  are low, there are many varieties, and each variety brings with it additional consumer surplus. Holding fixed cost constant, relative market performance in the variable market size model rises as  $\theta$  falls.

In contrast, when market size is invariant to the extent of product differentiation, the market works best when  $F$  is small and  $\theta$  large (toward the upper left-hand corner of Table 2). When market size is fixed, relative market performance rises, for any level of  $F$ , as products become more standardized (as  $\theta$  rises). When market size is fixed, each additional variety means an additional social charge - fixed cost - against a constant potential consumers' surplus. Less product differentiation means fewer varieties and better market performance, holding  $F$  constant.

---

Table 3: Variable/Fixed Market Size Market Number of Firms, Quantity-setting Oligopoly

$F =$	1	2.5	5.0	7.5	10
$\theta$					
0.99	8.1/8.0	4.7/4.7	3.0/3.0	2.3/2.3	1.9/1.8
0.75	10.3/8.9	5.9/5.1	3.7/3.2	2.7/2.4	2.1/1.9
0.50	15/10.3	8.4/5.7	5.0/3.5	3.6/2.5	2.7/2.0
0.25	29/13.0	15.7/6.7	9.1/3.8	6.1/2.6	4.4/2.0
0.01	701/20.1	370/8.1	203/4.0	130/2.7	86/2.0

---

This diagnosis is confirmed by Table 3, which compares the equilibrium number of varieties in the flexible and fixed market size models. Where flexible market size relative market performance is high, the number of varieties is higher, all else equal. Where fixed market size relative market performance is high, the number of varieties is lower, all else equal.

## B. Price-Setting Firms

It is often the case that structure-performance relationships are different in quantity-setting and in price-setting models.<sup>26</sup> Thus it is of interest to examine the sensitivity of the product-differentiation/market performance relationship to the specification of firms' choice variable.

### Flexible Market Size

The short-run price-setting equilibrium values are

$$(55) \quad q_{pd}^{sr} = \left[ \frac{1 + (n-2)\theta}{2 + (n-3)\theta} \right] \frac{S}{1 + (n-1)\theta} \quad p_{pd}^{sr} = c + \frac{1 - \theta}{2 + (n-3)\theta} bS$$

The long-run equilibrium number of firms is a solution of the cubic equation

$$(56) \quad n^3 + \frac{5 - 7\theta}{\theta} n^2 + \frac{(2 - 3\theta)(4 - 5\theta) - \sigma_p^2}{\theta^2} n + \frac{(1 - \theta)(2 - 3\theta)^2 - (1 - 2\theta)\sigma_p^2}{\theta^3} = 0$$

where  $\sigma_p^2 = (1 - \theta) \frac{bS^2}{F}$ . Numerical

solutions of (56), substituted in (55), yield long-run equilibrium values for the flexible market size price-setting model.

### Fixed Market Size

The short-run price-setting equilibrium values are

$$(57) \quad q_{pd}^{*,sr} = \left[ \frac{1 + (n-2)\theta}{2 + (n-3)\theta} \right] \frac{S}{n} \quad p_{pd}^{*,sr} = c + \frac{1 - \theta}{2 + (n-3)\theta} bS$$

26. Cournot and Bertrand models of standardized-product oligopoly yield very predictions about the relationship between market concentration and market performance. The impact of mergers on market performance also depends critically on whether firms set quantities or prices (Davidson and Deneckere [1985]).

For given  $n$ , the short-run equilibrium price is the same in the flexible- and fixed-size markets. This follows from the fact that the demand curves in the fixed-size market are proportionally-scaled down versions of the demand curves in the flexible-size market.

The cubic equation which determines the long-run equilibrium number of firms is

$$(58) \quad n^3 + \frac{2(2 - 3\theta)}{\theta} n^2 + \frac{(2 - 3\theta)^2 - \sigma_p^2 \theta}{\theta^2} n - \frac{1 - 2\theta}{\theta^2} \sigma_p^2 = 0$$

By substituting numerical solutions of (58) into (57), one obtains long-run equilibrium values for the fixed market size price-setting model.

Table 4: Variable/Fixed Market Size Relative Market Performance, Price-setting oligopoly

F =	1	2.5	5.0	7.5	10
$\theta$					
0.99	0.99/0.98	0.99/0.98	0.98/0.98	0.97/0.97	0.96/0.96
0.75	0.98/0.89	0.96/0.84	0.93/0.79	0.89/0.75	0.84/0.71
0.50	0.98/0.81	0.96/0.72	0.92/0.64	0.88/0.59	0.83/0.56
0.25	0.98/0.69	0.95/0.58	0.91/0.49	0.86/0.45	0.81/0.43
0.01	0.97/0.30	0.95/0.29	0.90/0.29	0.84/0.31	0.76/0.34

Notes: intercept is 10, slope is - 1, marginal cost is 1; fixed cost and degree of product differentiation vary as indicated.

First number gives relative market performance in variable market size model, second number gives relative market performance in fixed market size model.

#### Relative Market Performance

Table 4 compares relative market performance in flexible- and fixed-market size price-setting oligopoly. For the fixed-size model, the product differentiation-market performance

relationship is similar to that shown in Table 2 for quantity-setting oligopoly. In the fixed-size price-setting model, relative market performance falls, holding fixed cost constant, as product differentiation increases.

For the flexible-size model, the product-differentiation market performance relationship in Table 4 is opposite that of Table 1. For given  $F$  and  $\theta$ , flexible market size relative market performance is higher in Table 4 than in Table 1, unless  $\theta$  is quite small. Further, holding  $F$  constant, relative market performance in the price-setting market falls as  $\theta$  falls, while in Table 1 relative market performance rises as  $\theta$  falls ( $F$  constant).

These relationships reflect the fact that price-setting oligopoly is more efficient than quantity-setting oligopoly (Vives [1985]). Comparing Tables 3 and 5, there are fewer varieties in long-run equilibrium, for given  $F$  and  $\theta$ , when firms set prices than when firms set quantities. In the fixed

Table 5: Variable/Fixed Market Size Market Number of Firms  
Price-setting oligopoly

$F =$	1	2.5	5.0	7.5	10
$\theta$					
0.99	1.5/1.5	1.2/1.2	1.1/1.1	1.07/1.07	1.05/1.05
0.75	5.8/5.2	3.6/3.3	2.5/2.3	2.0/1.9	1.7/1.6
0.50	11.2/8.0	6.5/4.7	4.1/3.0	3.0/2.3	2.4/1.8
0.25	25.6/11.9	14.1/6.3	8.3/3.7	5.7/2.6	4.1/2.0
0.01	699/20.1	369/8.1	203/4.0	129/2.7	85/2.0

market-size model, the market number of varieties produced is always more than the optimal number of varieties (which is one).

Producing fewer varieties reduces this inefficiency, improves market performance, and reinforces the product differentiation-relative market performance depicted in Table 2.

There are fewer varieties produced when firms set prices in the flexible-size market as well. When  $\theta$  is large, so many fewer varieties are produced in price-setting oligopoly that relative market performance exceeds any levels reported in Table 1. As  $\theta$  falls, the number of varieties increases, although always less in Table 5 than in Table 3. As  $\theta$  falls and the number of varieties produced in flexible market size equilibrium increases, relative market performance in the price-setting market approaches relative market performance in the quantity-setting market.

## V. Final Remarks

Product differentiation has fundamental and subtle implications for oligopolistic market performance. Because product differentiation means goods are imperfect substitutes, market share is biased downward as an index of market power. Because product differentiation reduces the gain to departing from a noncooperatively collusive equilibrium, increases in product differentiation increase the likelihood that such equilibria will be sustainable, all else equal.

In the long-run, increases in product differentiation worsen relative market performance in markets where firms set price. Increases in product differentiation improve market performance if firms set quantities and market size expands with the degree of product differentiation. If firms set quantities and market size is invariant to the degree of product differentiation, then increases in product differentiation worsen relative market performance.

## References

- Areeda, Phillip and Turner, Donald F. Antitrust Law, Volume IV. Boston: Little, Brown and Company, 1980.
- Boyer, Kenneth D. "Industry Boundaries," in Calvani, Terry and Siegfried, John Economic Analysis and Antitrust. Boston: Little Brown and Company, 1979.
- Clarke, Roger and Davies, Stephen W. "Market Structure and Price-Cost Margins," Economica Volume 49, Number 195, August 1982, pp. 277-287.
- Clarke, Roger, Davies, Stephen, and Waterson, Michael "The Profitability-Concentration Relation: Market Power or Efficiency?" Journal of Industrial Economics Volume 32, Number 4, June 1984, pp. 435-450.
- Carruth, A. "Product Diversity and Welfare: Some Further Results," Warwick Economic Research Paper Number 138, Department of Economics, University of Warwick, November 1978.
- Deneckere, R. "Duopoly Supergames with Product Differentiation," Economics Letters Volume 11, 1983, pp. 37-42.
- Denercke, R. and Davidson, C. "Incentives to Form Coalitions with Bertrand Competition," Rand Journal of Economics Volume 16, Number 4, Winter 1985, pp. 473-486.
- Elzinga, Kenneth G. and Hogarty, Thomas F. "The Problem of Geographic Market Delineation in Antimerger Suits," Antitrust Bulletin Volume 18, Number 1, Spring 1973, pp. 45-81.
- "The Problem of Geographic Market Delineation Revisited: The Case of Coal," Antitrust Bulletin Volume 23, Number 1, Spring 1978, pp. 1-18.
- Friedman, James W. "A non-cooperative equilibrium for supergames," Review of Economic Studies Volume 38, 1971, pp. 1-12.
- Game Theory with Applications to Economics. New York: Oxford University Press, 1986.
- Ireland, Norman J. Product Differentiation and Non-Price Competition. Oxford: Basil Blackwell, 1987.
- Landes, William M. and Posner, Richard A. "Market Power in Antitrust Cases," Harvard Law Review Volume 91, Number 5, March 1981.
- Majerus, David W. "Price vs. Quantity Competition in Oligopoly Supergames," Economics Letters Volume 27, 1988, pp. 293-297.

- Mankiw, N. Gregory and Whinston, Michael D. "Free entry and social inefficiency," Rand Journal of Economics Volume 17, Number 1, Spring 1986, pp. 48-58.
- Martin, Stephen "Product Differentiation, Welfare, and Market Size," Econometrics and Economic Theory Paper No. 8502, Department of Economics, Michigan State University, August 1985.
- Industrial Economics. New York: Macmillan Publishing Company, 1988a.
- "The Measurement of Profitability and the Diagnosis of Market Power," International Journal of Industrial Organization Volume 6, Number 3, September 1988b, pp. 301-321.
- "Market Share as an Index of Market Power in the Presence of Product Differentiation," Econometrics and Economic Theory Paper No. 8713, Department of Economics, Michigan State University, February 1988c.
- "The Petroleum Industry," in Walter Adams, editor, The Structure of American Industry. New York: Macmillan Publishing Company, forthcoming, 1989.
- Ordover, Janusz A., Sykes, Alan O., and Willig, Robert D. "Herfindahl Concentration, Rivalry, and Mergers," Harvard Law Review Volume 95, Number 8, June 1982, pp. 1857-1874.
- Schmalensee, Richard. "Another Look at Market Power," Harvard Law Review Volume 95, Number 8, June 1982, pp. 1789-1816.
- Segerstrom, Paul S. "Demons and Repentance," Journal of Economic Theory Volume 45, Number 1, June 1988, pp. 32-52.
- Shubik, Martin Market Structure and Behavior. Cambridge, Massachusetts: Harvard University Press, 1980.
- Spence, A. Michael "Product Differentiation and Welfare," American Economic Review Volume 66, Number 2, May 1976a, pp. 407-414.
- "Product Selection, Fixed Costs, and Monopolistic Competition," Review of Economic Studies Volume 43, Number 2, June 1976b, pp. 217-235.
- Tirole, Jean The Theory of Industrial Organization. Cambridge, Massachusetts: The MIT Press, 1988.
- Vives, Xavier "On the Efficiency of Bertrand and Cournot Equilibrium with Product Differentiation," Journal of Economic Theory Volume 36, 1985, pp. 166-175.
- Waterson, Michael "Economies of scope within market frameworks," International Journal of Industrial Organization Volume 1, Number 2, June 1983, pp. 223-237.

Wildman, Steven S. "A Note on Measuring Surplus Attributable to Differentiated Products," Journal of Industrial Economics Volume 33, Number 1, September 1984, pp. 123-132.

WORKING PAPERS ECONOMICS DEPARTMENT

- |  |   |
|--|---|
| 86/206: Volker DEVILLE                 | Bibliography on The European Monetary System and the European Currency Unit.  |
| 86/212: Emil CLAASSEN<br>Melvyn KRAUSS | Budget Deficits and the Exchange Rate   |
| 86/214: Alberto CHILOSI                | The Right to Employment Principle and Self-Managed Market Socialism: A Historical Account and an Analytical Appraisal of some Old Ideas |
| 86/218: Emil CLAASSEN                  | The Optimum Monetary Constitution: Monetary Integration and Monetary Stability  |
| 86/222: Edmund S. PHELPS               | Economic Equilibrium and Other Economic Concepts: A "New Palgrave" Quartet  |
| 86/223: Giuliano FERRARI BRAVO         | Economic Diplomacy. The Keynes-Cuno Affair  |
| 86/224: Jean-Michel GRANDMONT          | Stabilizing Competitive Business Cycles   |
| 86/225: Donald A.R. GEORGE             | Wage-earners' Investment Funds: theory, simulation and policy   |
| 86/227: Domenico Mario NUTI            | Michal Kalecki's Contributions to the Theory and Practice of Socialist Planning   |
| 86/228: Domenico Mario NUTI            | Codetermination, Profit-Sharing and Full Employment   |
| 86/229: Marcello DE CECCO              | Currency, Coinage and the Gold Standard   |
| 86/230: Rosemarie FEITHEN              | Determinants of Labour Migration in an Enlarged European Community  |
| 86/232: Saul ESTRIN<br>Derek C. JONES  | Are There Life Cycles in Labor-Managed Firms? Evidence for France   |
| 86/236: Will BARTLETT<br>Milica UVALIC | Labour Managed Firms, Employee Participation and Profit Sharing - Theoretical Perspectives and European Experience.                     |
| 86/240: Domenico Mario NUTI            | Information, Expectations and Economic Planning   |
| 86/241: Donald D. HESTER               | Time, Jurisdiction and Sovereign Risk   |

- |   |  |
|---|--|
| 86/242: Marcello DE CECCO                   | Financial Innovations and Monetary Theory  |
| 86/243: Pierre DEHEZ<br>Jacques DREZE       | Competitive Equilibria with Increasing Returns   |
| 86/244: Jacques PECK<br>Karl SHELL          | Market Uncertainty: Correlated Equilibrium and Sunspot Equilibrium in Market Games               |
| 86/245: Domenico Mario NUTI                 | Profit-Sharing and Employment: Claims and Overclaims   |
| 86/246: Karol Attila SOOS                   | Informal Pressures, Mobilization, and Campaigns in the Management of Centrally Planned Economies |
| 86/247: Tamas BAUER                         | Reforming or Perfecting the Economic Mechanism in Eastern Europe                                 |
| 86/257: Luigi MONTRUCCHIO                   | Lipschitz Continuous Policy Functions for Strongly Concave Optimization Problems                 |
| 87/264: Pietro REICHLIN                     | Endogenous Fluctuations in a Two-Sector Overlapping Generations Economy                          |
| 87/265: Bernard CORNET                      | The Second Welfare Theorem in Nonconvex Economies  |
| 87/267: Edmund PHELPS                       | Recent Studies of Speculative Markets in the Controversy over Rational Expectations              |
| 87/268: Pierre DEHEZ<br>Jacques DREZE       | Distributive Production Sets and Equilibria with Increasing Returns                              |
| 87/269: Marcello CLARICH                    | The German Banking System: Legal Foundations and Recent Trends                                   |
| 87/270: Egbert DIERKER<br>Wilhelm NEUEFEIND | Quantity Guided Price Setting  |
| 87/276: Paul MARER                          | Can Joint Ventures in Hungary Serve as a "Bridge" to the CMEA Market?                            |
| 87/277: Felix FITZROY                       | Efficiency Wage Contracts, Unemployment, and Worksharing   |
| 87/279: Darrell DUFFIE<br>Wayne SHAFER      | Equilibrium and the Role of the Firm in Incomplete Markets                                       |
| 87/280: Martin SHUBIK                       | A Game Theoretic Approach to the Theory of Money and Financial Institutions                      |

- |   |   |
|---|---|
| 87/283: Leslie T. OXLEY<br>Donald A.R. GEORGE | Perfect Foresight, Non-Linearity and<br>Hyperinflation  |
| 87/284: Saul ESTRIN<br>Derek C. JONES         | The Determinants of Workers' Participation<br>and Productivity in Producer Cooperatives               |
| 87/285: Domenico Mario NUTI                   | Financial Innovation under Market Socialism   |
| 87/286: Felix FITZROY                         | Unemployment and the Share Economy:<br>A Sceptical Note   |
| 87/287: Paul HARE                             | Supply Multipliers in a Centrally Planned<br>Economy with a Private Sector                            |
| 87/288: Roberto TAMBORINI                     | The Stock Approach to the Exchange Rate:<br>An Exposition and a Critical Appraisal                    |
| 87/289: Corrado BENASSI                       | Asymmetric Information and Financial<br>Markets: from Financial Intermediation<br>to Credit Rationing |
| 87/296: Gianna GIANNELLI                      | On Labour Market Theories   |
| 87/297: Domenica TROPEANO                     | The Riddle of Foreign Exchanges: A<br>Swedish-German Debate (1917-1919)                               |
| 87/305: G. VAN DER LAAN<br>A.J.J. TALMAN      | Computing Economic Equilibria by Variable<br>Dimension Algorithms: State of the Art                   |
| 87/306: Paolo GARELLA                         | Adverse Selection and Intermediation  |
| 87/307: Jean-Michel GRANDMONT                 | Local Bifurcations and Stationary<br>Sunspots   |
| 87/308: Birgit GRODAL<br>Werner HILDENBRAND   | Income Distributions and the Axiom<br>of Revealed Preference  |
| 87/309: Eric PEREE<br>Alfred STEINHERR        | Exchange Rate Uncertainty and Foreign<br>Trade  |
| 87/312: Pietro REICHLIN                       | Output-Inflation Cycles in an Economy with<br>Staggered Wage Setting                                  |
| 87/319: Peter RAPPOPORT<br>Lucrezia REICHLIN  | Segmented Trends and Nonstationary<br>Time Series   |
| 87/320: Douglas GALE                          | A Strategic Model of Labor Markets<br>with Incomplete Information                                     |
| 87/321: Gianna GIANNELLI                      | A Monopoly Union Model of the Italian<br>Labour Market: 1970-1984                                     |

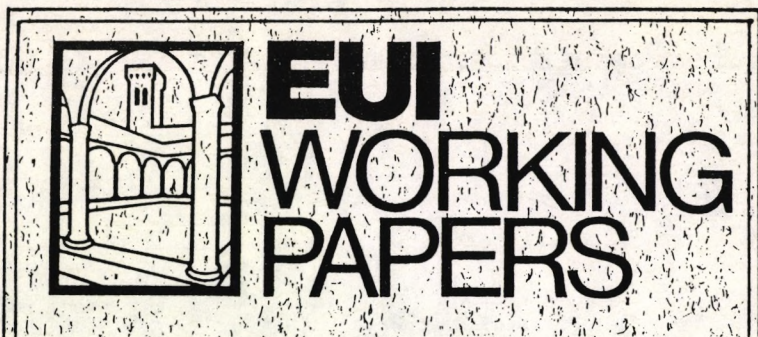
- |  |  |
|--|--|
| 87/322: Keith PILBEAM                      | Sterilization and the Profitability of UK Intervention 1973-86   |
| 87/323: Alan KIRMAN                        | The Intrinsic Limits of Modern Economic Theory   |
| 87/324: Andreu MAS-COLELL                  | An Equivalence Theorem for a Bargaining Set  |
| 88/329: Dalia MARIN                        | Assessing Structural Change: the Case of Austria   |
| 88/330: Milica UVALIC                      | "Shareholding" in Yugoslav Theory and Practice   |
| 88/331: David CANNING                      | Convergence to Equilibrium in a Sequence of Games with Learning  |
| 88/332: Dalia MARIN                        | Trade and Scale Economies. A causality test for the US, Japan, Germany and the UK.                             |
| 88/333: Keith PILBEAM                      | Fixed versus Floating Exchange Rates Revisited.  |
| 88/335: Felix FITZROY<br>Kornelius KRAFT   | Piece Rates with Endogenous Monitoring: Some theory and evidence   |
| 88/337: Domenico Mario NUTI                | On Traditional Cooperatives and James Meade's Labour-Capital Discriminating Partnerships                       |
| 88/338: Pietro REICHLIN<br>Paolo SICONOLFI | Government Debt and Equity Capital in an Economy with Credit Rationing   |
| 88/339: Alfred STEINHERR                   | The EMS with the ECU at Centerstage: a proposal for reform of the European rate system                         |
| 88/340: Frederick VAN DER PLOEG            | Monetary and Fiscal Policy in Inter-dependent Economies with Capital Accumulation, Death and Population Growth |
| 88/341: David CANNING                      | Optimal Monetary Policy in an Economy without a Forward Market for Labour                                      |
| 88/344: Joerg MAYER                        | Intervention Mechanisms and Symmetry in the EMS  |
| 88/345: Keith PILBEAM                      | Exchange Rate Management and the Risk Premium  |

- |   |  |
|---|--|
| 88/348: Milica UVALIC   | The Investment Behaviour of the Labour-Managed Firm: an econometric analysis   |
| 88/351: Alan P. KIRMAN  | On Ants and Markets  |
| 88/352: Gianna GIANNELLI                                      | Labour Demand, Pricing and Investment Decisions in Italy: An econometric Analysis                                    |
| 88/353: Niall O'HIGGINS                                       | The Progressivity of Government Taxes and Benefits in Ireland: a comparison of two measures of redistributive impact |
| 88/356: Mary McCARTHY<br>Lucrezia REICHLIN                    | Do Women Cause Unemployment? Evidence from Eight O.E.C.D. Countries  |
| 88/357: Richard M. GOODWIN                                    | Chaotic Economic Dynamics  |
| 88/358: Fernando PACHECO<br>Eric PEREE<br>Francisco S. TORRES | Duopoly under Demand Uncertainty   |
| 88/360: Domenico Mario NUTI                                   | Economic Relations between the European Community and CMEA   |
| 88/361: Domenico Mario NUTI                                   | Remonetisation and Capital Markets in the Reform of Centrally Planned Economies                                      |
| 88/362: Domenico Mario NUTI                                   | The New Soviet Cooperatives: Advances and Limitations  |
| 88/368: Stephen MARTIN  | Joint Ventures and Market Performance in Oligopoly   |
| 89/370: B. BENSARD<br>Robert GARY-BOBO<br>S. SIDERBUSCH       | The Strategic Aspects of Profit-Sharing in the Industry  |
| 89/374: Francisco S. TORRES                                   | Small Countries and Exogenous Policy Shocks  |
| 89/375: Renzo DAVIDDI   | Rouble Convertibility: a Realistic Target?   |
| 89/377: Elettra AGLIARDI                                      | On the Robustness of Contestability Theory   |
| 89/378: Stephen MARTIN  | The Welfare Consequences of Transaction Costs in Financial Markets   |
| 89/381: Susan SENIOR NELLO                                    | Recent Developments in Relations between the EC and Eastern Europe   |

- |  |   |
|--|---|
| 89/382: Jean GABSZEWICZ<br>Paolo GARELLA<br>Charles NOLLET | Spatial Price Competition with Uninformed<br>Buyers                             |
| 89/383: Benedetto GUI                                      | Beneficiary and Dominant Roles in Organiza-<br>tions: the Case of Nonprofits    |
| 89/384: Agustín MARAVALL<br>Daniel PEÑA                    | Missing Observations, Additive Outliers<br>and Inverse Autocorrelation Function |
| 89/385: Stephen MARTIN                                     | Product Differentiation and Market Per-<br>formance in Oligopoly                |
| 89/386: Stephen MARTIN                                     | The Welfare Consequences of Transaction<br>Costs in Financial Markets           |
| 89/387: Stephen MARTIN                                     | Modeling Oligopolistic Interaction  |

Spare copies of these Working Papers can be obtained from the Economics  
Department secretariat.





EUI Working Papers are published and distributed by the European University Institute, Florence.

Copies can be obtained free of charge - depending on the availability of stocks - from:

The Publications Officer  
European University Institute  
Badia Fiesolana  
I - 50016 San Domenico di Fiesole (FI)  
Italy

**Please use order form overleaf**

**PUBLICATIONS OF THE EUROPEAN UNIVERSITY INSTITUTE**

To            The Publications Officer  
              European University Institute  
              Badia Fiesolana  
              I - 50016 San Domenico di Fiesole (FI)  
              Italy

From        Name .....  
              Address .....  
              .....  
              .....  
              .....

Please send me the following EUI Working Paper(s):

No.            .....  
Author, title: .....  
              .....  
              .....  
              .....  
              .....

Date .....

Signature .....  
.....



© The Author(s). European University Institute.

Digitised version produced by the EUI Library in 2020. Available Open Access on Cadmus, European University Institute Research Repository.

- |   |  |
|---|--|
| 88/329: Dalia MARIN                         | Assessing Structural Change: The Case of Austria *   |
| 88/330: Milica UVALIC                       | "Shareholding" in Yugoslav Theory and Practice   |
| 88/331: David CANNING                       | Convergence to Equilibrium in a Sequence of Games with Learning  |
| 88/332: Dalia MARIN                         | Trade and Scale Economies. A causality test for the U.S., Japan, Germany and the UK  |
| 88/333: Keith PILBEAM                       | Fixed versus Floating Exchange Rates Revisited   |
| 88/334: Hans Ulrich Jessurun d'OLIVEIRA     | Die EWG und die Versalzung des Rheins  |
| 88/335: Felix Fitzroy and Kornelius Kraft   | Piece Rates with Endogenous Monitoring Some Theory and Evidence  |
| 88/336: Norbert LORENZ                      | Die Übertragung von Hoheitsrechten auf die Europäischen Gemeinschaften - verfassungsrechtliche Chancen und Grenzen einer europäischen Integration erläutert am Beispiel der Bundesrepublik Deutschland, Frankreichs und Italiens - |
| 88/337: Domenico Mario NUTI                 | On Traditional Cooperatives and James Meade's Labour-Capital Discriminating Partnerships   |
| 88/338: Pietro REICHLIN and Paolo SICONOLFI | Government Debt and Equity Capital in an Economy with Credit Rationing   |
| 88/339: Alfred STEINHERR                    | The EMS with the ECU at Centerstage: A proposal for reform of the European Exchange rate system  |
| 88/340: Frederick VAN DER PLOEG             | Monetary and Fiscal Policy in Interdependent Economies with Capital Accumulation, Death and Population Growth  |
| 88/341: David CANNING                       | Optimal Monetary Policy in an Economy without a Forward Market for Labour  |
| 88/342: Gunther TEUBNER                     | "And God Laughed..." Indeterminacy, Self-Reference and Paradox in Law  |
| 88/343: Jean BLONDEL                        | Ministerial Careers in Western European Governments  |

\* :Working Paper out of print

- |  |  |
|--|--|
| 88/344: Joerg MAYER  | Intervention Mechanisms and Symmetry in the EMS  |
| 88/345: Keith PILBEAM  | Exchange Rate Management and the Risk Premium  |
| 88/346: Efigio ESPA  | The Structure and Methodology of International Debt Statistics   |
| 88/347: Francesc MORATA and<br>and Jaume VERNET                                      | Las Asambleas Regionales en Italia y España: Organización Institucional y Reglas de Funcionamiento                   |
| 88/348: Milica UVALIC  | The Investment Behaviour of the Labour-Managed Firm: An Econometric Analysis   |
| 88/349: Massimo PANEBIANCO   | Inter-Regional Co-Operation in the North-South Dialogue<br>Latin America and the European Community                  |
| 88/350: Gregorio ROBLES  | La Cour de Justice des CE et les Principes Généraux du droit   |
| 88/351: Alan KIRMAN  | On Ants and Markets  |
| 88/352: Gianna GIANNELLI   | Labour Demand, Pricing and Investment Decisions in Italy: An Econometric Analysis                                    |
| 88/353: Niall O'HIGGINS  | The Progressivity of Government Taxes and Benefits in Ireland: A Comparison of Two Measures of Redistributive Impact |
| 88/354: Christian JOERGES  | Amerikanische und deutsche Traditionen der soziologischen Jurisprudenz und der Rechtskritik                          |
| 88/355: Summary of Conference,<br>debates and abstracts<br>of selected interventions | The Future Financing of the EC Budget: EPU Conference 16-17 October 1987   |
| 88/356: Mary MCCARTHY and<br>Lucrezia REICHLIN                                       | Do Women Cause Unemployment? Evidence From Eight O.E.C.D. Countries  |
| 88/357: Richard M. GOODWIN   | Chaotic Economic Dynamics  |
| 88/358: Fernando PACHECO<br>Eric PEERE and<br>Francisco S. TORRES                    | Duopoly Under Demand Uncertainty   |
| 88/359: Jaakko NOUSIAINEN  | Substance and Style of Cabinet Decision-Making   |

- |  |   |
|--|---|
| 88/360: Domenico Mario NUTI  | Economic Relations between the European Community and CMEA  |
| 88/361: Domenico Mario NUTI  | Remonetisation and Capital Markets in the Reform of Centrally Planned Economies                                   |
| 88/362: Domenico Mario NUTI  | The New Soviet Cooperatives: Advances and Limitations   |
| 88/363: Reiner GRUNDMANN   | Marx and the Domination of Nature<br>Alienation, Technology and Communism   |
| 88/364: Tony PROSSER   | The Privatisation of Public Enterprises in France and Great Britain<br>The State, Constitutions and Public Policy |
| 88/365: Silke BRAMMER  | Die Kompetenzen der EG im Bereich Binnenmarkt nach der Einheitlichen Europäischen Akte                            |
| 88/366: Goesta ESPING-ANDERSEN   | The Three Political Economies of the Welfare State  |
| 88/367: Goesta ESPING-ANDERSEN<br>Paul FARSUND and<br>Jon Eivind KOLBERG | Decommodification and Work Absence in the Welfare State   |
| 88/368: Stephen MARTIN   | Joint Ventures and Market Performance in Oligopoly  |
| 88/369: Giuseppe RAO   | The Italian Broadcasting System: Legal and Political Aspects  |
| 89/370: B. BENSAYD/<br>S. FEDERBUSCH/<br>R.J. GARY BOBO                  | The Strategic Aspects of Profit Sharing in the Industry   |
| 89/371: Klaus-Dieter STADLER   | Die Europäische Zusammenarbeit in der Generalversammlung der Vereinten Nationen zu Beginn der Achtziger Jahre     |
| 89/372: Jean Philippe Robé   | Countervailing Duties, State Protectionism and the Challenge of the Uruguay Round                                 |
| 89/373: Giovanni FEDERICO/<br>Antonio TENA                               | On the Accuracy of Historical International Foreign Trade Statistics<br>Morgenstern Revisited                     |
| 89/374: Francisco TORRES   | Small Countries and Exogenous Policy Shocks   |

- |  |   |
|--|---|
| 89/375: Renzo DAVIDDI                                      | Rouble Convertibility:<br>A Realistic Target?   |
| 89/376: Jean STAROBINSKI                                   | Benjamin Constant:<br>La fonction de l'eloquence  |
| 89/377: Elettra AGLIARDI                                   | On the Robustness of Contestability<br>Theory   |
| 89/378: Stephen MARTIN                                     | The Welfare Consequences of<br>Transaction Costs in Financial Markets   |
| 89/379: Augusto De Benedetti                               | L'equilibrio difficile. Linee di<br>politica industriale e sviluppo<br>dell'impresa elettrica nell'Italia<br>meridionale: la Società Meridionale<br>di Elettricità nel periodo di<br>transizione, 1925-1937 |
| 89/380: Christine KOZICZINSKI                              | Mehr "Macht" der Kommission?<br>Die legislativen Kompetenzen der<br>Kommission bei Untätigkeit des Rates.   |
| 89/381: Susan Senior NELLO                                 | Recent Developments in Relations<br>Between the EC and Eastern Europe   |
| 89/382: J. GABSZEWICZ,<br>P. GARELLA and<br>Charles NOLLET | Spatial Price Competition With<br>Uninformed Buyers   |
| 89/383: Benedetto GUI                                      | Beneficiary and Dominant Roles in<br>Organizations: The Case of Nonprofits  |
| 89/384: Agustin MARAVALL and<br>Daniel PEÑA                | Missing Observations, Additive<br>Outliers and Inverse Autocorrelation<br>Function  |
| 89/385: Stephen MARTIN                                     | Product Differentiation and Market<br>Performance in Oligopoly  |
| 89/386: Dalia MARIN  | Is the Export-Led Growth Hypothesis<br>Valid for Industrialized Countries?  |
| 89/387: Stephen MARTIN                                     | Modeling Oligopolistic Interaction  |
| 89/388: Jean Claude CHOURAQUI                              | The Conduct of Monetary Policy: What<br>has we Learned From Recent Experience?  |
| 89/389: Léonce BEKEMANS                                    | Economics in Culture vs. Culture in<br>Economics  |
| 89/390: Corrado BENASSI                                    | Imperfect Information and Financial<br>Markets: A General Equilibrium<br>Analysis   |