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**Bounded rationality and learning in market competition**

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## Samenvatting (Summary in Dutch)

In dit proefschrift worden de consequenties van begrensde rationaliteit en het gebruik van leer-methoden op verschillende soorten markten onderzocht. Empirisch onderzoek laat zien dat de aanname van volledige rationaliteit geobserveerd gedrag niet altijd goed kan beschrijven en dat modellen met begrensde rationaliteit sommige uitkomsten juist beter kunnen verklaren. Dit onderstreept het belang van dit onderwerp. We vullen de recente literatuur, die zich vooral richt op consumenten met begrensde rationaliteit, aan door modellen te beschouwen waar juist bedrijven niet volledig rationeel zijn.

Begrensde rationaliteit kan op verschillende manieren in marktcompetitie ingebouwd worden. In dit proefschrift focussen we op twee aspecten van rationaliteit. Onder volledige rationaliteit wordt er verondersteld dat bedrijven de marktomgeving volledig kennen (of dat hun inschatting van die marktomgeving niet systematisch fout is) en dat hun verwachtingen over de acties van hun concurrenten consistent zijn met de daadwerkelijk gekozen acties. Eerst laten we de aanname dat bedrijven de marktvrage volledig kennen los en beschouwen we verschillende leer-methoden die de bedrijven kunnen gebruiken. Daarna laten we de eis dat, gegeven een bekende marktvrage, verwachtingen consistent met werkelijke acties moeten zijn, vallen. We gebruiken analytische en numerieke methoden om te onderzoeken hoe de marktuitskomst verandert in vergelijking tot de standaard evenwichtsvoorspelling en wat de bijbehorende welvaartsgevolgen zijn. Bovendien bestuderen we daadwerkelijk menselijk gedrag in dit soort marktomgevingen met behulp van een laboratoriumexperiment.

In Hoofdstuk 2 focussen we op de interactie tussen verschillende leer-methoden. We be-

schouwen een situatie waarbij bedrijven de marktvraag niet kennen en ze twee verschillende methoden kunnen gebruiken om de optimale prijs te bepalen. We laten zien dat de methoden tot verschillende uitkomsten leiden, dat de verschillende methoden op de markt naast elkaar kunnen bestaan en dat deze coëxistentie invloed kan hebben op de dynamische eigenschappen van de methoden. Dit hoofdstuk toont daarmee aan dat het belangrijk is om met leren en heterogeniteit rekening te houden in economische modellen.

In Hoofdstuk 3 onderzoeken we de eigenschappen van de zogenaamde kleinste-kwadratenleermethode verder. We beschouwen een model waar bedrijven alle relevante variabelen die invloed op de vraag voor hun product hebben kunnen observeren en ze in de regressie een lokaal goed gespecificeerde functievorm gebruiken. We tonen aan dat sommige bedrijven een suboptimale situatie kunnen bereiken omdat ze niet de hele vraagfunctie goed kunnen leren maar slechts één deel daarvan. Dit hoofdstuk demonstreert dus dat kleinste-kwadratenleren tot een suboptimale uitkomst kan leiden, ook als de schatting correct lijkt omdat de geschatte functie volledig overeenkomt met de waarnemingen.

In Hoofdstuk 4 analyseren we de gevolgen van het laten vallen van de eis dat verwachtingen volkomen consistent met de werkelijke acties van concurrenten moeten zijn. We laten zien dat er een evenwicht in zuivere strategieën kan bestaan in een marktmodel dat geen evenwicht in pure strategieën heeft onder de standaard-aannames. We passen de standaard versie van simultane prijs-hoeveelheidscompetitie op de volgende manier aan: we veronderstellen dat de bedrijven risicomijdend zijn en dat ze onzeker zijn over de prijs en hoeveelheidskeuze van hun concurrent. We laten met behulp van numerieke methoden zien dat het aangepaste model een evenwicht in zuivere strategieën kan hebben. Dit hoofdstuk illustreert dat de uitkomst van een model met begrensde rationaliteit wezenlijk kan veranderen in vergelijking tot het rationele model en dat een kleine afwijking van het rationele model bovendien tot een hogere welvaart kan leiden.

In Hoofdstuk 5 beschrijven we een laboratoriumexperiment dat is uitgevoerd om te onderzoeken hoe de informatie over de hoeveelheidskeuze van de concurrenten de marktuitskomst beïnvloedt. Deelnemers spelen de rol van bedrijven in het experiment en ze krijgen informatie

hetzij over de totale geproduceerde hoeveelheid in de markt of over de individuele productieniveaus. Uit onze resultaten blijkt dat de totale productie typisch lager is als deelnemers bedrijfsspecifieke informatie krijgen. Dit is in overeenstemming met het inzicht van mededingingsautoriteiten dat bedrijfsspecifieke informatie een concurrentiebeperkend effect kan hebben. We vinden ook dat het vrijwillig delen van informatie als een signaal werkt: deelnemers kunnen aan elkaar laten zien dat ze bereid zijn om samen te werken door informatie met de anderen te delen. Dit hoofdstuk laat zien dat zowel het vrijwillige karakter van het delen van informatie, als het niveau van data-aggregatie belangrijke gevolgen voor de marktuitskomst kan hebben.

Samenvattend benadrukt dit proefschrift dat er in economische modellen rekening met begrensde rationaliteit en leren gehouden moet worden. Modellen met begrensde rationaliteit en leren kunnen tot wezenlijk andere uitkomsten leiden dan het standaard rationele model en deze alternatieve uitkomsten liggen mogelijk dicht bij werkelijk marktgedrag.



The Tinbergen Institute is the Institute for Economic Research, which was founded in 1987 by the Faculties of Economics and Econometrics of the Erasmus University Rotterdam, University of Amsterdam and VU University Amsterdam. The Institute is named after the late Professor Jan Tinbergen, Dutch Nobel Prize laureate in economics in 1969. The Tinbergen Institute is located in Amsterdam and Rotterdam. The following books recently appeared in the Tinbergen Institute Research Series:

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