

nake nieuws

jaargang 6, nr. 4

november 1994

Netwerk Algemene en Kwantitatieve Economie

Netherlands Network of Economics

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nake-secretariaat

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(bereikbaar op ma., wo. en vr.)

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Vooraf

Dit **nake** nieuws staat in het teken van de December workshop over *Growth, Migration and Regional Development*. Deze workshop wordt gehouden in de week van 12 t/m 16 december aan de Universiteit van Amsterdam. De docenten behoren tot de absolute top op hun gebied. **Paul Romer** (UC Berkeley) en **Elhanan Helpman** (Tel Aviv University) gelden als de grondleggers van de nieuwe groeitheorie en de nieuwe handelstheorie; zij zullen ieder een cursus verzorgen over hun specialisme. **Oded Stark** (Harvard University) is een autoriteit op het gebied van migratie. Zijn in 1991 verschenen boek "The Migration of Labor" is alomtorekend; dit boek zal ook als leidraad voor zijn colleges zal dienen. **Ariel Pakes** (Princeton) zal de econometrische aspecten voor zijn rekening nemen; zijn cursus over "empirische analyse van eenvoudige I.O. modellen" staat iets losser van het thema, maar is niettemin van groot belang voor onderzoek op dit gebied.

Naast de cursussen zal er ook weer gelegenheid zijn voor "private consultations". Op woensdagmiddag zullen de docenten aanwezig zijn om met AIO's/OIO's van gedachten te wisselen en te adviseren over hun onderzoek(splannen). AIO's/OIO's die hiervoor belangstelling hebben worden verzocht dit van tevoren kenbaar te maken, en bij aanvang van de workshop een korte beschrijving van hun onderzoek of onderzoeksplannen in te leveren (niet meer dan één pagina).

De programmering van de cursussen is in beginsel zo dat alle cursussen gevolgd kunnen worden. Van de AIO's/OIO's wordt verwacht dat zij tenminste drie cursussen volledig volgen. Het is wel raadzaam om als voorbereiding de papers die vooraf worden toegestuurd, door te nemen. Tevens wordt van de deelnemers verwacht dat zij een *verslag* schrijven van één van de cursussen. Als voorbeeld voor een dergelijk verslag kunnen de verslagen dienen van de voorjaars-workshop die in dit en het vorige "nake nieuws" zijn opgenomen.

Aanmelding voor de workshop kan door het formulier in dit **nake**-nieuws volledig in te vullen en zo spoedig mogelijk (uiterlijk vóór 21 november a.s.) in te sturen.

Voorts in dit **nake**-nieuws twee uitstekende (en uitvoerige) verslagen door Jaap Abbring en André Hoogstrate van de cursussen van Dewatripont en Hall van de workshop van mei 1994 in Tilburg.

Tijdens de AIO-presentatiedag in Tilburg hebben 14 AIO/OIO's hun "eindpresentatie"

voor het **nake diploma** verzorgd. Als het goed is, wordt daarom tijdens de workshop het diploma uitgereikt aan: Rob Aalbers (KUB), Paul de Bijl (KUB), Jan Bouckaert (KUB), Frank Bunte (RL), Dennis Dannenburg (UvA), Eline van der Heyden (KUB), Jan Lemmen (KUB), Elma van de Mortel (EUR), Alfons Oude Lansink (LUW), Chris van Raalte (KUB), Martijn van der Ven (KUB), Richard Venniker (VU), Harry Webers (KUB), en Wilko Bolt (VU).

Om de berichten over onderwijsactiviteiten, seminars, workshops e.d. sneller (en goedkoper) te kunnen verspreiden, willen wij binnenkort een E-mail bestand van alle AIO's en OIO's maken. In overleg met de andere netwerken en de AIO/onderzoekscholen is afgesproken dat het **nake** de E-mail verzorgd voor de algemeen en kwantitatieve economen; het Netwerk Bedrijfseconomie en het LNMB (Landelijk Netwerk Mathematische Besliskunde) doen hetzelfde voor de bedrijfseconomen. Het E-mail-net is vooral bedoeld voor mededelingen op korte termijn; de normale berichtgeving blijft gewoon in het **nake**-nieuws.

Tot ziens bij de workshop in Amsterdam,

Casper van Ewijk

Extra Courses Utrecht Programme 1994/1995

There will be two additional courses in Utrecht in 1995:

Philip-Hans Franses (EUR), Jan de Gooijer (UvA),
Recent Developments in Non-Linear Time Series Analysis
Block III (27 January - 3 March 1995)

Harald Uhlig (CentER, KUB)
Business Cycle Theories
Block IV (14 March - 28 April 1995)

nake workshop

Growth, Migration and Regional Development

12 - 16 December 1994

University of Amsterdam

During the week from Monday 12 to Friday 16 December the Netherlands Network of Economics will organise a PhD-workshop on *Growth, Migration, and Regional Development*. Four distinguished professors will teach an intensive course on different aspects of this theme. Each course consists of five lectures, and will be given at the Department of Economics, University of Amsterdam.

Courses

Professor Paul Romer, *UC Berkeley en NBER*
"Lessons from the Study of Economic Growth"

Professor Elhanan Helpman, *Tel-Aviv University*
"International Trade: Selected Topics"

Professor Oded Stark, *Harvard University*
"The Migration of Labor"

Professor Ariel Pakes, *Yale University*
"The Empirical Analysis of Simple I.O. Models"

Register by filling in the form on the middle page and returning it to the nake secretariat *before 21 November 1994*.

Lecturers

Paul Romer (*UC Berkeley en NBER*) is generally regarded as the founder of modern growth theory. His 1986 and 1990 articles in the *Journal of Political Economy* formed the starting point for the "endogenous" growth theory, in which technological change, innovations and knowledge-spillovers are the key variables to growth. After a general introduction of recent developments in theory, professor Romer will give particular attention to the question what causes the differences in growth between different regions and countries.

Elhanan Helpman (*Tel-Aviv University*) is renowned for his work on international trade and growth. He has written many articles on the ("new") theory of trade as well as on growth theory. His book *Innovation and Growth* (MIT Press 1991) with Gene Grossman is a standard work in this area. With Paul Krugman he has also written several well-known textbooks on international economics. Professor Helpman's recent work includes empirical studies on the importance of R&D spillovers for growth in different countries, and articles on the political aspects of international trade and economic growth. His lectures will focus on international trade and growth, but he will also discuss some of the political aspects of trade.

Oded Stark is affiliated with *Harvard University, Tel Aviv University* and the *World Bank*. He has written on development economics, economic demography, labour economics, urban economics and the theory of the firm. He has recently published the book "*The Migration of Labor*" of which Jagdish Bhagwati wrote: "Migration, internal and international, has now moved from the periphery to the center of discourse by topranking economists. This is in no small measure due to the contributions of Oded Stark. This book is to be studied and savoured". This book will form the basis of Professor Stark's course.

Ariel Pakes (*Yale University*) will deal with the econometric aspects of the theme of this workshop. Professor Pakes has written several innovative articles on econometrics and empirical industrial organisation. He will give a course on empirical models for the analysis of markets.

Programme December Workshop

Monday December 12	Tuesday December 13
<p>09.30 - 10.30 <i>registration/coffee</i> 10.30 - 11.45 Helpman 12.00 - 13.15 Pakes</p> <p><i>13.15 - 14.15 Lunch</i></p> <p>14.15 - 15.30 Romer 15.45 - 17.00 Stark</p> <p><i>17.00 - 18.00 Welcome reception</i></p>	<p>09.00 - 10.45 Pakes 11.15 - 13.00 Stark</p> <p><i>13.00 - 14.15 Lunch</i></p> <p>14.15 - 16.00 Helpman 16.15 - 18.00 Romer</p>
Wednesday December 14	Thursday December 15
<p>09.00 - 10.30 Stark 10.45 - 12.15 Romer</p> <p><i>12.15 - 13.30 Lunch</i></p> <p>13.30 - 15.00 Pakes 15.15 - 16.45 Helpman</p> <p>16.45 - 18.15 Private consultations</p>	<p>09.00 - 10.45 Romer 11.15 - 13.00 Helpman</p> <p><i>13.00 - 14.15 Lunch</i></p> <p>14.15 - 16.00 Stark 16.15 - 18.00 Pakes</p> <p><i>20.00 workshop dinner</i></p>
Friday December 16	
<p>09.00 - 10.30 Pakes 10.45 - 12.15 Stark</p> <p><i>12.15 - 13.30 Lunch</i></p> <p>13.30 - 15.00 Helpman 15.15 - 16.45 Romer</p> <p><i>16.45 - ... Closing drinks</i></p>	

A number of AIO's/OIO's will be presented with the **nake** diploma during the workshop-dinner on Thursday evening.

..... Private Consultations

During the workshop it is possible for PhD students to have a private talk with one (or more) of the lecturers. Students who wish to consult one of the lecturers on their research are invited to hand in a brief description (one page) of the research(-proposal) they would like to discuss. Each consultation will be approx. 30 minutes.

..... Judgement and Credits

The **nake**-workshops are obligatory for all first-year and second-year graduate students following the **nake**-programme. So, each student has to attend at least four workshops. For three workshops the student should write a summary of the lectures of one course based on notes taken during the workshop and the literature. These reports are judged by the organiser(s) of the workshop. The courses have been scheduled such that all participants can attend four courses. All (**nake**-) students are expected completely to follow at least 3 courses.

With regard to study intensity, participation in the workshop (including the judgement by the written report) is worth 2 "Study Points" (SP); 1 SP = 40 hours.

..... Registration

Participation in the workshop is free for AIO's/OIO's of the institutions participating in **nake**, including tea, coffee, lunches, reception, dinner on Thursday. The participants carry the costs of accommodation and breakfast. These costs, together with travel expenses, can however be declared at the faculties. There are hotel rooms available in the Amsterdam Prinsengracht Hotel***, Prinsengracht 1015, 1017 KN Amsterdam. It is possible to share a room. Prices about f 100,-- (single) and f 150,-- (double). The number of participants in the workshop is limited. **nake**-students have precedence, and the date of receipt of the registration form is also taken into consideration. Binding arrangements are made for lunches, dinner, accommodation etc. and we would

therefore request you to notify the **nake** secretariat of any alterations. You can register by filling in the form on the middle page as fully as possible and returning it to the **nake** secretariat before 21 November 1994. After registration you will receive a confirmation of registration together with readers for the courses, hotel information, a street plan of Amsterdam, etc.

.....*Addresses and Information*.....

Location: Faculty of Economics, University of Amsterdam, room A 404, (Building A),
Roetersstraat 11, 1018 WB Amsterdam

(Metro from Central Station or Amstel Station to Weesperplein, or tram
no. 9)

Information: **nake**-secretary, José Dijkzeul

Roetersstraat 11, 1018 WB Amsterdam. Tel. 020-5254199,
Fax 020-5255280, E-mail NAKE@butler.fee.uva.nl

Hotel: Amsterdam Prinsengracht Hotel***

Prinsengracht 1015, 1017 KN Amsterdam (tel 020-6237779, fax 020-
6238926)

..... *course outlines*

Lessons from the Study of Economic Growth

Paul Romer

I. What is at stake in the debate over growth theory? (1 lecture)

References: (By Paul Romer unless stated otherwise.)

1. "Beyond Classical and Keynesian Macroeconomic Policy," *Policy Options*, July-August 1994.
2. "The Origins of Endogenous Growth," *Journal of Economic Perspectives* 8, Winter 1994, 3-22.
3. "New Goods, Old Theory, and the Welfare Costs of Trade Restrictions," *Journal of Development Economics* 43, 1993, 5-38.

II. How should we think about the economics of ideas? (2 lect.)

4. "Endogenous Technological Change," *Journal of Political Economy* 98, October 1990, S71-S102.
5. Grossman, G., and E. Helpman, "Quality Ladders in the Theory of Growth," *Review of Economic Studies*, 58, 1991, 43-61.

III. Convergence (½ lecture)

6. Levine, R. and D. Renelt, "A Sensitivity Analysis of Cross-Country Growth Regressions," *American Economic Review*, 82, 1992, 942-963.
7. "Idea Gaps and Object Gaps in Economic Development," *Journal of Monetary Economics* 32, 1993, 543-73.

IV. Productivity Measurement (½ lecture)

8. Dale Jorgenson, "The Embodiment Hypothesis," *Journal of Political Economy* 76, 1966, 1-17.
9. J. Greenwood, Z. Hercowitz, P. Krusell, "Macroeconomic Implications of Investment Specific Technological Change," working paper, 1994.
10. Alwyn Young, "The Tyranny of Numbers: Confronting the Statistical Realities of the East Asian Growth Experience," NBER working paper # 4680.

V. Policy (1 lecture)

11. "Implementing a National Technology Strategy with Self Organizing Industry Investment Boards," *Brookings Papers on Economic Activity*:

Microeconomics (2), Martin Neil Baily, Peter C. Reiss, and Clifford Winston (eds.), 1993, 345-90.

12. "Two Strategies for Economic Development: Using Ideas and Producing Ideas," Proceedings of the World Bank Annual Research Conference 1992, supplement to the World Bank Economic Review, March 1993, 63-91.

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International Trade: Selected Topics

Elhanan Helpman

1. Heckscher-Ohlin

Dixit and Norman, Chapter 4.

Helpman and Krugman, 1985, Chapter 1.

Leamer, E.E., "The Leontief Paradox, Reconsidered", *Journal of Political Economy*, 1980.

Leamer, Chapters 4 and 6 (plus as much as you can).

2. Monopolistic Competition

Helpman and Krugman, 1985, Chapters 6, 7, 8 and 12.

Helpman, E., "Imperfect Competition and International Trade: Evidence from Fourteen Industrial Countries", *Journal of the Japanese and International Economics*, 1987.

Hummels, D. and J. Levinsohn, "Monopolistic Competition and International Trade: Reconsidering the Evidence", *NBER Working Paper*, No. 4389, 1993.

3. Trade and Growth

Grossman and Helpman, 1991, Chapters 3-12.

Coe, D. and E. Helpman, "International R&D Spillovers", *NBER Working Paper*, No. 4444, 1993.

Helpman, E., "Innovation, Imitation and Intellectual Property Rights", *Econometrica*, 1993.

4. Political Economy of Protection

Hillman, 1989, Chapter 2.

Grossman, G.M. and E. Helpman, "Protection for Sale", *American Economic*

Review, 1994.

Grossman, G.M. and E. Helpman, "Trade Wars and Trade Talks", *NBER Working Paper*, No. 4280, 1993.

Grossman, G.M. and E. Helpman, "The Politics of Free Trade Agreements", *NBER Working Paper*, No. 4597, 1993.

References

Dixit, A. and V. Norman, *Theory of International Trade*, 1980.

Learner, E.E., *Sources of International Comparative Advantage*, 1984.

Helpman, E. and P.R. Krugman, *Market Structure and Foreign Trade*, 1985.

Hillman, A.L., *The Political Economy of Protection*, 1989.

Grossman, G.M. and E. Helpman, *Innovation and Growth in the Global Economy*, 1991.

.....

Labor Migration and Economic Development

Oded Stark

1. Labor Migration: Beyond Wage Differentials

Neoclassical approach to labor migration. Risk, relative deprivation, and asymmetric information theories of labor migration. Evidence.

2. The Labor Market Performance of Migrants

Beyond human capital attributes: Modeling incentives; modeling market environment and trade technology.

3. Labor Migration and Human Capital Formation

4. The Microeconomics of Return Migration

5. Imperfect Information and Migrants' Remittances

Literature

Oded Stark, *The Migration of Labor*. Blackwell, Oxford 1991

The Empirical Analysis of Simple I.O. Models

Ariel Pakes

Purpose

Show how to translate the simplest I.O. models into frameworks for data analysis and then indicate how the output of that analysis can be of use in the analysis of policy and environmental change. The lectures are divided into those on static models and those on dynamic models.

Statics & Dynamics

The goal of the static analysis is to determine profits as a function of a firm's own state vector, the state vectors of the firm's competitors, and functional forms for the primitives of the model. If we accomplish this task we usually also determine consumer surplus as a function of the same variables. The goal of the dynamic analysis is to determine the evolution of the vector of tuples of state variables.

Statics

The profit function is derived from three more primitive constructs, and often one or more of these primitives is analyzed in isolation. The primitives are:

- i) A demand system. This provides functional forms for the demand for each product as a function of the characteristics of all products marketed and the prices of those products.
- ii) A cost or supply function. This provides costs as a function of the characteristics of the product, productivity, and factor prices.
- iii) An equilibrium assumption (usually Nash in either quantities or prices).

The relevant way to model these primitives depends on both the market we are considering and the problem we wish to analyze. There are two examples we will consider in detail. One is analyzing supply and demand in differentiated product markets (A). The second example will focus on estimating production and cost functions taking explicit account of the selection and simultaneity problems generated by the relationship between unobserved productivity variables on the one hand, and both exit and input demand decisions on the other (B).

A. Differentiated Products

The first example provides a way of obtaining estimates of demand and cost parameters for a class differentiated product markets. To obtain the estimates we need only use widely available product level, and aggregate consumer level, data, and the estimates are consistent with a structural model of equilibrium in an oligopolistic industry.

After developing the appropriate theory and estimation techniques we will illustrate with an application to the U.S. auto market. The example estimates the distribution of cost and utility functions for the auto industry. We will then illustrate how the estimate primitives can be combined with an equilibrium assumption to analyze one or more of the following issues:

- i) the effects of mergers;
- ii) the construction of "ideal" price indices;
- iii) the effect of a gas price increase (or a gas tax); and
- iv) the effects of the VER's (the voluntary export restraints on autos).

B. Estimating Production Functions and Analyzing Productivity

This example develops techniques of estimating production functions and analyzing productivity from panel data in industries which have undergone structural changes. A characteristic of the data for such industries is that they exhibit significant amounts of entry and exit, and large changes in the sizes of continuing establishments. Moreover, no matter the production function we assume, the data typically exhibits large differences in output (either deflated sales or value added) per unit input, or in productivity, among plants, and these differences are typically highly serially correlated over time.

Dynamics

The purpose here is to model the evolution of the vector of tuples of state variables. We will consider models in which firms invest in developing their state variables. The outcomes of the investment process are uncertain. Positive outcomes lead firms to states in which they earn more profits. If the outcomes are not positive, and the outcomes of the firm's competitors (both inside and outside the industry) are, the firm's profits deteriorate, and may lead to a situation in which it is optimal to abandon the whole undertaking (this endogenizes exit behavior, and provides one way of accounting for selection in the nature of the evolutionary process.

Entry, exit and investment decisions are made to maximize the expected discounted value of future net cash flow conditional on the current information set. That information set includes a distribution for the vector determining the industry structures in future years conditional on the current structure. The equilibrium notion insists that this distribution is in fact consistent with optimal investment behavior by all incumbents and potential entrants.

We begin by providing a description of the basis model. The central output of the model is a stochastic process for the industry structures that the model emits. That process is ergodic, but its more detailed characteristics depend on the precise value of the model's parameters. These parameters can be estimated. Indeed the subset of the parameters that determine the static profit function can be obtained directly from the static analysis described above.

Once all parameters are estimated we need an algorithm to compute their equilibrium implications. The second part of the dynamic talks will provide one such computational algorithm and show how it can be used. Finally, we conclude with a series of examples which show how one can use this algorithm to analyze different policy issues of interest.

References Will be available from the **nake** secretary.

Reports Spring workshop 1994

Alastair Hall

Generalized Methods of Moments

by André Hoogstrate (RL)

Alastair Hall presented a broad overview on the use of the Generalized Method of Moments (GMM) and the vast literature concerned with it. The **first two lectures** were an introduction to Instrumental Variables (IV) and GMM. The principal ideas of IV and GMM, the latter in the framework of IV, were presented under quadratic loss. Furthermore consistency results were indicated, as well for the static linear (instrumental variable) regression model as later for (stationary and ergodic) nonlinear dynamic models. The Overidentifying Restriction Test was presented in both the static and dynamic case for checking the assumptions on the moment conditions. These must hold for valid inference based on the GMM estimate.

Considerable attention was paid to the choice of the optimal weighting matrix W_n used in the quadratic loss function. This optimal matrix is defined as that matrix which minimizes asymptotically the variance of the estimator of the parameters. In the most common situation of more moment restrictions than parameters to be estimated, the estimator depends on this weighting matrix. It turns out that the optimal matrix is given by the (long run) covariance matrix of the disturbances of the moment conditions. This matrix depends on the parameters and so the estimator procedure has to be conducted in more steps. First a suboptimal matrix is used to get an initial estimator of the parameters, with which the weighting matrix is obtained which is then in turn used to get an estimate of the parameters. Iterating this procedure gives us, when it converges the final estimate of the parameters.

A problem which arises in practice, when estimating non-linear dynamic models, is that the estimated covariance matrix obtained from the above procedure is often not positive definite. To be able to perform inference we need however a consistent and positive definite estimate. Several methods are discussed to obtain estimates with the mentioned characteristics, but the overall conclusion must (alas) be that there still is no procedure which performs uniformly best. Further theoretical work is needed on to solve this problem to satisfaction.

REGISTRATION FORM

nake workshop 12 - 16 December 1994, Amsterdam

Name
Department
Institute
Address
Postal code/Place
Telnr. E-mail
AIO/OIO/
Otherwise

(Please circle what is applicable)

Would like to have a private consultation with: Romer, Helpman, Stark, Pakes

Will write a report on the lectures by: Romer, Helpman, Stark, Pakes

Will attend:

the courses on: Monday / Tuesday / Wednesday / Thursday / Friday

reception (Monday) yes / no

workshop dinner (Thursday) yes / no

vegetarian yes / no

Wants a hotelroom for: Mon/Tues Tues/Wednes Wednes/Thurs Thurs/Fri

Will share a room: yes / no *(Single room ± f 100, double ± f 150)*

with

Remarks:

Please return this form before 21 November 1994 to the *nake*-secretary.

In **lecture three** problems associated with the application of GMM were discussed. First GMM and MLE were compared. The accent in this comparison is put on the weak assumptions needed to ensure consistency of GMM (only : identification, stationarity, ergodicity) and the much stronger assumptions needed for MLE and associated estimators, where we have to - in contrast to GMM - specify the data generating process. The fact that we don't have to specify the dgp gives way to a very general use in econometrics of GMM.

The most prominent application of GMM is in the field of estimating Euler equations. These turn out to be computationally burdensome when one tries to estimate them by MLE and to be sensitive to possible misspecification of the likelihood. These problems do not arise when using GMM. The needed population moment conditions are, especially in the Euler equation estimating game, often provided "naturally" by economic theory so that GMM can be conducted rather easily. One problem in the application of GMM is that there is simulation evidence that finite samples statistics might be far away from their asymptotic behaviour which may cause problems with inference based on these statistics.

Lecture four was concerned with inference base on GMM. First a clear warning was put forward concerning the power of the earlier mentioned Overidentifying Restriction Test which is used to test the moment conditions. It turns out that there are alternatives under which the test has no power at all and further that the test cannot be interpreted as an "omnibus" specification test. Concerning the testing of parameter restrictions it turns out that the Wald, LR as well as the LM test are all consistent and moreover asymptotically equivalent.

As GMM assumes stability of the underlying parameters through time, it is sensible to test this assumption, especially in Euler equation models. The basic principle is to divide the sample into two parts at a so-called breakpoint and test for differences. Two kind of tests were presented : a Wald (LM, LR) based on augmented moment conditions and further predictive tests. However these tests considered the breakpoint known which is in practice of course not the case. For this more difficult case extensions of the before mentioned tests were presented. This test appeared to be not very general and only optimal within a rather ad hoc framework of assumptions. Also on this area more theoretical work has to be conducted.

As final subject of inference problems Hall addressed the problem of testing non-nested hypotheses based on GMM. When testing two competing models of which neither one is a special case of the other we cannot use the classical nested hypotheses tests. Two approaches were presented : nest both models in a general model and the Encompassing principle. It turns out that, especially in the Euler equation setting both are not working very well within the GMM framework. The first approach leads to implausible larger models and

conditions and the second approach needs the data generating process, which we just tried to avoid.

Although we have already mentioned some problems associated with GMM in **lecture five** a gathering of problems was presented. First the problem of obtaining the optimal instruments. A method using "quasi score equations" as instruments (Gallant and Tauchen) was presented. If the scores are based on the correct pdf then GMM boils down to MLE and is thus optimal. However if the scores are not based on the correct pdf no efficiency statement can be made. And furthermore to use this method we must be able to write down the dgp. In case the disturbances are uncorrelated then the optimal instrument as derived from "Generalized IV" turns out to be asymptotically the same as the one for GMM. Further it has been found that the optimal instrument performed very poorly in finite samples.

Next the problem of poor quality instruments was addressed. The linear model was used to explain the problems which can arise from poor instruments. It turns out that, especially in small samples, the estimated parameters show large biases. Therefore one has considered the possibility to screen the instruments on quality. Methods as an F-stat, canonical correlations R^2 test etc. are proposed to deal with this problem. However it turns out that this kind of pre-testing makes the results even worse. Alternatives, to tackle this problem to satisfaction seem not available yet.

The last problem considered in the lectures deals with the normalization of linear equations. It turns out that GMM estimates seem very sensitive for different ways of normalization in finite samples, however asymptotically the problem does not occur. Some simulation results were presented to illustrate the phenomenon, and further MLE was considered as alternative. Simulation results show that although maybe misspecified, MLE works better in small samples than GMM.

To conclude we might say that GMM provides us with an estimator which under weak assumptions works asymptotically well for a large class of models. However for GMM to be a real reliable tool in an applied econometricians toolbox, much theoretical work still has to be done to tackle the problems ones comes across, i.e. in field of dynamic models, finite sample properties and the choice of instruments. This course has certainly made this clear !!!

Economic Applications of Mechanism Design

by
M. Dewatripont

NAKE Spring Workshop 1994

A summary by
Jaap H. Abbring*

October 31, 1994

1 Introduction

At the NAKE workshop professor Dewatripont presented economic applications of mechanism design. The first application is a reconsideration of Williamsonian underinvestment in an observable, but nonverifiable information framework. Non-verifiability by a third party, *e.g.* a court, of the symmetric information on investments in relation-specific capital, implies noncontractability. This noncontractability leads to underinvestment. This is discussed in Section 2.

In the second application it is shown that informational constraints imply nonneutrality of the capital structure of a firm. This can be contrasted with the classical result that the value of the firm is independent of its capital structure. In Section 3 we review how types of financing differ from an informational point of view. Furthermore, the capital structure of the firm is endogenized to give a more positive account of finance under informational constraints.

The third application, described in Section 4, concerns auditing of an agent with private information on productivity levels. A principal wants to prevent an agent from shirking by auditing him through an internal auditor. Auditing is hardened by the possibility of collusion of the agent and the internal auditor, which may stimulate the principal to send for an expensive, but honest external audit.

*Report prepared for the NAKE graduate program. Correspondence: Tinbergen Institute, Keizersgracht 482, 1017 EG Amsterdam; tel./fax: 020 - 551 3534/3555; e-mail: jaap@sara.nl.

The fourth application sheds a light on structural reform of a large and inefficient sector of a socialist economy. An agenda setting government wants to stimulate part of the workers in the sector to leave and the remaining workers to be more productive. Doing so, it has to deal with adverse selection due to the private information about individual disutilities of effort. Section 5 gives more details.

Finally, due to time constraints, the fifth application, the strategic value of contracts, had to be skipped from the agenda. Thus, we may conclude our summary in Section 6.

2 Williamsonian underinvestment

Williamsonian underinvestment is underinvestment in relation-specific capital. In the first lecture reasons and solutions for this problem are formalized in a symmetric nonverifiable information setting as follows.

In period 1, a buyer and a seller can both engage in relation-specific investment. These investments are costly, but induce higher payoffs from trade later on. These payoffs are also affected by the state of nature that is realized and, together with the investment levels, observed by both parties in stage 2. In stage 3 trade occurs under this symmetric information. In the first best solution (FBS) the *ex post* efficient quantity is traded, and the *ex ante* efficient specific investments are implemented. This, however, will only occur if the investment levels are completely contractable. Under incomplete contracting underinvestment will occur due to the fact that investment is sunk in period 3.

This *ex ante* inefficiency can be avoided by implementing a revelation game after the state of nature is observed that delivers truthtelling to a court in equilibrium. Thus, the FBS could be contracted upon, and the underinvestment would disappear. However, this mechanism is not only too complex to implement in the real world, but also not renegotiation proof as the parties involved will renegotiate the outcome before punishment threats needed to induce truthtelling in the revelation game are enforced. Therefore, modern research has been directed to renegotiation-proof incomplete contracting with exogenous limits to contractual complexity. It can be shown that renegotiation proof FBS can be reached by restricting the possible contracts to contracts specifying a default price-quantity option that can be requested by both parties from period 3 onwards, and allocating full bargaining power and a penalty for delay in renegotiation to one party. Dewatripont adds that other simplifying restrictions on the contracting space may work as well.

As Hart and Moore (1988) show, however, the second best result comes back if courts can only impose price schedules depending on the quantity traded, but cannot answer the guilt question when quantity falls short.

Seminal work in incomplete contracting in a limited contract space is done by

Grossman and Hart (1986). In a similar model, but without a state of nature, and with both the investments and the *ex post* actions noncontractable, they show that it can be optimal to let one party purchase all the residual rights of control over the assets.

3 Capital structure of the firm

The second lecture deals with the capital structure of the firm in the presence of informational constraints. These constraints conflict with the well known result of Modigliani and Miller that the total value of a firm is independent of its capital structure.¹ First of all, asymmetric information implies different roles for inside equity, outside equity, and debt. Inside equity, held by managers, is not associated with agency problems, but is limited by wealth constraints and risk aversion. Outside equity does not suffer from these, but induces managerial undereffort. Undereffort is reduced under debt, but debt suffers from risky asset substitution. Clearly, the performance of a firm is affected by its capital structure in this setup. This relation is formalized in research which combines incentive modelling with an exogenously given capital structure.

Later on, the capital structure of firms is endogenized in the costly state verification model, in which an investor invests in the implementation of the idea of an entrepreneur which yields some random return. The return is only observed by the agent, but costly verification by the investor is possible. The optimal contract looks much like standard debt: for repayment offers above some reservation offer the investor decides not to inspect; there is no incentive to lie about the return for the entrepreneur.

Next, Aghion and Bolton (1992) is discussed, in which payoffs are freely verifiable, and contracts concern residual rights of control only. States of nature are distortedly observed through verifiable signals. Entrepreneurs are wealth constrained and have full bargaining power in renegotiation. It is shown that allocation of control contingent on the signal, *i.e.* debt, is best. If the bad state of nature is likely, entrepreneurs control will ensure *ex post* efficiency, possibly through renegotiation if the state of nature is good. When the good state of nature is likely, investor's control will yield some payoff for the investor. Dewatripont and Tirole (1994) extend the analysis to several investors, and add moral hazard problems.

4 Auditing and collusion

Kofman and Lawarrée (1993) examine the use of internal and external auditors in fighting undereffort of an agent, the manager of a firm, by a principal, the owner

¹See for instance Blanchard and Fisher (1989), section 6.3.

of a firm. An internal auditor has good access to information and is relatively cheap, but knows the manager well and is likely to collude out of selfinterest and deliver bad auditing work. An external auditor is costly, but truthful. As he has relatively bad access to the firm's records, the information value of an external audit is too small to explain the widespread use of it in practice. Kofman and Lawarrée argue that the main reason for using external auditors is that it improves the independence of internal auditing. This is supported by the fact that external audits are usually performed randomly.

Kofman and Lawarrée present a model in which the manager has private information about his productivity and effort. Together, these determine output, which is publicly observable and verifiable. The manager has disutility from effort. The principal earns the output and compensates the manager for his effort. Auditors used will observe a signal imperfectly correlated with productivity. Internal auditors will report selfinterestedly to the principal. External auditors simply report the signal observed. A punishment, bounded from above by maximum liability legislation, can be specified for undereffort detected by an auditor. Furthermore, the internal auditor can be punished, again subject to maximum liability, when collusion is detected by an external auditor.

Nature realizes productivity and the signal given productivity, both from discrete distributions with two mass points. After the manager observes his productivity, the principal offers a contract that maximizes his profit. The contract specifies transfers to the manager and the internal auditor depending on the output and the signals reported, a fixed transfer to an external auditor, probabilities of conducting internal and external audits depending on output and output and the signal reported by the internal auditor, respectively, and punishments for the manager and the internal auditor. After the contract is signed by all parties, effort is chosen, and output is produced, the auditors and the manager observe the signal. When productivity is low and the signal is high collusion may occur, and the internal auditor and the manager may sign a side contract. The internal auditor reports, bribes are realized, and external auditing may take place. Finally, pay-offs are realized.

The FBS is found by maximizing the principal's profits under full information. With the private information described above the no-auditing solution shows the standard moral hazard result that the high productivity type performs incentive compatible at the cost of an informational rent, whereas rent is extracted from the low productivity type at the cost of some allocative efficiency.

When one truthful, *i.e.* external, auditor is available, solutions vary with the parameters of the model. Absent the collusion danger, according to the principle of expected maximum deterrence the principal will use maximum punishments only. Using this result it can be derived that with low maximum punishment and low quality of the signal, the auditor is too expensive compared to the informational gain. When punishments and signal quality rise principals use auditing with certainty first to (completely) extract informational rents from the high pro-

ductivity type, then to (partially) improve the low type's effort. Finally, when both maximum punishment and signal quality are high enough, random auditing, which is cheaper, is possible. The low type's effort will remain inefficiently low, due to the boundedness of punishment. In the limit when punishments become very large, however, effort adjustment of the low type will be complete.

Things change when the auditor is selfinterested and free. Now, higher punishments not only increase incentives to exert sufficient effort, but also increase the willingness to pay higher bribes to avoid punishment. Thus, the principal faces a trade off when hardening punishment: it both raises managerial incentives and the amount that has to be paid to the auditor to induce truthtelling. Therefore, no auditor is used when the quality of the signal falls below some threshold, whatever the maximum liability of the manager. When the signal is good enough, we again observe rent extraction and (partial) effort adjustment under maximum deterrence when the maximum punishment increases. From some point on, however, increasing expected punishments is no longer optimal, as inducing honesty becomes too expensive relative to the efficiency gain. Therefore, expected maximum deterrence is no longer optimal, and the FBS is not even reached with unbounded punishments.

Next, an external auditor can be hired as an additional instrument to induce truthtelling. The informational gains from an additional auditor are zero under truthtelling, as he can only report the same truth. Dewatripont and Roland show that no auditor is used when the signal is very much distorted and maximum punishments are not too high: the gains from auditing are simply too small. On the contrary, if the signal is of very high quality the internal auditor will hardly ever be mistaken, and there will hardly be any room for bribes. In that case, using the internal auditor alone will be optimal. If the quality is mediocre, and punishments are high enough, using both auditors will be optimal. Important sideresult is the fact that using the external auditor as a 'stick' to enforce truthtelling dominates its use for informational reasons. As argued before, this is consistent with auditing practice in the real world.

5 Agenda setting and structural reform

In Dewatripont and Roland (1992) structural reform of a too large and inefficient sector, as they can be found in former socialist economies, is analyzed. The government would like to both reduce the size of the sector and increase the productivity of the workers. The agenda setting government, however, faces informational problems in proposing reform plans, as workers have private information on their disutilities of effort, now leading to adverse selection. Furthermore, the government operates under political constraints: both unanimity and majority voting by the workers in the sector over the reform plans proposed in both static and dynamic environments are considered. All in all, the government faces a

trade off between allocative efficiency, achieved by keeping the lowest disutility of effort workers only, and budgetary cost, incurred in order to induce the other workers to leave. Main result is that the adverse selection and time consistency may lead to the frequently observed gradual reforms. Furthermore, under majority voting, the government can get majority votes for reforms that hurt the majority, by strategic use of the threat of time inconsistent behaviour.

The model specifies three unit mass groups of infinitely small workers. Productivity, *i.e.* effort, is common to all and a choice variable to the government implementing the reform. The disutility of effort varies over the three groups and is private information to the individual workers. Initially, all workers are in the industry under consideration, providing low effort against a wage higher than the maximum disutility of low effort. Outside opportunities, visualized as working in the market sector, are normalized to 0. Individual utility equals the wage minus the disutility of effort. Social welfare in the *status quo* equals the aggregate low effort production minus the total disutility of low effort and the social costs of raising the total wage bill through distortionary taxes.

By assumption, the parameters of the model are such that in the FBS only the worker group with the lowest disutility of effort are kept within the reformed industry at the high effort level. A government offer to the workers consists of wages, effort levels and exit bonuses for each period of the model, and is voted for by all workers in the industry. If the offer is accepted all workers decide to stay or leave the industry. Otherwise, all stay under the status quo wage and effort regime. In the second period the government may offer a new reform plan for the second period only. Doing this, the government cannot be forced to commit to the second period specification of the first period proposal.

Four cases are considered, *i.e.* combinations of one and two period models and majority and unanimity voting rules. In a static model with a unanimity voting rule full reform, inducing all but the low disutility of effort group to leave, can only be achieved by leaving a rent to the highest disutility of effort group in order to induce exit of the middle (and high) group. This is primarily caused by the fact that successful reform and unanimity require nonnegative rents to all workers. Partial reform, facilitating full rent extraction, can only be reached at an efficiency cost, namely the presence of the middle group in the reformed industry. It can be shown that full reform is optimal if the middle and high disutility of effort group are much alike, *i.e.* if rent extraction losses of full reform are small, and that partial reform is optimal if the middle group is close to the efficient low disutility group of workers, *i.e.* if efficiency losses from partial reform are small.

In a dynamic model with unanimity voting full reform is easily replicated if it is optimal in the static model. If partial reform is optimal in the static case partial reform maintained over two periods is dominating gradual reform, which in turn dominates full reform. Partial reform, however, is not sustainable in the second period due to the information revealed by the workers in the first period. Gradual reform causing some to leave in the first and the rest in the second

period, however, can be sustained as a unique perfect Bayesian equilibrium. Thus, adverse selection problems and time consistency in structural reform could be in favour of gradualism.

Things are quite different under majority voting as now one of the groups of workers can successfully be offered a negative rent. Full reform in the static case can either be achieved by hurting the low or the middle disutility of effort group. Full reform is dominated by partial reform only if the rent extraction argument is important and the loss of allocative efficiency under partial reform is small, *i.e.* again if the middle group looks much like the low group. Furthermore, the government may either hurt the middle group if it is really near the middle, or seek the approval of two lookalike groups in other cases. Thus, any two-group majority may emerge at the optimum. Finally, it may be optimal to propose partial reform which hurts none of the workers if the gain from increasing effort is small and the middle group looks much like the low one, such that the allocative gain from full reform is small.

Whereas the possibility of time inconsistent behaviour weakened the position of the reforming government under unanimity voting in a dynamic setting, it may now facilitate *divide et impera* reforms in which groups are stimulated to vote in favour of reforms that hurt them. In fact, when full reform is optimal in the static case, the government may prefer two offers in consecutive periods to one take-it-or-leave-it offer, which seems to contradict the standard results of bargaining theory. The difference is of course in the majority voting which allows for threat points in bargaining below the *status quo* outcome. When partial reform is optimal in the static case, however, the government faces the same time-inconsistency cost as in the unanimity case stemming from the fact that partial reform cannot be sustained. The majority voting does, however, allow the government to hurt two groups compared to the *status quo*.

6 Conclusion

The lectures of Dewatripont made clear that mechanism design can be fruitfully applied to various well known economic problems. In his lectures Dewatripont gave a lot of indications of possibilities for future research for PhDs working in the field. For non-specialists, like myself, the fun of the material is in the fact that it stresses an important extra dimension of various economic problems.

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.....Gepromoveerd.....

Inge van de Doel

Dynamics in cross-section and panel data models

Universiteit van Amsterdam, 20 juni 1994

Peter Vlaar

Exchange rates and risk premia within the European Monetary System

Rijksuniversiteit Limburg, 29 september 1994.

..... Diploma's

Tijdens de workshop in Tilburg is het **nake** diploma uitgereikt aan:

Arjan Gras

Rijksuniversiteit Leiden

Wolter Hassink

Vrije Unversiteit

Jenny Ligthart

Universiteit van Amsterdam

Simone Dobbelsteen

Landbouwniversiteit Wageningen

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CentER, Kath. Universiteit Brabant

Announcements

New

The Economics of Pensions: the Case of the Netherlands,
Papers and Proceedings 9401, OCfEB, Erasmus Universiteit Rotterdam, 1994.

This research memorandum collects the papers that were presented at the Symposium on 'The Economics of Pensions: the Case of the Netherlands'. This symposium was organised by OCfEB, nake and the Tinbergen Insitute during the nake workshop in December 1993. This volume has been edited by A. Lans Bovenberg.

Call for papers

10th Annual Congress European Economic Association
Charles University, CERGE-EI, Prague, 1 - 4 September 1995

Submission (two copies of the paper + abstract) to the programme chariman:
Professor Damien J. Neven, University of Lausanne, DEEP-HEC, BFSH-1,
CH-1015 Dorigny, Switzerland.

1995 Meeting European Public Choice Society
Saarbrucken, Germany, April 19-22, 1995

Submission before 30 November 1995, to:
Professor Werner W. Pommerehne, University of Saarland, Dept. of Economics (FB2),
Public sector economics, Postfach 15 11 50, 66041 Saarbrucken, Germany.

First Internat. Conference of the Society Computational Economics
on "Computing in Economics and Finance"
Austin, Texas, 22-24 May 1995

Information: Hans Amman (UvA)
Submission: abstract before 31 Januari 1995, full paper, 1 April 1995 to:
Melissa Brown, RGK Foundation, 2815 San Gabriel, Austin, TX 78705, USA.

agenda

12-12-1994

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16-12-1994

nake-workshop, University of Amsterdam

27-01-1995

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03-03-1995

Block III, Utrecht-courses

10-03-1995

AIO-Presentation Day

17-03-1995

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28-04-1995

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29-08-1995

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01-09-1995

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04-09-1995

Annual Congress European Economic Society, Prague