

CORE

CENTER FOR  
OPERATIONS RESEARCH  
AND ECONOMETRICS



$$\pi = M \tilde{\pi}(P)$$

## CORE AT A GLANCE

The Center for Operations Research and Econometrics (CORE) is a research centre of the Université catholique de Louvain (UCL), located in Louvain-la-Neuve (Belgium). It is recognized as a leading interdisciplinary research institute in the fields of economic theory, game theory, operations research and econometrics. It has developed contributions and expertise in Bayesian inference in econometrics, economic geography, economics of information, environmental economics, financial econometrics, general equilibrium theory, macroeconomic dynamics, industrial organization, public economics and social choice theory, political economics, integer programming as well as convex and large scale optimization, computational economics, regulation of network industries and risk management in the gas and electricity industries.

## THE CORE PROJECT FROM THE START



- <sup>1</sup> Cf *Equilibrium Theory and Applications*, W.A. Barnett, B. Cornet, C. d'Aspremont, J. Gabszewicz and A. Mas-Colell eds, Cambridge Univ. Press, 1991, page 5.
- <sup>2</sup> Interestingly, the by-laws of the then bilingual university did stipulate that the programs of instruction should be identical in Dutch and French!
- <sup>3</sup> These came in pairs: one each on the Dutch and French sides.
- <sup>4</sup> In 1965, it was known that Henry Theil was leaving Rotterdam for Chicago. The sponsorship of TIMS was moral plus ... 2.000 dollars per year !
- <sup>5</sup> The visit was prompted by George P. Shultz, then dean of the Business School at Chicago, who had consulted for the Ford Foundation together with the author.
- <sup>6</sup> Anton Barten and Jos De Smit (Netherlands), Werner Hildenbrand (Germany), Alan Kirman (UK), Bruce Miller (US), Jean-Philippe Vial (France) and Laurence Wolsey (UK).
- <sup>7</sup> The university of Brussels was sponsoring CORE officially while the Ford Foundation grant lasted, but dropped its sponsorship when direct financial contributions were called for. Similarly, at the time when CORE moved to Louvain-la-Neuve, sponsorship by Katholieke Universiteit Leuven was discontinued. It is clear that universities are reluctant to contribute financially to activities away from their own premises. This reluctance must be reckoned with when planning institutional arrangements.

### European success stories

Let me claim without false modesty that CORE has been a success story. Retrospectively, it is amazing that success came so fast and so easily. Indeed, the centre was created at Leuven in 1966. In his opening address to a symposium held at CORE in 1989, Gérard Debreu (generally a master of understatement!) writes<sup>1</sup> :

“By the end of the 1960’s, CORE had become the major research centre in mathematical economics outside the United States. Since then, it has remained at the edge of the exponentially expanding universe of mathematical economics and game theory, operations research, and econometrics.”

So, within three or four years, CORE could attain international recognition for its research in mathematical economics. Is that believable? Well, it did happen; it had happened ten years earlier for econometrics in Rotterdam, with the creation by Tinbergen and Theil of the Econometric Institute; and it happened again several times in Europe since then. Particularly convincing are the success stories of CentER at Tilburg, CREI at Pompeu Fabra, ECARES at Brussels, GREQAM at Aix-Marseille or IDEI at Toulouse, all of which attained visibility and prominence in a matter of years; and there are further examples.

I guess that these initiatives

came at the right time, in the right places, with the right focus, at the hands of the right people! That may be asking a lot. But the university scene in Europe is wide open to such initiatives. Perhaps one should wonder instead why they remain few and far between, in spite of all the talent now widely available.

Regarding focus, there is no doubt that the combination of mathematical economics, game theory, econometrics and operations research was a winner. The reference model for CORE came from the Cowles Foundation. The initial ambition to replicate Cowles on a modest scale was largely fulfilled. For Cowles in the US as well as for CORE in Europe, there was an early stage of unique distinction, progressively diluted as the same combination of interests became more widespread – a natural and entirely desirable development.

### CORE’s early days

In the case of CORE, and I guess in other cases as well, there was a measure of luck, of happy coincidences. The University of Louvain, in the mid-sixties, offered broad programs of instruction in Dutch and French. The fields of mathematical economics, econometrics and operations research were hardly developed, but some courses were offered by the Economics Departments,

the Business Schools and the Engineering Schools<sup>2</sup>. Importantly, the six teachers in charge of these subjects recognised the merits of a research environment. They concurred in endorsing the project of (i) developing a small research centre, and (ii) offering more advanced courses to be taught in English. The request to the university, introduced in 1965, called for two new faculty appointments, two secretaries, two post-doctoral fellowships<sup>3</sup>, some physical facilities and a minimal operating budget. The request was backed by two signs of outside recognition: a research grant from Belgian public sources, and the transfer to Louvain of the International Center for Management Science which had been set up in Rotterdam a few years earlier by the scientific society *The Institute of Management Science*<sup>4</sup>.

The request was approved in the fall of 1965, and by the opening of academic year 1966-67 CORE was alive! Modest premises enabled CORE to host the two new faculty members, Anton Barten from the Netherlands and Peter Schönfeld from Germany; the first two research fellows, Jan Mossin from Norway and Wlodek Swarcz from Poland; and two distinguished American visitors, Gordon Kaufman of MIT and Merton Miller of Chicago. A small but truly international research group was at work.



CORE was founded in 1966.  
Today, it houses about 30 professors and  
100 doctoral and postdoctoral researchers.

This feature was to prove crucial in convincing the Ford Foundation to provide some additional support. In 1967, two representatives of the Ford Foundation visited CORE<sup>5</sup> and negotiated with the University the terms of a five-year grant (400.000 \$) meant to initiate a discrete jump in the size of CORE – aiming for twelve professors and several visitors annually. Reciprocally, the University was to provide enlarged facilities, to appoint four new professors, and to take over the visitors' budget five years later – quite a commitment, faithfully honoured thereafter!

The Ford grant was particularly helpful towards attracting visitors, the number and quality of which were to play an important role in building up CORE's reputation. Thus, in 1968, as CORE moved into its new premises (some 40 comfortable offices), the set of mathematical economists visiting for the full year included Gérard Debreu, Truman Bewley, Herbert Dierker, Birgit Grodal, David Schmeidler and Karl Vind. The presence of Werner Hildenbrand as a regular member of CORE was being felt... Importantly, these persons worked on issues defining the research frontier of the day.

#### Faculty

There is one development that looked likely and promising forty years ago, but that did not

materialise. I refer to the presence on the permanent staff of research centres like CORE (and others) of foreign professors. In the early seventies, CORE counted seven foreign professors among its permanent members.<sup>6</sup> Today, there are two. The others mostly returned to their home country, essentially in Europe. This of course benefited the development of economic research there and contributed to later success stories. But the situation is not very different elsewhere: it is still the case in continental Europe that few academics settle permanently in foreign countries. It may take another while until Europe develops an integrated labour market for academics. This is in contrast with the situation in the US, and carries important implications.

Still, CORE was able over these forty years to alternate systematically between internal and external research directors. Every three years, an outsider (typically a former visitor) assumes responsibility for the orientation and stimulation of research at CORE. That practice has proved highly beneficial: the local habits come regularly under question and scrutiny, while new suggestions emerge. Hopefully, this practice will be perpetuated in the future.

Reference should also be made to a development that was not

part of the initial project, but that proved significant over the years, namely the regular presence at CORE of up to a dozen academics affiliated with neighbouring universities (Brussels, Leuven, Liège and Namur, but also Lille or Maastricht). This has broadened significantly the basis of research collaborations, with mutual benefits. At this time, closer links with ECARES at Brussels are developing, starting with joint seminars, joint workshops and conferences but aiming much further in developing a joint venture, ECORE.<sup>7</sup>

#### Doctoral training

Another interesting element from the CORE story concerns teaching. CORE is a research centre, not a degree-granting institution – though it has all along housed PhD students at the dissertation stage. Already in the late sixties, the question was raised – and debated vividly – whether CORE should offer a PhD programme of its own. Reservations concerned CORE's ability to offer a sufficiently diversified program. Eventually, this led to the creation of the European Doctoral Program in Quantitative Economics (EDP) in 1976, under a joint initiative with David Hendry of LSE and Werner Hildenbrand then of Bonn, both of which were CORE visitors at the time. This was an important initiative in its own

rights, and again one that has been emulated by others. International joint degrees are today part of the European scene. They provide an example of European originality in comparison with the US.

#### A personal tribute

As I reminisce over 40 years of life at CORE, my privileged memory is one of friendly and productive human interactions. The friendly side encompasses dozens of long-time associates – either colleagues or members of the CORE staff – as well as hundreds of students and visitors. I have no recollection of significant frictions, and regard the warm human relations among CORE members as an essential input to the success story. Indeed, human proximity facilitates scientific collaboration, whether through joint projects or through interdisciplinary complementarities. I have myself enjoyed working with some 60 co-authors over CORE's lifetime. Not surprisingly, I rate the solid basis of scientific interactions cum friendship as a major asset of CORE, worthy of everyone's daily attention. •

Jacques Drèze



## CORE'S OBJECTIVES

### The development and dissemination of knowledge at the most advanced level

About one hundred research reports are produced every year at CORE. Most of them will appear in leading peer-reviewed journals. As a result, more than 800 articles were published in the last fifteen years (including 200 in the top 30 economics journals and the top 5 operations research journals), as well as 60 books and monographs.

CORE members have been acting as editors and co-editors of more than 40 journals, and have received numerous scientific distinctions (the Lanchester Prize, several Honoris Causa doctorates, two Francqui Prizes, EURO Gold Medal, Francqui Chairs, the Alonso Prize in Regional Science,

the Dantzig Prize, the Humboldt Research Prize, the Solvay Prize, etc.)

### The establishment of a forum for scientific exchange and cooperation at an interuniversity and international level

Every year CORE hosts more than one hundred visitors, professors, senior and post-doctoral researchers, for visits ranging from a few days to a full year. Several one-year grants at the post-doctoral level (CORE fellowships) are offered every year and attributed on an international and competitive basis.

Five weekly research seminars in the fields of Operations Research, Econometrics, Economics and Game Theory allow CORE

members and visitors to present their work and share ideas.

### The training of young researchers, as well as the diffusion of knowledge in the relevant professional circles, both in the private and the public sectors

Every year, a group of about 50 young doctoral researchers are in residence at CORE; this has resulted in more than a hundred and fifty PhD theses supervised by CORE members. CORE is a founding member of the European Doctoral Program in Quantitative Economics, a member of several national and European training programs as well as a frequent organizer of summer schools, lectures series, workshops and conferences.



*“A major feature in the development of European scientific research is the extension of networking activities. In its fields, CORE has been at the forefront of these activities, through its foundation as an interuniversity center, the creation of the European Doctoral Program, the ECORE association, the co-ordination of important European and Belgian research networks (e.g. Interuniversity Poles of Attraction), all essentially based on CORE worldwide set of alumni,*

*co-authors and enthusiastic supporters. Hence CORE is a multi-dimensional open place. A physical place for scientific work and discussions, with all its facilities and its famous “coffee lounge” right in the middle, and a virtual place extending all over intense scientific and personal relationships.”*

*Claude d'Aspremont, president, former research director.*



“What has always impressed me at CORE is its extraordinary visitors’ programme. Whether you are Ph. D. student, researcher, postdoctoral fellow, or professor, you have the opportunity to meet visiting researchers from all over the world. This creates extraordinary opportunities for scientific cooperation and personal friendships, and it has resulted in an extended network of beneficial long-run relations. I know no other research center having such a degree of international openness. It is amazing.” **Luc Bauwens, research director**



## WHAT IS CORE RESEARCH ABOUT?

CORE’s activities integrate **fundamental and applied research**; they are oriented towards:

- > theoretical and methodological research that aims at providing frameworks for the analysis of a wide range of decision problems arising from economic policy and the management of private and public firms;
- > developments in the theory of optimization and statistics contributing to the solution of design and decision problems;
- > the development of computational tools (algorithms and software), and their use in empirical studies.

## PRIZES AND AWARDS

**1976** • Jacques DRÈZE: Honorary member of the American Economic Association • **1978** • Jacques DRÈZE: Foreign Honorary member of the American Academy of Arts and Sciences • **1980** • Jacques DRÈZE : Foreign Member of the Royal Netherlands Academy of Arts and Sciences • **1984** • Luc BAUWENS : Leonard J. Savage Thesis Award • **1986** • Anton BARTEN: Erik Kemps Prize in Memory of T. Palander • **1988** • Laurence WOLSEY: Triennial Orchard-Hayes Prize of the Mathematical Programming Society • **1989** • Pierre PESTIEAU: Francqui Prize • Laurence WOLSEY : Lanchester Prize of the Operations Research Society of America • **1990** • Henry TULKENS : Prix Ferdinand de Lesseps, Paris • **1993** • Jacques DRÈZE: Prix Emile de Laveleye, Académie Royale des Sciences, des Lettres et des Beaux Arts de Belgique • Foreign Associate, National Academy of Science, Washington • **1994** • Laurence WOLSEY: EURO gold medal of the Association of European Operational Research Societies • **1995** • Claude d’ASPREMONT: Prix Francqui • Yves SMEERS: Award for “Outstanding Contribution to the Profession” of the International Association of Energy Economics • **1999** • Jacques DRÈZE: International Prize for the Economics of Insurance funded by Istituto Nazionale delle Assicurazioni, Roma, Italy • Michel GOEMANS: SIAM Activity Group on Optimization Prize • **2000** • Yurii NESTEROV : Dantzig Prize • **2002** • Louis EECKHOUDT: Robert C. Witt Research Award of the American Risk and Insurance Association • **2004** • François MANIQUET: Social Welfare Prize • Annual Koç University Prize for the best paper published in the Review of Economic Design • Jacques THISSE: William Alonso Memorial Prize, Seattle, USA • **2005** • Pierre GIOT: Joseph de la Vega Prize, Federation of the European Stock Exchanges • Jacques THISSE: Prix Solvay (FNRS), Belgium • Sébastien VAN BELLEGEM: 2005 Prix Marie-Jeanne Laurent-Duhamel • **2006** • Pierre PESTIEAU: Prix Risques – Les Echos • **2007** • Jacques THISSE: European Prize of Regional Science



## Contributions

### IN ECONO- METRICS

Following upon the work at the Cowles Commission in the late forties and fifties on simultaneous equations systems (intended to represent the macroeconomic system as a set of coherent equations to be used for policy scenario analyses), CORE's basic contribution in the late sixties consisted in introducing Bayesian estimation of such systems. This brought in flexibility by allowing for the inclusion of prior knowledge about the economic structure. The intellectual legacy of that trend is still present as Bayesian inference methods are used and further developed in research on financial markets. The failure of simultaneous equation systems to take into account the occurrence of structural

changes, such as those resulting from, e.g. the first oil shock in 1974, led to questions concerning several of their assumptions. One of them is the exogeneity status of certain variables for statistical inference. The CORE team contributed to this debate with the new and much quoted concepts of weak and strong exogeneity, which facilitate inference by allowing simpler models to accommodate structural changes.


In financial econometrics, which has become a major area of research over the last twenty years, topics dealt with at CORE include the microstructure of financial markets and volatility models. Each topic has required the development of new models and econometric tools. Dynamic

duration, count, and intensity models are complementary approaches to model the dynamics of the trading processes of securities on stock markets. Empirical evidence has been shed on the issue of whether fully electronic markets based on order books are viable in periods of stress. For volatility studies, the workhorse is still the auto-regressive conditional heteroskedasticity (ARCH) model and its numerous extensions, as well as the recent concept of realized volatility. The impact of announcement of news on the volatility of stock and foreign exchange markets is studied in the framework of both ARCH and realized volatility models.

Visitors have been very important to CORE's reputation as a leading international research institute in economics and operations research.

*"The greatness of CORE is mainly based on two factors. The first, and the better known one, is due to the research excellence that CORE was able to sustain over the amazingly long (by academic standards) period of forty years. The scientific achievements of CORE are well-documented and its crucial contribution to developments in economic and game theory, industrial organization, and operations research are well-known everywhere. But nothing of this nature would have been possible without the spirit of CORE, its inclusiveness and its ability to provide young and senior researchers with not only scientific but also social and human environment that allowed scholars with such heterogeneous backgrounds to thrive and succeed. In a nutshell, excellence and spirit."*

Shlomo Weber, former research director and visitor



## Contributions

### IN ECONOMIC THEORY AND GAME THEORY

General equilibrium, a cornerstone of economic theory, has been from the beginning an essential part of CORE's research. Beyond contributing to extending its fundamentals to large competitive economies and their equilibria, developments have been achieved in several directions: uncertainty, incomplete markets, non-convexities in the production sector, introduction of money, computation of equilibrium, coordination failures leading to price equilibria with rationing in quantities and the study of unemployment.

Research at CORE has developed in several other fields of economic theory.

- > In industrial economics, theoretical extensions have been achieved on product differentiation, imperfect competition, market entry decisions.
- > In spatial economics new concepts have been offered on location decisions, regional development and location externalities.
- > In individual and collective decision theory, the foundations of expected utility theory have been conceptually enriched, and the notion of Bayesian incentive compat-

ibility has been introduced.

- > Public economics has been developed in several directions: management of public enterprises, measurement of productive efficiency, redistributive taxation, fiscal competition and decentralized resource allocation processes for economies with public goods.
- > A particular attention has been paid at CORE on environmental economics especially since the creation of the Lhoist Berghmans Chair in 2002: coalition theory applied to climate issues, best available techniques and innovation, intergenerational issues and properties of alternative policy instruments are some of the topics covered by the research group organized around the chair.
- > A related development is political economics with contributions in abstract voting theory and on the decentralization of political decision making.
- > In macroeconomic theory, a substantial part of research has been devoted to develop the so-called unified growth theory by providing better micro-foundations to population dynamics.

Parallel to general equilibrium, game theory plays a no less unifying role in CORE's research agenda.

- > The work here consists in developments of the theory itself, both in its non-cooperative and cooperative aspects (new equilibrium concepts as well as new properties of classical cooperative solutions, introduction of uncertainty), and
- > in using game theoretical concepts and results (e.g. Nash equilibria and the core) in several of the fields mentioned above.

A team of geographers and economists join in studying the location of human activities, which encompasses the movements of persons and goods and the impact on the environment. Different spatial levels of analysis are covered, including the behavior of firms and households, the structure of urban areas, the systems of cities, regional development. Tools are borrowed from various disciplines (cartography, economics, geographical information systems, mathematical programming, statistics,...).



## Contributions

### IN OPERATIONS RESEARCH

One of the main fields covered at CORE is related to optimization and mathematical programming.

- > Discrete optimization and integer programming has been a major area of research. In particular the work on cutting planes for mixed integer programming has had a significant influence in the development of the remarkably powerful mixed integer programming systems now available. In the last years, application of integer programming models for production planning and network design has received particular attention both theoretically and computationally.
- > The importance of structure in convex optimization, with the growing awareness of its applicability in both engineering, discrete optimization and other branches of mathematics, is another area in which research at CORE has played a major role. Recent work has

shown that structure affects even fundamental methods such as Newton's method, and basic nonlinear optimization can benefit significantly both theoretically and computationally from this new viewpoint.

The study of large energy investments as well as of electricity transfers and markets has been a major activity for over twenty-five years, while the design and regulation of markets in Europe has become of particular importance in the last 5-10 years. These ties have been concretized in the creation of the Tractebel Chair at CORE and the creation of a research group at Electrabel employing numerous researchers who have obtained their UCL doctorates at CORE.

A further area is Supply Chain Management (SCM) that has become an important application area for Operations Research. SCM covers different aspects of production, logistics and supplier

relations. With the recent integration of most researchers from the centre of excellence in Supply Chain Management at CORE, new streams of applied research are being developed. Examples of current research topics are the modelling of the influence of supply chain configuration on variability and models for performance evaluation and incentive in network industries.

Finally, the area of economic geography has close ties to Operations Research. Many problems dealing with location decisions (firms, public facilities, ...) are formulated and solved by methods of mathematical programming. Research interests include the development of models, special purpose algorithms, and sensitivity analyses of the results to the various inputs of these models such as demand, externalities, the transportation network, ... along with applications to real-world problems, involving fire stations, schools, multimodal platforms.



*"As a CORE visiting postdoc who has stayed for over 30 years, I can vouch for the wonderful reception young visitors receive at CORE, and though the center has grown enormously there is still, I believe, a special atmosphere that inspires and stimulates both friendship and top-class research."* **Laurence Wolsey**, co-director, former research director and former president



## DOCTORAL TRAINING

PhD students at CORE undertake their research under the supervision of CORE members. PhD degrees are conferred by various departments (Economics, Mathematics, Applied Mathematics, Geography, ...). These PhD programmes include the Graduate School of Economics, the Doctoral School of Applied Mathematics, the Institute of Mathematics and the Louvain School of Management. Students in Economics have the option to join the European Doctoral Program in Quantitative Economics.

The PhD program (of which the master is the first year of courses) has recently been ranked third among European PhD programs (see Amir, R. and Knauff, M., «Ranking Economics Departments Worldwide On the Basis of PhD Placement». *Review of Economics and Statistics* 90 (1), 185-190, 2008). 168 PhD dissertations were defended at CORE since 1966.

Created in 1977, the European Doctoral Program in Quantitative Economics, (EDP) is organised jointly by the

- > Université catholique de Louvain (Belgium)
  - > École des Hautes Etudes en Sciences Sociales, Paris (France)
  - > Rheinische Friedrich-Wilhelms-Universität Bonn (Germany)
  - > European University Institute, Florence (Italy)
  - > Universitat Pompeu Fabra, Barcelona (Spain)
  - > London School of Economics (United Kingdom) with
  - > Tel Aviv University (Israel) as exchange partner
- within the framework of the existing degree requirements in each institution. Its aim is to promote the exchange of doctoral students between these institutions depending on the area in which they work.



“What I mostly like at CORE, besides its exceptional research atmosphere, is the large number of visitors coming from all over the world and spending short or long periods of time here. That offers not only the possibility of stimulating scientific exchanges, but also of casual discussions about politics, culture, daily life, etc. in so many different countries.” [François Maniquet, co-director](#)



*“I have been lucky to spend 5 years at CORE during my PhD training. It has been a splendid experience. CORE combines a great working environment with a relaxed and friendly social atmosphere. I still go back to CORE several times a year to work with my former colleagues and live the great CORE experience for a while.”* [Susana Peralta, former PhD student](#)

## POSITIONS OF PAST CORE PHD STUDENTS

**Academic positions in Belgium** > EPHEC, Bruxelles - Facultés Universitaires Notre-Dame de la Paix, Namur - Facultés universitaires Saint-Louis - Katholieke Universiteit Leuven - Université catholique de Louvain - Université Libre de Bruxelles - Université de Liège - Universiteit Gent

**Academic positions in the rest of the world** > Aarhus Universitet, Denmark - Aristotle University of Thessaloniki, Greece - Brown University, USA - Business College, Rio de Janeiro, Brazil - Center for European Economic Research, Mannheim, Germany - Centrum voor Wiskunde en Informatica, Amsterdam, The Netherlands - Ecole Mohammadia d'Ingénieurs, Rabat, Maroc - Ecole Polytechnique, France - European University Institute, Firenze, Italy - Fordham University, Bronx, USA - HEC, Montréal, Canada - HEC, Paris, France - INSEAD, Fontainebleau, France - Libera Università Internazionale degli Studi Sociali Guido Carli, Roma, Italy - Massachusetts Institute of Technology, USA - National University of Ireland - National University of Singapore - Otto-von Guericke Universität Magdeburg, Germany - Technische Universität Darmstadt, Germany - The University of Western Australia - Universidad Autonoma de Barcelona, Spain - Universidad Carlos III de Madrid, Spain - Universidad de Alicante, Spain - Universidad de Cantabria, Spain - Universidad de Chile - Universidad de Valencia, Spain - Universidad del País Vasco, Spain - Universidad Porto, Portugal - Universidade Catolica Portuguesa, Portugal - Universidade de Lisboa, Portugal - Universidade Estadual de Campinas, Brazil - Universidade Federal de Pernambuco, Recife, Brazil - Universidade Nova de Lisboa, Portugal - Università Ca' Foscari di Venezia, Italy - Università degli Studi di Bologna, Italy - Università degli Studi di Brescia, Italy - Università degli Studi di Padova, Italy - Università degli Studi di Udine, Italy - Università di Bologna, Italy - Università di Firenze, Italy - Università di Palermo, Italy - Università di Roma, Italy - Università di Siena, Italy - Università "La Sapienza", Roma, Italy - Università Milano, Italia - Università Tecnica de Lisboa, Portugal - Universitat Autònoma de Barcelona, Spain - Universitat de Girona, Spain - Universität Trier, Germany - Université d'Evry, France - Université de Bordeaux 1, France - Université de Cergy-Pontoise, France - Université de Fribourg, Switzerland - Université de Genève, Switzerland - Université de la Méditerranée, France - Université de Lille III, France - Université de Montréal, Canada - Université de Paris I, France - Université de Toulouse 1, France - Université des Antilles et de la Guyane - Université des Sciences Sociales de Toulouse, France - Université du Littoral, Dunkerque, France - Université du Luxembourg, Luxembourg - Université Laval, Canada - Université Paris I, France - Université Paris-Dauphine, France - Universiteit Amsterdam, The Netherlands - Universiteit Maastricht, The Netherlands - University of Birmingham, United Kingdom - University of California at Davis, USA - University College London, United Kingdom - University of Ottawa, Canada - University of Pittsburgh, USA - University of Singapore - University of Southampton, United Kingdom - University of Taiwan, Taiwan - University of Warwick, United Kingdom - Warsaw School of Economics, Poland - York University, United Kingdom - Zhejiang University, China

**Positions in private firms** > Autorita Garante della Concorrenza a del Mercato, Italy - AXA Bank, Belgium - Banca del Ceresio, Lugano, Switzerland - Bank Luxemburg - Central Bank of Bolivia - Cockerill, Belgium - Electrabel - European Central Bank, Frankfurt, Germany - Federal Public Service for Health and Environment, Brussels, Belgium - Fortis, Belgium - Inspection des Finances, Bruxelles, Belgium - Schoumaker Consultation, Bruxelles, Belgium - Swiss National Bank, Switzerland

**Positions in international organizations** > European Commission, Belgium - United Nations Economic Commission for Africa - World Bank Washington, U.S.A



*“By both its inter-university and inter-disciplinary dimensions, CORE certainly constitutes a highly stimulating environment to undertake a PhD dissertation. Close interaction with outstanding faculty and researchers, other PhD students with various backgrounds and regular visitors from all around the world is an exceptional asset that makes CORE a center of excellence. Its international composition and its friendly atmosphere are also continuous sources of personal enrichment.”* [Jean-François Maystadt, PhD student](#)

# THE CORE FOUNDATION



Since its beginning CORE's financing has been provided by the University as well as research grants and contracts. Yet, over the years, the need for an autonomous, complementary source was increasingly felt. The purpose was to trigger non standard initiatives, to allow new special projects, and sometimes to ensure smooth transitions between successive and not always overlapping grants and contracts. This is why in the mid-eighties, steps were taken to set up a privately financed foundation, independent from but linked with the University.

As a result, the "CORE FOUNDATION" was formally established in 1987, on the occasion of CORE's 20th anniversary. Its bylaws specify that the foundation is an « Association Internationale à But Scientifique » (AIBS) of Belgian law, whose triple purpose is to foster the development of scientific knowledge in the fields of econometrics, operations research and economic theory; to maintain the existence in Belgium of a forum of interdisciplinary, interuniversity and international scientific cooperation

in the stated fields; and to ensure the education of young scientists in these disciplines.

From an initial amount of Euro 1,2 million, the Foundation's current capital has reached over 2 million. It finances the following activities:

- > **CORE Lecture Series** (from 1989 on): every year, a young internationally renowned scientist is invited to come and stay at CORE to give a series of lectures in one of the research areas of interest to the members of the Centre. Speakers are expected to produce a written version of their lecture. Some monographs have appeared and are offered for sale at CORE library.
- > **Temporary special appointments:** Of special importance for CORE is its tradition that every other research director be a non-UCL faculty member, preferably from abroad, especially invited for that purpose with a substantially reduced teaching load. To overcome the foreseeable administrative difficulties of reconciling these objectives with standard academic statutes and

payscale, the CORE Foundation sometimes steps in and contributes to the extra expenses entailed. The hiring of Research Directors Michel Le Breton in 1999-2001 and Shlomo Weber for 2004-2006 was made possible in this way.

- > **The CORE Prize:** It was realized in the early decades of CORE's existence that long term visits by foreign colleagues are particularly conducive to lasting and successful scientific collaborations. The Foundation was solicited to finance the creation of a special one year research position named "CORE Prize". It is offered by the CORE Board to a confirmed scientist with an invitation to stay at CORE during several months.

**Contributors to the capital of the Foundation** include: Banque Degroof, Banque Drèze, Banque Nationale de Belgique, Groupe Bruxelles Lambert, IBM, Loterie Nationale, Petrofina, M. Puisse Baeyens, Société Générale, Tractebel.

## FUNDING

Apart from generous support of the University, CORE benefits from research contracts with the Communauté française, the Belgian Federal Science Policy Department, the European Commission and private firms.

The **Communauté française** supports research done at CORE through > the Belgian National Science Foundation (FNRS), in collaboration with the French Centre National de la Recherche scientifique > the Special Research Fund and > the Actions de Recherche Concertées

The **Federal Science Policy Department** supports research contracts aimed at fostering scientific interactions between all Belgian universities of the Flemish- and the French-speaking communities as well as between Belgian and European universities (Interuniversity Poles of Attraction). It also promotes more targeted scientific programmes.

The **European Commission** promotes research actions to develop Europe's international scientific competitiveness.

**Private firms**, also support applied research contracts.

## CHAIRS



### Tractebel Chair

The aim of the Tractebel Chair in energy economics is to incentivise research on questions arising from the restructuring of the gas and electricity sectors. The activity concentrates on market simulation, investment and risk management problems. The methodological approach is to cast fundamental ideas of economic theory in a computable framework using methods derived from Optimization. Current work concentrates on the analysis of electricity spot prices using variations of unit commitment type models, long-term gas and oil resource development by equilibrium models, invest-

ments in generation capacity under uncertainty through real option type methods and development of special contracts for large industrial consumers in the EU-ETS context (again equilibrium models).

### Lhoist Berghmans Chair

It is now a recognized fact that environmental issues are pervasive in business today. This concern is quite rightly interpreted as the expression of collective aspirations for a better quality of life. The Lhoist Berghmans Chair in Environmental Economics and Management takes part in this process. A teaching and research chair, the Chair

aims at fostering research likely to improve our knowledge from three points of view:

- > evaluating the costs for industry of applying clean technologies,
- > evaluating the benefits for our society of applying these technologies,
- > evaluating the global impact of industrial activities on the environment and on the improvement of living conditions through the use of their products.

An interdisciplinary approach to these problems is needed in order to integrate environmental, economic, technological and institutional factors into a

coherent process and to quantify the effects of new environmental policy instruments on the competitiveness of industries and countries and on their overall wealth. Improving decision-making tools, both on individual firms and on society as a whole, is the main theme of this research. The Chair involves about ten researchers at CORE every year. It is also responsible for four courses in environmental economics and management, which are offered in many departments in the university.

## PARTNERS

CORE has developed scientific collaborations with Belgian, European and international partners. Scientists from several Belgian universities are permanent members of CORE. International relations are developed through various networks, including the thirty-years old European Doctoral Program as well as through the important visitors program (CORE fellowships). An American CORE Alumni Association has recently been created to support visitors from the U.S. Doctoral researchers from many countries are residents at CORE.

### Scientific partners

Aarhus School of Business - Academy of Sciences of the Czech Republic - Center for Financial Studies, Frankfurt - Centre for Economic Policy Research - Central European University, Budapest - Centro de Estudios Monetarios y Financieros (CEMFI), Madrid - Université Libre de Bruxelles - Katholieke Universiteit Leuven - Ecole des Hautes Etudes en Sciences Sociales, Paris - Ecole Nationale de la Statistique et de l'Administration Economique, Paris - Ecole Polytechnique Fédérale de Lausanne - European University Institute, Florence - Facultés Universitaires Catholiques de Mons - Facultés universitaires Notre-Dame de la Paix, Namur - Facultés Universitaires Saint-Louis - Graduate Institute of International Studies, Geneva - Harvard College - Istituto di Analisi dei Sistemi ed Informatica, Roma - Katholieke Universiteit Brabant; Limburgs Universitair Centrum - London Business School - London School of Economics and Political Science - Massachusetts Institute of Technology - Norwegian School of Economics and Business Administration - Pennsylvania State University - Princeton University - State University Moscow - Stichting Centrum voor Wiskunde en Informatica, Amsterdam - Stockholm School of Economics - Tel Aviv University - Tilburg University - Tinbergen Institute - Trinity College, Dublin - Universidad Carlos III de Madrid - Universidade de Lisboa - Università degli studi di

Genova - Universitat Autònoma de Barcelona - Universitat Pompeu Fabra, Barcelona - Universität Bonn - Universität Konstanz - Universität Magdeburg - Universität Mannheim - Universiteit van Amsterdam - Universiteit Antwerpen - Universiteit Gent - Universités d'Aix-Marseille II et III - Université Joseph Fourier, Grenoble - Université de Liège - Université de Mons-Hainaut - Université des Sciences Sociales (Toulouse I), Toulouse - University of Alberta - University Budapest - University College London - University of Oxford - Yale University - Maastricht Universiteit

### Business partners

Banque De Groef - Banque Nationale, Dexia - ECGI - Electrabel - Fortis - Groupe Lhoist - IBM - ING - Loterie Nationale - Total.



## ECORE, a joint venture with ECARES, Université Libre de Bruxelles

*“Belgian economic research is internationally known as fostering the development of rigorous mathematical, statistical and computational methods. It is also known for its contributions on major issues in the global economy, such as unemployment and poverty reduction, pollution control, innovation, growth and competition policy. A clear message is that ethical implications as well as strategic interactions cannot be avoided in economic analysis and policy. ECOPE is meant to maintain this recognized expertise in Belgium, to encourage its development by the young generation and to open its availability and usefulness to a larger set of decision-makers.”* [Claude d’Aspremont and Jacques Thisse](#)

ECORE is a research and teaching institution which federates two centers of excellence: CORE (Center for Operations Research and Econometrics), born in 1966 at Université catholique de Louvain, and ECARES (European Center for Advanced Research in Economics and Statistics), born in 1991 at Université Libre de Bruxelles.

ECORE will integrate the research activities and the doctoral programs of both institutions. It promotes their position on the international scene in the fields of economics, finance, op-

erations research, econometrics and statistics.

### AIMS

- > Exploit the existing complementarities between the research themes at CORE and ECARES. Combining theoretical expertise and more applied research, makes ECOPE a privileged partner.
- > Foster teaching and research by developing a common doctoral school, offering a wide variety of fundamental and topical courses. This gives ECOPE a large advantage, in an international environ-

ment, that is becoming increasingly competitive.

- > Intensify collaborations and common projects with Belgian and European universities, including research programs and doctoral training.
- > Increase interactions with partners from the private and from the public sector.

*“Higher education is also affected by the process of globalization. Dutch universities were among the first to feel the need to merge some of their activities. In Barcelona two prestigious universities followed the same path a few years ago. More recently, the European University Institute in Florence launched the “largest EU post-doctoral program in the social sciences” offering 100 fellowships to graduate students in economics, law, history, political science and sociology who want to embark on an academic career, improve their teaching and professional skills. End of 2005, the French government launched the “Ecole d’Economie de Paris.” ECOPE will now also be able to compete.”* [Mathias Dewatripont and Victor Ginsburgh](#)



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# CORE

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