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General equilibrium models with rationing: The making of a 'European specialty'

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ABSTRACT

Unlike the U.S., Europe was a hotbed for general-equilibrium models with rationing (GEMR). Our goal is to explain how and why GEMR became a "European specialty" (Portes, 1987: p. 1332). We show how research on GEMR took off and developed in France and Belgium from the mid-1970s, before expanding all around Europe. We also argue that three main factors enabled the deployment of GEMR in Europe over the 1970s and 1980s. First, GEMR opened up research opportunities in areas in which European economists had specific interests (e.g., general equilibrium theory). Second, GEMR benefited from the support of some leading academic figures who mobilized institutional resources to keep stimulating research over years (e.g., Jacques Drèze, at the Center for Operations Research and Econometrics). Third, there were problems specific to the Old Continent that stimulated research on GEMR, namely persistent unemployment in Western Europe and planning in Eastern Europe.

1. Introduction

In 1987, Richard Portes observed a major difference between macroeconomics in the United States (U.S.) and in Europe:

> "Non-Walrasian macroeconomics was not embraced in the U.S. […] it has now become something of a European specialty" (p. 1332).

Our goal is to explain how and why general-equilibrium models with rationing (GEMR) became a European specialty.[1] GEMR started to become a European specialty in the second half of the 1970s. The 1978 annual meeting of the American Economic

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[1] Portes used the label "non-Walrasian macroeconomics" when referring to GEMR. We chose not to use this label, due to its lack of precision. For instance, sunspot models are "non-Walrasian" and yet very different from GEMR. We also chose not to use the label "fixed-price equilibrium models." The main reason is that many economists elaborated models where prices moved from one market period to another from the 1970s on. An important challenge was thus to analyze the dynamics of non-clearing markets (Plassard et al., 2021). Finally, despite the existence of dynamic models with rationing, we chose not to use the label "disequilibrium macroeconomics" either. The label can be misleading given that all the models considered in our article rest on equilibrium. Even if markets do not clear, economic agents are rational and there is coordination between their optimizing plans.

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Association (AEA) was a case in point. Robert Solow wanted to organize a session on GEMR. However, while discussing his project with Herschel I. Grossman, he realized that it would not be possible. According to Grossman:

> "A good sampling of recent work along these lines [included] Bénassy, Grandmont, Peisa, Siven, and Varian in the latest issue of the *Scandinavian Journal of Economics*, No. 2/1977 […] The economists doing this work are European."[2]

This forced Solow to reconsider the topic of his session. With Grossman, he solicited papers on the "future of non-market-clearing macro-models."[3] Robert Barro, Grossman, and Peter Howitt answered the call and unanimously claimed that GEMR were a dead-end street (Barro, 1979; Grossman, 1979; Howitt, 1979).

This US/Europe difference grew throughout the 1980s. European economists started to study the dynamics of non-clearing-markets (e.g., D'Autume, 1985; Bohm, 1989), to consider open economies (e.g., Cuddington et al., 1984; Hénin, 1985), and to test GEMR against data (e.g., Artus et al., 1984; Kooiman and Kloek, 1985; Drèze and Bean, 1989). Moreover, GEMR spread to many European countries in both West (e.g., Germany and Netherlands), East (e.g., Czechoslovakia and Poland), North (Denmark), and South (e.g., Italy and Spain). However, this dynamism eventually disappeared. *Europe's Unemployment Problem* (Drèze and Bean, 1989) marked the end of a European specialty in macroeconomics (more below).[4]

Historians of macroeconomics have paid particular attention to GEMR in recent years, focusing mostly on their early developments (Backhouse and Boianovsky, 2013; Béraud, 2020; De Vroey, 2016; Plassard et al., 2021). First, they established that GEMR arose independently and almost simultaneously on both sides of the Atlantic (Barro and Grossman, 1971; Younès, 1970), under Patinkin (1965); Robert Clower's (1965), and Axel Leijonhufvud's (1968) influences. Second, historians stressed the central role of French and Belgian economists in the early developments of GEMR. Key figures include Bénassy, Drèze, Grandmont, Guy Laroque, Edmond Malinvaud, and Yves Younès. Third, historians shed light on many theoretical aspects of the research agenda, notably how to prove the existence of a general equilibrium with quantity rationing and fixed prices, to address the dynamics of non-clearing markets, and to link choice theory with aggregates. However, under which conditions GEMR became a European specialty remains an open question.

The existence of this European specialty is puzzling. On the one hand, U.S. economists did research on GEMR. Errol Glustoff (1968) offered the first proof that a general equilibrium with an inflexible-downward nominal wage and quantity rationing existed; Barro and Grossman (1971) pioneered the use of GEMR to study unemployment and inflation; and Richard Quandt (1976; 1982) discussed the difficulties posed by the estimation of GEMR. On the other hand, some U.S. universities offered an intellectual environment favorable to research on GEMR. Berkeley, Princeton, and Stanford are cases in point. Bénassy started working on GEMR while doing his PhD at Berkeley, under Gérard Debreu's supervision;[5] Younès found how to prove the existence of a general equilibrium with fixed prices and quantity rationing while visiting Debreu in Berkeley (Younès, 1975, p. 493); Wojciech Charemza applied GEMR to Centrally Planned Economies with the help of Quandt at Princeton (Personal Conversation); and Takatoshi Ito started to work on GEMR during his PhD at Stanford, under Kenneth Arrow's supervision. Therefore, why did GEMR thrive in Europe and not in the US?

We went through most of the articles and books devoted to GEMR over the period 1970–1994 to answer this question.[6] This led us to study not only the theoretical but also the empirical research based on GEMR. We also built our own dataset by carrying out 20 semi-directed interviews with economists who were involved in the development of GEMR in Europe.[7]

Three factors explain why GEMR became a European specialty. First, GEMR opened up a wide range of new research opportunities in areas in which European economists had specific research interests (Portes, 1987; Frey and Eichenberger, 1993): general equilibrium theory, econometric theory, and economic policy. Second, leading economists marshaled institutional resources to stimulate research projects on GEMR over the years. The most significant example is Drèze at the Center for Operations Research and Econometrics (CORE). Our article also brings light to the crucial role played by Hénin, Jean-Jacques Laffont, Volker Böhm, Claus Weddepohl, and Karl-Gustav Lögfren. Third, GEMR were considered relevant for addressing issues specific to Europe, namely persistent unemployment in Western Europe and planning in Eastern Europe. These three factors explained why research on GEMR took off and developed in France and Belgium before expanding all around Europe.

2. The pioneers

The period 1968–1976 marked the beginning of research on GEMR. Table 1 lists the pioneers in the U.S. and in Europe:

The pioneers' works show differences in the research strategies adopted in the U.S. and in Europe. Differences concerns how to

[2] Letter from Grossman to Solow, 31 October 1977, Box 3 OF-IUF-G5. Note that Hal Varian is American.

[3] Letter from Solow to Grossman, 3 November 1977, Box 3 OF-IUF-G5.

[4] Based on a bibliometric analysis, Goutsmedt and Truc (2023) also found that GEMR were a European specialty from the mid-1970s until the second half of the 1980s.

[5] Grandmont also did his PhD (1970) under Debreu's supervision at Berkeley. However, at the time, he focused on the development of general equilibrium theory under market-clearing conditions (Linnemer and Visser, 2018: p. 4).

[6] Results from the "European Unemployment Program" continued to be published after the publication of Drèze and Bean (1989). For instance, see Bean (1994).

[7] The list of interviewees includes Patrick Artus, Antoine D'Autume, Charles Bean, Dominique Bureau, Charemza, David de la Croix, Pierre Dehez, Avinash Dixit, Vladimir Dlouhy, Drèze, Miroslaw Gronicki, Pierre-Yves Hénin, Omar Licandro, Michel Lubrano, Didier Miqueu, John Muellbauer, Karl Pichelmann, Miguel Sebastian, Quang Vuong, and Bernard Salanié. Note that many other economists replied to our questions by e-mail (e.g., Volker Böhm, Werner Hildenbrand, Wim Driehuis, Jean-Michel Grandmont, Jean-Pierre Laffargue, and Lars E.O. Johansson). Any excerpt from these exchanges and our interviews shall be indicated by the acronym PC (for Personal Conversation) in the article.

Table 1
The pioneers in GEMR (1968–1976).

Countries	U.S.	France	Belgium	UK
Pioneers	Robert **Barro**, Errol **Glustoff**, Herschel I. **Grossman,** David **Howard**, and Richard **Quandt**	Jean-Pascal **Bénassy**, Jean-Michel **Grandmont**, Jean-Jacques **Laffont**, Guy **Laroque**, Edmond **Malinvaud**, Alain **Monfort**, and Yves **Younès**	Jacques **Drèze**	Richard **Portes**

address the microfoundations of macroeconomics, how to test GEMR, and the place of economic policy in research.

2.1. Different research strategies

Over the period 1970–1976, US and European economists started using GEMR to address the microfoundations of macroeconomics (Backhouse and Boianovsky, 2013; Béraud, 2020; De Vroey, 2016). The pioneers were Barro, Grossman, and Glustoff on the US side, and Bénassy, Drèze, Grandmont, Laroque, Malinvaud, and Younès on the European side. A comparative analysis of their research reveals a different use of general-equilibrium theory.

Glustoff (1968) used the fixed-point theorem to prove the existence of a general equilibrium with inflexible-downward money wage and an excess supply in the labor market. Moreover, he used his model to integrate money into general equilibrium theory. He concluded that his GEMR provided microfoundations to John Maynard Keynes' *General Theory* (1936).

By contrast, Barro and Grossman applied very little of the technical work in general-equilibrium theory to macroeconomics. Whether in "A General Disequilibrium Model of Income and Employment" (1971) or in *Money, Employment, and Inflation* (1976), they did not prove the existence of equilibria with quantity rationing. To explain the determination of production and employment under non-market-clearing conditions, Barro and Grossman only used graphs, not the fixed-point theorem.

Moreover, Barro and Grossman were not concerned with the gaps in general-equilibrium theory. Their use of the law of supply and demand is a case in point. Commenting on Arrow's (1959) problem, Barro and Grossman (1971, p. 85) acknowledged that "the inability of a firm to sell its desired output at the going price [violated] an assumption of the perfectly competitive model [i.e., the perfectly elastic demand curve]." They concluded that "if one wished to analyze explicitly the dynamics of price adjustments, it would be necessary to discard the perfectly competitive paradigm of the producer as a price taker" (1971, p. 85). However, they never broke with the assumption of perfect competition. Barro and Grossman (1976, p. 95) addressed the dynamics of non-clearing markets considering that price and wage changed according to the law of effective supply and demand. Therefore, the pioneers had different approach to the microfoundations of macroeconomics in the U.S.

The situation was different in the case of Bénassy, Drèze, Grandmont, Laroque, Malinvaud, and Younès. Besides addressing the microfoundations of macroeconomics, they all used GEMR to fill the gaps in general-equilibrium theory (Béraud, 2020). Younès (1970) addressed the integration of money and value theory. Drèze (1972) used market price rigidities to analyze resource allocation under the assumption of incomplete markets. Bénassy (1973) formalized the operation of exchange in a decentralized system.[8] Finally, Malinvaud and Younès (1974) used game theory to break with the Walrasian auctioneer while Grandmont and Laroque (1976) considered that economic agents set prices in an imperfect competition framework.

Moreover, all applied technical work in general-equilibrium theory to macroeconomics. Working papers cited above aimed to prove the existence of a set of general equilibria with market price rigidities and quantity rationing (Béraud, 2020). The task was difficult but Bénassy, Drèze, Grandmont, Laroque, Malinvaud, and Younès eventually offered existence proofs. They proved that non-Walrasian equilibria existed in a game theory setup (Younès, 1975; Malinvaud and Younès, 1977), under monopolistic assumptions (Bénassy, 1975; Laroque and Grandmont, 1976), and in a perfect competition framework (Drèze, 1975).

This points to one difference between the research strategies adopted in Europe and in the US. In Europe, all the pioneers considered that research on the microfoundations of macroeconomics was also an opportunity to reconsider general equilibrium theory.

Another difference concerns the place of economic policy in research. Over the period 1970–1976, Barro and Grossman mentioned the issue of economic policy only twice (1971, p. 87; 1976, pp. 61–62). The same applies to Howard, who only touched upon economic policy in the conclusion of "The Disequilibrium Model in a Controlled Economy: An Empirical Test of the Barro-Grossman Model" (1976). Finally, Quandt did not even raise the issue of economic policy. In "Maximum Likelihood Estimation of Disequilibrium Models" (1976), he reflected only on the difficulties posed by the estimation of GEMR.

However, economic policy was on top of Malinvaud's agenda. In his Yrjö Jahnsson Lectures (1976), Malinvaud used a GEMR to address unemployment policy. The central message was that governments' action should depend on the "regime" in which the economy is. Malinvaud argued that in a "Classical Regime," unemployment resulted from supply deficiency. The return to full employment therefore required reducing the costs of firms and encouraging the accumulation of capital. However, in a "Keynesian

[8] The three working papers were published in 1975.

Regime," unemployment resulted from demand deficiency. To curb unemployment, the best course of action was therefore to increase public spending. These results, later published in *The Theory of Unemployment Reconsidered* (1977), marked the beginning of a research program on economic policy in GEMR (Plassard et al., 2021; Renault, 2016).[9]

The third and last difference concerns how to test GEMR. On both sides of the Atlantic, econometricians had indicated problems with the estimation of GEMR. According to Quandt (1976), a general equilibrium may not exist when a rationing in one market affected demand and supply in another. Moreover, non-linearities within regimes could lead to multiple solutions. Quandt (1976) concluded that the existence of a reduced form was not guaranteed. In a review of disequilibrium econometrics (e.g., Fair and Jaffee, 1972; Amemiya, 1975; Goldfeld and Quandt, 1975), Laffont and Monfort (1976, pp. 29–30) also mentioned problems concerning the construction of the maximum likelihood function, its maximization, and the consideration of equilibrium and disequilibrium hypotheses in the same testing framework.[10]

Given these difficulties, there were two attitudes when testing GEMR. In the US, Howard took Barro and Grossman's (1971) specifications when the economy was in a situation of repressed inflation (general excess demand on markets) and checked whether they fitted the Soviet Union's data (1976, p. 844). The question was whether forced saving and forced leisure were observed. If yes, Howard argued, the test would have confirmed that the Soviet Union's economy was in a situation of repressed inflation. If not, Howard would have concluded that the Soviet Union's economy was not trapped in a regime of repressed inflation. A regular three-stage least squares method served to perform the test (1976, p. 844). Therefore, Howard saw no need to use disequilibrium econometrics.

However, Portes (1976) chose to apply disequilibrium econometrics to the case of centrally planned economies (CPEs). Instead of assuming the existence of chronic excess demand, Portes included the equilibrium and disequilibrium hypotheses in the same testing framework. Equilibrium was the null hypothesis and disequilibrium was its alternative. The empirical test was therefore conducted under the maintained hypothesis that quantities could either be determined by the equality between supply and demand, or by a minimum condition. This implied writing down a maximum likelihood function considering every regime. Since problems with the estimation of GEMR were still unsolved at the time, Portes (1976) focused only on the consumption goods market.

To conclude, early developments of GEMR differed on both sides of the Atlantic. The pioneers adopted different approaches to the microfoundations of macroeconomics and to the estimation of GEMR. They also differed in the place given to reflections on economic policy. The next section shows that these differences affected the dynamics of research on GEMR.

2.2. *Different research opportunities*

In Europe, all the pioneers furthered research on GEMR during the 1970s and 1980s. Some of them, such as Drèze and Laroque, even continued developing GEMR during the 1990s (e.g., Laroque and Salanié, 1993; Drèze, 1997). This contrasts with the intellectual paths followed by Barro, Glustoff, Grossman, Howard, and Quandt. Glustoff developed only one GEMR. Barro and Grossman, on their sides, had decided to abandon research on GEMR before the publication of *Money, Employment, and Inflation* (Plassard, 2021). The same applied to Howard, before the publication of *The Disequilibrium Model in a Controlled Economy* (1979). The sole exception was Quandt, who did not completely move on. In 1982, Quandt wrote a review on disequilibrium econometrics in which he discussed the progress in the estimation of GEMR (pp. 39–56). Later, Quandt (1986) addressed the misspecification problems posed by aggregation in GEMR. However, unlike Laffont or Monfort, Quandt never put the estimation of GEMR on top of his agenda. Quandt was more interested in the use of disequilibrium econometrics in partial-equilibrium frameworks. His extensive analysis of the US labor market, with Harvey Rosen, is a case in point (e.g., Quandt and Rosen, 1978, 1985, 1986, 1988, 1989).

Several reasons might explain why, on both sides of the Atlantic, pioneers followed such different intellectual paths. Our goal is to show that their research strategies were instrumental in the decision to further research or not.

While the 1971 article was still in press, Barro and Grossman were already working on the extension of their GEMR (Plassard, 2021). Their 1971 model was static, so it was natural to add a price adjustment rule and study the dynamics of non-clearing markets. Their model also ignored intertemporal choices, so they began to study the determination of exchange when economic agents anticipated price and quantity constraints. Yet, as early as 1971, Barro and Grossman considered that GEMR no longer offered research opportunities. In a letter sent to Barro on 24 May 1971, Grossman claimed:

> "So far in our work, we have assumed that all transactors have always been price takers, for whom it is not possible to get more by paying more (in any form). I think that once you relax this strong assumption, you are entering a world in which you must explain price and quantity behavior simultaneously – the world of Phelps, Mortensen et al. […] I do agree that there is not much more to be melted out of the fixed-price method, and that this should probably be the last paper along these lines."[11]

[9] Malinvaud was particularly interested in the relationship between unemployment policy and the dynamics of economies. For instance, he acknowledged that a stimulation of aggregate demand could (in the medium run) lead to an increase in wages and, in turn, to a lower profitability. The main issue, therefore, was to determine how to ensure a long-lasting decline in unemployment. Malinvaud addressed this issue in *Profitability and Unemployment* (1980a).

[10] Fair and Jaffee (1972) designed methods for estimating partial equilibrium models in which quantities were given by the minimum of supply and demand. They also used their methods for estimating a model of the housing and mortgage market. Both contributions gave birth to a voluminous literature on the econometrics of rationing.

[11] Grossman's papers, Box 3 OF-IUF-G5, John Hay Library Special Collections.

Barro and Grossman were not satisfied with GEMR. According to Grossman, the problem came from the assumption of perfect competition. In their framework, a market authority informed agents about the level of prices and rationing on markets.[12] Economic agents therefore knew with certainty the rationing on markets, and no individual action could change the level of quantitative constraint. This posed a problem to Barro and Grossman since it short-circuited the substitution between leisure and consumption. One solution could have been to break with perfect competition but they did not consider it. Instead, Barro and Grossman reoriented their research towards new modeling techniques, including search *à la* Phelps (1970).[13]

Like Barro and Grossman, European pioneers were concerned with the dynamics of non-clearing markets. Whether the economy could remain trapped in a non-Walrasian equilibrium became a central issue, notably for Bénassy (1976, 1978, 1984, 1986) and Malinvaud (1978, 1980a).[14] Modeling intertemporal choice was also a research priority. Bénassy (1973, Chapter 6) early addressed the issue in his PhD, and continued doing it thereafter (e.g., 1984, 1986). The same applies to Grandmont and Laroque (1977) and Malinvaud (1980a).

However, the extension of GEMR was not the only driver of their research. Research also focused on issues specific to general-equilibrium theory. The first issue concerned the conditions under which a non-Walrasian equilibrium existed. When offering existence proofs, Drèze (1975) and Bénassy (1975) assumed that agents could not manipulate rationing schemes. It meant that an economic agent could not increase the quantities bought (sold) by increasing her demand (supply). How did assumptions about rationing schemes affect the existence of a non-Walrasian equilibrium? Bénassy (1977), Grandmont et al. (1978), and Drèze and Müller (1980) provided answers. The second issue concerned the unicity of non-Walrasian equilibria. Under which conditions a non-Walrasian equilibrium is unique? The issue began to be explored by Laroque (1978, 1981). Therefore, the interest in general-equilibrium theory contributed to further research on GEMR.[15]

Finally, there is the case of Howard, Laffont, Monfort, and Portes. Howard's (1976) article is an excerpt from "The Disequilibrium Model in a Controlled Economy: A Case Study of the Soviet Union" (Howard, 1975), a PhD thesis prepared at the University of Virginia, which resulted in a book (1979). When comparing the empirical work in 1976 and 1979, there is nothing new. Howard (1979) used the same GEMR as in 1976, the same method for estimating it, and presented the same results concerning the existence of repressed inflation in the Soviet Union. This lack of novelty suggests that his approach to the estimation of GEMR offered no research opportunities.

The opposite was true for Laffont, Monfort, and Portes. How they considered the estimation of GEMR raised theoretical issues. For instance, it was necessary to identify the conditions under which a reduced form existed in a GEMR. Laffont and Monfort did it, with Christian Gourieroux, in "Disequilibrium Econometrics in Simultaneous Equations Systems" (1980). Second, the estimation of GEMR raised methodological issues. Because of the non-linearities introduced by switching regimes, it was complicated to compute the maximum likelihood estimator. It thus became a challenge to design proper maximization algorithms (Gourieroux et al., 1980, p. 76). Third, the estimation of GEMR raised issues at the material level. There was no software to estimate GEMR, so original computational programs had to be designed. One was built by Laroque, with Patrick Artus's and Gilles Michel's help, when working on "Estimation of a Quarterly Macroeconomic Model with Quantity Rationing" (Artus et al., 1984, p. 1395). Fourth, once methods for estimating GEMR were available, it was possible to test GEMR against data. With Artus and Michel, Laroque (1984) proposed the first of a long series of tests against French data (e.g., Laffont et al., 1984; Artus et al., 1985); with David Winter, Portes (1980) paved the way for the estimation of GEMR in centrally planned economies.[16]

Therefore, GEMR started to become a European specialty because of differences in the research strategies adopted on both sides of the Atlantic. Depending on whether there was an interest in general-equilibrium theory, disequilibrium econometrics, and economic policy, GEMR either offered many or few research opportunities. This explained why all European pioneers continued doing research on GEMR while Barro, Glustoff, Grossman, and Howard did not.

3. The intensification of research in France and Belgium

From the mid-1970s, research on GEMR intensified in France and Belgium. In both countries, the number of economists and econometricians involved (to varying degrees) in GEMR had more than tripled between 1976 and 1986.[17] Table 2 provides a non-exhaustive list. Our goal is to show that the pioneers' agenda translated into new research thanks to institutional support.

When Drèze circulated "Existence of an Equilibrium under Price Rigidities and Quantity Rationing" (1972), the reception was rather lukewarm at CORE. His article had been rejected from CORE's Working Papers Serie.[18] Dehez, on his side, recalled that Werner Hildenbrand and Gabszewicz had reservations about introducing disequilibrium transactions into general-equilibrium theory (Dehez,

[12] Barro and Grossman (1976, pp. 30-31 and p. 95) assumed a centralization of economic activities, thus echoing Léon Walras's auctioneer.

[13] This decision does not imply the interruption of research on what Barro and Grossman called "non-market-clearing macroeconomics." For more details, see Plassard (2021).

[14] For details on Bénassy's and Malinvaud's approach to disequilibrium dynamics, see Plassard et al. (2021).

[15] This raises the issue of why Glustoff stopped doing research on GEMR. One possibility could be that Glustoff felt isolated in the U.S. Unlike him, Barro and Grossman were not interested in problems specific to general equilibrium theory. Having no colleague to collaborate or even to interact, Glustoff would have therefore moved on. Information on Glustoff's intellectual path is required to confirm our explanation.

[16] Plassard (2023) explores the history of empirical works based on GEMR.

[17] For details on D'Autume's and Picard's contributions, see Béraud (2020).

[18] Grandmont's e-mail, sent on 25 May 2021. Grandmont spent three days a week at CORE between 1972 and 1973.

Table 2
New researchers in France and Belgium (1976–1986).

Countries	France	Belgium
New researchers	Patrick **Artus**, Antoine **D'Autume**, Sanvi **Avouyi-Dovi**, Jean-Claude **Berthélémy**, Danièle **Blondel**, Michel Benoît **Boissou**, Paul **Champsaur**, Olivier **Favereau**, Jean-Paul **Fitoussi**, Claude **Fourgeaud**, Frédéric **Gagey**, Rosa-Maria **Gelpi**, Michel **Lubrano**, Pierre-Yves **Hénin**, Jean-Pierre **Laffargue**, Bernard **Lenclud**, Pierre **Lévine**, Philippe **Michel**, Jeanne-Marie **Parly**, Pierre **Picard,** Bernard **Salanié**, and Quang **Vuong**.	Pierre **Dehez**, Stephan **Gepts**, Henri **Sneessens**, Jean **Jaskold-Gabszewicz**, Jean-Paul **Lambert** (plus Volker **Böhm**, and Werner **Hildenbrand**, as research fellows at CORE).

05/12/2021, PC).[19] For this reason, when starting his PhD (under Drèze's and Hildenbrand's supervision), Dehez did not choose to work on GEMR. Instead, in 1975, Dehez chose to work on the dynamics of stochastic equilibria in overlapping generation models.

According to Dehez, the situation changed at CORE in 1976. The launch of a series of seminars on Malinvaud's Yrjö Jahnsson Lectures was the game-changer. Drèze's initiative led several CORE members to start research on GEMR. With his brother Kurt, Werner Hildenbrand questioned Malinvaud's policy recommendations by showing their sensitivity to assumptions, particularly on households' expectations (1978). Gepts (1977) and Böhm (1978) discussed the conditions under which a non-Walrasian equilibrium was unique for a given set of wages and prices in Malinvaud's (1977) model.[20] Dehez and Jaskold Gabszewicz (1977, 1979), on their side, regretted that Malinvaud (1977)'s analysis remained static. By incorporating changes in money balances into his model, their goal was to study the dynamics of non-clearing markets. The resulting articles eventually formed the basis of Dehez (1980) PhD thesis.

At CORE, Drèze also stimulated research on the estimation of GEMR (Lubrano, 09/28/2021, PC). Around 1978, Jean-François Richard and Hans Tompa were working on a software for estimating a large variety of models with Bayesian econometrics. Originally, GEMR were not part of the models to be estimated. But GEMR eventually joined the list, under Drèze's influence. Moreover, to help Richard and Tompa, Drèze hired Lubrano, a young econometrician from Aix-Marseille University. Lubrano had just ended a PhD thesis on a limited information estimator, a topic that had nothing to do with disequilibrium econometrics. However, while working with Richard and Tompa and interacting with Victor Ginsburg and Sneessens, Lubrano ended up doing research on the econometrics of GEMR.[21] With Sneessens and Jean-Paul Lambert, another young economist from CORE, Lubrano tested a GEMR against French data (1984).[22] This marked the beginning of a research program, in France and Belgium, on the Bayesian estimation of GEMR.

Just like CORE in Belgium, the "center pour la Recherche Économique et ses Applications" (CEPREMAP) was instrumental in stimulating research on GEMR in France. On the one hand, Bénassy, Grandmont, and Younès influenced their colleagues at CEPREMAP. Gelpi and Fourgeaud are cases in point. While Bénassy, Grandmont, and Younès were working on existence proofs in GEMR, Gelpi's research focused on the history of the French Banking system.[23] The four economists, therefore, differed in their methodology and in their research topics. However, just like Gelpi, Bénassy, Grandmont, and Younès were interested in the role of money in capitalist economies. This resulted in collaborations. Gelpi ended up working with Younès on the introduction of banks (Gelpi and Younès, 1975, 1976) into GEMR, and with Bénassy on inflation (Gelpi et al., 1979). Fourgeaud, on his side, did not collaborate with Bénassy, Grandmont, or Younès. However, under their influence, he also ended up doing research on GEMR. With Lenclud, another colleague from CEPREMAP, Fourgeaud used GEMR to address the dynamics of non-clearing markets and how open economies worked (1979, Fourgeaud et al., 1980, 1984).

On the other hand, the CEPREMAP secured funding for research on GEMR. In "Two-Sector Model with Quantity Rationing" (1979) and "Dynamic Analysis of Disequilibrium" (Fourgeaud and Michel, 1980), Fourgeaud, Lenclud, and Michel acknowledged having benefited from the financial support of the Ministère de l'Économie, under a contract between CEPREMAP and the Direction de la Prévision.[24] New research on GEMR also occurred thanks to the financial support of the Commissariat Général du Plan. A contract

[19] Hildenbrand was a Research Professor at CORE from 1968 to 1976.

[20] Lévine, an economist from Paris VI University, visited CORE in 1975-1976, a period during which he worked with Böhm on "Temporary Equilibria with Quantity rationing" (1979, p. 377). Böhm was Assistant Professor at CORE between 1973 and 1977.

[21] With Asher Tishler and Israel Zang, two colleagues from Tel-Aviv University, Ginsburg (University of Brussels and CORE) designed a method for estimating partial-equilibrium models involving regimes switching Tishler and Zang, (1979, 1980). At the same period, Sneessens was preparing a PhD under Drèze's supervision. Sneessens adapted Ginsburg-Tishler-Zang's method to estimate a GEMR. This empirical work formed the bulk of his PhD thesis, "Theory and Estimation of Macroeconomic Rationing Models" (1980).

[22] Lambert did his PhD under Drèze's supervision. It is titled "Disequilibrium Macroeconomics Models: Theory and Estimation of Rationing Models using Business Survey Data" (1984).

[23] For instance, see "Les objectifs intermédiaires et les indicateurs de liquidité bancaire du système monétaire français d'après-guerre" (Gelpi, 1972).

[24] The same applies to Pierre-Alain Muet (1979, p. 4), for research on the microfoundations of large-scale macroeconometric models. According to Muet, GEMR offered a promising avenue to close the gap between microeconomics and models used in French planification. Malinvaud was on the same page (Renault, 2022). The relationship between GEMR and large-scale macroeconometric models later became a research topic at the Direction de la Prévision (Bureau et al., 1984a, 1984b).

between CEPREMAP and the French Planning Institution notably funded Laffargue's (1986) research.[25]

Then, there is the case of Paris I University, where Hénin stimulated new research on GEMR. Hénin became familiar with Clower's (1965) and Leijonhufvud's (1968) disequilibrium economics during his graduate study, thanks to Bernard Ducros (Hénin, 07/07/2021, PC). Interested in mathematical economics, Hénin worked on the construction of a general equilibrium model with quantity rationing in the early 1970s. Around the same time, Hénin created (with Henri Guitton) a new research unit, "Conjoncture et analyze des Déséquilibres" (CAD). Its original goal was to build a team where academics could advance research on the microfoundations of macroeconomics. No modeling technique was imposed. Yet, GEMR became a central topic of research at CAD. This is clear from Hénin's preface to *Études sur l'économie du déséquilibre*. Hénin indicated:

> "Since 1973, a group of academics has gathered at Paris I University to discuss research on the microfoundations of macroeconomics. The present book reflects their concerns: to emphasize the contributions of disequilibrium economics in the most general models [and its application] to growth, firms' behavior, monetary relationships, and stabilization policy (Hénin, 1980, p. 8; our translation)."

The "group of academics" included Antoine D'Autume, Danièle Blondel, Olivier Favereau, and Jeanne-Marie Parly. D'Autume (1980) used a GEMR to study the effects of income distribution on market dynamics. Favereau (1980), on his side, focused on economic growth and its regulation, while Blondel (1980) and Parly (1980) addressed economic policy. Neither Blondel nor Favereau or Parly continued working on GEMR after 1980. However, D'Autume and Hénin continued, stimulating new research on the microfoundations of macroeconomics.

Finally, there is the case of Toulouse University, where Laffont stimulated research on GEMR (Vuong, 09/21/2021). In 1978, Vuong was working on a research project in econometrics at Northwestern University. His supervisor, Marc Nerlove, had had access to INSEE's business survey data and wanted to study whether it matched with firms' actual decisions (production, investment…). At the time, there was no relationship with GEMR or, more generally, with disequilibrium economics. However, there was a change in perspective when Vuong visited INSEE's research unit in 1979. There he met Laffont, who proposed to use the same data to analyze the empirical implications of GEMR (e.g., the existence of regimes).[26] Vuong accepted the project along with an Assistant Professor position that Laffont had secured for him at Toulouse University. The research outcomes appeared in three articles written with Boissou, a colleague from Toulouse University (Boissou et al., 1984, 1986a, 1986b).

4. The expansion over Western Europe

From the mid-1970s, GEMR quickly disseminated across Western European countries, in particular Germany, the Netherlands, United Kingdom, and in Scandinavian countries. Table 3 provides a non-exhaustive list.

GEMR expanded over Western Europe for the same reasons they took off and developed along the Paris–Louvain axis (see Sections 2 and 3). First, GEMR benefited from the institutional support of some local leading academic figures who stimulated and fostered research on these models from the mid-1970s to the 1980s. Second, GEMR opened up new research opportunities in areas of knowledge belonging to European economists' specialties: general equilibrium theory and econometrics, to which we shall add applied macroeconomics (large-scale macroeconometric models). Curiously enough, GEMR also expanded in some Western European countries because they stimulated research in an area of research that Portes (1987, p. 1333) yet considered explicitly to be *not* within European economists' specialties, namely international macroeconomics.

4.1. General equilibrium theory

GEMR disseminated in Western Europe because they opened up promising avenues for research to mathematical economists specialized in general equilibrium theory. Two important challenges were the study of dynamics and the analysis of GEMR under stochastic rationing.

GEMR quickly raised the interest of mathematical economists in Germany from the mid-1970s. This included Hildenbrand, now at Bonn University. In 1977, Hildenbrand held a special session on Malinvaud's book at the Conference of the German Economic Association [Verein für Sozialpolitik] in Münster. Among the speakers was Reinhard John, a PhD student at Bonn working on GEMR under Hildenbrand's supervision (Hagemann, 2021).[27] Another conference took place in Germany in 1978, focusing exclusively on Malinvaud's book and GEMR (Hagemann, 2021). It was organized by the German Association for Political Economy [Arbeitskreis Politische Ökonomie], gathering critical economists including economists specialized in general equilibrium theory. The most influential of them, Winfried Vogt (Regensburg University), presented his interpretation of Malinvaud (1977) and GEMR (Vogt, 1979), which would have a strong and enduring influence on some young mathematical economists in Germany and Austria (e.g., Schittko and Eckwert, 1985).

[25] Laffargue's (1986) model was later tested against French data (Artus et al., 1987, 1993). For details on the history of empirical research led by Artus, Avouyi-Dovi, and Laffargue, see Plassard (2023).

[26] For more details on Laffont's research project, see Plassard (2023).

[27] Hildenbrand pursued his own agenda in general equilibrium theory (based on the core concept and statistical aggregation). But he kept supporting research on GEMR at Bonn University, which hired Hans Wiesmeth in 1981 after a PhD about "Fixed-price Equilibria and Non-tâtonnement Processes" (Hamburg, 1979).

Table 3
New researchers in Western Europe (1977–1985)[56].

Countries	Germany	Netherlands	UK	Scandinavia
New researchers	Bernhard **Eckwert**; Jürgen **Eichberger**; Wolfgang **Franz**; Kurt **Hildenbrand**; Reinhard **John**; Heinz **König**; Ulrich **Schittko**; Werner **Smolny**; Winfried **Vogt**; Hans **Wiesmeth**; Gerd **Weinrich**; Klaus **Zimmerman**	Peter **Broer**; Simon **Kuipers**; Marius **Kooiman**; Teun **Kloek**; Jan **Gunning**, Peter **Ruys**; Jan **Siebrand**; Klaas **Springer**; Claus **Weddepohl**; Frederick **Van der Ploeg**; Paul **Van den Heuvel**; Gerard **Van der Laan**; Sweder **Van Wijnbergen**	Avinash **Dixit**; Douglas **Gale**; Alan **Kirman**; Michael **Moore**; John **Muellbauer**; Paul **Neary**; David **Winter**	Michael **Blad** (Denmark); Seppo **Honkapohja** (Finland); Per-Olov **Johanson** (Sweden); Karl-Gustav **Lögfren** (Sweden); Lars **Mathiesen** (Norway); Erling **Steigum** (Norway); Lars E.O. **Svensson** (Sweden)

[56] This table only displays the countries in which GEMR involved a significant number of researchers. Accordingly, it does not include a few isolated researchers who yet contributed to the development of GEMR in the 1980s: Joaquim Silvestre (Spain), Renzo Orsi (Italy), Peter Stadler (Switzerland), and Manuel Vilares (Portugal).

From the mid-1970s, studying the dynamics of GEMR was at the top of the agenda, as it was regarded by many as a natural theoretical next step. The challenge of dynamics quickly brought many new researchers specialized in general equilibrium theory in GEMR. This was the case of Seppo Honkapojha, a Finnish mathematical economist at Helsinki University. As the scientific director of the Yrjö Jahnsson foundation (1975–1987), he managed to invite Malinvaud in Helsinki to deliver his famous lectures. Shortly after, Honkapohja embarked on studying the dynamics of GEMR (Honkapohja, 1979, 1980), often in collaboration with Takatoshi Ito. Honkapohja kept doing research on the dynamics of non-clearing-markets throughout the 1980s.

Studying the dynamics of GEMR also brought in Völker Böhm, in Germany. Böhm was the main speaker at Hildenbrand's special session in Münster (1977), where he presented one of the very first paper studying the dynamics of GEMR (Böhm, 1978). Using an aggregate and simplified version of Grandmont and Laroque (1976) in which consumers' money holdings change between periods (while price and wages remained fixed), Böhm (1978) showed that Keynesian equilibria were globally stable, unlike Walrasian and Inflation equilibria. Assistant Professor at CORE (1973–1977), Böhm became then Professor of Economics at Mannheim University – a hotbed for mathematical economics in Germany.[28] There, Böhm greatly contributed to stimulate research on the dynamics of GEMR, at first through his own theoretical contributions (e.g., Böhm, 1989). He also stimulated the interest of newcomers for GEMR, through his textbook on the microfoundations of macroeconomics (Böhm, 1980) – the first to be published in German– and his supervising of PhD students (e.g., Jürgen Eichberger, and Gerd Weinrich), as some of them pursued research on GEMR afterwards.

GEMR also raised the interest of mathematical economists in the Netherlands. In this process, Claus Weddepohl, the first Dutch economist *à la* Arrow–Debreu (Ramer, 2002), played a pivotal role. Teaching mathematical economics at Tilburg University, Weddepohl spent one year at CORE (1973–74) and created long-lasting contacts with specialists in general equilibrium theory, such as Drèze. Weddepohl started doing research on GEMR by the late 1970s on, while moving to the University of Amsterdam (UvA) to take the prestigious chair of mathematical economics. As for research, Weddepohl (1982, 1983a) studied how introducing increasing returns and multiple firms in GEMR affected the nature of disequilibrium regimes. Then, he touched upon the dynamics of GEMR (Weddepohl, 1983b, 1987), a topic on which he supervised Paul Van den Heuvel's (1983) PhD thesis. Moreover, Weddepohl stimulated research on GEMR in the Netherlands over the 1980s and well beyond. Under his impulse, his colleague at UvA, Gerard Van der Laan, started doing research on GEMR (e.g., Van der Laan, 1980, 1983). Both managed to hire Sweder Van Wijnbergen (more below), a Dutch researcher who eventually developed GEMR. Besides, GEMR also raised the interest of two Weddepohl's former colleagues at Tillburg, Frederick van der Ploeg and Peter Ruys (more below).

Besides dynamics, another challenge was to model GEMR under stochastic rationing. It also drew in many mathematical economists specialized in general equilibrium theory in Western Europe from the late 1970s. Existence proofs of GEMR had been provided by pioneers a few years ago (see Section 2), but appeared to hold on very different concepts of effective demands – namely the "Clower-type demand" (e.g., Bénassy, 1975) and the "Drèze-type demand" (e.g., Drèze, 1975). Bénassy (1977) pointed the issue and attempted to provide a synthetic concept based on perceived rationing schemes and quantity signals, covering both definitions. In doing so, he came to shed light on the diversity of rationing schemes used in GEMR (Bénassy, 1977, pp. 160–166). First, rationing schemes could be non-manipulable (e.g., uniform rationing) or manipulable (e.g., proportional rationing), depending on whether agents could influence or not the value of their rationing by increasing their level of demand. Second, rationing schemes could be deterministic or stochastic, depending on whether agents knew with certainty or not the rationing constraints they would face. Bénassy (1977) made it clear that existence proofs of GEMR required underlying rationing schemes to be both deterministic and non-manipulable.[29]

Bénassy (1977)'s reformulation of the concepts of effective demand was not enough, though, to some mathematical economists

[28] Another important figure at Mannheim was Heinz König. President of the university (1979-1982) and founder of the ZEW (1990), he encouraged empirical applications of GEMR through his supervising of PhD students, such as Klaus Zimmerman and Wolfgang Franz. The latter continued stimulating research in GEMR over the 1980s, through his research and his supervision of PhD students, such as Werner Smolny (1993).

[29] Bénassy (1977) noted that the existence of GEMR would vanish in (determinisitic) manipulable rationing schemes as a result of "overbidding", whereby some agents are induced to express a demand beyond their desired trades so as to displace the perceived transaction curve and to make impossible an equilibrium in quantities.

specialized in general equilibrium theory in Western Europe. This was the case of Svensson (1980), a Swedish mathematical economist at the Institute for International Economic Studies (more below). According to Svensson, a satisfactory concept of effective demand should "allow for (*i*) a distinction between effective demand and *trade*, and (*ii*) a definition of effective demand that involves some explicit maximizing behavior with respect to the resulting trade." (Svensson, 1980, p. 339) None of the existing concepts fulfilled these requirements: the Clower-demand fulfilled only (*i*), and the Drèze-demand only (*ii*). A proper concept of effective demand satisfying both requirements, argued Svensson (1980), also imposed to discard the deterministic rationing scheme. Modeling GEMR under stochastic rationing was thus the only way to provide a reliable measure of the size of "disequilibrium", i.e., agents' dissatisfaction about trades restrictions. Then, Svensson (1980) embarked on studying the demand of an agent facing the probability of being rationed (stochastic) to a fixed and predetermined maximum trade in each market (non-manipulable). For doing so, he relied on the highly abstract equilibrium concept with stochastic rationing recently crafted by Douglas Gale (1979), a specialist in general equilibrium theory at LSE.

However, Svensson (1980)'s application did not result in a feasible equilibrium, as shown by Jerry Green (1980). For this U. S.-based theoretician (Harvard), who collaborated actively with Laffont at the time, providing sound foundations to the concept of effective demand was fundamental for specifying the dynamic adjustment of prices in GEMR. Focusing on a special case of Gale (1979)'s model, Green (1980) argued that a proper modeling of effective demand required to assume a manipulable rationing mechanism. A prolific researcher along this line was Gerd Weinrich, Böhm's former PhD student (Mannheim) and then Research Associate at CORE (1983–1984). Over the 1980s, Weinrich followed suit and generalized Green's approach. After amending Green's results (Weinrich, 1982), he proved the existence of GEMR in stochastic and manipulable rationing schemes (Weinrich, 1984), and reinforced his case for stochastic rationing as the best possible way to model GEMR (Weinrich, 1988).[30]

Noteworthy, stochastic rationing was not confined to a discussion among mathematical economists specialized in general equilibrium theory. It inspired several applications in GEMR macro-models across Western Europe, such as Muellbauer and Portes (1978), Hans Jäckel (1980), Honkapohja and Ito (1985), and Gérard-Varet et al. (1990).

4.2. International macroeconomics

Research in GEMR was more scattered in UK. There was no real hotspot, except for Birkbeck College, which benefited from Portes's early and enduring commitment to GEMR (see above). After creating the Economics Department in 1972, Portes devoted a great part of his time to promoting research in economics across Western Europe, cofounding the "center d'Economie Quantitative et Comparative" in Paris (EHESS, 1978) and the Center for Policy Research (CEPR, 1983). However, Portes had enough time to foster research in GEMR at Birkbeck through several collaborations, in particular with David Winter. One of his other collaborators, John Muellbauer, developed Birkbeck's connections with the Paris-Louvain axis as he made a research stay at CORE in 1976. There, he saw "buzzing" GEMR (Muellbauer, 2018, pp. 5–6). On his return to Birkbeck, Muellbauer produced three influential papers for the development of the GEMR approach (Muellbauer, 1978; Muellbauer and Portes, 1978; Muellbauer and Winter, 1980).

Warwick University was another place of interest for the dissemination of GEMR in UK, and more broadly in Western Europe. The university became connected with the Paris-Louvain axis when Alan Kirman, Associate Professor at CORE (1970–72), was hired in 1973. Together with Michael Blad, his PhD student working on disequilibrium dynamics, they crafted a dynamic version of Malinvaud's (1977) model following Hildenbrand and Hildenbrand's (1978) insights. Their working paper "The long-run evolution of a rationed equilibrium model" circulated since 1978, before being eventually published in French (Blad and Kirman, 1985).[31] Blad's second supervisor was Avinash Dixit, who arrived at Warwick in 1974 after he had studied at MIT (PhD in 1968, with Robert Solow). Interested in public finance, Dixit started doing research in GEMR in quest for a unified framework allowing a joint analysis of both price and employment effects of stabilization policies (Dixit, 1976). In interview, Dixit (07/26/2022, PC) recalled the isolation that research in GEMR was suffering in UK. He himself made only a few contributions to this literature, consistently with what he described ironically as his "ADHD style of research" (for Attention Deficit Hyperactivity Disorder) jumping from one topic to the other in economics. However, one of his contributions (Dixit, 1978) was a path-breaking one as it paved the way to the vast literature about GEMR in open economies, which would become highly influential in Northern Europe.

In his pioneering article, Dixit (1978) extended Malinvaud's (1977) model to an open economy thanks to his "small-country" hypothesis. First, he assumed a single-good economy in which both the foreign-currency price p^* and the exchange rate e were fixed so that the domestic currency price was fixed alike: $p = ep^*$. Second, he assumed both domestic supply and demand to be perfectly elastic at the foreign price, so that quantity rationing could not occur on the goods market – thus discarding the possibility of any demand-constrained (Keynesian) unemployment. Accordingly, any discrepancies between domestic output and domestic demand resulted in a disequilibrium of the balance of trade. In Dixit (1978), small open economies suffered thus from disequilibrium regimes of a very different nature, depending on the pair of states of both the labor market and the balance of trade.[32]

[30] For a recent review of theoretical developments in stochastic rationing, see Weinrich (2002).

[31] After his PhD in 1979, Blad returned to Denmark at the Institute of Economics in Copenhagen University, where he kept contributing to research on the dynamics of GEMR (e.g., Blad and Zeeman, 1982). As for Kirman, he quickly moved to Aix-Marseille II in 1976, where he supervised another PhD thesis on disequilibrium dynamics, Robert Jordan (PhD in 1987), with whom he worked on the dynamics of GEMR. This resulted in two papers, together with Louis-André Gérard-Varet (Gerard-Varet et al., 1987, 1990).

[32] Dixit returned to the United States (Princeton University) in 1981. There, he pursued his research effort to provide new foundations to international macroeconomics, which resulted in a textbook in which he gave large room to GEMR (Dixit Norman, 1980, chapter 8).

In the wake of Dixit (1978), GEMR researchers quickly searched for alternatives to overcome what they perceived as its major shortcomings: the absence of spillover effects and any Keynesian unemployment in small open economies. A notable example is Peter Neary, an Irish scholar (University College of Dublin) who had started studying the role of expectations in GEMR in the late 1970s, together with Joseph Stiglitz (Neary and Stiglitz, 1983). To come over Dixit (1978), Neary (1980) assumed that small open economies produced and consumed two distinct goods: a "traded good" (internationally) and a "non-traded" good (domestically). This hypothesis was enough to allow for quantity rationing to occur on the (domestic) non-traded good market, thus restoring the possibility of Keynesian unemployment in small open economies.

Neary (1980)'s model became standard and quickly disseminated outside the UK, especially in Northern Europe.[33] Erling Steigum, a Norwegian economist at Bergen school of economics, took over Neary (1980)'s modeling by introducing an importable intermediate good (typically, oil) used in the two sectors. At variance with Dixit (1978) and Neary (1980), Steigum (1980) shifted attention away from the trade balance and studied how a sudden rise of price was transmitted in open economies and could generate either Classical or Keynesian unemployment.[34]

Neary (1980)'s augmented GEMR reached Sweden too, where his "traded vs. non-traded good" terminology echoed the "sheltered vs. exposed sectors" distinction (e.g., Lindbeck 1979). In this dissemination process, Karl-Gustav Lögfren (University of Umea) played a pivotal role, even being described the "father of GEMR in Sweden" (Johansson, 07/28/2022, PC). After his PhD thesis about GEMR written in Swedish (Lögfren, 1977), he made an extensive review of Malinvaud's book (Lögfren, 1978). Lögfren stimulated research in GEMR in Sweden throughout the 1980s, both through his publications (e.g., Lögfren, 1979) and his supervising of PhD students. Some of them did their PhD on GEMR but did not continue (such as Bertil Holmund, and Henry Ohlsson). Others, like Per-Olov Johansson, contributed to GEMR throughout the 1980s. Johansson and Lögfren quickly endorsed Neary's augmented GEMR to study trade issues (e.g., Johansson and Löfgren, 1981a,b, 1980). Together with John T. Cuddington, a Swedish-born international economist who had early settled in the USA (Princeton), they published the handbook *Disequilibrium Macroeconomics in Open Economies* (Cuddington et al., 1984).[35]

This handbook was published with the support of the Institute for International Economic Studies (IIES). Based in Stockholm, the IIES aimed to speed up the integration of Swedish economics within international standards, especially since Assar Lindbeck's directorship (1971–1995). Research priorities during the 1980s were the micro-foundations of macroeconomics and international trade issues, with a special focus on GEMR in open economies (Dixit et al., 1992). With only a few young permanent scholars, including Svensson, the IIES wished to an international outreach through his policy of visiting scholars. It did contribute to improve Swedish economists' connections with their Western European counterparts, as some made a stay at the IIES, such as Muellbauer (1976) and Neary (1979).

Northern European countries had another reason to develop GEMR in open economies. From the mid-1970s, many of them had become gas- and oil-exporting countries (Denmark, Norway, UK, Netherlands), but then suffered from a common economic problem. While energy prices and foreign investment rose, these countries faced an increase in their exchange rate which had a depressing effect on other exporting sectors in the economy. This phenomenon became soon famous as "the Dutch disease," for it was a much-discussed issue in Dutch policy-making circles. In turn, Dutch economists tried to account for this disease through various types of modeling, though they favored GEMR in open economies.

In this regard, Sweder Van Winjbergen (1984)'s approach is illustrative, as he compared both equilibrium and disequilibrium approaches for explaining the "Dutch disease." An equilibrium model with two sectors (Meade-Salter-Swan), he noted, might well portray the progressive decline of the traded sector resulting from a real appreciation of the exchange rate, itself caused by higher transfers from abroad after a rise in oil prices (or gas prices in the Dutch case). However, this model also implied that unemployed resources in the traded sector will be automatically drawn out and fully absorbed by the non-traded sector. Van Winjbergen (1984) argued that GEMR did not have the same shortcoming because it allowed for the possibility that inflation and employment effects would differ across countries, depending on how prices and wages were to react. Then, he showed how the mode of wage indexation determined whether a "Dutch disease" scenario would result in repressed inflation or classical unemployment. The challenge to account for the "Dutch disease" explains why research in GERM in open economies was particularly prominent in the Netherlands throughout the 1980s. It concerned not only Van Winjbergen (e.g., 1985, 1986), but also Gunning (1983), Van der Ploeg (1987), and Klaas Springer (1989). Besides, the "Dutch disease" also raised the interest of other European researchers in GERM, from Scandinavian countries to the rest of Western Europe (e.g., Neary, 1985), giving way to some cross-countries collaboration (e.g., Herberg and Enders, 1984; Neary and Winjbergen, 1985).

Albeit mostly located in North Europe, the development of GEMR in open economies was not without connections with the Paris-

[33] Neary followed this evolution, for he kept contributing to the development GEMR over the 1980s (e.g., Neary and Roberts 1980), in particular if related in open economies (e.g., Corden and Neary 1982) insofar as international macroeconomics progressively became one of his expertise domains – as much as Avinash Dixit.

[34] In the years after, Steigum (1983) refined the concept of classical unemployment and carried out his long-lasting ARMOD project aiming to simulate medium-run dynamics of a GEMR-based open economy (Steigum, 1987).

[35] From the early 1980s, and probably thanks to Cuddington and Dixit, research in GEMR in an open context became a bit more appealing to a few other American economists. The case of Robert Owen is interesting for our narrative (see section 1). After he had completed his PhD dissertation ("A two-country disequilibrium model of international trade and finance") under Quandt's supervision at Princeton in 1981, Owen decided to get closer Europe by making a long research stay at both CEPREMAP and CORE. There he matured research made in his PhD and eventually published a paper about GEMR in open economies (Owen, 1985).

Louvain Axis. A few French researchers had indeed followed this line of research from the outset (e.g., Younès 1978, Grandmont 1981), in particular Hénin who stimulated GEMR research on this topic (along with growth) in Paris 1 from the late 1970s on. He himself studied the impact of an oil shock (Hénin, 1983), and engaged in an intense collaboration with Philippe Michel and William Marois over the 1980s. The latter did his entire PhD thesis, under Hénin's supervision, on GEMR in open economies (Marois, 1980). Besides, French economists' connections with other Western European economists became obvious when Hénin organized an international conference in Paris on recent progress of research in GEMR in open economies. This resulted in a book *Déséquilibres en économie ouverte* (Hénin et al., 1985), with some contributions of Steigum and Lars Mathiesen (Norway), Neary and Michael Moore (Ireland), alongside other contributions of French scholars either based at or passing through Paris 1 (e.g., Hénin, Michel, Marois, Picard, Fourgeaud, and Didier Laussel).

4.3. Econometrics and applied macroeconomics

GEMR was also disseminated in Western Europe because it raised the interest of both econometricians and applied macroeconomists from the late 1970s. This was particularly true in the Netherlands, where large-scale models were most advanced and played an important role in research and policy-making. In the Netherlands, GEMR were regarded as a framework providing theoretical foundations for the current practice of large-scale models, but also as a baseline for improving these models in the future. This was typically the case of Simon Kuipers at Groningen University, who was deeply involved in the building of large-scale "vintage models" but yet explored the potentialities of GEMR for the study of growth and trade cycles (e.g., Kuipers, 1981).[36]

In April 1979, a Franco-Dutch conference took place at Tilburg, "Econometric Modeling in Theory and Practice" (Plasmans, 1982). It gathered French (e.g., Raymond Courbis, Alain Fonteneau, and Patrick Artus) and Dutch applied macroeconomists (e.g., Marius Kooiman, Theo van de Klundert, and Joseph Plasmans), who were all involved in both research and planning activities – respectively at the INSEE and the Central Bureau of Planning. The purpose of this conference was to explore connections between GEMR and the theoretical underpinnings of large-scale models (e.g., Plasmans, 1982, p. 2). It opened with a theoretical session, with keynote lectures by Younès ("Microeconomic Foundations of Macroeconomic Theory") and Peter Ruys ("Disequilibrium in Economics and Econometrics"). It was followed by sessions aiming to compare the properties of some large-scale models in use (METRIC, DMS, REGINA, MOGLI, and GAMA for France; GRECON, VINTAF II, and INTERPLAY for the Netherlands). It appeared that most large-scale models relied on some common notion of disequilibrium, in particular METRIC and INTERPLAY. They portrayed indeed the economy as if evolving in a Keynesian regime, insofar as output was assumed to be constrained by aggregate demand. They also took increasingly into account the role of supply-side factors through an intensive use of "tension indicators" on both goods and labor markets (e.g., capacity utilization, inventories, unemployment, vacancies, and liquidity ratios).

In the same year, Jan Siebrand – an applied macroeconomist at the Erasmus University (Rotterdam) also involved in the Central Bureau of Planning – claimed that GEMR offered "an ex-post justification for empirical macro-economic practices" (Siebrand, 1979, p. IX). These practices were the intensive use of adjustment lags and tension indicators in large-scale models, whose theoretical foundations were hazy but enabled to depict other disequilibrium regimes than the Keynesian regime. This was the case whenever unemployment occurred while firms produced at full capacity (i.e., the Classical regime), and firms' output was limited by the labor supply (Inflation). This was the very reason for the great interest of GEMR, according to Siebrand (1982, p. 235), who claimed that "the theoretical background of these tension indicators was revealed in the 1970s, when disequilibrium analysis became more explicit." Interestingly enough, similar observations were made in France by Malinvaud at the very same time (Renault, 2022).[37]

For Siebrand (1979, p. IX), GEMR also called for "new ways of empirical macro-economic model building." There was a long way to go, though. His book *Toward Operational Disequilibrium Macro Economics* precisely aimed at listing the obstacles that still prevented GEMR from being fully relevant to applied macroeconomics. In particular, he pointed out that the distinction between notional (ex-ante) and effective (ex-post) decisions was intractable in practice, insofar as statistical data provided no observation on these (latent) variables (Siebrand, 1979, pp. 27–28). To cope with this issue, he proposed to rely on tension indicators that disclosed information on firms' and households' trading plans. Siebrand provided other hints to adjust GEMR with the constraints of applied macroeconomics, such as replacing the minimum condition with a smoother device. Siebrand suggested thus that there was an alternative to the "Maddala-Nelson" econometric approach, which was developing in the 1970s and that he struggled to apply to a two-market model in a working paper with Peter Broer (Erasmus) since 1978.

This econometric strategy yet was about to come to fruition, notably thanks to the Ginsburgh–Tishler–Zang approach (see Section 3). This approach, together with other methods available by the late 1970s, paved the way to the first wave of econometric applications of GEMR in Western Europe: in Belgium (Sneessens, 1981), Portugal (Vilares, 1982), France (Artus et al., 1984). In the Netherlands, this task was carried out by two young econometricians of the prestigious Econometric Institute (Erasmus), namely Marius Kooiman and Teun Kloek (1985).[38] Thanks to Kooiman, Broer and Siebrand (1985) eventually succeeded in estimating their two-market model

[36] For details on Kuipers's professional career, see Fase and Van de Klundert (1998).

[37] Three French applied macroeconomists of the "Direction de la Prévision" [Forecasting Department] addressed the extent of these connections between GEMR and large-scale models (Bureau et al., 1984a, 1984b). For them, GEMR happened to solve issues that had resulted from the multiplication of large-scale models in France during the 1970s, such as unclear microfoundations. Besides, Didier Miqueu (06/23/2021, PC) and Dominique Bureau (10/12/2021, PC) underlined that GEMR provided a multi-regime framework which enabled to shrink tensions between modeler teams on the appropriate specifications (Neoclassical or Keynesian?) to adopt in large-scale models.

[38] For a comparative study of these applications, see Laffont (1985, pp. 338–341) and Lambert (1988).

by relying on the Ginsburgh-Tishler-Zang approach.

Siebrand's call for an alternative and more tractable econometric approach, which should allow a "gradual integration of the 'new macro economics' [GEMR] in macro-econometric model building" (Siebrand, 1979, p. X), was also about to come to fruition.[39] In his influential (and never published) working paper "Macrotheory vs. Macroeconometrics," Muellbauer (1978) forcefully argued that the minimum condition was implausible at the aggregate level. This caused discrete switching disequilibrium regimes and led to all-or-nothing ("bang-bang") explanations, contrasting with (more continuous) reality. The minimum condition was then said acceptable only if assumed on micro-markets. Accordingly, Muellbauer designed an alternative "smoothing by aggregation" approach, in which aggregate markets were seen as a continuum of micro-markets in disequilibria and varied smoothly with the proportion of markets in excess demand and excess supply. This approach resulted in a continuously time-varying mixture of disequilibrium regimes at the aggregate level, which quickly gave rise to a few empirical applications in one market (e.g., Muellbauer and Winter, 1980; Kooiman and Kloek, 1979). Malinvaud followed suit and crafted a full-fledged disaggregated GEMR (Malinvaud, 1980b), providing hints on how such a model built from micro-markets could be estimated through business survey data (Malinvaud, 1982). The latter presented the outcome of his research at a conference for the 25th anniversary of the Econometric Institute, which was celebrated by Siebrand.[40]

Lambert was the most influential craftsman of the micro-market approach, which he developed in his PhD (1981–84) under Drèze's supervision at CORE. Convinced that a simple econometric transposition of GEMR was "inappropriate for applied macroeconomics" (Lambert, 1988, pp. 6–7), he strove to give room to business survey data within the specification to be estimated. In assuming a (bivariate) lognormal distribution of excess demands and supplies on micro-markets, he obtained an aggregate CES (Constant Elasticity of Substitution) transaction function. Such a CES function was convenient because it depended only on observable variables and a parameter ρ, which was inversely related to the dispersion of excess demands and excess supplies on micro-markets estimated from business survey data.[41] From that CES function were derived useful analytical expressions such as the proportion of micro-markets in excess demand (supply) on both labor and goods markets, for which business survey data also provided direct information. These proportions were then used to give an analytical expression and a specific value to the latent variables (i.e., effective and notional demands/supplies), on which depended the value of demand multiplier in GEMR.[42] Once fully specified after Lambert's method, a GEMR could be estimated through traditional econometric methods such as Full-Information Maximum Likelihood (FIML).

The micro-market approach was also useful for macroeconomic policy. First, it made it possible to picture the dynamics of the aggregate economy as a smoothly but continuously time-varying mixture of the disequilibrium regimes, thereby making the value of the demand multiplier to vary over time.[43] This contrasted with the aggregate approach whereby an implemented (and, yet, properly diagnosed) cure could suddenly turn ineffective or even harmful with discrete switching. For instance, Artus et al. (1984) found that the Keynesian regime turned Classical within the first two semesters of 1976. Second, the micro-market approach accounted for the coexistence of vacancy (excess of labor demand) and unemployment (of labor supply) at the aggregate level. Current unemployment could be thus disaggregated and broken down into its structural (given by the dominant regime) and frictional (reduced to a mismatch phenomenon) components. Lambert's micro-market approach disseminated quickly from the mid-1980s.[44] It gave rise to a second wave of econometric applications of GEMR in Western Europe (Gerard and Berghe, 1984; Lambert et al., 1984; Sneessens and Drèze, 1986; Bleuze et al., 1988; Stalder, 1989; Franz and König, 1990; Smolny, 1993), and was the backbone of the "European Unemployment Program" (more below).

5. Persistent unemployment and planification

From the mid-1980s, GEMR kept expanding and attracting new researchers, who regarded this framework as relevant to address problems specific to Europe. Table 4 provides a non-exhaustive list. On the one hand, GEMR was used to handle planning issues in Eastern Europe. On the other hand, GEMR was used to account of persisting unemployment in Western Europe.

[39] This complete integration of GEMR into the large-scale models used for policymaking never really happened. André Dramais had such an ambition while modeling COMPACT at the European Commission in the first half of the 1980s (Acosta et al., 2023). However, he only applied GEMR to the labor market, confessing that "methodological problems for a full (and consistent) disequilibrium approach are, however, considerable." (Dramais, 1986, p. 122) Instead, GEMR gave birth to a new class of small-scale macroeconometric models for analyzing medium-run evolutions, such as Maribel II and MOISES that were respectively implemented at the Belgian Planning Bureau and the Spanish Ministry of Economic Affairs in the early 1990s (Sebastian, 09/14/2021, PC).

[40] In his recollection, Malinvaud (2006, p. 172) stressed that his contribution "was well accepted by the organizers of the meeting, who moreover had definite views on how the subject should be approached. It so happened that these views had a good degree of agreement with mine, particularly with respect to the relevance of tension indicators."

[41] Noteworthy, this CES function includes the aggregate case when the parameter ρ tends to infinite, that is, when the dispersion of excess demands and excess supplies on micro-markets tends to zero.

[42] For Laroque and Salanié (1995, p. 398), the main advantage of Lambert's method was not theoretical but empirical insofar as it alleviated the problem of latent variables.

[43] Lambert's (1988, Part 3) estimations for the Belgian manufacturing industry nuanced Sneessens's (1980) results.

[44] Econometricians and applied macroeconomists used to quote directly Lambert's (1984) PhD thesis, which took a while before being published (Lambert, 1988).

Table 4
New researchers in Western and Eastern Europe (1985–1990).

Countries	Western Europe	Eastern Europe
New researchers	Torben **Andersen** (Denmark), Javier **Andrés** (Spain), Charles **Bean** (UK), Michael **Burda** (USA/France), Juan **Dolado** (Spain), Wim **Driehuis** (Netherlands), Horst **Entorf** (Germany), Wolfgang **Franz** (Germany), Frédéric **Gagey** (France), Andrea **Gavosto** (Italy), Heinz **König** (Germany), Fatemeh **Mehta** (Belgium), Cesar **Molinas** (Spain), Peter **Neudorfer** (Austria), Benoit **Ottenwaelter** (France), Per **Overgaard** (Denmark), Fiorella **Padoa-Schioppa** (Italy), Karl **Pichelmann** (Austria), Miguel **Sebastian** (Spain), Werner **Smolny** (Germany), Michael **Wagner** (Austria), and Antonio **Zabalza** (Spain).	Wojciech **Charemza** (Poland), Vladimir **Dlouhy** (Czech Republic), Miroslaw **Gronicki** (Poland), Katalin **Hulyák** (Hungary)

5.1. Assessing the effects of planning

Economists developed GEMR in Eastern Europe. The list includes Vladimir Dlouhy (1984) in Czechoslovakia (Czechoslovak Academy of Science), Wojciech Charemza and Miroslaw Gronicki (1985,1988) in Poland (University of Gdańsk), and Katalin Hulyák (1985, 1989) in Hungary (Institute of Economic Planning). All four ended up developing GEMR, due to issues specific to CPEs.

Before working on GEMR, Dlouhy addressed the conditions under which neoclassical theory could be applied to CPEs in his PhD, "Unequal Models of Socialist Economies" (1983). Charemza and Gronicki, on their sides, applied Ray Fair and Dwight Jaffé's "Methods of Estimation for Markets in Disequilibrium" (1972) to the analysis of Polish maritime transport. This was the topic of their PhD theses, prepared at Gdańsk University (Charemza and Gronicki, 05/20/2021, PC). Charemza (1975) used disequilibrium econometrics to analyze the determination of quantities in the tanker market, while Gronicki (1975) focused on the bulk carrier market. Finally, Hulyak introduced input-output tables into an econometric model of the Hungarian economy, "M-4″ (Hulyak, 1973). She also contributed to the elaboration of large-scale macroeconometric models *à la* Klein, at the Hungarian Institute of Planning (Hulyak and Nyari, 1971; Halabuk et al., 1973). Therefore, the four economists became interested in GEMR because these models offered a tool for applying structural econometrics to CPEs.

Then, Dlouhy and Hulyak were interested in determining whether Czechoslovakia and Hungary experienced repressed inflation. Following Portes, Dlouhy (1981) used disequilibrium econometrics to test whether there were chronic excess demands for goods in Czechoslovakia. Later, he continued his research by elaborating on and estimating a GEMR of the Czechoslovakian economy (1984). Likewise, Hulyak (1982) addressed Portes and Winter's (1980) question in the case of Hungary, and later estimated a GEMR of the Hungarian economy (1985, 1989). Reflections over the existence of repressed inflation were therefore a driver in the use of GEMR in Eastern Europe.

Finally, the political context was favorable to the use of GEMR in Eastern Europe. What happened in the Hungarian economy is a case in point. Between 1979 and 1981, the Hungarian Socialist Workers' Party implemented a series of reforms to reduce market imbalances and speed up the insertion of the Hungarian economy into the international division of labor (Richet, 1981). This included a new policy for price determination. Instead of referring to domestic costs and the purchasing power of Hungarian households, the central planner had to set prices according to the value of foreign exportations. According to Hulyak, GEMR could help to clarify the effects of the reforms:

> "The stimulus of our economic situation led us to build a multimarket disequilibrium macromodel which aimed at analysis of foreign and domestic disequilibrium states of the Hungarian economy […] We hope that our model provides a tool for analyzing the interdependences of foreign and domestic disequilibria and hence the consequences of economic policy which aimed, first of all, at improving foreign imbalances. Believing in the importance of this question, we used a disequilibrium modeling framework to test the direction and size of responses (Hulyak, 1989, p. 248)."

To explain the relevance of GEMR, Hulyak reflected on her experience as a model builder at the Institute of Economic Planning. According to Hulyak (1989, p. 247), there were two gaps in the "M" models.[45] First, "the feedback from demand to supply [had] been neglected by model builders". The reason was that M models were supply determined. Output was determined by available inputs and then allocated by the central planner, according to his preference. Second, M models assumed equilibrium. This was a problem since "concrete economic policy and planning permanently with disequilibrium problems." (Hulyak, 1989, p. 247)

Due to the minimum condition, GEMR considered both supply and demand in the determination of quantities. Over the sample, markets could be in excess supply or excess demand. Quantities were determined by demand in the former case, and by supply in the latter case. Then, it was possible to elaborate a GEMR in which the central planner considered the existing disequilibria on markets and adjusted quantities accordingly. Charemza and Gronicki (1985, 1989) did it. Finally, GEMR allowed measuring the size of disequilibria on markets as well as the sign and the intensity of spill-over between markets. Hulyak concluded that GEMR offered a promising tool

[45] Throughout the 1970s, the different versions of "M" models were used in forecasting and economic policy simulations at the Hungarian Institute of Economic Planning (Welfe 1991, p. 220). For details on "M-1," "M-2," "M-3," and "M-4" models, see Harold Shapiro's review of macro-econometric models used in CPEs Shapiro, (1977, pp. 1756-1757).

for informing policymaking in CPEs. Charemza, Dlouhy, and Gronicki were on the same page.

5.2. Diagnosing persistent unemployment in Western Europe

From the mid-1970s, the GEMR framework was regarded as increasingly relevant to account for the stagflation and the troubles of economic policies in Western Europe. Again, Malinvaud's (1977) role was pivotal in spotlighting the effects of GEMR on policy-making. His simplified model exhibited a correspondence between the three main disequilibrium regimes and the constellation of exogenous variables (mainly prices and wages), which required alternative economic policies. He insisted on the dichotomy Keynesian-Classical unemployment, which called for opposite cures (i.e., to stimulate global demand or drop real wages). While stabilization policies hardly succeeded in curbing both inflation and unemployment in the 1970s, GEMR suggested it may be due to an error of diagnosis: stabilization policies (of Keynesian inspiration) were inefficient because the underlying regime was no longer (or not only) Keynesian.

In this context, GEMR fostered discussions on the nature of unemployment in Western Europe: was it Keynesian or Classical? In doing so, GEMR allowed for the revival of old schemes. Herbert Giersch hastened to claim that Germany was experiencing Classical unemployment from the late 1970s (Hagemann, 2021). His longstanding concern with curbing real wages led him to endorse and (wrongly) reinterpret the concept of Classical unemployment, claiming it was relevant not only in the short-run (unemployment caused by too high real wages), but also in the medium-run (by capital shortage), and in the long-run (by technological change) (Giersch, 1978, 1979).[46] At the same time, Michael Bruno and Jeffrey Sachs – influential in Western Europe albeit not Europeans – embarked on assessing unemployment in OECD countries in a wide range of publications, later gathered in Bruno and Sachs (1985). Discussing the issue using the Keynesian-Classical dichotomy, they focused on the second term (especially through the "real wage gap") to explain why stabilization policies in Western Europe had not cured stagflation, by contrast to the USA.

After the second oil shock (1979), the situation worsened in Western Europe, which was characterized by low growth, inflation, and rising unemployment. To boost the economy, (moderated) expansionary policies were being set up in Germany (1978–1979) and France (1981–1982), but these proved to be insufficient and provoked some perverse effects, such as trade deficits and monetary depreciation. This situation contrasted markedly with the USA, where the recovery was strong with a declining rate of unemployment after 1983. Some economists then argued that Western Europe had entered into a phase of "eurosclerosis," a term coined by Giersch (1985). Unemployment rose (reaching a peak of 11% in 1985) and became a top concern among Western European economists and policy-makers. However, uncertainty prevailed on the very nature of unemployment and how to cope with it through policy-making over the 1980s Fig 1.

The European Commission (EC) reflected this tension. The EC was equally concerned with the rise in unemployment in Western Europe, as illustrated in his 1984 *Annual Economic Report*, and equally uncertain on his very nature and how to cure it. From the early 1980s on, the EC (together with OECD) endorsed a "stability-oriented policy" (i.e., supply-side policies aiming at the medium-run stability of prices) and argued that unemployment was Classical (Maes, 2000, 1996).[47] However, a mixture of economic ideas (of French, German, and Britain traditions) long prevailed at the EC. In particular, the GEMR approach remained influential at the DG II (through Dramais, for instance) during the 1980s (Acosta et al., 2023). As for the diagnosis of unemployment in Western Europe, the EC's *Annual Economic Reports* contrasted sharply with those of the Macroeconomic policy group of the Center for European Policy Studies (CEPS), created in 1983 and funded by the EC (Maes, 2000, pp. 261–264). According to this group made of external experts (known as the "Dornbusch group"), unemployment in Western Europe was Keynesian and required concerted expansionary fiscal policies (Dornbusch et al., 1983; 1984). A compromise arose by the mid-1980s: both argued that curing unemployment in Western Europe required a mix of supply- and demand-side policies. This led to the EC's "Cooperative Growth Strategy for more Employment" and the CEPS's "Two-handed Approach" (Blanchard et al., 1985), in which Drèze took part. They diagnosed that unemployment had been provoked by a sudden but lasting drop in global demand during the 1970s, and then amplified by supply-side factors (e.g., rigidities in the labor market) over the 1980s. Accordingly, measures targeting only the supply- or the demand-side to cure unemployment were bound to fail. A "two-handed Strategy" was thus needed, and it called for collaboration between Western European countries.

Mass unemployment in Western Europe also became a top concern of economists during the 1980s (Bean, 1994), including for proponents of GEMR (e.g., Malinvaud, 1984). This concern was at the center of the international conference Chelwood Gate, held in May 1985 (Sussex, UK) and funded by the EC (DG V).[48] The original motivation was clearly set out by the organizers: "The rise of unemployment in Europe is one of the main economic problems of our time. It is also not easy to explain. Though unemployment has risen in most countries, the size of the increase differs greatly. There is much to be learned from a simultaneous attempt to explain the

[46] Giersch had an increasing influence on the Council of Economic Experts in Germany over the 1970s, which switched position and promoted supply-side policies in 1976 (Hagemann, 2000, p. 116). Later on, Giersch became involved in the CEPS Macroeconomic Policy group (more details below).

[47] The EC had endorsed a Keynesian view throughout the 1970s, supporting fine-tuning and concerted economic policies in Western Europe in which they figured they could play a role as a supranational entity (Maes, 1998, pp. 396–402). In particular, they supported the concerted macroeconomic policy defined at the Bonn G-7 Summit in 1978, whereby Germany accepted to act as a "locomotive" for Western European countries and set up a fiscal stimulus. The failure of that plan (abandoned by Germany after the second oil shock in 1979) was a trauma for the EC, which switched position and endorsed supply-side policies thereafter.

[48] Papers and proceedings were published in a special issue of Economica in 1986, and in a book (Bean et al., 1987).

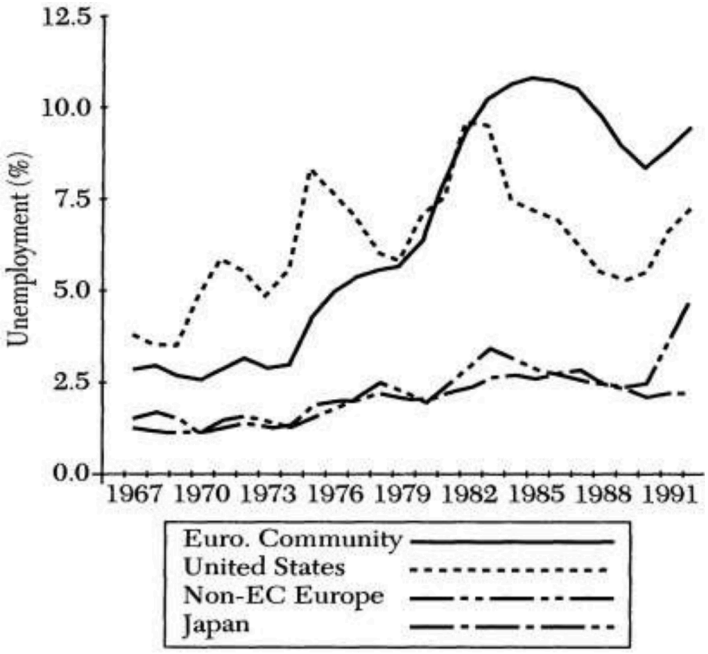

Fig. 1. Unemployment rates (1967–1992) (Source: Bean, 1994, p. 573).

experience of different countries." (Bean et al., 1986) For this purpose, 26 economists from 8 countries of the European community (plus Australia, Japan, and the USA for international comparisons) were invited.[49] All papers discussed against data the rise in unemployment since the mid-1970s in their home countries, with some of them adopting a fairly descriptive view (e.g., Franz and König, 1986; Malinvaud, 1986).

As for the general explanation of unemployment in Western Europe, indeterminacy also prevailed and resulted from serious disagreements on the theoretical frameworks to be applied. Bruno (1986) studied unemployment in OCDE countries through an AS-AD approach. In his keynote "Unemployment: Getting the Questions Right," Solow (1986) fired against explanations in terms of high real wages and the natural rate of unemployment (NAIRU). Layard and Nickell (1986) proposed such a NAIRU-based explanation of UK unemployment which they derived, however, from an imperfect competition framework.[50] In doing so, Layard and Nickell (1986, S121) aimed at overcoming "the fruitless debate now raging (especially in Europe) as to whether current unemployment is 'Classical' or 'Keynesian'."

Sneessens and Drèze (1986) put forth such a GEMR-type explanation of the rise in Belgian unemployment. Their model offered a synthesis of research advances in GEMR from the late 1970s. Their model was indeed a dynamic GEMR of a small open economy (Belgium) estimated with the Lambert method. Rationing did not result per se from price and wage, which were treated endogenously,[51] but from production constraints. Based on Sneessens (1980), the firm defined ex ante optimal technical coefficients (output-labor and output-capital ratios), which were fixed in the short-run and adjusted slowly to relative costs between periods. Given these production constraints, the firm's output – hence, employment – could be limited at each period by a sales constraint (Keynesian unemployment), by a capacity constraint (Classical unemployment), or by a labor supply constraint (Repressed inflation). The ensuing rates of capacity utilization and employment triggered in turn the adjustment of price and wage. The demand side included imports and exports, which offset disequilibria on the goods market. The dynamics of Belgian was described as a time-varying mixture of the three regimes, thanks to a procedure of aggregation over micro-markets (Lambert, 1984).

Frustrated by the inconclusive results of Chelwood Gate, Drèze proposed to participants that they meet again in order to agree on a theoretical framework, facilitating cross-national comparisons. The challenge was thus to identify properly the very reasons behind the rise and persistence of unemployment in Western Europe since the mid-1970s. This proposal resulted in the European Unemployment Program (EUP), a 10-country study supervised by Drèze and Bean and funded by the EC (DG II and V). The EUP focused on Western

[49] The Western European countries considered were the major ones of the then European community: France, Germany, Austria, Belgium, Netherlands, UK, Italy, and Spain.

[50] The conference at Chelwood Gate marked a turning point for Layard and Nickell's imperfect competition framework, which started disseminating in Europe. For more details, see Backhouse et al. (this issue).

[51] Sneessens and Drèze (1986) modeled price and wage adjustment so as to capture the inflation-unemployment trade-off and to address the relevance of the Non-Inflationary Rate of Unemployment (NIRU). Arguing the NIRU made no sense in a GEMR framework (Sneessens and Drèze, 1986, pp. S103), they crafted alternative concepts – NIRED (Non-Inflationary Rate of Excess Demand) and SURE (Structural Unemployment Rate at Equilibrium) – to estimate the role of supply-side factors (e.g., mismatch) on Belgian unemployment.

Europe (8 countries of Chelwood Gate, plus Denmark). As for international comparisons, only the USA was considered. An important purpose of the EUP was precisely to explain why unemployment in Western Europe contrasted sharply with the USA. Not all participants of Chelwood Gate accepted Drèze's proposal (e.g., Layard and Nickell), and new economists joined the EUP. The final squad included Frédéric Gagey (studying France), Benoit Ottenwaelter (France), Jean-Paul Lambert (France), Fatemeh Mehta (Belgium), Drèze (Belgium), Sneessens (Belgium), Bean (UK), Andrea Gavosto (UK), Horst Entorf (Germany), Wolfgang Franz (Germany), Heinz König (Germany), Werner Smolny (Germany), Peter Neudorfer (Austria), Karl Pichelmann (Austria), Michael Wagner (Austria), Wim Driehuis (Netherlands), Fiorella Padoa-Schioppa (Italy), Javier Andrés (Spain), Juan Dolado (Spain), Cesar Molinas (Spain), Miguel Sebastian (Spain), Antonio Zabalza (Spain), Torben Andersen (Denmark), Per Overgaard (Denmark), and Michael Burda (USA).

The first EUP meeting was held at the center for Labour Economics (LSE) in January 1986, where participants agreed on relying on a simplified version of Sneessens and Drèze (1986). The 25 economists involved in the EUP gathered then every 6 months during 3 years at the LSE or Louvain-la-Neuve to discuss technicalities and their empirical results. This collective endeavor resulted in another conference held in May 1988, Chelwood Gate II (Sussex, UK).[52] This also resulted in a book, *The Europe's Unemployment Problem* (Drèze and Bean, 1991a).

The EUP model comprised ten equations to be estimated for each country, using the micro-market approach. This collective work shed light on 10 empirical regularities, unfolding the specific traits of the Western European economy (Drèze and Bean, 1991b, pp. 58–59). They diagnosed that production and employment had adjusted to a reduced level of global demand (from 1975 to 1985) and high labor costs, leading to both a decrease in productive capacities and a strong capital-labor substitution over the years.[53] These factors, in turn, explained the contrast with the USA. First, the wage process formation was different in Western Europe, where productivity gains were quickly and fully incorporated into real wages. Hence, unemployment had no downward pressure on real wages and capital-labor substitution took place. Second, the USA had not experienced a similar decline in global demand from the mid-1970s as in Western Europe, thanks to low openness, sustained consumption, and repeated public deficits. This second factor pointed out the crucial need for a concerted macroeconomic policy in Western Europe.

The EUP's empirical findings and conclusions came to substantiate by and large the diagnosis and policy recommendations of the "Two-handed Approach." These were, however, refined in the 1987 CEPS report, "The two-handed growth strategy for Europe: Autonomy through flexible cooperation" (Drèze et al., 1987). The strategy envisioned rested on a long-lasting stimulation of global demand so that firms increase their capacities (targeting a more than 3% growth rate) while maintaining wage moderation (and even fiscal deduction on low-wages workers) to curb capital-labor substitution. Besides, the 1987 CEPS report argued that such a two-handed growth strategy would be efficient only if implemented together by Western European countries. Arguing that Western Europe overall was not more open than the USA or Japan, albeit each country one by one was more open (with some widely more open, such as Belgium and Luxemburg), this "autonomy" provided a room for cooperation that would limit externalities, such as deficit trade or competitive gains. The cooperation at play was then said "flexible" as it did not imply that the same policies be implemented in all Western European countries. To implement it only in some leading countries (France, Germany, UK, Spain, and the Netherlands) would be enough to get better results than any previous isolated expansionary policies (such as Germany in 1978–1979 and France in 1981–1983). In the context of extending the European integration, while the signing of the Single Act (1986) paved the way to a full-fledged EMU (Maastricht Treaty 1993), the two-handed growth strategy appeared to be a reasonable plan to cure the problem of mass unemployment in Western Europe.

6. Conclusion

From the late 1980s on, research on GEMR has become less and less dynamic in Europe. Such a decline was reflected in the publications of the *European Economic Review*, which had played an important role in spotlighting research on GEMR throughout the 1980s (e.g., Muellbauer and Winter, 1980; Ginsburgh et al., 1980; Kooiman and Kloek, 1985; Sneessens, 1987). Interestingly, the very same three factors that explain the rise and development of research on GEMR in Europe also account for its gradual loss of dynamism from the late 1980s onwards.

First, GEMR ceased to open up new research opportunities, but progressively merged into other research programs. This was notably the case of imperfect competition. Rationalizing fixed prices through imperfect competition had been an early concern in GEMR (e.g., Bénassy, 1973; Grandmont and Laroque, 1976), thus proving its connections with earlier developments in general equilibrium theory (Backhouse and Boianovsky, 2013, Chap. 7). Imperfect competition remained Bénassy's benchmark model thereafter (Plassard et al., 2021). Besides, more and more economists committed to GEMR embarked on studying these models in the context of monopolistic competition from the late 1980s on (Sneessens, 1987; Malinvaud, 1987; Licandro, 1992). Arguably, Arnsperger and de la Croix (1993) best captured the very purpose of this general move. In their paper "Bargaining and Equilibrium

[52] Some other economists took part in Chelwood Gate II, such as Malinvaud and Blanchard who made a keynote, replying directly to Solow (1986): "Unemployment: Getting the Questions Right – and Some of the Answers".

[53] Commenting on Drèze and Bean (1991b), Lögfren and Karlson (1990) praised the empirical findings of the EUP. They also argued that Sweden could have been easily included in the sample since its experience over the 1970s and 1980s was quite similar, as evidenced by Karlson (1988)'s estimations of a EUP-like model on Sweden.

unemployment: Narrowing the gap between New Keynesian and 'Disequilibrium Theories'," they showed how quantity rationing could be introduced into the recently-established standard monopolistic competition framework (Blanchard and Kiyotaki, 1987).[54] Alternatively, GEMR might have also ceased to open up new research opportunities because of its intrinsic limits which, according to Laroque and Salanié (1995), were increasingly patent in both disequilibrium dynamics and econometrics. For instance, d'Autume justified his shift to endogenous growth models in the late 1980s by the intractable analytical issues he met when addressing growth within GEMR (Plassard, 2021, p. 24).

Second, GEMR progressively lost the benefit of those leading economists who committed early to this framework and mobilized academic resources to keep stimulating research over the years. Drèze and Malinvaud remained active during the 1990s, and never really gave up supporting this line of research (e.g., Malinvaud, 2006). However, they lost a great part of their institutional resources when Malinvaud retired from INSEE in 1987, and Drèze stopped teaching and supervising PhD students in 1989.[55] Hénin could have played a leading role in France, especially when he became director of CEPREMAP (1991–2004). However, he opted for reorienting research at CAD (Paris 1) on new classical and real business cycles models by the late 1980s. These models offered "a technical revolution in macro, and we had to master its instruments," with the ultimate purpose to introduce imperfect elements of a new-Keynesian type (Hénin, 07/07/2021, PC). This gave birth to a prolific new generation of macroeconomists who got their PhD from Paris 1 University in the first half of the 1990s, such as François Langot (supervised by Hénin), Franck Portier, and Jean-Olivier Hairault. In other words, the French-Belgium axis that had been so instrumental for the dynamism of research in GEMR across Europe lost most of its leading figures during the second half of the 1980s.

Third, GEMR progressively lost their relevance among Western European macroeconomists to explain persistent unemployment. By the mid-1990s, Sneessens and Shadman-Mehta (1995, p. 256) noted bitterly that, nowadays, "real wage and labor market rigidities usually explained the persistence of unemployment in Western Europe." Such evolution reflected the rising influence of Layard and Nickell's approach (Backhouse et al., 2022; this issue). A symbolic turn in this regard was the conference "Mismatch and Labour Mobility" organized by Fiorella Padoa-Schioppa in Venice in 1990 (sponsored by the LSE and the CEPR, and funded by Directorate General V of the EC). Taking over the format of Chelwood Gate I, scholars from 8 countries were invited to study unemployment as a structural mismatch phenomenon in their home countries (Padoa-Schioppa, 1991). Regarding the decline of GEMR in Eastern Europe, the reason was more straightforward. When Eastern European communist regimes collapsed around the end of the 1980s, planning was no longer a major concern. The outcome was that economists such as Charemza and Gronicki (05/20/2021, PC) turned to other and more pressing economic issues.

Declaration of Competing Interest

We have no conflict of interest to disclose.

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[54] Backhouse and Boianovsky (2013, Chap. 9) argued that GEMR did not really vanish but rather inspired some of modern developments in macroeconomics, in particular monopolistic competition. However, how and why GEMR merged into monopolistic competition remains an open question that requires further analysis.

[55] Drèze regretted this decision because many of his PhD students had extended his own research interests, such as in GEMR. "In 1989, I made the mistake of giving up Ph.D. supervision, a mistake that I regret to this date. I mention this for the benefit of other early retirees. There is no doubt that my work in Bayesian econometrics or in empirical estimation of macroeconomic models with rationing, for instance, was substantially extended by my students, and enriched through interaction with them. A majority of these Ph.D. students had taken courses from me here, so the transition to a thesis topic was natural." (Drèze in Dehez and Licandro, 2005, p. 450)

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