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Preface

Most recent contributions to disequilibrium theory have a high level of abstraction. Empirical studies explicitly based on disequilibrium are still relatively scarce. However, empirical macro economics anticipated the theoretical development, and amalgamated classical and Keynesian elements often without a clear-cut formal base. Now a theoretical integration of neo-classical and neo-Keynesian economics seems under way. There is a renewed interest in the micro-economic foundations of macro economics with a special focus on the behaviour of economic agents operating in non-clearing markets. In some instances these theoretical developments offer an ex post justification for empirical macro-economic practices. Generally however, they call for new ways of empirical macro-economic model building.

This study operates on the border line between empirical macro economics and theoretical disequilibrium macro-economic theory. Our interest in macro-economic disequilibrium originates from the empirical side. Foreign trade relations for several countries revealed significant pressure of demand effects. Hence, the spillover of excess demand in domestic markets to foreign markets seemed a rather general phenomenon. This fact could be explained by a theory that states that actual demand for products from domestic firms will generally and systematically differ from the ex ante demand as suggested by equilibrium analysis. This latter demand concept comes close to Clower's 'notional demand' and Patinkin's 'potential demand'. Our first step in disequilibrium analysis was the construction of a model which determines this potential demand for domestic products as a function of potential imports and potential exports; the next was the development of an iterative estimation scheme for the empirical approximation of potential demand and its application to Dutch figures.

The idea that actual transactions could be conceived of as determined partly by neo-classical explanation schemes (based on items like prices) and partly by distribution devices such as rationing (often denoted as pressure effects) seemed general enough to try applications to other markets. The labour market held out a particular promise in this context. The analysis of wage-formation is generally based on disequilibrium schemes. Pressure effects are widely accepted in the analysis of short-term labour supply and furthermore there were signs that, for some periods in the sixties, actual employment in the Netherlands was suppressed

by labour scarcity.

Our effort to identify potential demand and potential supply in the Dutch labour market called for the development of a more general disequilibrium model, however, and a more general iterative approximation method. The model developed contains the conventional minimum model based on the so called principle of 'voluntary trade', i.e. with rigid prices actual transactions are equal to the minimum of demand and supply, as a special case. We argue that, as a rule, transactions are a compromise between the wishes of demanders and those of suppliers, more or less tending to the minimum. Technically this means that transactions are a weighted average of potential demand and potential supply, the weights of supply tending to zero in case of abundant excess supply (the Keynesian view of the thirties, applied to other economic conditions long after date) and transactions close to potential supply in periods of great excess demand (perhaps in a major part of the after war years, in which supply-oriented growth models became popular).

The application of ex ante/ex post analysis to partial models of product demand, and of demand and supply in the labour market, raises the question of their mutual integration. Our analysis of this question suggests that interpretable multi-market ex ante/ex post macro-economic models may be derived from rather conventional ex post models, under some simplifying assumptions. Theoretical feasibility of such ex ante/ex post models does not imply however that their implementation will be an easy task. In fact, the approximation to ex ante variables is generally a relatively complicated matter. Nevertheless, it seems worthwhile, as these models can contribute to the understanding of the behaviour of economic agents under the joint impact of equilibrium considerations and disequilibrium constraints. The further integration of short-term models and growth models, in particular, may benefit from ex ante/ex post analysis. To demonstrate this, we linked up with Hicks' theory of constrained cycles and built a two-market recursive dynamic model. In this model not only the labour-supply constraint, but also the availability of material production capacity – as a backbone of potential supply – together with potential demand for products and potential demand for labour, determine the transactions in both markets: production and employment.

In our view, the full scale empirical implementation of disequilibrium principles to macro-economic model building is not a matter of a few man-years; therefore, this book just gives some basic tools for a new approach with a few examples of their use. A large part of the hard work still remains to be done. We hope to have shown that the prospects for a gradual integration of the 'new macro economics' in macro-econometric model building are promising.

List of symbols

General

1) Lower-case letters stand for quantities in terms of constant prices or price variables.

2) Greek letters indicate coefficients.

3) Letters without a small o denote levels of variables.

4) Letters with a small o denote (annual) percentage

   changes of variables $(\overset{o}{x} = 100. \dfrac{x_t - x_{t-1}}{x_{t-1}})$.

5) The use of the symbol Δ preceding a variable indicates a first difference operation applied to that variable $\Delta x_t = x_t - x_{t-1}$.

6) Letters with a bar (−) denote average values; $\overline{\overset{o}{x}}$ denotes the average value of $\overset{o}{x}$, $\overline{x}$ denotes the average value of x.

7) Variables for the current year do not have a numerical suffix.
   They may or may not have the suffix t.
   A lag of 1, 2, ..., n periods is indicated by either −1, −2, ..., −n or t−1, t−2, ..., t−n.
   A lead of 1, 2, . . ., n periods is indicated by either 1, 2, . . ., n or t+1, t+2, ..., t+n.
   The suffix t4321 denotes a specific lag structure:
   $x_{t4321} = 0.4\, x_t + 0.3\, x_{t-1} + 0.2\, x_{t-2} + 0.1\, x_{t-3}$.
   The suffix 0 refers to a base year, the suffix 60 to 1960 etc.

8) The suffix au denotes an autonomous component of the variable under consideration.
   The suffixes d and s are used to indicate ex ante demand and ex ante supply

variables respectively, or, in the case of prices, anticipations of potential buyers and potential sellers respectively.

The suffixes de and se refer to effective demand and effective supply respectively.

The corresponding variables without a suffix indicate the (ex post) realizations. Where needed, ex ante variables are also labeled with an upper index p ('potential') to differentiate between ex ante variables without a clear-cut demand or supply nature and ex post variables. In Chapter 6 this upper index is combined with a second letter b ('business'), p ('private households') or w ('world'), to indicate anticipations of different agents.

9) As a consequence of their hypothetical character, the definitions of ex ante variables in this list are only rough, as the accurate meaning of these variables can only be defined in the context (model) in which they are used.

10) Labour-market variables referring to numbers of persons are denoted with the basic symbol 'a', variables based on 'constant-working-hours-man-years' with the basic symbol 'l'. These variables can coincide if no changes in working hours are assumed.

Specific

a_a	dependent labour force
a_b	employment in industry
a_{bd}	potential labour demand in industry
a_{bse}	effective labour supply for industry
a_c	total actual labour demand (industry and government)
a_d	potential total labour demand (industry and government)
a_g	government employment
Δa_m	net foreign migration of (potential) workers
a_n	capacity employment, including the impact of normal contractual working hours
a_p	number of frontier workers
a_s	total potential labour supply (industry and government)
a_{se}	total effective labour supply (industry and government)
a_y	dependent labour force corrected for frontier workers
a_{ys}	dependent potential labour supply corrected for frontier workers
a_z	self-employed labour force
b	exports of goods and services
b_d	export demand (goods and services)
b_g	exports of goods
b_{gd}	potential exports of goods
c	consumption

c_a	part of consumption planned ex ante
cap	production capacity
c_b	basic consumption
c_d	consumption demand
c_r	part of consumption fixed ex post
d_i	determinant i of potential demand
F	labour share in total income of industry
g	working-age population
g_x	working-age population corrected for external migrants
h_c	index number of contractual working hours per man per year
i	investment
i*	auxiliary variable investment determination
i_a	investment demand as determined by a curvilinear accelerator function
i_d	investment demand
i_l	investment demand as determined by a linear accelerator function
i_n	net investment
k	capital stock
l	employment (quantity of labour expressed in man-years based on a constant number of working hours per man per year)
L	wage income
l_b	potential labour demand, including liquidity effect
l_d	labour demand
Δl_e	change in capacity employment due to economic obsolescence
l_n	capacity employment (at normal utilization rate)
l_q	liquidity ratio of industry
l_s	labour supply
l_{se}	effective labour supply
m	imports of goods and services
m_d	import demand (goods and services)
m*	age of the oldest vintage of capital goods
m_g	imports of goods
m_{gd}	potential imports of goods
m_w	world imports (weighted according to export shares)
n_{ba}	net inventory formation expressed as a percentage of sales, in deviation of the average value of this percentage
n_i	total number of social groups, relevant for labour supply
n_D	number of demand determinants
n_S	number of supply determinants
o_b	overtime index
p	price
P	prediction
p_b	export price
p_b'	price of competing exports
p_c	consumption price
p_d	price anticipated by potential buyers

pl	wage rate (per man-year)
pl_b	wage rate per worker
p_m	import price
p_s	price anticipated by potential sellers
p_v	price of sales
p_y	price industrial production
q	relative excess production capacity
q_a	relative excess production capacity, measured in deviation from its average value
r	participation rate
R	realization
r^*	domestic participation rate apart from demographic factors
r_i	participation rate of social group i
r_s^*	upper limit of participation rate (saturation level)
s	scrapping
s_j	determinant j of potential supply
$t(T)$	time
u	weight generally used to indicate the relative importance of the anticipations of potential sellers; the specific meaning of individual u's is explained by the context
v	sales
v_n	domestic sales plus net exports of services
v_{n_d}	potential domestic sales plus net exports of services
w	unemployment rate
w^p	potential unemployment rate
x	transactions
x_d	potential demand
x_{de}	effective demand
x_s	potential supply
x_{se}	effective supply
y	industrial production
Y	value industrial production (income)
y_d	potential demand for products
y_{ed}	excess demand for products as a percentage of actual industrial production
y_i	component i of y
y_{i_d}	component i of y_d
y_{i_s}	component i of y_s
y_{la}	agricultural production in deviation from its trend
y_n	net production
y_{n_d}	net demand for products
$y_{n_{sk}}$	net material production capacity
$y_{n_{sl}}$	net product supply as conditioned by labour availability
y_p	real family income
y_s	potential supply of products

y_{sc} intended short-time supply of products (exclusive of the impact of the availability of labour and liquidities)

y_{sh} production at normal operating rates given contractual working hours of labour

y_{sk} potential supply of products based on capital availability

y_{sl} intended short-term supply of products including the impact of the availability of labour and liquidities

z   real nonwage income

Z   nonwage income

z/y   real share of nonwage income

SD   standard error of the regression

R^2 coefficient of determination

DW   Durbin-Watson ratio

Contents

1. Introduction

The main focus of this book is on the application of disequilibrium theory in empirical macro economics. In this introduction we will indicate how our work links up with that of others and for which fields our contributions may be of interest. For this purpose we will start with a brief discussion of disequilibrium in general and its role in the development of macro economics.

Usually, disequilibrium is defined indirectly: first the concept equilibrium is described and disequilibrium is interpreted as a deviation from that situation. Economic literature offers many, often rather different, equilibrium definitions. Hansen's Survey of General Equilibrium Systems (1970b) gives a recent global survey of some equilibrium concepts. We do not intend to present a new, more general definition which encompasses all former ones. A major reason for not attempting such a definition is that equilibrium definitions are closely related to the system to which they are applied, which tends to make any partial exploration of the equilibrium concept, which is unrelated to the underlying system, redundant. For our purpose, it will suffice to present some elements common in equilibrium definitions which may have an important bearing on the specification of disequilibrium. These elements are partly borrowed from Hansen's study.

The first element we want to mention is *constancy*, in the sense of the existence of a situation or configuration which is able to maintain itself under the whole of forces acting upon it. A constant situation implies a static solution to the model involved. A constant configuration can be conceived of as the existence of a solution of a dynamic system. The existence of a known value for any of the variables of the system for any future period is equivalent to Hicks' (1946) concept of dynamic equilibrium. An alternative and much more narrow definition of dynamic equilibrium requires the existence of constant rates of change or constant ratios.

An element of equilibrium in economic systems often mentioned is *equality of demand and supply* in one or more periods. This equality can be stated in terms of quantities (for a given price) or in terms of prices (for a given volume of transactions). The choice between both interpretations will depend on the nature of the assumed adaptation mechanism.

Related to this element is the *equality of realized and expected or planned*

demand and supply. If the former equality of demand and supply would hold only in ex post terms, this would imply that economic agents would not be able to adapt their behaviour according to their expectations or plans. The implied ex ante/ex post divergence could induce them to review their anticipations and hence this situation would tend to be unstable. Both equalities would hold only permanently if also ex ante demand would be equal to ex ante supply. Therefore a combination of the first element with the two other elements implies a fourth one: *equality of ex ante demand and ex ante supply.* Hahn (1973, p. 2) describes a similar element somewhat more general as: 'states in which the intended actions of rational economic agents are mutually consistent and can therefore be implemented'.

It is worth noting that Hahn is inclined to weaken this consistency criterion. In a preliminary version of what he thinks to be a more adequate concept he considers an economy in equilibrium 'when it generates messages which do not cause agents to change the theories they hold or policies which they pursue'. This implies that Hahn only requires that the actions of agents 'not be systematically and persistently inconsistent'. From this description it is clear that he reserves some margin for deviations between the anticipations of different agents and between planned and realized values per agent, which do not necessarily have to lead to a change of conduct. In a stochastic environment, some widening of the equilibrium concept along the lines envisaged by Hahn seems only realistic. However — as always — the price of widening a concept is a loss of content. The extension of economic systems with 'tolerance margins' for deviations that do not lead to adaptation of economic behaviour may be acceptable. But further attempts to generalize economic systems so as to enable the systems to generate equilibrium may endanger the very analytical power of the concept equilibrium. What really matters is not saving the equilibrium concept but the analysis of forces working in economic systems.

The existence of the dilemma just mentioned is clear from the inspection of systems that generate disequilibria. In many instances those disequilibria may be 'removed' by the integration in the system of the adaptation mechanisms triggered by the initial disequilibria. The further this integration is carried on, the bigger is the chance that the adapted system may generate equilibria. However, in the end the concept equilibrium looses its discriminatory character.

The preceding argument illustrates the fact that the equilibrium concept is not only linked to entities influenced by forces and adaptation mechanisms, but also to those forces and mechanisms themselves, or in the words of Hansen (1970, p. 3) 'the concept of economic equilibrium also requires specification of the forces working in or upon the economic system'.

Among other things, this implies that a situation classified as a disequilibrium from the point of view of the supposed functioning of the price mechanism may fall under the heading of equilibrium if also other — e.g. volume types of — adaptation processes are taken into account. Therefore it is theoretically acceptable to label a situation underemployment equilibrium, when supply exceeds demand in

the labour market. Of course, there is a considerable chance of confusion if the relation of the concept equilibrium to the underlying model is disregarded in this context. Macro economics seems to have suffered badly from this confusion. Apparently, the inheritance of classical equilibrium analysis — in which constancy, equality of demand and supply and equality of anticipations (plans and expectations) with realizations coincide — has been a very tainting one.

In spite of Patinkin's earlier and partly similar analysis (1956), it was mainly Clower's work (1965) and perhaps Leijonhufvud's support (1968), which succeeded in drawing broad attention for the disequilibrium character of Keynes' General Theory, which implies a possible divergence between anticipated and realized values. It took some thirty years before their work emerged. Much earlier, already in the thirties, Swedish economists from the Stockholm School pointed out, that a differentiation between ex ante and ex post values is · meaningful and illuminating.

However, by that time they did not succeed in giving macro economics a decisive new turn. Looking backward now, it is not easy to indicate why their view did not have more influence. Keynes' misunderstanding of the ex ante/ex post concepts may have played a role in this respect.[1] Perhaps the obvious objection that ex ante values are generally not directly observable was another reason; from the end of the thirties on econometric model building — based on ex post variables — had an important impact on macro economics. Whatever the reason, it is obvious that equalization of anticipations and realizations, and related to this, of demand and supply, has led to much confusion within macro economics.[2]

The opinion that *generally* aggregate demand determines transactions and hence the level of activity is perhaps the most widespread misconception in macro economics. One can hardly say that Keynes has done his utmost to prevent the emergence of such a doctrine. However, it is remarkable that it did take 30 or 40 years for the idea to get wide attention that not only 'classical' equilibrium analysis but also this piece of Keynesian disequilibrium analysis is rather a special case.

An analysis purely in ex post terms has hardly anything to contribute to the explanation of the role of demand in the determination of transactions. If ex post the equality of demand and transactions is looked upon as an identity, this implies the neglect of any kind of unsatisfied demand. The same line of thinking applied to the case of supply would imply abstracting from excess supply taking e.g. the form of unvoluntary unemployment or unintended stock formation. But if this line is followed, ex post transactions are equal to ex post supply as well. Therefore, taken as an ex post identity, equality of demand and transactions has a similar meaning as ex post equality of supply and transactions. This implies that there is only room for a special role of demand in the determination of transactions if *ex ante* demand is of special interest for the determination of transactions. To comment on this issue we will go into Clower's exegesis of the analysis of Keynes.

As Clower sees it, there is room for a special role of ex ante demand in the determination of transactions. Clower uses the concepts 'planned or notional' demand and supply to demonstrate that the anticipations of different economic agents may be inconsistent.[3] If families supply labour and demand commodities, and if firms envisage the opposite transactions, differences in the anticipations in both markets will not necessarily vanish under the influence of the working of the price mechanism. If prices are rigid this is evidently true. But even if prices are flexible to some extent — e.g. only in one market — it is not sure that both markets will reveal the correct information for the prices to change according to the ex ante inconsistence. In a monetary economy, money is the means of exchange and prices are expressed in money. Moreover, accumulation or decumulation of money can interfere with the spending circuit. Clower abstracts from the latter complication. He concentrates on the consequences of the assumption that the proceeds in one market precondition the spending possibilities in another market. More specifically, he assumes that families' labour income conditions their commodity spending. In that case an overestimation of demand for labour by families may induce those households to a 'dual decision' round in which commodity demand is adapted to the effective demand for labour (the amount of labour they can sell). For the commodity market this implies that effective demand — demand expressed in the market — will be lower than notional demand. Hence, the dependence on the earnings in the labour market may cause a divergence between the relative scarcity according to ex ante anticipations and relative scarcity as expressed in the markets. Clower stresses the difference between the ex ante equilibrium of notional demand and notional supply and the ex post equilibrium of their actual counterparts. If each agent aims to finance all his planned purchases completely (the conventional ex ante budget constraint), notional demand equals notional supply, both at an individual level and at the aggregate level. The ex post spending/earnings identity implies by definition equality of actual demand and actual supply at both levels. But if some agents find their transactions constrained by the anticipations of their trading partners the ex post levels of demand and supply are lower than the ex ante levels.[4]

We can accept Clowers argument that, dependent on the assumptions about relative speeds of adjustment of volumes and/or prices to budgetary constraints or prices, situations are conceivable in which the 'correct' information for a price adaptation as given by the ex ante scarcity relations is not expressed in the markets. If the adaptation of prices is deficient, households may be forced to adjust their demand for goods to the income they are able to earn, which makes income an independent determinant of spending. This argument can be seen as an attempt to justify the Keynesian consumption function.[5] In Clower's view, (at least) two types of relationships between income and spending of households exist. Ex ante planned demand for goods may depend on expected income, ex post effective demand for goods may depend on actual income. In the first relation income may be replaced by other economic variables such as prices, in the latter case income is an independent constraint, based on the character of a

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