Mesoeconomics

A Micro-Macro Analysis

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Preface

This book is an extension of the analysis contained in my *Economica* paper (Ng, 1982a), though certain aspects of the analysis were published earlier (Ng, 1977, 1980). All chapters contain mainly new arguments or extensions, except Chapter 3 (the first four sections of which correspond to the *Economica* paper), Chapter 10 (reproducing much of Ng and McGregor, 1983), and Chapter 11 (reproducing much of Ng. 1981).

Basically, a microeconomic analysis of a representative firm that takes account of the effects of macroeconomic variables (aggregate demand, aggregate output, average price) is used to model the responses of the economy (or an industry in Ch. 5) to economy-wide changes in cost, demand, expectation, and so on. It is believed that it is the simplest analysis that captures essential interactions at the macro and general-equilibrium level. It can be used to examine the effects on output and the price level of many changes, shedding light on important problems like unemployment and inflation. The simplicity of the analysis makes the book accessible not only to professional economists but also to advanced undergraduate and graduate students. To enlarge the potential readership, a note to non-mathematical readers follows this preface, and an intuitive explanation of the basic results is provided in section 2.1.

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A Note to Non-mathematical Readers

This book should be accessible to non-mathematical readers as most mathematical derivations are put at the back of the book in the form of mathematical notes. Although basic equations are displayed in the text, they are mostly very simple and easily understood. The only notations that may cause some unease with less mathematical readers are σ^{xy} and η^{xy}, but they can be easily explained. The symbol η^{xy} is the abbreviation of $(\partial x/\partial y)y/x$ and stands for the response of x with respect to a change in y only, in proportionate (or elasticity) terms. For example, η^{cP} stands for the (proportionate) increase in marginal cost c with respect to the price level P. The symbol σ^{xy} stands for $(dx/dy)y/x$ and represents the (proportionate) response of x with respect to an exogenous change in y, with all endogenous variables allowed to change. For example, $\sigma^{P\bar{c}}$ stands for the effect of an exogenous change in marginal cost on the final equilibrium price level (in proportionate terms) after all endogenous variables are allowed to adjust to the change. This depends on, among other things, how marginal costs respond endogenously to changes in the aggregate output Q and the price level P. Thus, terms like η^{cQ} and η^{cP} appear in the equation determining the value of $\sigma^{P\bar{c}}$.

With the above explanation, I believe that even readers untrained in differential calculus should be able to follow the equations. For those who still have difficulties with my equations, they should still be able to follow the exposition since all our results are stated in non-mathematical propositions and illustrated in simple figures familiar to all those who have done elementary microeconomics of a profit-maximising firm.

λ = labour (firm)
Λ = labour (economy, Chs. 9–10; union, Ch. 13)
M = $(p-c)/p$ (mark-up of price over marginal cost)
MCC = marginal cost curve
MRC = marginal revenue curve
μ = marginal revenue
N = number of firms
p = price (firm)
P = average price (economy, except in the case of oligopolistic competition in section 7.2, where P is the average price of the industry)
$\hat{P}$ = expected average price (economy)
π = average price (industry)
$\hat{\pi}$ = expected average price (industry)
q = output (firm)
Q = real aggregate output (industry)
r = rate of interest
R = real government revenue
R^i = real profit of firm i
s^j = $p^j q^j / \Sigma p^k q^k$ (share of firm j in the total value of output)
σ = total response elasticity, $\sigma^{xy} \equiv (dx/dy)/y/x$
t = indirect tax rate
T = income tax rate
w = real wage rate
W = money wage rate
X = non-negative expression defined under equation 10.4 on p. 152
Y = real aggregate output (economy)
Z = positive expression defined under equation 10.4

Contents

PART I
Introduction

1 Introduction

There are three principal methods of theoretical economic analysis (excluding statistical, historical, institutional, etc.). First, there is the partial-equilibrium microeconomics of the consumer and the (usually profit-maximizing) firm and the supply-demand analysis of a perfectly competitive industry. The advantage of this method is its simplicity, its rigorousness within its framework and its fruitfulness in terms of substantive results. Its principal weakness is its neglect of general-equilibrium repercussions and/or macroeconomic effects. Second, there is the macroeconomic analysis of the whole economy in terms of aggregates. This overcomes the disadvantages of microeconomics to some extent but loses its advantages as the postulated behavioural patterns of aggregates may not be consistent with the maximizing actions of individual economic units. The recent new microeconomics, or the study of the microeconomic foundation of macroeconomics,[1] is beginning to overcome this deficiency, which is however far from eliminated. Third, there is the general equilibrium analysis that analyses the whole economy by taking its constituent parts and their interactions simultaneously. In some sense, it overcomes the deficiencies of both partial-equilibrium microeconomics and aggregative macroeconomics and represents an important intellectual achievement. But it has its own shortcomings. First, due to the demanding requirement of general equilibrium, the analysis is usually only manageable and/or understandable by an average economist if conducted under a very restrictive set of assumptions, including the assumption of perfect competition.[2] Second, apart from establishing the existence of equilibrium, uniqueness, stability, Pareto-

optimality under various (usually highly restrictive) sets of assumptions, general-equilibrium theories typically provide very little, if any, substantive results that may serve, say, to predict the definite effects of a particular disturbance.

An attempt is made here to develop a method of economic analysis that avoids, at least in some respects, the disadvantages of all the three principal methods mentioned above. It concentrates on the microeconomics of a representative firm but takes account of the effects of macroeconomic variables (aggregate demand, aggregate output and the price level) on the firm. It is thus more than a partial microeconomic analysis but does not go to a fully general-equilibrium analysis of the Arrow-Debreu type. It deals with aggregates and averages but through the microeconomics at the firm level. It can be used to analyse the effects of industrial or economy-wide changes in costs, demand, expectations, and so on. It is thus somewhere between microeconomics and macroeconomics and between partial- and general-equilibrium analysis. Let us call it 'mesoeconomics'.

The concept of a representative firm was first used by Marshall (as far as I know). However, he used it to determine the normal supply price of a perfectly competitive industry. Here, the response of the representative firm is used to approximate the response of an industry or the whole economy, typically non-perfectly competitive. More importantly, the effects of macroeconomic variables and secondary disturbances are included in the analysis here.

Our non-perfect competition aspect resembles the analysis of imperfect competition in some respects. But the theories of imperfect competition need to be cast in general-equilibrium terms, as emphasized by Triffin (1940), who himself has not gone much further than delineating specific cases (pure monopoly, circular and atomistic homeopoly and heteropoly, etc.). On the other hand, modern studies of monopolistic general equilibrium have to be based, understandably, on some highly simplistic assumptions (not to mention the loss of comparative static results).[3]

Our analysis may be particularly reminiscent of Chamberlin's (1933) analysis of monopolistic competition, with his use of the pair of dd and DD demand curves. However, our analysis is used mainly for the whole economy, taking account of the role of aggregate demand, while Chamberlin's is exclusively for an industry. Second, while not attempting to downgrade the historical

contribution of Chamberlin, his analysis yields few comparative static results, as emphasized by Archibald (1961). The use of the representative-firm methodology allows us, as will be seen below, to derive definite comparative static results both for the short run and for the long run, both for aggregate output and for individual output (of the representative firm), and so on.[4] Without adequately imposing the characteristics required by a representative firm, the behaviour of an individual firm (in the presence of economy-wide or industry-wide changes) is largely unpredictable (lack of comparative static results). But the group of firms as a whole, and hence its representation in a representative firm, is fairly predictable. I cannot resist the temptation of noting the similarity in thermodynamics and quantum physics where an individual event (e.g. the movement of a particular molecule, the radiation of a specific particle, etc.) is unpredictable, but a large number of events conform to fairly strict laws (e.g. half life).

For many purposes we are interested mainly in the responses of the whole economy or an industry to certain changes, not so much in the responses of a specific firm. For these purposes a representative-firm analysis is adequate despite the approximation involved. This is clear if we recognize that (1) all theories abstract away some complications of reality, (2) it is better to have an approximate result than no result at all and (3) by the way the representative firm is constructed and the fact that secondary repercussions are taken account of, one may reasonably believe that the approximation will be acceptable, or at least superior to, a purely partial analysis or a purely aggregative analysis. In the spirit of positive economics, the acceptability of the approximation should be settled by the empirical testing of our propositions.

A question arises as to why one should concentrate on a representative *firm* rather than a representative *consumer*. The simple reason is that price and output decisions are made and changed by firms. Since we want to model changes in prices and output, it is most fruitful to concentrate on the firm. Consumers do exert important influences on the decisions of firms through the demand functions for firms' products and through the input supply functions which affect the cost functions of firms (see Ch. 13). For profit maximization, each firm must be in equilibrium with respect to its demand and cost functions. Moreover, a knowledge of these two functions is sufficient to determine the equilibrium price and output levels. Thus, the equilibrium position and the compa-

rative static effects of all changes can be modelled through these functions.

A theory abstracts away complicating features of the real world and concentrates on the relationships that are important for the problem at hand. This is especially true for an aggregative analysis, which must necessarily involve some simplification in the procedure of aggregation. In fact, even for non-aggregative general equilibrium analysis, drastic simplifications are still necessary. Our analysis is no exception. First, we take a firm to represent the whole industry or the whole economy. A theoretically most straightforward way to do this is to assume a number of identical or rather symmetrical firms.[5] Then, apart from changes in the number of firms, each firm is representative of the whole industry/economy. The methodological issues associated with non-identical firms are discussed in the next chapter, and a methodological justification of the representative-firm analysis is provided in Appendix 3I. It is shown there (i) that a representative firm exists that exactly represents the response of the economy in average price and aggregate output to any given economy-wide change in cost or demand, and (ii) that a representative firm defined by a simple method (weighted average) can be used as a good approximation.

Second, while the whole vector of prices, in general, affects the demand for the product of a firm, we shall simplify by taking account of just the price of the product, the average price of the whole industry/economy, (nominal) aggregate demand and the number of firms. Though this is a simplification, it is an advance over the traditional partial-equilibrium microeconomic analysis, and the degree of simplification is no more (probably less) than that of aggregative macroeconomics. Moreover, the microeconomic foundation is built into our analysis, and hence it is superior to the traditional aggregative macroeconomics in this respect. By putting the average price, instead of all other prices, in the demand function of the average firm, we are abstracting from the complication of different effects of different price vectors of the same average value. The full consideration of this complication will lead us to a full Arrow-Debreu-type general-equilibrium analysis, which is precisely what we wish to avoid. Hence, this complication is disregarded as likely to involve divergences of a smaller order of magnitude than the one we are interested in. Moreover, these divergences are likely to be offsetting to each

other. Their effects on the average magnitudes which we are interested in are likely to be quite negligible.

Mesoeconomics is *not* designed to analyse inter-firm changes or changes in relative prices but to approximate the effects of economy-wide (or industry-wide) changes on the average price and aggregate output by examining the responses of the representative firm; the less the change in relative prices, the better the approximation. For example, changes in output and price levels due to economy-wide demand-pull or cost-push factors, or due to industry-wide changes in costs or demand, are suitable subject matter for mesoeconomics. It is true that, in the real world, changes in relative prices are usually superimposed on the change in the price level. But these changes are mainly caused by other factors (e.g. changes in consumer preferences, differential changes in technical advance) and may thus be held constant under *ceteris paribus*. Our analysis thus differs completely from the aggregation literature (e.g. Gorman, 1953; Green, 1964, 1974; Muellbauer, 1975; von Daal and Merkies, 1984) which examines the inaccuracy involved in aggregation and conditions (usually very strict) for perfectly accurate aggregation.

In the case of an economy, it may be thought that we should at least put the average price of the industry, as well as the average price of the whole economy, into the demand function of the average firm. Since in this case, the representative firm is to represent the whole economy and not the industry, we may define it as a representative firm of a representative industry whose price will then move by the same extent as the average price of the whole economy. The two average prices may thus be combined into one.

Third, we assume initially that the representative firm is small enough to have no appreciable effects on the average price, aggregate demand, aggregate output and the number of firms. The complications of size and oligopolistic interdependence are examined in Chapter 7, with no significant effects on our results. Fourth, we shall be using mainly comparative static analysis with realized expectations (hence consistent with the assumption of rational expectations). Fifth, questions like joint products, non-price competition, and so on, will be ignored.

While we have made a number of simplifications as outlined above, we have also achieved some generalizations. Apart from the basic feature of combining macroeconomics and microecono-

mics, we allow the representative firm to be a perfect or a monopolistic competitor, or even an oligopolist (see Ch. 7). It is hoped that these generalizations, and the substantive results obtained, more than justify the simplifications involved. In addition, it may be noted that a simplified model is desirable when a method of analysis is first developed. Also, the simplified model allows our non-traditional results (such as the possible non-neutrality of money) to be seen in their proper perspective, instead of being mistakenly attributed to such complications as time-lags, misinformation or other factors (see e.g. Gale, 1982, Ch. 1), which do not provide usable insights for policy decision.

Mesoeconomics can be used to examine many problems of macroeconomics and microeconomics. For the important macroeconomic problems of inflation and unemployment, we may use it to examine how changes in aggregate demand, costs, expectations, and so on, affect output and the price level of the economy. This is regarded by Friedman as a most important unsolved problem: 'key need to remedy the defects common to all the models I have sketched [the quantity theory, the Keynesian income-expenditure theory, and Friedman's theory of nominal income] is a theory that will explain...the short-run division of a change in nominal income between prices and output' (Friedman, 1971, p. 48). We do not only provide a theory to explain (at least partly) the short-run division (see Ch. 3) but also to explain the long-run division (see Ch. 4). Friedman, of course, believes that in the long run, nominal aggregate demand does not affect real output. Our analysis shows that this may be true or false depending on the conditions of the economy. Since we assume the realization of expectations (hence our analysis is consistent with rational expectations), and since we use a comparative static analysis with no misinformation, time-lags, and so on, our results on the possible real effects of nominal aggregate demand under non-perfect competition may sound impossible to some money-neutrality theorists. But these results can be explained intuitively. An inter-firm macroeconomic externality (which differs from the income multiplier effect) is shown to exist that works through the effect of a reduction in prices of firms relative to aggregate demand in increasing the demand for other firms' products and real profits. This externality (which vanishes under perfect competition) may explain the existence of a low-level equilibrium with involuntary unemployment (see sect. 3.5). Our analysis suggests that an