AN INTRODUCTION TO INTERNATIONAL ECONOMICS

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sion–making in an open economy. On the other hand, the traditional theorems of descriptive trade theory (the Heckscher–Ohlin, Stolper–Samuelson, Rybczynski and Factor Price Equalization Theorems) are omitted altogether not because they are incapable of providing a Chinese student with insights into the working of the world economy but because they belong to the superstructure of international economics, not to its foundations; and the traditional but fruitless debate concerning the ultimate determinants of trade patterns has been relegated to a brief appendix (Appendix 1).

Chapters are divided into numbered sections. If reference is made from one chapter to a section of another chapter, both chapter number and section number are cited; for example, Sec. 4.2 is the second section of the fourth chapter. Similarly, eq. (5.10) is the tenth numbered equation of the fifth chapter.

A Message for Chinese Instructors in International Economics

In my lectures at the Shanghai University of Finance and Economics, and in the written record of those lectures, my objectives were necessarily limited. I had just four weeks at my disposal. In the time available, I could not pretend to provide a broad introduction to the subject matter of international economics. Instead I focussed on three broad and overlapping themes:

(a) The interdependent nature of the world economy and the need to think about it in terms of formal general-equilibrium models.

(b) The relevance of formal cost-benefit analysis to debates about Chinese economic policy.

(c) The potentially high rate of return to the use of elementary mathematics (including the calculus and linear algebra) in international economics. I believe that Chinese instructors will serve their students and their country best if they harp on the same themes.

The fact remains that, for a comprehensive exposition of international economics, instructors must look elsewhere. For the time being they will perforce rely on translations of one or the

other of the many excellent western texts currently available. (I list several texts at the end of this message.) However all such texts are deficient in their lack of attention to Chinese history, institutions and problems. It is highly desirable that a genuinely Chinese textbook be written and I hope that some of the young Chinese graduates of western universities, now returning to China in considerable numbers, will find that to be an agreeable task.

Elementary Textbooks

Caves, R.E. and Jones, R.W. (1988), *World Trade and Payments*, 4th ed. Boston: Little Brown.

Ethier, W. (1988), *Modern International Economics*, 2nd ed. New York: W.W. Norton.

Advanced Textbooks

Dixit, A.K. and Norman, V.D. (1980), *Theory of International Trade*, Cambridge: Cambridge University Press.

Jones, R.W. and Kenen, P.B. (1984), *Handbook of International Economics*, Vol.I, Amsterdam: North–Holland.

Kemp, M.C. (1969), *The Pure Theory of International Trade and Investment*, Englewood Cliffs, N.J.: Prentice-Hall.

Takayama, A. (1972), *International Trade: An Approach to the Theory*, New York: Holt, Rinehart and Winston.

Woodland, A. (1982), *International Trade and Resource Allocation*, Amsterdam: North–Holland.

PREFACE

The following pages are a distillation of lectures given at the Shanghai University of Finance and Economics during five weeks of July and August 1987, under the auspices of the Chinese University Development Project II. Most of those in the audience were young Chinese graduate students and instructors drawn from tertiary institutions across the country. The purpose of the lectures was to convey some notion of the scope and methods (and limitations) of the "western" theory of international trade and investment. It is hoped that in their published incarnation the lectures will serve a further purpose in easing the transition to the revised university curriculum in economics.

What is offered is an introduction to international economics for Chinese students who have mastered market economics at the "principles" level, have studied the multi-variate calculus and linear algebra and, most important, have learned to apply their mathematics in their economics. It is an introduction, not an elementary survey. As in the orginal lectures, the emphasis is on scope and method. Thus it is hoped that,by means of simple exercises in model-building and -manipulation, readers will learn to appreciate the interdependent or "feedback" nature of the world economy. And it is hoped that they will obtain a feel for the complicated cost-benefit calculations which must inform public deci-

Chapter One

The Scope of International Economics

1. Why international economics?

The world map of the economist and geographer consists of regions each of which is, in terms of climate and other resources, relatively homogeneous. It is natural, then, that the economist should be interested in quantifying and explaining the movements of resources and produced commodities across regional boundaries, that is, in constructing a theory of *inter-regional* trade and factor flows.

Evidently the direction and volume of inter-regional trade and factor movements depend on the regional distribution of natural resources and preferences and on the distribution of knowledge acquired by education and on-the-job training. But they can be modified, even reversed, by the economic policies of governments, of national governments in particular. Such policies may directly intervene at the national boundaries, as in the case of import duties and of quantitative restrictions on trade and investment; or they may influence trade indirectly by regulating the general level of activity and the relative scarcities of products and factors of production, as in the case of monetary policy. Moreover the primary focus of economic policy may be national rather than regional magnitudes. For these reasons,

and because data on commodity and factor flows are most plentiful at the national level, economists have found it useful to develop a theory of *international* trade and factor flows.

2. Scope and method

Traditionally, the theory of international trade has developed on the basis of some quite extreme assumptions concerning the intranational and international mobility of goods and factors. Indeed it has been customary to assume that each product or factor of production is *either* perfectly mobile within national frontiers but perfectly immobile across them or perfectly mobile in all directions. Thus international economics has emerged as the study of trade and factor movements between sovereign nations subject to the restriction that some products and some factors of production are by their nature unable to participate in trade or migration. Some have been tempted to *define* the subject in those terms. In recent times, however, trade theorists have learned to accommodate factors of production characterized by degrees of intersectoral and international mobility which depend on the cost of movement and on the time allowed for movement. Such a definition is therefore far too restrictive.

Similarly, the theory has developed on the basis of a rather simple-minded view of national sovereignty. Typically, it was not recognized that the attempt by one nation to exercise its power may provoke replies by other nations, so that the sovereignty of each nation is conditional on the objectives and strategies of

constitutionally subordinate to another. However these deficiencies are being remedied. The development of game theory, with its new perspective on the sources of power, has opened the eyes of trade theorists to topics ranging from tariff bargaining between governments to international cooperation in coordinating national fiscal and monetary policies; and , coinciding with a revival of interest in Marxian economics generally, there has appeared a new wave of western studies of the economics of imperialism.

International economics does not provide a set of propositions or precepts which can be immediately applied in practical policy–making or in accounting for the pattern of trade and factor movements during a particular period of time. Rather it provides a general approach to explanation and policy–making in an economy open to international trade and factor movements. Most important, it reveals the necessity of looking beyond the immediate, localized impact of disturbances for delayed responses in distant parts of the world economy; and of looking for feedback from a distance to the point of impact. In short, it imparts a heightened awareness of the interactions of the several components of the world economy.

This training is provided by a series of exercises involving simple representations or models of the world economy. The models abstract from many features of the world about us. They may contain only two produced commodities and one factor of

production. But even such models can be useful in isolating a relationship which,in more complicated models, may be obscured.

International economics goes back to Adam Smith (1723—1790) and David Ricardo (1772— 1823). Not surprisingly, then, it is heavily oriented towards market economies. Throughout the pages which follow I shall confine myself to models of equilibrium, that is, representations of the economy in which all markets are in balance, with the quantity demanded equal to the quantity supplied. The training exercises then concern the manner in which the equilibrium responds to changes in the basic data—preferences, technologies, and endowments.

A typical proposition from international economics tells us how a trading country (or group of trading countries) with specified characteristics responds to a disturbance. The disturbance may be man—made (an import duty, foreign aid or the development of a new product) or it may be a natural phenomenon (unusually good or bad weather). It may be quite small (the marginal adjustment of a tax) or it may radically change the whole pattern of production and distribution (the formation of a customs union or the abandoment of foreign trade), that is, it may be *local* or *global*. The response to the disturbance may be recorded in terms of commodity outputs, commodity prices, the distribution of income, imports, exports, net borrowing or the general wellbeing of the residents.

It should not be imagined that international economics has

handled all questions with equal success. In later chapters we shall move back and forth between local and global questions, and in the first appendix we discuss a traditional global question. To anticipate just a little, it will emerge that local questions have been treated much more satisfactorily than have global questions.

References

On questions of scope one cannot do better than read the treatises of Ohlin (1933) and Haberler (1936), now more than fifty years old; for a good recent treatment, see Bhagwati and Srinivasan (1983, Lecture 1). For a survey of game-theoretical formulations of the theory of international trade, the reader may consult McMillan (1986). For a survey of recent western studies of economic imperialism, see Willoughby (1986).

Chapter Two

The Construction and Manipulation of a Model of a Closed Economy

In this chapter it is shown how to construct a very simple model of a closed economy. The raw materials of the construction are expenditure and revenue functions the main properties of which are listed in Appendix 2. The purpose of the chapter is to give the reader some practice in the construction of equilibrium systems and in their manipulation. Throughout the chapter, and the three following chapters, it will be assumed that all individuals are exactly alike in preferences, abilities and asset holdings so that, collectively, they behave like a single price-taking individual. Moreover, it will be assumed that there are just two produced goods, each of them a pure consumption good, and that there are just two primary factors of production, each supplied in fixed amount, independently of commodity prices and factor rewards. Finally, it will be assumed that production can be carried on efficiently in specialized productive units, that is, that there is no intrinsically joint production. Evidently there can be no pretence that our model faithfully represents every feature of the world about us, or even that it captures all of those aspects of interest to economists. It is claimed, however, that it enables us to isolate some of the more important relationships and to study their properties.

1. The model

In any equilibrium, the purchases of each individual, and therefore of the collectivity of individuals, must satisfy a budget constraint. Thus

$$E(p_1,\ p_2;\ u) \leqq R(p_1,\ p_2;\ v_1,\ v_2) \tag{1}$$

where p_i is the price of the ith commodity, in any unit of account, u is the utility or wellbeing of the typical individual, v_j is the total available amount of the jth primary factor of production, $E(p_1,\ p_2;\ u)$ is the minimum expenditure needed to ensure that each individual attains the level of wellbeing u when prices p_1 and p_2 prevail, and $R(p_1,\ p_2;\ v_1,\ v_2)$ is the maximum value of output attainable when prices p_1 and p_2 prevail and the endowments v_1 and v_2 are available. (E and R are expressed in the same units as prices.) In any equilibrium with positive prices and unsatiated individuals (the only kind of equilibrium we will consider), (1) will be satisfied as an equality. Under the same conditions, the demand for each commodity must equal the supply, that is,

$$E_i(p_1,\ p_2;\ u) = R_i(p_1,\ p_2;\ v_1,\ v_2) \quad i=1,\ 2 \tag{2}$$

where $E_i \equiv \partial E / \partial p_i$ and $R_i \equiv \partial R / \partial p_i$. If the factor endowments are treated as known constants, equations (1) and (2) form a complete system. However, one of the equations is redundant. This can be verified by multiplying each side of (2) by p_i, summing over i, and recalling that E and R are homogeneous of

degree one in prices. On the other hand, in view of the homogeneity of E and R, we can hope to solve for price ratios at most. Thus the loss of an equation is matched by the loss of a variable. Any of the three equations can be abandoned and we can still hope to solve for utility and the price ratio p_1 / p_2. Let us drop the second of the two members of (2), so that our system reduces to

$$\begin{aligned} &E(p_1,\ p_2;\ u) = R(p_1,\ p_2;\ v_1,\ v_2) \\ &E_1(p_1,\ p_2;\ u) = R_1(p_1,\ p_2;\ v_1,\ v_2) \end{aligned} \tag{3}$$

or, recalling the homogeneity of E and R and writing $E(p_1 / p_2,\ 1;\ u) \equiv e(p;\ u)$ and $R(p_1 / p_2,\ 1;\ v_1,\ v_2) \equiv r(p;\ v_1,\ v_2)$, to

$$\begin{aligned} &e(p;\ u) = r(p;\ v_1,\ v_2) \\ &e_p(p;\ u) = r_p(p;\ v_1,\ v_2) \end{aligned} \tag{3'}$$

where $e_p \equiv \partial e / \partial p$ and $r_p \equiv \partial r / \partial p$. It will be assumed that there is a unique solution $(p^*,\ u^*)$ to (3'), with $0 < p^* < \infty$.

The solution to (3') tells us nothing directly about quantities produced, factor allocations and the prices of factor services. However, once (3') has been solved for p^* and u^*, the additional information is easy to obtain. Thus we know that

$$R_j(p_1,\ p_2;\ v_1,\ v_2) = p_2 r_j(p;\ v_1,\ v_2)$$

where $R_j \equiv \partial R / \partial v_j$ and $r_j \equiv \partial r / \partial v_j$. Hence

$$(w_j / p_2)^* = r_j(p^*;\ v_1,\ v_2) \quad j = 1,\ 2 \tag{4}$$

where (w_j / p_2) is the price of the jth factor service in terms of the second commodity (so that $(w_j / p_2) / p$ is its price in terms of the first commodity). Moreover,

$$\begin{aligned} x_1^* &= r_p(p^*;\ v_1,\ v_2) \\ x_2^* &= r(p^*;\ v_1,\ v_2) - p^* r_p(p^*;\ v_1,\ v_2) \end{aligned} \tag{5}$$

Finally, $x_i^* \hat{G}_j^i((w_1 / p_2)^*,\ (w_2 / p_2)^*)$ is the amount of the jth factor employed by the ith industry, where $\hat{G}^i$ is defined in terms of the unit cost function $G^i(w_1,\ w_2)$ by the equation

$$p_2 \hat{G}^i(w_1 / p_2,\ w_2 / p_2) = G^i(w_1,\ w_2)$$

and $G_j^i = \partial G^i / \partial w_j = \partial \hat{G}^i / \partial (w_j / p_2) = \hat{G}_j^i$ is the average amount of the jth factor employed by the ith industry. (The unit cost function is defined in Appendix 2.)

The pair of equations (3′) describes an equilibrium. But the equilibrium loses much of its interest if it is dynamically unstable, that is, if the economy fails to return to that position after being dislodged from it. Let us suppose, therefore, that the economy is stable, at least in a neighbourhood of the equilibrium. The assumption implies some restrictions on the structure of the economy, and those restrictions will be useful to us in our study of the economy's equilibrium.

There are many ways in which an economy might behave out of equilibrium. In the present introductory treatment, I consider one only of them. Suppose that the relevant price of the first

commodity rises if there is an excess demand for that commodity and falls if there is an excess supply, so that the dynamic version of (3′) is

$$\begin{aligned} e(p_i;\ u) &= r(p;\ v_1,\ v_2) \\ \dot{p} \equiv dp/dt &= e_p(p;\ u) - r_p(p;\ v_1,\ v_2) \\ &\equiv z^1(p;\ u;\ v_1,\ v_2) \end{aligned} \tag{6}$$

where z^1 is the excess demand for the first commodity. Linearized at $(p^*,\ u^*)$, the system reduces to

$$\dot{p} \equiv dp/dt = z_p^1 \cdot (p - p^*) \tag{6′}$$

For local stability, then, it suffices that

$$e_{pp} - r_{pp} \equiv z_p^1 < 0 \tag{7}$$

where $e_{pp} \equiv \partial^2 e / \partial p^2$ and $r_{pp} \equiv \partial^2 r / \partial p^2$.

2. Properties of the model

We conclude this chapter with a brief exercise involving the manipulation of the equilibrium system (3′). Suppose that an initial equilibrium is disturbed by a *small* improvement in productive efficiency, uniform over both industries and unbiased towards either factor of production. A new equilibrium emerges, with a different value of p and a different value of u. How, precisely, do the equilibrium p and u respond to the change in productivity? As a first step towards answering this question, we re-write (3′) with a productivity parameter λ, initially equal to

one:

$$e(p;\ u) = \lambda r(p;\ u) = r(p;\ v_1,\ v_2)$$
$$e_p(p;\ u) = \lambda r_p(p;\ v_1,\ v_2) \qquad (3'')$$

Differentiating (3″) totally with respect to λ, we obtain the system of linear equations in dp and du :

$$\begin{bmatrix} e_p - \lambda r_p & e_u \\ e_{pp} - \lambda r_{pp} & e_{up} \end{bmatrix} \begin{bmatrix} dp \\ du \end{bmatrix} = \begin{bmatrix} \lambda r \\ \lambda r_p \end{bmatrix} d\lambda \qquad (8)$$

(The coefficients of the equations are evaluated at the initial equilibrium values of p and u.) Solving, recalling that $\lambda = 1$ and $e_p - r_p \equiv z^1 = 0$, so that $e_{up} = z^1_u \equiv \partial z^1 / \partial u$, and scaling the utility function so that $e_u = 1$ in the initial equilibrium, we find that

$$du / d\lambda = r > 0 \qquad (9a)$$

as expected, and that

$$dp / d\lambda = (r_p - r z^1_u) / z^1_p \qquad (9b)$$

From Appendix 2, however,

$$r = px_1 + x_2$$

and

$$r_p = x_1$$

where x_i is the output of the ith commodity, $i = 1,\ 2$. Moreover, $m_1 \equiv pz^1_u$ is the marginal propensity to consume the first commodity and $a_1 \equiv px_1 / r$ is the average propensity to consume that commodity. Hence

$$z_p^1(dp/d\lambda) = r_p - rz_u^1$$

$$= \frac{r}{p}\left(\frac{px_1}{r} - m_1\right)$$

$$= m_1 x_1\left(\frac{1}{m_1} - \frac{1}{a_1}\right) \tag{9b}$$

Thus the direction of change of p depends on the difference between the marginal propensity to consume the first commodity and the share of the first industry in total output and, given the unbiased nature of the productivity increase, on the constant-price increase in output at the prices of the initial equilibrium; alternatively, the direction of change of p depends on the difference between the marginal and average propensities to consume the first commodity. In the special case of homothetic preferences, marginal and average propensities are equal and the price ratio is independent of uniform technical improvements.

Problem

Calculate the effect of a uniform, equi-proportionate increase in the two factor endowments of the price ratio and on *per capita* wellbeing. Compare your answers with (9a) and (9b′).