NĚKTERÉ PŘÍSTUPY MODELOVÁNÍ GLOBALIZAČNÍCH A INTEGRAČNÍCH PROCESŮ

SOME APPROACHES TOWARDS GLOBALIZATION AND INTEGRATION PROCESSES MODELING

Jiří Tvrdoň

Abstrakt:

Článek se zabývá problematikou modelování globalizačních a integračních procesů, které zásadním způsobem ovlivňují fungování podniků a obsah u formy jejich obchodní činnosti jak v oblasti vnitřního, tak i zahraničního obchodu. V řadě odvětví produkce je výsledkem mezinárodně koordinovaného výrobního procesu s minimalizací nákladů na vstupy a polotovary pořizované v různých zemích. Kapitál i pracovní síla se stávají mobilní a národní hranice propustné. Ekonomická realita, která je předmětem modelování se mění a vyžaduje tomu přizpůsobené modelové techniky analyzované v článku.

Klíčová slova:

Globalizační procesy, globální řetězce, modely výroby v mezinárodním prostředí, modely zahraničně obchodních vztahů

Abstract:

The paper deals with the modelling of globalization and integration processes which fundamentally influence enterprise functioning, subject and business forms in both the internal and external trade. Final output is the result of internationally coordinated production in many sectors. The impact of this process is that costs of inputs are minimized and intermediate products are made in different countries. As capital becomes more mobile and technology facilitates international communication, national borders become more permeable to economic activity. Economic reality that is the aim of this modelling is changing and due to this it is necessary to adjust modelling techniques analysed in this paper.

Key words:

Globalization processes, global chains, production model in international environment, models of foreign trade relationships.

1. INTRODUCTION

The globalization processes in recent decades has captured the attention of policy makers, academics, and business managers. Although the term is used loosely, globalization refers to the growing integration of national economies through trade and foreign direct investment (FDI). As capital becomes more mobile and technology facilitates international communication, national borders become more permeable to economic activity.

International production and sourcing entail trade in intermediate products between manufacturing enterprises located in different countries, and usually involve some degree of co-ordination between the enterprises. International production and sourcing differ in that the former refers to transactions within a framework of common ownership and control, while the latter refers to transactions between independent firms.

2. AIMS AND METHODOLOGY

The aim of this paper is to analyze the possibilities of modelling processes with using the theory of functionality of multinationals.

The working hypothesis is based on the following assumptions:

(i) Characteristic of present stage of world economy development is a fundamental background for application of suitable modeling technics
(ii) Efficiency of creation of international product is a result of efficiency of creation of intermediate products and low costs of sourcing
(iii) International trade content involves by growing rate intra-firms trade in framework of given multinational
(iv) Classical basic production models and trade models can be applied also at present global economy only partially modified

In these consequences, Pareto optimum can be used. Given a set of alternative allocations and set of economic subjects - in aggregated form it is national economy -, a movement from one alternative allocation to another one that can make at least one economic subject better off, without making any other economic subject worse off

3. RESULTS OF THE ANALYSIS

3.1 Specifics of present stage of world economy development

Today´s economy is a global web of institutions, public policy, and business practices that govern economic activity to fulfill needs of consumers their way of life. Voluntarily aligned enterprises that manage common interests across what has become known as value chains are dominated. As these value chains span national boundaries, they are truly global. This new paradigm involves new approaches of analysis of those processes including their modeling.

The trend toward globalization of production is driven by a number of economic, political, and technological forces. These include higher fixed costs and a resultant need to exploit economies of scale on a global basis, competitive pressures to take advantage of international production cost differentials, and access to markets and supplier capabilities. The reduction of risk and the need for flexibility in the face of volatile markets and technologies also propel firms toward international operations, and to engage in international alliances and joint ventures. In responding to these pressures for global production, firms have been helped by deregulation and by technological changes that lower the cost and improve the quality of international co-ordination.

Offsetting these forces, there are some important constraints on globalization. Differences between national markets and the particular needs of their consumers have not disappeared. The costs of integrating a global value chain, such as freight and duty, telecommunications and travel, and the cost of time delays, can be significant impediments to international production and sourcing. In particular, the diffusion of Japanese-style “lean production” systems, including just-in-time delivery and close relationships with suppliers, could restrict, if not reverse, the trend toward geographically dispersed production. On the other hand, the adoption of lean production systems which accelerate the speed of reactions to changing demands can enable new international opportunities to be addressed more readily.

Empirical evidence on international sourcing, strategic alliances, FDI, and intra-firm trade, all demonstrate the growing integration of national economies. Multinational enterprises (MNEs) have played a major role in the integration of trade and production as they have increasingly rationalized their global operations to serve regional or international markets. Nevertheless, the data indicate that the international integration of production is not

dominated by transactions within MNEs; the proportion of intra-firm trade in total trade for exam for the United States has fluctuated around 30 per cent for exports and 40 per cent for imports during the 1970s and 1980s. One reason for this is the rapid growth in outsourcing, international joint-ventures, and alliances as organizational forms for coordinating production.

International production and sourcing have distinct regional patterns. International transactions are increasingly triadic, centered on the United States, Europe, and Japan (the "Triad"), replacing the earlier predominant role of the United States. Although inter-regional linkages have grown rapidly in absolute terms, there has also been a trend toward the regionalization of production within North America, Europe, and the Pacific rim. This trend has been fuelled by rising protectionism and perhaps by the spread of lean production systems. As the United States has lost its predominant role, the relative growth of international linkages such as FDI and intra-firm trade has been faster for Europe and Japan than for the United States. In fact, much of the absolute growth in FDI during the 1980s was concentrated in Pacific rim countries. The share of FDI going to developed countries (LDCs) dropped, although average annual flows of FDI to LDCs nearly doubled in absolute terms during the 1980s.

3.2 Deriving of market models

For market analysis very often econometric models are sited. The econometric market form commodity model is considered first because it generally provides a basis from which the process, trade, and other methodologies follow. Its particular characteristic is that it contains a set of relationships pertaining to the demand for a commodity, its supply and, in some cases, the inventories held. Each of these relationships is influenced by the level of commodity prices. When prices decline, demand normally would increase or, alternatively, the supply to the market would decrease. The effect of either of these adjustments, however, would be to force prices upward, causing the market to return to a condition of equilibrium.

Econometric market models basically consist of four equations, although in practice many more are present, e.g., see Labys [1] for a more thorough discussion of specifying and estimating models of this type.

$$D = f\left(D_{-1}, P, P^{c}, A, T\right) \qquad \ldots\ldots \qquad (1)$$

$$Q = g\left(Q_{-1}, P_{-\theta}, N, Z\right) \qquad \ldots\ldots \qquad (2)$$

$$P = h\left(P_{-1}, D, \Delta I\right) \qquad \ldots\ldots \qquad (3)$$

$$I = I_{-1} + Q - D \qquad \ldots\ldots \qquad (4)$$

Definition of variables:

D = Commodity demand
Q = Commodity supply
P = Commodity prices
P^{c} = Prices of substitute commodities
$P_{-\theta}$ = Prices with lag distribution
I = Commodity inventories
A = Income or activity level
T = Technical factors
N = Natural factors
Z = Policy variable influencing supply

Demand is explained as being dependent on prices, economic activity, prices of one or more substitute commodities, and possible technical influences such as the growth of synthetic substitutes. Other possible influencing factors and the customary stochastic disturbance term are omitted to simplify the example. Accordingly, supply would depend on prices as well as natural factors such as weather and yields, and a possible policy variable. A lagged price variable is included since for certain commodities there usually are long lags between changes in price and changes in supply; it takes years to put new acreage into production or to open new mines. Prices are explained by demand and inventories, although this equation is sometimes inverted to explain inventory demand. The model is closed using the market clearing identity which equates inventories with lagged inventories plus supply minus demand. Where the price equation is inverted to represent inventory demand, the identity can be recognized as the equivalent supply of inventories equation. Not closing the model would put it in a disequilibrium form, and conventional estimation techniques might have to be replaced by those advocated for exam by Fair [2].

The application of a market model requires that its variables be classified as endogenous variables or targets - D, Q, I, and P; lagged endogenous variables - D_{-1}, Q_{-1}, I_{-1}, and P_{-1}; and exogenous variables - P^c, A, T and Z. Of the latter group Z is also known as an instrument or policy controllable variable. We normally refer to the above equation system in its matrix form.

$$\Gamma Y + \beta_1 Y_{-1} + \beta_2 X = U \qquad \ldots\ldots \qquad (5)$$

where Y = a $G \times n$ matrix of current endogenous variables; Y_{-1} = a $G \times n$ matrix of lagged endogenous variables; X = a $M \times n$ matrix of exogenous and policy controllable variables; U = a $G \times n$ matrix of current disturbance terms; Γ and β_1 = $G \times G$ matrices of coefficients on the current and lagged endogenous variables respectively; and β_2 = a $G \times M$ matrix of coefficients on the exogenous and policy variables. Policy analysis is best discussed using the equivalent reduced form

$$Y = \pi_1 Y_{-1} + \pi_2 X + V \qquad \ldots\ldots \qquad (6)$$

where π_1 = a $G \times G$ matrix of reduced form coefficients on the lagged endogenous variables, and π_2 = a $G \times M$ matrix of reduced form coefficients on the exogenous and policy variables X. The latter matrix is composed of coefficients called multipliers, which define the effects on the target variables of varying any of the instruments. By simulating the structural or reduced form of the model through suppressing or generating the stochastic terms, one can also assess these effects using policy simulation analysis. Note that the model containing lagged endogenous variables is a dynamic one and the resulting simulation would be evolutionary: the model can generate its own values for the endogenous variables with only the exogenous variables given. Validation can follow by investigating the model´s stability as a set of first order difference equations or by verifying the cyclical response of the model through the use of stochastic simulation.

The above described model approach can be applied for all of market levels by which original raw material comes to given processing stage till final product of analyzed product chain.

3.3 Deriving of international trade models of world level

World trade models are noted more as a means for explaining flows of commodity aggregates than flows of individual commodities. Where the latter have been of interest, spatial equilibrium models have been employed. World trade models, nonetheless, are worth considering because of globalization and integration processes and many commodity trade problems need to be analyzed in relation to capital flows and balance of payments, the most obvious case in point being petroleum at present time. This type of model can also cope with problems of measuring the impact of changes in exchange rates.

There are a number of different methodologies associated with world trade models, as have been described in the works of Rhomberg [3], Taplin [4], and Leamer and Stern [5]. These methodologies are normally classified as falling into one of two possible approaches using the following import-export matrix.

$$\begin{array}{cccccc|c} F_{11} & F_{12} & \ldots & F_{1j} & \ldots & F_{1n} & X_1 \\ F_{21} & F_{22} & \ldots & F_{2j} & \ldots & F_{2n} & X_2 \\ \ldots & \ldots & \ldots & \ldots & \ldots & \ldots & \ldots \\ F_{i1} & F_{i2} & \ldots & F_{ij} & \ldots & F_{in} & X_i \\ \ldots & \ldots & \ldots & \ldots & \ldots & \ldots & \ldots \\ F_{n1} & F_{n2} & \ldots & F_{nj} & \ldots & F_{nn} & X_n \\ \hline M_1 & M_2 & \ldots & M_j & \ldots & M_n & T \end{array}$$

Let F_{ij} represent the commodity export flow between the i^{th} country and the j^{th} country. When the F_{ii} equal zero, then the i^{th} row shows the exports of country i to all other countries. Similarly, the j^{th} column describes the imports of country j from all other countries. The matrix when completed should give all flows in world trade.

$$\sum_j M_j = \sum_i X_i = \sum_i \sum_j F_{ij} \qquad \ldots\ldots \quad (7)$$

Total world imports equal total world exports.

The two approaches can now be identified depending on the selection of flows to be studied and in the way the selected flows are introduced. The first, which has been termed the transmissions approach, can have separate equations to explain each of the M_j and X_i but does not necessarily attempt to compute the F_{ij}, the individual flows between countries. More particularly, it concentrates on tracing the short-run fluctuations in domestic activities between countries. The alternative or structure of trade approach tends to estimate individual F_{ij}´s directly, and then obtains M_j and X_i only as a summation of flows between countries. This approach would analyze the actual structure of trade based on income, population, geographical distances, and other related factors.

The transmissions approach has thus far proven to be the more practical, especially when operated within a consistency framework. Consider the following example which would add an income determination equation based on domestic conditions to the customary export and import functions. The latter sets of equations would be formulated for as many countries as are included, in this case up to *n*.

$$M_i = f(Y_i) \qquad i = 1, 2, \ldots, n \qquad \ldots\ldots \quad (8)$$

$$X_i = g(a_{ij} M_j, RC_i). \qquad \ldots\ldots \quad (9)$$

The corresponding set of income equations explain aggregate demand as the sum of demand induced by the current level of economic activity, autonomous expenditures, and net trade.

$$Y_i = b_i Y_i + E_i + X_i - M_i . \qquad \ldots\ldots \quad (10)$$

Definition of variables:

M_i = Value of imports of country *i*
X_i = Value of exports of country *i*
Y_i = Income of country *i*
RC_i = Relative competitiveness of country *i* against other countries
a_{ij} = Country *i´*s share of country *j´*s imports
b_i = Coefficient reflecting demand induced by current Y_i
E_i = Autonomous expenditure.

By solving the system on the basis of given values for the independent variables, one obtains a forecast of trade flows (X_i and M_i) and income flows (Y_i). When the forecasts of total imports are inconsistent with respect of forecasts of total exports, an iterative procedure is used to provide a new set of forecasts based on a new set of assumptions regarding domestic conditions. The world totals are compared again and iteration continues until the forecasts of imports and exports are consistent. If consistency is obtained for each commodity group, then estimates of demand by importing countries and estimates of supply by exporting countries could be used to obtain a set of commodity prices. Applications of the transmissions approach have been only at the aggregative, country trade level as seen in the work of Adams and Meyer-zu-Schlochtern [6], and of Samuelson [7].

The structure of trade approach has not lent itself as easily to quantitative analysis. Both import functions and a fixed coefficient trade share matrix have to be estimated. And exports must subsequently be based on the matrix transformation of the import estimates. The latter task is particularly difficult given wide differences in valuation bases.

4. DISCUSSION

From these two types of models the market form of model has been applied to a large number of commodity studies. The markets of interest normally are assumed to be competitive, although in some cases forms of noncompetitive organization have been incorporated for exam in the Myers and Havlicek model of the US beef, pork, and broiler markets, and the Labys model of the lauric oils market. Although the simple framework of market models is limited in its ability to capture commodity market realities, these models are a practical tool whose use is likely to increase with the growing interest in control theory and continuous time systems.

The world trade model is useful above all when trade items are not very disaggregated due to back of suitable data.

5. CONCLUSION

Globalization processes form different types of production output which is created by international intakes of inputs at the lowest cost. These flows are realized by intra-multinationals trade or by world trade which can be analyzed with application of in paper described models.

LITERATURE REVIEW

1. Labys, C.: Dynamic Commodity Models: Specifications, Estimation and Simulation. Lexington, Mass.; Heat Lexington Books, 1993
2. Fair, C.: Methods of Estimation for Markets in Disequilibrium. Econometrica 40 (1972)
3. Rhomberg, R.: Possible Approaches to a Model of World Trade and Payments, IMF Papers 14 (1967)
4. Taplin, B.: Models of World trade, IMF Papers 14 (1967)
5. Leamer, E.: Quantitative International Economics Boston, Allyn and Bacon, 1970
6. Adams, G. and others: An Econometric Analysis of International Trade, OECD, 1989
7. Samuelson, L.: A New Model of World Trade, OECD, 1973 in Greenaway D.: Economics of Commodity Markets, EE, 1999

KONTAKTNÍ ADRESA

Prof. Ing. Jiří Tvrdoň, CSc.
Katedra zemědělské ekonomiky
PEF ČZU v Praze
Kamýcká 129, 165 21 Praha 6 – Suchdol
e-mail: tvrdon@pef.czu.cz
tel.: +420 224 382 290