THE DYNAMICS OF
EXPORT-PROCESSING ZONES

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CONTENTS

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Using a monopolistic pricing model as benchmark, this paper develops a dynamic framework within which issues concerning the role of export-processing zones in promoting economic openness and transition is assessed. Technological learning and adaptation contribute profoundly to economic development in LDCs; multinational activities tend to generate an externality that facilitates the process of technology transfer and learning. The model signifies these critical factors. The study suggests, among other things, that the concept of export-processing zones may serve as an effective policy means, when implemented properly, in achieving greater economic openness and growth. In this gradual evolving development process, countries that operate export-processing zones may follow a different transitional path and sequence from the one that is often cited in literature.

Introduction

As a policy means of achieving greater economic openness and growth, the concept of export-processing zones (EPZ) has gained noticeable significance during the past three decades. According to a recent count, there are well over 850 zones of various sorts operating around the world, compared with just a handful in the 1960s (ILO, 1998). Most of the latecomer zones are established in less-developed countries (LDCs) and economies in transition. To break away from an inward-looking growth path, to facilitate international flows of trade, capital and technology, and to hasten the pace of economic development and structural transformation, the opening of the EPZs has been taken as the first, albeit partial, step in that direction.

Conceptually, an EPZ may be characterized as a geographic area within the territory of a country where economic activities of certain kinds are promoted by a set of policy instruments that are not generally applicable to the rest of the country. In practice, the types of zone activities vary from bonded warehouse, export processing and assembling, border or port trade, and high-tech R&D, to trade-related transportation or financial services. Despite these variations, export-oriented manufacturing activities have been the main focus of most zones, where production tends to be dominated by foreign invested firms.[1] To attract foreign and, very

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[1] According to the types of activities that are most emphasized, the zones have been given various names, ranging from free-trade zones, duty-free zones, free-export zones, free-investment zones, free-

often, multinational firms into the zones, various policy incentives have been offered by the host countries: common elements in these incentive packages are: duty-free status; tax holidays, exemption and reduction; simplified administrative procedures and fewer regulations; improved infrastructure and facilities; and advantageous geographic location. From the standpoint of foreign invested firms, these incentives can all be translated into a lower production costs in the zones and, all else being equal, higher potential profits from the EPZ operation. In return, the host countries may expect to benefit from job creation, improved capability of foreign exchange earnings, trade expansion, transfer of more advanced foreign technologies and resulting productivity gains. Eventually the economies may be put onto an export-led growth path, leading to a fuller integration into the world economy, and doing so in accordance with their comparative advantages.

Some of the potential gains from an EPZ operation are static in nature. Once a zone is successfully established, for instance, the production carried out by foreign firms creates jobs for local workers; the expanded export-processing activities in the zone contribute foreign exchange earnings to the host country. Other gains are dynamic in the sense that they can only be realized over time through deliberate efforts, such as learning and absorbing foreign technologies and transforming the pattern of economic growth from an inward-looking to an outward-looking one. By and large, the static gains have been evident, while the degree of dynamic gains varies greatly from case to case, as suggested by empirically based studies of the EPZs.[2]

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economic zones, free-enterprise zones, free manufacturing zones, economic and technology development zones, and industrial estates, to industrial or scientific parks. Bonded warehouses free ports, and duty-free shops can be regarded as zones of special types, where services are at the center stage of economic activities. Free banking zones or free insurance zones also fall into this category. To highlight the underlying economic structure of a zone, specific terms are often added to describe its main characteristics, such as electronics export-processing zones to signify the dominance of electronics manufacturing. We use the name export-processing zone here to signify the dominance of export-oriented production activities that tend to be most common among the real-world zones.

[2]   For a descriptive discussion on some of the EPZs, see, for instance: Wall (1976), Ping (1979), Pollack (1981), Jayawardena (1983), Spinanger (1984), Sklair (1986), and Rondinelli (1987). More empirically and institutionally oriented case studies include: Warr (1984) about the zone in the Republic of Korea; Leinbach (1982); Warr (1987) about the EPZs in Malaysia; Kumar (1987) about the zones in India; and Wideman (1976) about the zones in Philippines. Vittal (1977) and Takeo (1978) have provided some general discussions about the export-processing zones established in Asian countries. In Germidis (1980), Basile and Germidis (1985), as well as in UNIDO (1980), and UNCTAD (1983), the export-processing zones in some other developing countries are described – such as those in Egypt, Peru, Sri Lanka, Brazil, Mexico, Mauritius, Tunisia, and Puerto Rico. Thoman (1956) addressed economic issues raised by the presence of free port and bonded warehouse for, to my knowledge, the first time, but the discussion is less relevant to the practice of the modern type of EPZs. Studies of the special economic zones in China include Chang (1986), Chu (1985), Crane (1990, 1993), Fewsmith (1986), Harding (1987), Howell (1993), Kleinberg (1990), Li and Zhao (1992), Oborne (1986), Pepper (1986), Solinger (1984), Stoltenberg (1984), Sit (1986, 1988), Sklair (1985), Wong (1987), Ge (1999a).

Analytically, existing studies of the EPZs have, to my knowledge, all been confined to a static framework along the lines of international trade theory.[3] The employment and welfare effects of opening an EPZ are the main concern to these studies. The issues of technology transfer and structural change resulting from an EPZ operation have recently been brought up by some authors; the static analytical framework which they adopted has, nevertheless, undermined the robustness of these analyses. Although these studies have captured certain features of the EPZs, a set of questions of fundamental importance are left unanswered. It is not clear that whether, or under what conditions, the opening of an EPZ would generate the above-mentioned dynamic gains in a host economy, and what would be the mechanism through which the gradual evolving development process might come about.[4] This recognition warrants a major shift in the ground on which the concept of EPZ is understood and the role of an EPZ in the process of economic growth and transition is analysed. There is a need for a dynamic framework to address these issues; developing such a framework is the purpose of this paper.

By taking explicitly into consideration the behaviour of foreign firms and the presence of a technology spillover (both of which will be specified shortly), we study the following questions in a dynamic setting. Would the export performance of a host country be improved by opening an EPZ? What are the conditions under which this improvement may be forthcoming? What are the changing patterns of EPZ production, exports of the host country, and the world market condition, and what are the factors that may affect these dynamic paths? And how can we comprehend the fact that some countries have been able to capture the dynamic gains from an EPZ operation, and some have not? These questions reach the central motive of the EPZ establishment, and address the most significant birthmark of the real world EPZs. It is hoped that the study will shed light on these crucial issues and stimulate further modelling efforts, so as to put the study of EPZ-related issues on a firmer footing.

The paper is organized as follows: the structure of the model is specified in chapter I; the solution to the model is derived in chapter II; chapter III examines the dynamics and stability of the system; chapter IV discusses the main propositions derived from the model; chapter V concludes the paper by discussing some of the policy implications of EPZ practice in the context of economic liberalization and development.

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[3]   Theoretical studies of the EPZs include Hamada (1974), Rodriguesz (1976), Hamilton and Svensson (1982), Miyagiwa (1986), Young (1987), Young and Miyagiwa (1987), Chaudhuri and Adhikari (1993), Tsui (1993), Din (1994), Devereux and Chen (1995), Basu (1996), Litwack and Qian (1998), Ge (1999a).

[4]   These issues were taken up in an intertemporary analytical framework by Ge (1993, 1995).

I.   THE MODEL

To concentrate on the issues at hand, consider the following system. Prior to the establishment of EPZ, an article in the world market is produced mainly by a multinational firm (MNF), which possesses considerable monopolistic power and acts as a price-setter. The same article is also produced by a group of competitive domestic firms in an LDC, where an EPZ is about to be opened up. The output produced by the domestic firms is sold either on the world market at the price set by the MNF, or on the domestic market at a price that is determined domestically. Exports by the domestic firms may account for a relatively small share of their total production, due to inadequate production technology, inefficient management, and a lack of market access and marketing know-how. To improve the situation, an EPZ is established and various policy incentives are made available to foreign firms. These incentives, together with a lower cost of labour that is readily obtainable in the LDC, may be summarized into a single factor: the unit cost of production in the EPZ, c_1. Denoting the unit cost of production attainable outside the EPZ by c_2, we assume, without any loss of generality, that $c_1 < c_2$, and that both c_1 and c_2 remain constant over time.[5]

Attracted by the lower unit cost of production in the EPZ, the MNF now diversifies its production into two separate locations: the EPZ and the rest of the world. At any period of time t, the output produced by its EPZ subsidiary is given by $Q_1(t)$, and the output produced elsewhere, $Q_2(t)$. The outputs from the two locations are sold in the world market at a price $p^*(t)$ charged by the MNF. Assume for simplicity that the EPZ production of this merchandise is carried out exclusively by the MNF subsidiary.

The presence of the MNF in the EPZ provides local firms in the domestic zone (DZ) with a technology source. The technologies include not only those embodied in a production process, but also designing, engineering, managerial, and marketing know-how and market information. These technologies may be transferred to the domestic firms through various channels. For instance, sophisticated equipment or production lines used in the EPZ may be operated and managed by local employees; the trained workers may carry their skills to other domestic jobs if they choose to do so. The foreign EPZ firm may set up subcontracting or joint venture

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[5]   The inequality $c_1 < c_2$ may be interpreted as follows. When compared with the unit production cost attainable elsewhere, the policy incentives available in the EPZ, together with an improved regulatory framework, as well as physical and institutional infrastructure, tend to make the zone a more attractive location for foreign investment. This may hold, even when the cost of labour is the same in both locations.

arrangements with domestic firms, which may require the former to pass certain designing and engineering specifications and market information onto the latter. Information and knowledge concerning market condition, managerial and marketing techniques, trade and distribution networks, and changing consumer tastes may be transmitted to domestic firms through, for instance, formal or informal personal contacts, business dealings, or trade fairs. Once an EPZ is established, it is often difficult for the MNF subsidiary, regardless of its willingness, to prevent the technologies from being transferred to the locals through these linkages. That is, there exists a positive externality. The opportunity of learning from the foreign EPZ firm may, over time, help to enhance the productivity and international competitiveness of the domestic firms, and thereby accelerate export and economic growth in the host country. It is in this sense that the concept of EPZ may serve as a policy means of promoting trade and economic transition towards a fuller integration into the world economy.

To specify these linkages, we assume that the export of domestic firms at any period of time t, $Q_n(t)$, is a continuous, twice differentiable, function in the following two variables:

(i)   The technological externality, or a learning factor, $T(t)$. $T(t)$ is assumed to be related to the EPZ production, $Q_1(t)$, in such a way that the change of $T(t)$ over time[6] is subject to:

$$\dot{T}(t) = \boldsymbol{a} Q_1(t) \tag{1}$$

where α is a positive constant. The specification asserts that the degree of technological externality, measured at the site of domestic firms, is proportionate to the economic size of the EPZ; the larger the EPZ production is, the stronger the externality in the DZ will be. By treating T as an explicit function of time t, equation (1) takes into account the fact that technological learning is a cumulative process; it would take time and effort for the domestic firms to move up their learning curves, even with the presence of technological externality. The