

An Input-Output Approach to the Analysis of Agricultural Policies and Agro-Industry Structure

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The desire to accelerate economic growth and to optimize the allocation of factors of production has led some of the world's largest agro-export nations to strongly support the liberalization of the international agro-food trade. However, protection and regulation are still prevalent in a great number of countries where agriculture accomplishes functions other than the production of commodities for internal consumption or export. The latter concern self-sufficiency, food security, occupational roles, management of the environment and support for industrial development. The aim of this paper is, taking national input-output tables as the starting point, to propose a methodology for the analysis of the relations between international trade and the internal structures of agro-food systems. The hypothesis is that indiscriminate liberalization, especially if "export-oriented", leads to the homogenization of techniques, the specialization of agriculture and filières, and, finally, to an extraverted economy. All these factors operate against the globalization of exchange in agriculture. Well-oriented protectionism, on the other hand, leads to the diversification of production and international exchange. It also favors the expansion of agro-industrial complexes, the diffusion of technical change and the internalization of the benefits of agricultural growth. The analysis of the Chilean case is very instructive in this respect. Here, an attempt will be made to evaluate the impact of the progressive shift from import-substituting to export-oriented industrialization after 1973 on the national agro-industrial complexes.

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Introduction

The desire of some major world agro-exporters to liberalize world trade in farm and food products in order to accelerate economic growth and optimize production factor use is in opposition to the protectionist and regulatory policies which presently prevail in a large number of countries. In the latter, agriculture is expected to perform functions other than solely producing consumable or exportable goods. These include the achievement of self-sufficiency, food security, employment equilibrium, management of the environment and industrial development.

The priority that has been given to export-led, outward-oriented growth or, on the contrary, to focusing on other domestic constraints and demands, constitutes the very basis of divergences that have emerged in the new international agricultural order. These options diverge profoundly in their knock-on effects and their impact on domestic productive structures. The assumption has been made that the first option (export-led and outward-oriented growth policies) fixes growth around vertical filières¹ (production routes), whereas the second favors "irradiation" and the constitution of diversified agro-food complexes.

The liberalization of exchange in agro-exports eventually entails a globalization of agricultural markets and industries. The implementation of this strategy requires not only that the local agricultural production process be under control, but also requires a highly developed knowledge of global strategies in terms of international competition. However, the indiscriminate application of neo-liberal, and in particular "export-led"

policies, which involve the use of sophisticated techniques **imported** from outside and the excessive **specialization** of agriculture, in no way meets the new demands of global strategy. The destruction of the local production apparatus and the instability of world agricultural markets are thus likely to lessen the multiplier effects of agro-exports on the local production structure, and eventually lead to the extraversion of the economy and the under-mining of the major macro-economic equilibria. These unforeseen consequences on the new international order are, however, of central importance in the implementation of the new strategic dimension, that of globalization.

The aim of this paper is first, to highlight, on the basis of an analysis of input-output tables, the relations that exist between exchanges, or flows and the organization of productive systems, or structures. It is, secondly, to analyze by processing the data from input-output tables the impact of Chilean economic policy options, and, in particular, of the high priority given to developing foreign trade on the structure of the domestic agro-food complex. Particular attention will be given in demonstrating how the move from the import-substitution policies, that had been implemented until 1973, to the agro-export led growth policies that were adopted thereafter (Gomez and Goldfrank, 1990) led to a profound modification of the agro-food complexes and the emergence of specialized filières.

After having recalled our assumptions and analytical framework, we will proceed by showing how the growing outward-orientation of the Chilean economy has gone hand in hand with a regressive restructuring (Ominami, 1988) of the domestic agro-food complex.

Assumptions and the Analytical Framework

The basic assumption is that the increase in foreign trade is conducive to economic growth and utilizes classical and neo-classical economic theories (the law of comparative advantage and of optimal factor allocation). This assumption is also implicitly referred to in the present largescale negotiations on trade in agro-food products and the liberalization of exchange. This naturally leads to a globalization of exchange based on

the internationalization of the strategies developed by the agro-exporting powers. Any political, administrative or commercial impediment to the free circulation of commodities is seen not only as compromising the intensity of exchange but, above all, as calling into question the economic growth of the countries involved. However, history does show that many of the export-led booms based on mono-exports or specialization, in countries like Chile, Brazil or Venezuela have often been short-lived, and that there is a considerable distance between the increase in trade, measured in terms of the performance of the trade balance, and the development of domestic productive structures. Thus, although "agro-export led" options in Latin America have had undoubted success in developing certain productions, regions or specialties, they have also precipitated opposition between modern and traditional forms of agriculture, destructured the agro-food complexes and upset the technical, cultural and financial support mechanisms for agricultural production. Thus, such options have been severely criticized by the supporters of dependency theory from two points of view. They demonstrated that agricultural specialization does not lead to growth and that there is no direct relation between the development of trade and that of productive structures. Moreover, they demonstrated that specialization is a source of extraversion and dependency². Nonetheless, the theses on self-reliant development that are derived directly from these criticisms, theses which insist on the need to reduce the importance of the foreign sector in the operation of the economy, give no more a clearer lead than the theses they attack as to how trends in trade affect structures or what impact economic policy choices have on the domestic productive structure through international or intersectorial exchange.

In order to deal with this question, we will process data from the input-output tables and relate this to the measures taken concerning agro-food policies. These policies, which are characterized by the amount of importance given to foreign trade, induce substantial disparities as far as inter-industry exchanges are concerned. The most outward-oriented policies lead to the predominance of vertical flows along fragmented and specialized filières. The most inward-oriented

lead, on the other hand, to the predominance of **horizontal flows**³ between filières which are conducive to the "darkening" of the matrices and to "irradiation" within the interconnected economic complexes.

In the case of Chile, we will attempt to measure, in this way, the impact of the change in agro-food policies after 1973 by insisting on two elements. One is the high priority given to "agro-export led growth"⁴. This would appear to have developed only a narrow part of the domestic agro-food complex without benefitting the rest of the economy, which, in another context, would have drawn benefits from the knock-on effects induced by the industrialization of agriculture (Fuche et al., 1987). The second element is the opening of the economy to the world market⁵. This, on the other hand, would seem to have impeded the economic development of all those Chilean agro-food activities that were not working for the export market (Echenique, 1989). If this has been the case, the internal destruction of the Chilean farm and food system, without any compensatory effect in terms of controlling international markets, would situate this country in a position of inferiority as far as international competition is concerned. In other words, Chile would be placed in an inferior position in the globalization process.

The Extraversion of the Chilean Economy

An initial analysis of foreign trade between 1977 and 1986 confirms the growing outward-orientation of the Chilean economy and the importance of exports. The calculation of the rate of exporting effort (RE) (exports/effective output) and the import penetration rate (RP) (imports/resources - exports) shows that between 1977 and 1986, exports of primary products (other than copper) totally replaced exports of industrialized products. Industrial chemicals and basic metals, which had occupied foremost positions (behind copper) in Chilean exports in 1977, were replaced by exports of agricultural and food products. Also, over the same period of time, the figures show that the dependency of the Chilean economy, in terms of imports (penetration rate), increased substantially in almost all the sectors

under consideration, and particularly in mechanical engineering, the manufacturing of transport equipment, the manufacturing of glass and glass products and the manufacturing of industrial chemicals. All these activities contribute to supplying agriculture with industrial products.

Globally, industrial exports have fallen and the knock-on effects of agro-exports on local industry (on glass and the manufacture of chemical products in particular) have been negligible. These trends are consistent with what has been happening to the Chilean production apparatus in general and to the agro-industrial system in particular.

The Restructuring of the Agro-Food System

The restructuring of the agro-food system may be carried out in two ways: **vertically** along the filières or **horizontally** along the segments that provide a link between the filières. There may, therefore, be an observable concentration of all or part of the activities of a filière, or, on the other hand, "irradiation" effects induced by the technical-economic synergies arising from the relations between filières (Quelin, 1988).

We make the assumption that, although the high priority given to certain agricultural or agro-food exports (fruit and vegetables, wine, wood, fishing, etc.) undoubtedly helped to develop these particular productions, there has been little impact on the other agro-food productions and industrial activities. Moreover, by reinforcing the organization into filières, agro-export policies have undermined the development of networks of exchange between the filières. Thus, they have blocked the development transmission mechanisms in particular by limiting the multiplier effect of investment and the diffusion of technical progress (Parent, 1974). They have also limited the impact of economic policy measures and compromised long-term economic growth. This reduces agro-food growth to geographic areas, making producers and productions more vulnerable and dependent on the international division of labor. The growing extraversion of the Chilean economy has been accompanied by a deterioration of the local agro-

industrial system.

On the basis of the data we have processed for the period 1977-1986, there are two important results to report: the agro-food system is fragmented around specialized products whereas the links between upstream and downstream industries have been weakened. From a technical point of view, three interdependent divisions of the productive system (input-output table) are made: the first step is to determine the bloc of branches (Goux, 1978) which are linked to the agro-industry. This subgroup of activities (bloc) is then broken down into the "segments" which link one filière to another, and into production "filières". The blocs are obtained by an Upward Hierarchical Classification (UHC) of the branches of the input-output table associated with an inter-branch distance which is inversely proportional to the intensity of inter-sectorial exchange. The segments are obtained, on the same principle, after constructing a UHC of the branches of the bloc, and the filières are obtained by applying an algorithm which makes it possible to construct, within the bloc, chains of activities united on a "nearest neighbor" basis (Bellet et al. 1990).

Applied to the case of Chile for the years 1977 and 1986 (input-output tables of 57 branches, not including commerce), this method (for the 24 branches associated with agro-industry) leads to a break-down into segments and filières which are partly described in the two following sections of the present text.

Fragmentation

The agro-food system, composed of filières and inter-filière segments, is fragmented into specialized sub-systems (multiplication of production routes) which have become isolated from one another (absence of links between the segments). The two integrated agro-food filières of 1977 (the agricultural filière, and the food filière), have split into three distinct and mutually independent parts (agriculture, manufacturing of beverages, and food manufacturing), whereas the sole segment linking the agro-food industries and hunting activities has decreased in intensity.

Weakening of Upstream Downstream Links

Despite the dynamics of the agro-exporting activities, no measures were taken to guarantee the upstream (chemicals, glass manufacturing, mechanical engineering, etc.) and downstream (transport, road infrastructures, marketing networks, etc.) integration of the agro-food filière. However, in 1977 there were strong (reciprocal) links between the two chemical filières (the chemical industry filière, and the chemical product filière) through the chemical segment. By 1986, these internal connections in the chemical complex had been weakened and replaced by a link between chemicals and services. The internal coherency of the chemical complex has been weakened, and the restructuring that should have been conducive to tightening the links with the rapidly expanding agro-food industry on the contrary favored services and extraversion.

Similarly, the "upstream" industry for manufacturing transport equipment, which had been closely associated in 1977 with the manufacturing of non-electrical machinery and business services to supply the Public Administration and Defence branch, was by 1986 only associated with the Communication branch. Thus, the industrial fabric in the immediate environment of this activity (transport) has partially disintegrated.

By stressing certain agro-food exports, Chile has no doubt improved its trade balance. It has not, however, been able to resolve certain structural problems concerning, in particular, the operation of its agro-food complex. According to some authors (Ominami, 1989), it has, from this point of view, accumulated handicaps. Benefiting little from industrialization, Chilean agro-food exports have had few multiplier effects (increase in intermediate consumption and agro-supplies), on the local productive structures. In the long run, the foreign outlets for agro-food products are uncertain, given the latent instability of the market prices for primary products at an international level. Thus, the unconditional opening of the Chilean economy to world trade has destructured the domestic productive system, as well as considerably increasing its vulnerability to outside pressures. The

absence of control over internal production arrangements and the inability of a small country like Chile to foresee major trends on the international markets offer little hope of Chile successfully confronting world competition (global strategies) in the food industry. Chile has relied on its abundant natural resources (forestry, fishing and agriculture) and the liberalization of trade in order to accelerate its economic growth and reestablish the major external equilibria. Its example is likely to be followed throughout the continent. A more detailed analysis (based on Input-Output tables) shows, however, that the country's successes remain fragile.

The Input-Output table traces the exchanges between industries in a given economy. Although it does have its drawbacks⁷, it is an appropriate instrument for analyzing major economic aggregates and inter-sectorial flows. It does not, however, provide sufficient information to judge the impact of an economic policy, which necessarily has repercussions outside the national framework (global strategies).

The methods used here to evaluate the degree of articulation or disarticulation⁸ of a productive system do make it possible to pinpoint the "paths" along which the knock-on effects between sectors or branches may travel. In this sense they are a useful addition to policy analysis and to the analysis of economic growth. Applied to the case of the Chilean agro-industry, these methods confirm, for example, that the undiscerning application of the neo-liberal model of an outward oriented economy, from 1973 on, has led to the partial dismantling of the national productive structures. The real choice for Chilean agro-food policy lies between growing outward orientation and dependence and the birth of a new development policy. That has still to be defined clearly. For the time being, actual results still contradict those provided by conventional macro-economic indicators. The "success" has been arrived too rapidly, in our view, to legitimate talk of a Chilean "economic miracle". A well-oriented protectionism, allowing for the diversification of agricultural production and the upstream reorganization of the agro-export sector (development and assimilation of advanced techniques and production of agricultural ingredients), while continuing to take into account the new global dimension

of economic growth in the field of technological research and world strategy⁹, would, we believe, make it possible to correct the present drift and combine, harmoniously, growth and development.

Notes:

1 A production "filière", or production route, is essentially conceived as a set of production operations articulated vertically along an upstream-downstream axis from raw materials to the finished product, passing through all the intermediate phases necessary for such production.

2 The theory of comparative advantage has been accused of being essentially static and therefore incapable of accounting for the dynamics of economic policies. The foundations of the theory are said to ignore, on the one hand, the transformation of production factors and the productive combinations which are notably induced by industrialization, and, on the other hand, the perverse effects linked in particular with excessive specialization in supplying raw materials.

3 These horizontal flows are called "inter-filière segments". These are materialized in strong and balanced reciprocal exchange between activities situated in distinct production filières. Being complementary, by definition, to the production filières [cf. note (1)], they favor horizontal flows of exchange between branches, in contrast with the vertical upstream-downstream dimension of exchange within the filières.

4 A priority whose practical consequence can be seen in the progressive introduction of a series of measures, firstly (before 1981) in favor of forestry (massive subsidies for reforestation, authorization for exporting untreated tree-trunks etc.), and later covering all export products (zero VAT rating, recovery of 10% of the FOB value of sales, opening of a credit line of 600 million dollars at preferential rates, generalized technical assistance, etc.)

5 An opening which in practice meant the systematic elimination of the protectionist policies developed before 1973 (removal of tariff barriers, withdrawal of subsidies, preferential interest rates and technical assistance) and the massive importation of basic food products. The crisis of

1982-83, however, forced the authorities to return to more moderate practices in favor of certain basic foodstuffs (milk and wheat essentially), although this did not involve globally calling into question the principle of opening the internal market to the outside.

6 For the 24 branches of the "bloc" linked with the agro-industry (see below note 5).

7 The Input-Output table includes neither financial flows nor transactions on patents related to the economy.

8 A production system is all the more disarticulated if it is fragmented, (i.e. if it is composed of a large number of autonomous sub-systems of activity). This fragmentation limits the impact of multiplier effects on the productive structure.

9 By participating for example, in international exchange networks, which would associate the country in scientific and technological research programs, thus enabling it to reach a global dimension in agricultural strategy (Drouvot, 1991).

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RESUMEN

Una aproximación Input-Output para el análisis de las políticas agrícolas y la estructura agroindustrial.

El deseo de acelerar el crecimiento económico y optimizar los factores de producción ha conducido a algunas de las naciones exportadoras más grandes del mundo a dar un fuerte apoyo a la liberación del comercio internacional agroalimentario. Sin embargo, la protección y la regulación es todavía predominante en un buen número de países donde la agricultura lleva a cabo otras funciones que la producción de mercancía para el consumo interno o para exportación. Estas conciernen a la auto suficiencia, a la seguridad alimentaria, al rol ocupacional, la dirección del ambiente y el apoyo para el desarrollo industrial. Este artículo toma las tablas de input-output nacionales como punto de partida para proponer una metodología para el análisis de las relaciones entre comercio internacional y las estructuras internas del sistema agro-alimentario. La hipótesis es que la liberalización indiscriminada, especialmente si es de orientación exportadora, conduce a la homogenización de técnicas, a la especialización de la agricultura y similares, y, finalmente, a globalización del intercambio en la agricultura. Un proteccionismo bien orientado, en cambio, conduce a la diversificación de la producción y al intercambio internacional. También favorece la expansión del complejo agro-industrial, la difusión del cambio técnico y la internacionalización de los provechos del crecimiento agrícola. El análisis del caso chileno es muy instructivo al respecto. Aquí, se hace un ensayo para evaluar el impacto, del cambio progresivo de la industrialización de sustitución de importaciones a otra orientada a la exportación después de 1973, sobre el complejo agro-industrial nacional.

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