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AN ANALYSIS OF THE PERFORMANCE OF THE AGRO-FOOD INDUSTRY IN THE DOMESTIC AND INTERNATIONAL MARKETS OF CÔTE D'IVOIRE

ABSTRACT: *Since its independence in 1960, Côte d'Ivoire has opted for an industrial policy that has given rise to two major types of agro-food industry. The first is small-scale units owned by nationals and the second is agro-food industries owned by large international firms that mainly export their products. This strategy has led to commodity specialisation that deteriorates the terms of trade. Thus, despite a significant industrial sector, the country suffers from deteriorating trade terms due to an overly extroverted economy, the corollary of which is over-indebtedness. This paper compares the performance of domestic and international markets of Côte d'Ivoire to identify the type of agro-food industry that should be promoted for development. The ripple effects in domestic and international markets are estimated and compared using the Leontief model and data from the Côte d'Ivoire Input-Output Table of 2018.*

We show that the cocoa and coffee processing branch of the agro-food industry is commercially outward-oriented, the oilseed industry is commercially mixed or dual-oriented, and the other branches are commercially inward-oriented. The ripple effects of the domestic market are almost four times higher than those of the external market. The high rate of population growth, galloping urbanization and the social nature of food are key determinants of the findings. We conclude that the domestic market better stimulates the development of the agro-food industry. We therefore recommend a strategy of orienting products towards domestic and West African markets, which could lead the country to sustainable economic development more rapidly.

KEY WORDS: *Côte d'Ivoire, agri-business, agricultural policy, trade ripple effect, agricultural trade.*

JEL CLASSIFICATION: Q13

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1. INTRODUCTION

Upon accession to independence in 1960, Côte d'Ivoire showed a willingness to industrialise its economy and opted for an industrial policy of import substitution and exports. This choice enabled it to experience remarkable economic growth during its first two decades of independence. The aim of this industrial policy was to reduce manufactured imports through local manufacturing, significantly reducing the import bill while enhancing the development of local agricultural resources. This justifies the attention given to the agro-food industry in view of the massive investments it received in the 1970s and multiple government interventions, starting with the Investment Code Act of September 1959. The main objective of this Code was to attract foreign capital by offering various advantages (customs, tax, and administrative), thereby laying a foundation for liberalism in Ivorian industry (Ministry of Industry and Mines, 2017). This has enabled Côte d'Ivoire to have a larger industrial sector than other countries in the sub-region.

This industrial policy has given rise to two main types of agro-food industry (AFI): the first is small-scale units owned by nationals, and the second is agro-food industries owned by multinationals that mainly export their products and make large profits. The latter are also likely to have a considerable impact on the development of Ivorian agriculture.

This strategy limited the country to commodity specialisation, according to Ricardo's theory of openness and liberalism. In terms of production, the country is first in the world for cocoa, first for cashew nuts, seventh for rubber, eleventh for oil palm, and fifteenth for coffee. Moreover, commodity specialisation further deteriorates the terms of trade. These two obstacles to increased international trade in developing countries are strongly linked because the deterioration of trade terms is often explained by low commodity prices. Today, according to the Ministry of Agriculture and Rural Development (2020), Ivorian cocoa producers receives only 6% of the international price. The terms of trade deteriorate because import prices increase faster than export prices, leading to an unfavourable imbalance for the country. Despite a significant industrial sector, the country has always suffered from deteriorating terms of trade as a consequence of an overly extroverted economy, the corollary of which is over-indebtedness (11,000 billion CFA francs, or about 48% of GDP).

The deterioration of trade terms is a real problem for developing countries and runs counter to liberal economic principles, according to which trade leads to automatic enrichment. In fact, products that developing countries export (commodities in general) do not earn them the income necessary to meet the cost of imports (manufactured products in general) since the latter are much more expensive than the exports. This creates a significant imbalance, illustrating the existence of an unequal and asymmetrical exchange between developing countries and industrialised countries (Atse, 2007). At the same time, domestic and sub-regional consumption demand for local goods is growing because of galloping demography (3.3%), and the volume of food crop production rose from 2.6 million Tons in 1975 to 11.13 million Tons in 2010 and 18.84 million Tons in 2018, of which 49% was yams, 21% cassava, 15% plantains, 6.4% rice, and 5.9% corn (LSCC, 2019).

Given the strong growth in domestic demand for local consumer products, in the interest of better business orientation it seemed important to conduct a comparative analysis of the ripple effects of domestic and international markets on the domestic economy. Therefore, the objective of this study is to identify whether the domestic or international market has the greatest impact on the Ivorian domestic economy, particularly the agricultural sector.

2. AGRICULTURAL TRADE AND ECONOMIC DEVELOPMENT

International trade appeared in Truman's 1949 discourse on development because according to liberal theses, international trade, or more precisely free trade, is the cornerstone of development and poverty reduction (Atsé, 2007). Indeed, the French Justice and Peace Commission (1990, p.132) mentions that liberal thought on development is based on two certainties: that free trade is the guarantor of the enrichment of each of the partners, and that according to the postulate of the universal validity of the theory of growth, free enterprise and the functioning of markets will solve the problem of underdevelopment.

Classical economists such as Smith (1723–1790), Ricardo (1772–1823), Mill (1806–1873), and more recently development economists Rostow (1988), Brasscul (1989), Friedman (1912–2006), and Krugman (1979, 2003) proposed theories that demonstrate the advantages of liberalism. International institutions such as the International Monetary Fund (IMF) and the World Bank (WB), the

main donors to developed countries, adopted these liberal theories. It is in this context that the Côte d'Ivoire subscribed to the theory of comparative advantage and specialised in the export of agricultural and agro-industrial products (ATSE, 2007).

According to economic development theory, as a country develops its service sector expands faster than its primary production sector. The total resources devoted to marketing agricultural products tend to increase faster than the resources allocated to the production of the products. This trend becomes more pronounced when a country begins to transition from a subsistence economy to a market or monetary economy. Agricultural development, like economic development in general, must be based on a division of labour into specialised functions, and the growth of the economy reflects this specialisation. The specialisation must be progressively associated with the expansion of the marketing system and its ability to move commodities from one region and community to another. Economic development raises incomes and thereby diversifies the diet. In this context, the marketing system must expand to provide a greater variety of foods and ensure food security (CIRES, 2014).

An effective trading system not only serves as a link between producers and consumers, but also makes an active and positive contribution to development. Marketers work to increase their turnover and sales, and their efforts to do so stimulate economic activity in both the production and service sectors. Embracing the idea of Stiglitz (1989), Loy and Wichern (2000) assert that economic growth in the least developed countries is not primarily related to lack of physical or human capital, but rather to lack of efficiency in the functioning of markets.

A good trading network stimulates consumption and helps to increase production by seeking additional supplies. If the price system works properly, it provides an incentive to increasingly meet (consumer) demand in terms of type, quality, and delivery time. In this way, production adapts to demand by reacting to price signals from the marketing system, allowing us to argue that the marketing of agricultural and agro-industrial products generates three main utilities (LSCC, 2019):

- 1) Place utility is when products are moved from the place of production to the places where they are sought. It therefore includes the transport and spatial distribution of the product.
- 2) Time utility is when products are stored for a period of time and made available for several weeks, months, or years.
- 3) Form utility is when products are processed or turned into new products to reflect consumer tastes and preferences.

Besides stimulating research on techniques for the preservation, sale, and preparation of various types of food to satisfy different consumer tastes and needs, the marketing of agricultural products has an impact on the domestic economy: it stimulates the development of agro-food industries and creates new income-generating opportunities. In order to identify the means and items of an adequate trade policy it is therefore necessary to reflect on the logic, ripple effect, and current dynamics of the different types of agro-industrial market.

3. AGRO-FOOD INDUSTRY AT THE HEART OF THE GLOBAL FOOD SYSTEM

Today, the agro-food industry is at the heart of a major economic complex, the food system, whose purpose is to feed people, most often through market relations (Rastoin and Gherzi, 2012). The position of the agro-food industry in sectors that make up the food system varies from country to country. However, there is a global convergence towards a tertiary agro-industrial model in which the agro-food industry is global, involves sophisticated technology, is financed by multinationals, and occupies a strategic pivotal position. In 2009 the agro-food industry accounted for 10% to 30% of total manufacturing industries, nearly USD 4 trillion of production, and over 25 million employees (Rastoin et al. 2012).

Ten countries account for 85% of the agro-food industry's global production and 70% of its employees. Remarkably, at the beginning of the 2000s the absolute supremacy of developed countries (United States, Germany, France, and Japan) was replaced by a shared global leadership with the emerging economies of China, Russia, Brazil, and India. In industrialised food systems the agro-food industry market consists mainly of mass distribution, itself highly concentrated and constituting over 80% of food purchases in Western European households. Competition between mass distribution firms is mainly through consumer prices and therefore through net prices paid to food suppliers. Thus, in the agro-food

industry there is an obsession with productivity gains, pushing players to reduce the fixed unit cost by increasing the size of factories (economies of scale, replacement of labour with mechanisation and robots). Technological advances have made it possible to significantly reduce losses and to improve product quality controls. Finally, concentration ensures the financing of intangible investments (innovation and communications) that enable the company to gain market share through a leverage effect enabled by size. The investments are considerable. In 2008, research and development accounted for approximately 1.5% of the turnover of large agro-food companies in the OECD, while, depending on the product, advertising represented 5% to 15% of the final price. Here again the scale effect favours large firms.

Most big agro-food companies use the stock market, where hedge funds are active, to finance themselves. This financing requires high returns in the short term and has an amplifying effect on price volatility. It causes enormous problems for farmers and small businesses, and forces firms to use sophisticated production and marketing technologies and to intensively harness biological resources, leading to major new challenges: climate change; controlling greenhouse gas emissions, waste production, and soil pollution; improving energy efficiency through bioenergy production; conserving biodiversity; using bio-recyclable raw materials and controlling food waste; improving nutritional quality, food biosecurity and certification, and information on manufacturing conditions (and consumer confidence in such information); and digitising information for traceability and developing e-commerce using barcodes, QR codes, and block chain technology.

Technologies being developed that combine digital and bio technologies will allow specific knowledge of manufacturing and transport conditions, especially cold-chain compliance, provided that the deployment of such technologies is properly organised and regulated. As in other industrial sectors, digital technology in the agro-food industry will allow further productivity gains through the organisation of production chains from the primary producer to the end consumer, with even the prospect of optimising logistics chains by using drones for home deliveries.

3.1 Agro-food industry and the ripple effect

Bernade and LeClercq (2005) define the agro-food industry as any industry that processes plant- or animal-based raw materials into products intended for human or animal consumption. In its narrowest sense this definition does not include either raw material producers or peripheral activities (fertilizers, agricultural machinery, and specific services). In the Côte d'Ivoire the agro-food industry comprises eight branches, according to National Accounts product classification (INS, 2020), as follows:

- Meat and Fish Production (MFP)
- Grain Processing and Starchy Product Manufacturing (GPSPM)
- Cocoa & Coffee Processing (CCP)
- Oilseed Industry (OI)
- Bakery, Pastry and Pasta (BPP)
- Dairy Industry and Fruit & Vegetable Industry (DIFVI)
- Beverage Industry (BI)
- Tobacco Industry (TI).

The agro-food industry is the industrial sector that offers the greatest opportunities in terms of sustainable growth, employment, and poverty reduction in Africa (UNCTAD, 2010). The strategic role of agro-food industry activities in development can be explained by several factors. First, technology and innovation are essential for economic development, and the agro-food industry has traditionally been the primary source of innovation in modern economies (Gault et al. 2010). The research and development activities of agro-food enterprises have been key to technological advances in the global economy (Shen et al. 2007).

The agro-food sector has another advantage over other sectors: since agro-food companies are particularly heavy consumers of banking, transport, insurance, and communication services, the sector is an essential source of demand for other sectors. The agro-food sector also boosts the growth of the agricultural sector by creating demand. The sector therefore has significant downstream and upstream ripple effects and thus contributes to domestic investment, employment, and production for development purposes.

The agro-food sector is also attractive because, according to Engel's law, as per capita income rises the share of agriculture in total household expenditure declines and the share of processed products increases. As a result, agro-food products offer significant opportunities for export expansion and are therefore key drivers of growth in merchandise trade (UNCTAD and UNIDO, 2011). Ripple effects can also be assessed for markets using Leontief's model (Coulibaly and Ghersi, 1993). This justifies the relevance of analysing the ripple effects of domestic and international markets and ascertaining which one better drives the development of the agro-food industry. Ripple effects are defined as actions whereby an increase in the growth rate of production (or productivity) for activity A causes an increase in the growth rate of profit (or productivity) for activity B (Coulibaly and Ghersi 1993). According to Leontief's model, the driving unit A acts on unit B through a set of dimensional effects. That is to say, unit A causes additional production for B by the size of the purchases made from B.

Some studies similar to ours have focused on ripple effects. Bojnec (2016) uses an input-output table of the Slovenian economy with 60 branches to analyse direct and indirect effects by economic activity, technological intensity of products and services, and statistical region in Slovenia. Comparisons with alternative non-dual-use high tech are analysed by economic activity in terms of value-added and labour productivity. Dual-use exports are associated with technologically intensive suppliers and sub-suppliers of defense/civilian goods and services. Bojnec argues that empirical estimations can serve as a guide when comparing alternative economic policy designs in the investigation of trade-offs between expenditure allocation for defense equipment and the opportunity costs of non-dual use of high-tech products and services. Bojnec and Ferto (2015) use a gravity trade model to assess the effects of institutional drivers of trade in agricultural and food products. The focus is on the effects of institutional quality and similarity among OECD countries when explaining variation in bilateral agricultural and food exports. The empirical results confirm that institutional similarity and institutional quality have separate effects on agro-food export patterns. Institutional similarity has significant but mixed associations with agro-food exports in similar institutional frameworks, while the effect of institutional quality on agro-food exports varies: different institutions have different impacts. A good quality institution reduces the effects of distance, which, jointly with the level of economic development in importing OECD countries, promotes

international agro-food trade. Coulibaly et al. (2019), based on the input-output table (IOT) of the Ivorian economy, show that all agro-food industry branches have lower-than-average ripple effects of 0.132%. This low agro-food industry power and sensitivity is a result of low integration between branches and with the agricultural sector, in particular with the food agriculture branch, and of the obsolete technologies used. These results are in line with those of Koko (2013).

3.2 Hypotheses

Since its independence in 1960 the Côte d'Ivoire has willingly industrialised its economy and has opted for an industrial import substitution and agro-export policy model. In terms of economic theory, external openness influences economic growth through the expansion of the market, the acquisition of new technologies, and the acceleration of capital formation (CIRES, 2014). Faced with the deterioration of the terms of trade and the strong growth in domestic demand for consumer products, this study tests two hypotheses:

H1: The international market has greater trade ripple effects than domestic or local markets.

H2: The domestic market has greater trade ripple effects than the international market.

4. METHODOLOGY

Leontief's input-output model (Leontief, 1936) is a tool for analyzing inter-sectoral exchange flows that uses data from the Supply Use Table (SUT), or Input-Output Table (IOT) (also called the Flow Table) provided by national accounts (Coulibaly et al., 2019).¹ The Input-Output Table (IOT), the Economic Overview Table (EOT), and the Social Accounting Matrix (SAM), are key instruments of economic analysis. Leontief (1936) first used the input-output table, commonly referred to as IOT or SUT (Supply Use Table). The analysis of the IOT is based on a linear equation system showing the distribution of an industry's production

¹ The United Nations System of National Accounts was established in 1993 (SNA93) and set out the reference nomenclature by which countries define institutional units and sectors and their economic accounts, and the three types of economic transaction (goods and services, income distribution, financial transactions) that constitute the major economic aggregates.

across the economy (Yu et al., 2010). It is a double entry table that tracks all economic transactions in goods and services. It describes the structure of the domestic economy and of product flows, which makes it useful for prioritising activities and highlighting the driving and driven branches of the economy. It is considered not only as a forecasting tool for predicting the effect of a given policy on the production of the branches, but also as a tool for economic impact analysis because it allows measuring the effects of variation in an item of final demand for a strategic product on the entire economy (Zaoujal, 2016). We consider Leontief's model as a particular case of the general equilibrium theory, which aims to overcome the contradictions of prices and quantities equilibrium analysis in partial equilibrium. In fact, IOTs were conceived as an accounting matrix twinned with a mathematical model of general economic equilibrium. The scheme was designed as an alternative to econometrics, as Leontief considered the latter ill-equipped to link economic theory with statistical measurement. We chose Leontief's model because of its robustness in assessing ripple effects. It allows us to identify the type of market that is most stimulating for the agro-food industry. However, it should be noted that Leontief's model provides an essentially static image that does not explain changes and evolution. It ignores technical progress, changes in behaviour, and everything that constitutes structural change. Such a model is acceptable only for small variations and for a short term. Nor are climatic hazards or training and production technologies included in the IOT, and the functions of the model are assumed to be linear. However, structural changes are weak and slow in Africa and the model remains well suited to developing economies like Côte d'Ivoire.

This paper applies three steps to identify the commercial orientation of the branches, to analyse the trade ripple effects of the domestic and international markets, and to recommend a commercial orientation for the agro-food industry.

4.1 Identifying the trade orientation of the economy's branches.

Leontief's model makes it possible to simulate expenditure related to different types of final demand and to follow the shock wave that this creates in the economy. For every expenditure made by an economic agent, the economy adjusts to the increase in demand by increasing the branch's production (Zaoujal, 2016). According to Coulibaly and Ghersi (1993), in Leontief's model the total

production of a sector is equal to the sum of the intermediate uses and final consumption of the products. Mathematically, this can be written as:

$$\sum X_{ij} + Y_i = X_j \tag{1}$$

Where X_{ij} represents the purchases of sector j from sector i ; Y_j the final demand for goods of sector j ; and X_j is the total gross production of the sector. Leontief's model is a representation of an economy's Input-Output Table (IOT) that is based on calculated indicators, called 'technical coefficients', which express the participation of other industries in the production of a given industry. In other words, the technical coefficients of an industry (j) present the purchases made by that industry from other industries (i) in order to produce one unit of production. The technical coefficients a_{ij} are determined as follows:

$$a_{ij} = \frac{X_{ij}}{X_j} \tag{2}$$

$$\text{Hence } X_{ij} = a_{ij} * X_j \tag{3}$$

Equation (1) can be re-written as

$$\sum a_{ij} * X_j + Y_j = X_j \tag{4}$$

For an economy with n sectors, all of the technical coefficients a_{ij} form Matrix A below:

$$A = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1i} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2i} & \dots & a_{2n} \\ \vdots & \vdots & \dots & \vdots & \dots & \vdots \\ a_{n1} & a_{n2} & \dots & a_{ni} & \dots & a_{nn} \end{bmatrix}, \tag{5}$$

This matrix is commonly referred to as the technical coefficient matrix. In Leontief's model, a_{ij} is assumed to be fixed and stable because production techniques are complementary factor techniques, returns to scale are constant,

the model is short term, and it is stable because it is not significantly affected by technological change. In an economy with n sectors the coefficients form a matrix called A . A simplified form of the system of equations representing the economy leads us to the following equation:

$$X=AX+Y \tag{6}$$

Where X is the gross production of the economy, A is the matrix of technical coefficients for the overall economy, and Y is the final demand vectors. Note that the final demand consists of several components: household consumption (Cm), exports (E), gross fixed capital formation ($GFCF$), and variation of stock (VS).

$$Y= Cm + E +GFCF + VS \tag{7}$$

An arrangement of Equation (6) gives:

$$X= (I-A)^{-1} \cdot Y \tag{8}$$

Where $(I-A)^{-1}$ is called Leontief's inverse matrix. Equation 8 summarises the Leontief model.

Before analyzing the performance of the domestic and international markets, we first identify the current market orientation of the branches; i.e., whether the sub-sectors are oriented towards the domestic market, the international market, or both at the same time. To do this we use a classification scale developed by Coulibaly and Ghersi (1993). A sub-sector is said to be inward-oriented if its domestic consumption (Cm) is greater than or equal to 75% of final demand.

$$(Cm/Y)*100 \geq 75\% \tag{9}$$

However, if its external consumption (exports) is higher than 75% of the final demand the branch is said to be outward-oriented.

$$(E/Y)*100 \geq 75\% \tag{10}$$

If its internal and/or external consumption is between 25% and 75% the branch is said to be dual-trade (Coulibaly and Ghersi, 1993).

4.2 Measuring the trade ripple effects of markets

After classifying the various industries according to markets, we simulate a 10% increase in domestic demand and then a similar increase in foreign demand and compare the ripple effects on the economy. The second step will consist in assessing the trade ripples from the equations below:

$$Y = C_m + E + GFCF + VS \quad (11)$$

The impact of internal market demand on final demand can be seen by simply increasing household consumption (C_m). At the same time, acting on exports (E) and seeing the effects on final demand will act on international market demand. We note that the production variation of an industry leads to a variation in value added, which in turn induces a variation in wages, which will also impact final demand. The ripple effect of a market is its ability to stimulate the production of an industry in order to increase its value added.

We simulate an increase of 10% in both the domestic and international market and assess the rate of variation in final demand (Y). These simulations enable us to compare the performance of the two markets and deduce which performs better. Final demand (Y) is composed of household consumption (CM), exports (E), gross fixed capital formation ($GFCF$), and variation of stock (VS). For the domestic market we vary final demand (Y) by positively varying household consumption (CM) by 10%. This enables us to write that:

$$Y1 = 10\%C_m + E + GFCF + VS \quad (12)$$

Therefore:

$$\Delta Y1 = Y1 - Y \quad (13)$$

The trade ripple effect of the domestic market is $K1$ and is assessed as follows:

$$K1 = \frac{\Delta Y1}{Y} \quad (14)$$

A 1% growth in domestic demand (household consumption) allows K1% growth in the domestic economy in terms of financial resources. K1 is the trade ripple effect of the domestic market.

For the international market we vary final demand (Y) by positively varying exports (E) by 10%. This enables us to write that:

$$Y_2 = C_m + 10\%E + GFCF + VS \quad (15)$$

Therefore:

$$\Delta Y_2 = Y_2 - Y \quad (16)$$

The trade ripple effect of foreign market K_2 is assessed as follows:

$$K_2 = \frac{\Delta Y_2}{Y} \quad (17)$$

A 1% growth in international demand (exports) allows K2% growth in the domestic economy in terms of financial resources. K2 is called the trade ripple effect of the international market.

K1 and K2 represent the trade elasticity of the domestic and international markets respectively, according to the Leontief model.

4.3 Criteria for recommendations

We can compare K1 and K2 and see which of the two markets provides a higher ripple effect. If $K_1 > K_2$ the domestic market provides a better stimulus to growth in the agro-food industry. If not, the international market provides a better stimulus to growth in the agro-food industry, and in turn to the domestic economy. These results allow us to make recommendations, taking into account the political and economic implications.

5. EMPIRICAL ANALYSIS AND RESULTS

The study takes place in the Côte d'Ivoire, a forested country in West Africa. The data used for our study are secondary quantitative data from the most recent

National Accounts (2018). They are produced by the Ministry of Planning and Development every three years. This national database contains several tables, including the Input-Output Table (IOT). The Ivorian IOT is divided into 44 branches. However, the 44 branches have been aggregated into 21 sub-sectors in order to study the performance of the agro-food industry markets. And this because policies are drawn up by sector or sub-sector for more efficiency. The sub-sectors are:

1 – Food Agriculture (FA), 2 – Industrial or Export Agriculture (IEA); 3 – Livestock and Hunting (LH); 4 – Fisheries (F); 5 – Meat and Fish Production (MFP); 6 – Grain Processing and Starchy Product Manufacturing (GPSPM); 7 – Cocoa and Coffee Processing (CCP); 8 – Oilseed Industry (OI); 9 – Bakery, Pastry and Pasta (BPP); 10 – Dairy Industry and Fruit & Vegetable Industry (DIFVI); 11 – Beverage Industry (BI); 12 – Tobacco Industry (TI); 13 – Wood Industry (WI); 14 – Chemical Industry (CI); 15 – Construction and Public Works (CPW); 16 – Energy and Water (EW); 17 – Miscellaneous Industries (MI); 18 – Oil Extraction/Mining and Refining Industry (OEMRI); 19 – Public Services (PuS); 20 – Private Services (PrS); 21 – Other Sectors (OS).

The two main sectors are: Agriculture (sub-sectors 1 to 4) and the Agro-Food Industry (sub-sectors 5 to 12).

5.1 Current commercial orientation of the economy's branches

Table 1 shows the trade rate of the economy's branches in domestic and international markets, estimated according to Equations 9 and 10. The Food Agriculture and Livestock and Hunting sub-sectors mainly target the Ivorian domestic market. Industrial and Export Agriculture is 72.61% oriented to the foreign market. The Fisheries sub-sector is mainly inward-oriented, as are Meat and Fish Production (89.47%), Food Grains and Starchy Product Manufacturing (84.82%), Bakery, Pastry and Pasta (92.31%), the Dairy Industry and Fruit & Vegetable Industry (84.64%), the Beverage Industry (95.76%), and the Tobacco Industry (84.91%). Only the Cocoa & Coffee Processing branch is outward-oriented, with a low domestic consumption rate (9.50%). This is explained by the fact that this sub-sector is mainly managed by foreign investors. The Oilseed Industry has a domestic consumption rate of 68.92% and an export rate of 29.86% and is therefore mixed or dual-traded.

Table 1: Trade orientation of sub-sectors of the domestic economy (%)

Component	Domestic Consumption Cm/Y	Exports E/Y	Gross Fixed Capital Formation (GFCF), GFCF/Y	Variation of stock (VS), Vs/Y	Final Demand (Y) Y/Y	Orientation
Sub-sector of the economy						
1 - Food Agriculture (FA)	89.63%	0.49%	0.00%	9.87%	100.00%	Inward
2 - Industrial or Export Agriculture (IEA)	14.12%	72.61%	0.95%	12.33%	100.00%	Outward
3 - Livestock and Hunting (BH)	76.13%	0.22%	6.52%	17.13%	100.00%	Inward
4 - Fisheries (F)	20.62%	9.31%	0.00%	70.07%	100.00%	Inward
5 - Meat and Fish Production (MFP)	89.47%	8.25%	0.00%	2.28%	100.00%	Inward
6 - Food grains and Starchy Products Manufacturing (GPSPM)	84.82%	6.14%	0.00%	9.04%	100.00%	Inward
7 - Cocoa and Coffee Processing (CCP)	9.50%	75.00%	0.00%	15.50%	100.00%	Outward
8 - Oilseed Industry (OI)	68.92%	29.86%	0.00%	1.22%	100.00%	Dual-Trade
9 - Bakery, Pastry and Pasta (BPP)	92.31%	7.69%	0.00%	0.00%	100.00%	Inward
10 - Dairy Industry and Fruit & Vegetable Industry (DIFVI)	84.64%	11.25%	0.00%	4.11%	100.00%	Inward
11 - Beverage Industry (BI)	95.76%	3.11%	0.00%	1.12%	100.00%	Inward
12 - Tobacco Industry (TI)	84.91%	12.52%	0.00%	2.57%	100.00%	Inward
13 - Wood Industry (WI)	66.09%	27.26%	1.71%	4.94%	100.00%	Dual-Trade
14 - Chemical Industry (CI)	47.01%	38.50%	0.00%	14.49%	100.00%	Dual-Trade
15 - Construction Materials	31.03%	0.32%	68.65%	0.00%	100.00%	Dual-Trade
16 - Energy, Electricity, Water	74.67%	25.33%	0.00%	0.00%	100.00%	Dual-Trade
17 - Miscellaneous Industries	38.73%	22.53%	24.18%	14.57%	100.00%	Dual-Trade
18 - Oil Extraction/Mining and Refining	4.26%	62.05%	0.00%	33.69%	100.00%	Inward
19 - Public Services	99.85%	0.15%	0.00%	0.00%	100.00%	Inward
20 - Private Services	90.05%	9.95%	0.00%	0.00%	100.00%	Inward
21 - Other Branches	22.31%	13.28%	44.43%	19.98%	100.00%	Inward

Source: Authors' calculations based on IOT 2018 at current prices using Equations 9 and 10.

5.2 Trade ripple effects of the domestic and international agro-food industry markets

A market’s ripple effect is its capacity to stimulate production in order to increase value added. Leontief’s model makes it possible to determine the ripple effects of the domestic and international markets by simulating a 10% increase in demand in both. These ripple effects were estimated using Equations 14 for the domestic market ripple effect) and 17 for the international market ripple effect. The results are presented in Table 2.

Table 2: Trade ripple effects of the domestic and international markets (%)

Agro-Food Industry Branch	Domestic Market (K1)	International Market (K2)
5 – Meat and Fish Production	11%	0.99%
6 – Food Grains and Starchy Products Manufacturing	14%	1.10%
7 – Cocoa & Coffee Processing	1%	9.72%
8 – Oilseed Industry	16%	5.95%
9 – Bakery, Pastry and Pasta	9%	0.77%
10 – Dairy Industry and Fruit & Vegetable Industry	12%	1.55%
11 – Beverage Industry	12%	0.42%
12 – Tobacco Industry	9%	1.29%
AFI Trade Elasticity or Ripple Effect	84%	22%

Source: Authors’ calculation based on IOT 2018 at current prices, using Equations 14 and 17.

To illustrate, the information contained in Table 2 on Meat and Fish Production means that a 10% increase in domestic demand for Meat and Fish Production causes an 11% increase in the production of Meat and Fish; on the other hand, the same 10% increase in demand, this time oriented towards the international market, leads to an increase of only 0.99% in Meat and Fish Production. The stimulus the domestic market provides to the development of the agro-food industry is almost four times higher than that of the international market, with average performances of 84% and 22% respectively.

As domestic demand for agro-food products increases the agro-food industries are exploiting the strong potential of the domestic market. However, Coffee & Cocoa Processing is better stimulated by the international market.

5.3 Discussion

Our results show that the ripple effects of the domestic market are almost four times higher than those of the international market (84% vs. 22%). Our results are in the same direction as those of World Bank (Banque Mondiale, 2020) market competitiveness study Côte d'Ivoire using comparative advantage revealed (CAR), which shows that Côte d'Ivoire is more competitive in food products and vegetables (subsistence agriculture). Our results confirms a World Bank study (Banque Mondiale, 2015) according to which domestic and sub-regional (Mali, Burkina Faso, Niger, and Ghana) markets have become great opportunities thanks to demographic growth. This study of the World Bank in 2015, also reveals that exports from Côte d'Ivoire are not competitive because of the low prices of products on the international market, which does not allow capitalisation of production systems. These results confirm our hypothesis H2 that “The domestic market has a greater trade ripple effect than the international market”. On the other hand, using the 1986 IOT, Coulibaly and Gherzi (1993) showed that the international market's ripple effect of 21.8% boosted the economy better than the domestic market's average ripple effect of 10% because the prices of agricultural raw materials were better on the international market than the domestic market.

The performance of the domestic market can be explained by the average rate of population growth in Côte d'Ivoire (2.59% per year) combined with the rate of urbanisation (from 32% in 1975 to 50.3% in 2014). One of the advantages of the domestic market for agro-food industries is the strong, partially satisfied demand for traditional local products, or products that have undergone artisanal processing. The social nature of food is also a factor, as each social group is identified by a consumption pattern. Traditional food products have a symbolic and cultural character, leading to a reluctance to switch to industrially processed foods. The early stages of agro-food processing require simple and low-cost technologies (threshers, cleaners, huskers, rollers, sifters, dryers, oil extractors, etc.), which makes them accessible to small-scale enterprises.

Moreover, given the advanced sophistication of processed products in developed countries there is not a sustained global demand for such products from African countries. Thus, the most attractive option for agro-food industries remains domestic and sub-regional markets that are characterised not only by proximity but also by similar food preferences, which constitute a source of competitive advantage. In addition, the African population growth rate and galloping urbanisation are opportunities for agro-food industry development. However, products need to be low cost and nutritionally adapted to people's needs. GIZ (2017) confirms the market opportunities for Ivorian AFIs in the sub-region. Mass-production industries are also more resistant to external shocks, although low purchasing power presents a risk for a domestic-market-oriented strategy.

The strategy of orienting products towards domestic and West African markets needs to be accompanied by policies to enlarge the African middle class that can consume the manufactured products, such as a savings policy, domestic investment by nationals, a tax policy, and an adequate supply chain policy.

Orientating commercial policy towards the domestic market will revitalise research on processing technologies for large consumption products such as food crops. Food agriculture produces approximately 18,842,420 tons of crops per year over an area of 2,448,000 hectares, constitutes 14.7% of GDP, and employs more than 2,500,000 agricultural workers, or about 90% of rural families (85% of the active agricultural population), and is mostly made up of women and the informal sector. The food agriculture sector is an important dormant source of increased employment and farm income that can provide food security and reduce rural poverty. In terms of income, food production has significant development potential, particularly for women and young people. Orientating to the domestic market is a more appropriate policy than liberalism because deteriorating trade terms generate an external debt (48% of GDP) that the economy cannot support. According to Atse (2007), poverty rates have not fallen despite the fact that Ivory Coast's trade with the rest of the world has increased; on the contrary, poverty has increased. An economic policy based on trade liberalisation has not automatically led to poverty reduction.

6. CONCLUSION

Our study shows that most agro-food industry categories (Meat and Fish Production; Grain Processing and Starchy Product Manufacturing; Bakery, Pastry and Pasta; Dairy Industry; Fruit and Vegetables; Beverages; Tobacco) are commercially inward-oriented. Only the Cocoa and Coffee Processing category is outward-oriented, while the Oilseed Industry is commercially mixed or dual-oriented.

The ripple effect, or trade elasticity, is almost four times higher in the domestic market than the foreign market, which is explained by the population growth in Côte d'Ivoire, the rate of urbanisation, and the social character of food. Thus, the domestic market better stimulates the development of the agro-food industry – and thus the economic development of the country – than the international market. On the other hand, the Coffee and Cocoa Processing branch is better stimulated by the external market. The rate at which the African population is increasing and the growing urbanisation present an opportunity for the development of the agro-food industry. However, products should be low-cost and nutritionally adapted to people's needs. Industries that produce most of their production for the domestic mass market are more resistant to external shocks, but an agro-food product marketing strategy oriented towards the domestic market faces the risk of consumers' low purchasing power.

We therefore recommend that the strategy of orienting products towards domestic and West African markets should be supported by policies aimed at enlarging the African middle class that can consume the products offered by manufacturers; for example, a savings policy, domestic investment by Ivoirians, and adequate and efficient tax and supply chain policies. Thus, the analysed weaknesses could foster the development of a sound investment policy, and indirectly a sound economic policy.

REFERENCES

Akhabbar, A., & Lallement, J. (2011). *Appliquer la théorie économique de l'équilibre général: de Walras à Leontief*. Paris GRESE, Lausanne University, Centre Walras-Pareto, Centre d'Economie de la Sorbonne 37P. https://mpra.ub.uni-muenchen.de/30210/1/MPPA_paper_30210.pdf

Atse, M. (2007). *Développement, commerce international et réduction de la pauvreté: cas de la Côte d'Ivoire*. Mémoire Université du Québec à Montréal, Canada, 213P. <https://archipel.uqam.ca/4794/1/M9901.pdf>

Banque Mondiale (2015). Étude sur la Compétitivité de l'Industrie Manufacturière Ivoirienne. Rapport, 108P. <http://documents1.worldbank.org/curated/en/480881468189533348/text/97221-Revised-WP-P148295-OUO-9-Box391473B-ACS.txt>

Banque Mondiale (2019). Au pays du cacao, comment transformer la Côte d'Ivoire. *Situation Economique en Côte d'Ivoire*. Juillet 2019. Neuvième édition.64p. <https://www.worldbank.org/en/country/cotedivoire/publication/cote-divoire-economic-outlook-why-the-time-has-come-to-produce-cocoa-in-a-responsible-manner>

Banque Mondiale (2020). *Mobiliser le secteur privé pour appuyer la transformation économique de la Côte d'Ivoire et créer des marchés en Côte d'Ivoire*. Septembre 2020. <https://www.ifc.org/wps/wcm/connect/7af977c8-43e9-4fc2-95d2-2146941d8e4b/CPSD-Cote-d-Ivoire-FR.pdf?MOD=AJPERES&CVID=nlCgZ5d,92p>.

Bernade, C., & LeClercq, C. (2005). *Industrie agro-alimentaire*. DRIRE, Nord Pas-de-Calais. <http://docplayer.fr/572729-Industrie-agro-alimentaire-cyril-bernade-chantal-leclercq-synthese-industrie-agro-alimentaire-en-nord-pas-de-calais-forces.html>

Bojnec, S., (2016). Dual-use product export multipliers with indirect effects. *Technological Forecasting and Social Change*, 102, 287–296. <https://doi.org/10.1016/j.techfore.2015.09.004>.

Bojnec, S., & Ferto, I. (2015). Institutional determinants of Agro-Food Trade. *Transformations in Business & Economics*, 14, (2/35), 35–52.

CIRES (2014). Les moteurs de la croissance et l'ouverture commerciale en Côte d'Ivoire. *Cellule d'Analyse de Politiques Économiques* du CIRES. http://www.capec-ci.org/NEW/docs/etudes/ETUDE_EMERGENCE_MOTEURS_DE_LA_CROISSANCE_version_finale.pdf

CNUCED (2010). Créer les capacités de production dans les PMA pour assurer un développement durable et sans exclusion. *Rapport, Quatrième Conférence Des Nations Unies Sur Les Pays Les Moins Avancés*, Palais des Nations, Genève. <https://unctad.org/fr/node/30697>.

Coulibaly, N., & Ghersi, G. (1993). Stratégie de développement de l'industrie agro-alimentaire en Côte d'Ivoire. Vol. 34. *Série conférence, La Bibliothèque populaire du développement (ENDA)*. http://enda-cremed.org/bpd/opac_css/index.php?lvl=author_see&id=9988

Coulibaly, N., Kone, S., Yapi Y. M., & Kouassi Y. D. M. (2019). Analysis of the commercial integration between agricultural and agri-food industries sectors in Côte d'Ivoire. *International Journal of Agricultural Economics*, 4(4), 144–153.

Gault, J., Leach E., & Duey, M. (2010). Effects of business internships on job marketability: the employers' perspective. *Education + Training*, 52(1), 77–88.

GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit) Tunisie (2017). Etude de Marché Côte d'Ivoire, 306. https://www.giz.de/en/downloads/Guide_de_l_investisseur_GBN.pdf

Institut National de la Statistique (INS), (2020). *Leader des Chiffres en Côte d'Ivoire*. Ministère du Plan et du Développement. www.ins.ci

Koko, K. B. (2013). *Le rôle des Industries Agro-alimentaires dans la croissance agricole: Cas de la Côte d'Ivoire*. Doctorat en Sciences Économiques, Université Ibn Zohr, Faculté des Sciences Juridiques Économiques et Sociales, Agadir. <http://thesesenafrique.imist.ma/handle/123456789/1424>.

Leontief, W. (1936). Quantitative input and output relations in the economic systems of the United States. *Review of Economics and Statistics*, 18(3), 105–125. <https://books.openedition.org/enseditions/11407?lang=fr>.

Logistics & Supply Chain Consulting (LSCC) (2019). Élaboration de la stratégie nationale de développement de la commercialisation des produits vivriers en Côte d'Ivoire. Rapport final, Projet de Pôle Agro-Industriel dans la Région du Bélier (2PAI-Bélier), Ministère de l'Agriculture et du Développement Rural.

Loy, J.-P. & Wichern, R. (2000). Integration of Zambian maize markets. *Zeitschrift für Ausländische Landwirtschaft*, 39(2), 173–198.

Ministry of Agriculture and Rural Development (2020). Journée Nationale du Cacao et du Chocolat. (JNCC), 7ème édition à Yamoussoukro Côte d'Ivoire.

Ministère de l'Agriculture (2012). Stratégie de transformation des produits agricoles. Direction de la Valorisation des Produits, pp 12-32.

Ministère de l'Industrie et des Mines (2017). La conjoncture industrielle à fin 2017. Bulletin d'information industrielle n°50, p.5.

Perroux, F. (1973). L'effet d'entraînement: l'analyse au repérage quantitative. *Économie Appliquée* 1973(2-3-4), 647–674.

Rastoin, J.-L., & Ghersi, G. (2012). *Le système alimentaire mondial: Concepts et méthodes, analyses et dynamiques*. Paris-Versailles, Éditions Quæ.

Salifou, I. M. (2008). *Analyse du système de commercialisation des noix de cajou produites dans les départements de l'Atacora et de la Donga*. Mémoire Diplôme d'Ingénieur Agronome, Université de Parakou pp.1–95.

Shen, J., Dunn, D., & Shen, Y. (2007). Challenges facing U.S. manufacturing and strategies. *Journal of Industrial Technology*, 23(2), 1–10.

Stiglitz, J. (1989). Markets, market failures, and development. *American Economic Review*, 79(2), 197–203.

Truman Harry S. (1949), “President Truman delivers his Fair Deal speech”, January 5, 1949, <https://www.history.com/this-day-in-history/truman-delivers-his-fair-deal-speech>

UNCTAD and UNIDO (2011). Fostering Industrial Development in Africa in the New Global Environment. *Economic Development in Africa Report 2011, Special Issue*. New York and Geneva: United Nations. <https://www.crop.org/Other-Resources/Reports-and-Surveys/Fostering-Industrial-Development-in-Africa-in-the-New-Global-Environment.aspx>

Yu, Y., Hubacek, K., Guan, D., & Feng, K. (2010). Construction and application of regional input-output models: assessing water consumption in South East and North East of England. *Ecological Economics*, 69, 1140-1147. https://www.researchgate.net/publication/272021894_A_multi-region_input-output_analysis_of_global_virtual_water_flows

Zaoujal, N. (2016). Contribution de la consommation finale des ménages a la croissance et a la création d'emploi au Maroc: Simulation a l'aide d'un modèle input-output. *Global Journal of Management and Business Research: B Economics and Commerce*, 16(7). https://globaljournals.org/GJMbr_Volume16/5-Contribution-De-La-Consommation.pdf

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