

**Zeitschrift:** Agrarwirtschaft und Agrarsoziologie = Économie et sociologie rurales [1980-2007]  
**Herausgeber:** Schweizerische Gesellschaft für Agrarwirtschaft und Agrarsoziologie  
**Band:** - (2000)  
**Heft:** 1

**Artikel:** The effects of the export sector on the economic growth of Côte d'Ivoire : a co-integration analysis  
**Autor:** Jaquet, Philippe  
**DOI:** <https://doi.org/10.5169/seals-966298>

### **Nutzungsbedingungen**

Die ETH-Bibliothek ist die Anbieterin der digitalisierten Zeitschriften auf E-Periodica. Sie besitzt keine Urheberrechte an den Zeitschriften und ist nicht verantwortlich für deren Inhalte. Die Rechte liegen in der Regel bei den Herausgebern beziehungsweise den externen Rechteinhabern. Das Veröffentlichen von Bildern in Print- und Online-Publikationen sowie auf Social Media-Kanälen oder Webseiten ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. [Mehr erfahren](#)

### **Conditions d'utilisation**

L'ETH Library est le fournisseur des revues numérisées. Elle ne détient aucun droit d'auteur sur les revues et n'est pas responsable de leur contenu. En règle générale, les droits sont détenus par les éditeurs ou les détenteurs de droits externes. La reproduction d'images dans des publications imprimées ou en ligne ainsi que sur des canaux de médias sociaux ou des sites web n'est autorisée qu'avec l'accord préalable des détenteurs des droits. [En savoir plus](#)

### **Terms of use**

The ETH Library is the provider of the digitised journals. It does not own any copyrights to the journals and is not responsible for their content. The rights usually lie with the publishers or the external rights holders. Publishing images in print and online publications, as well as on social media channels or websites, is only permitted with the prior consent of the rights holders. [Find out more](#)

**Download PDF:** 15.09.2025

**ETH-Bibliothek Zürich, E-Periodica, <https://www.e-periodica.ch>**

## **Preisträger 2000**

### **The Effects of the Export Sector on the Economic Growth of Côte d'Ivoire: A Co-integration Analysis**

**Philippe Jaquet**

The object of this study is to examine the “export-led growth” hypothesis which states that exports have positive effects on economic growth. We have used Côte d'Ivoire as our case study and have applied co-integration analysis to the time series.

The results of the empirical analysis support the “export-led growth” hypothesis in the case of Côte d'Ivoire which exhibits a close relationship between gross domestic product and total exports in both the long- and short-run. The same outcomes are present in the case of agricultural exports. However, the effects of agricultural exports on the economic growth of Côte d'Ivoire are less significant when they are in competition with non-agricultural exports.

Therefore, when considering the future development of Côte d'Ivoire, special attention should be given to its trade policy. Appropriate policies are essential if Côte d'Ivoire, and indeed all other Sub-Saharan countries which are caught up in a similar economic situation, are to achieve economic growth and poverty alleviation. These policies must aim at trade liberalisation, diversification of exports and a low real effective exchange rate with a view to reducing trade distortions and enhancing the competitiveness of the export industry.

**Keywords:** “Export-led growth” hypothesis, Côte d'Ivoire, Sub-Saharan Africa, co-integration analysis, Granger causality.

# **1. Introduction**

## **1.1 Statement of the Problem**

Over the last four decades, the developing world has made enormous economic progress. Most human welfare indicators (OECD, 1996) serve to confirm this: life expectancy in the developing countries has risen from 41 to 62 years; the percentage of the population with access to clean water has doubled (from 35 to 70 percent); adult literacy has risen from less than half the population to about two-thirds; food production and consumption have increased at a rate which is about 20 percent faster than population growth.

Viewed against this background of progress and achievement, it is almost incredible that in anno 2000, four fifths of the world's population lives in the developing countries and that more than one billion people in the developing world subsist in poverty. According to the World Bank, this is the number of people who are struggling to survive on less than \$370 a year, or on less than \$1 a day (World Bank, 1990).

Moreover, there is growing diversity within countries and among countries. Some developing countries are achieving considerable rates of growth and impressive reductions in poverty, although significant concentrations of poverty remain. Other countries, especially in Sub-Saharan Africa and South Asia, have been increasingly marginalised from the rest of the world and their already deplorable living standards continue to deteriorate steadily. For example, in 1998, life expectancy was 74 years in the developed world, but only 51 in Sub-Saharan Africa and 61 in South Asia. Furthermore, as some regions are close to achieving universal enrolment in primary education, net primary education is only 56 percent in Sub-Saharan Africa and about 75 percent in South Asia (World Bank, 1999).

At the end of the 1970's, there was much discussion among economists on the relative merits of development strategies designed to improve economic growth. Basically, these strategies involved either import substitution or export promotion. On the one hand, import substitution entails the erection of protective barriers and means that imports must be replaced by products from domestic industry. On the other hand, an

export promotion strategy involves less protective barriers so that domestic industry is encouraged to export goods under international market competition. The export promotion theory has given birth to the “export-led growth” hypothesis. In this study, this “export-led growth” hypothesis will be examined with the help of an empirical analysis.

## **1.2 The Approach Adopted in the Analysis**

Several studies have attempted to examine this “export-led growth” hypothesis in empirical analysis using either cross-section data or time series (see JAQUET, 1999). Unfortunately, most of these empirical investigations used classical regression analysis that ignores the times series properties of the variables involved. This can lead to incorrect results and false interpretations of the relationship between exports and economic growth. In addition, these previous studies have dealt mainly with Asian countries, where the export sector has led to strong and rapid economic growth. Sub-Saharan African countries which exhibit much slower economic development have received far less attention.

The principal object of this study is to examine the “export-led growth” hypothesis in the case of Côte d'Ivoire. The first step involves the application of co-integration analysis to the time series and in a second stage exports and growth are tested for Granger Causality. Moreover, we will venture to advance some policy recommendations for the future development of Côte d'Ivoire and other Sub-Saharan countries on the basis of our analysis of the results of the empirical investigation. Finally, this study is designed to contribute to the reduction of poverty and the alleviation of adverse living standards in the developing world.

The rest of the article is organised as follows. Section II presents some theoretical considerations on different development strategies, as well as an explanation of the “export-led growth” hypothesis. Section III contains a brief review of the economic development in the post-independence period in Côte d'Ivoire. The econometric methodology and empirical results are presented in Section IV while the final Section summarises the conclusions.



## **2. Theoretical Considerations**

### **2.1 The Different Strategies**

Import substitution is an inwards-orientated strategy which foresees the replacement of imports by products from domestic industry.<sup>1</sup> The concept and conditions for an import substitution strategy are quite simple. The first step involves the identification of large domestic markets, as indicated by substantial imports over the years. It must then be verified that local manufacturers can cope with the required production technologies or that foreign investors are willing to supply technology, management and capital. Finally, protective barriers, in the form of either tariffs or import quotas, must be erected to overcome the high initial cost of local production and make it profitable for potential investors in the target industries. A good example of import substitution is the consumer goods industries, especially processed foods, beverages, textiles, clothing, and footwear. These products are manufactured with relatively standardised technologies which are easily accessible to producers in developing countries. Furthermore, it was felt that consumers could bear the higher costs of local production without curbing development.

The “infant industry” concept is a valid argument in favour of an import substitution strategy. Domestic investors and managers are obliged to acquire technologies which are new to the country, that is to say, they must manufacture products not previously made at home, or introduce new production processes. The managers and workers in the infant industry must then learn to use these technologies efficiently according to the standards of the industrialised countries. This process of “learning by doing” can take several years. However, while these infant industries are gaining the necessary experience, they are unable to manufacture profitably and must sell at the same price as competing imports. Therefore, tariffs and import quotas must be imposed to protect them from imports. In order to justify protection or subsidies, an infant industry must eventually be capable of competing against imports on the home market or, a more rugged test, on export markets. This suggests a

---

<sup>1</sup> This section relies principally on GILLIS ET AL. (1996)

temporary tariff, that is, one that declines toward zero as productivity rises and costs fall. All too often, these conditions are not met and the industrial landscape is littered with infants that never grew up and require protection indefinitely (see KRUEGER, 1984).

Export promotion is an outward-orientated strategy which shifts the focus away from import substitution for the domestic market towards manufacturing for export to foreign markets. A government pursuing an export promotion strategy has to turn the entire incentive system inside out, and make it profitable for firms to sell overseas while diminishing the profits from sales at home. It must not be a bias toward exports, but rather a regime that is neutral in its treatment of exports, import substitutes, and non-traded goods. The market determines most prices and allocations with minimal government intervention and taxes.

In *The Wealth of Nations*<sup>2</sup>, Adam Smith recognised that export markets would permit factories to produce larger quantities of any single item and thus to achieve a higher degree of specialisation than if they produced for the home market only. Longer production runs reduce the set-up costs of switching from one product to another and specialisation permits each firm to learn more about manufacturing its products efficiently. It permits the realisation of economies of scale. The theory of comparative advantage, developed by David Ricardo during the nineteenth century (see RIEDER AND ANWANDER, 1994), represents yet a further argument in favour of an export promotion strategy. This theory states that nations with different endowments of capital, labour and natural resources gain by specialising in those areas where their relative production costs are low and importing in those areas where their relative production costs are high. During the first half of the twentieth century, the Swedish economists, Eli Heckscher and Bertil Ohlin, expanded the theory of comparative advantage to deal with two factors, such as labour and land. The fundamental idea of the Heckscher-Ohlin theory is as follows: each country should concentrate on producing that commodity which makes intensive use of the factor which is most readily available within the country itself. It should import other goods rather than attempting to manufacture quantities of both products (KRAUSS, 1979). This course is more efficient both for the world as a whole and for individual nations.

---

<sup>2</sup> Cited in GILLIS ET AL. (1996)

## **2.2 The “Export-Led Growth” Hypothesis**

There are substantial reasons for believing that there is a causal relationship between exports and economic growth and that this relationship is one of interdependence rather than of unilateral causation. However, there are also reasons for believing that exports are a key factor in promoting economic growth and that, in general, a rise in exports stimulates an increase in aggregate economic growth, rather than vice versa. This hypothesis is known as the “export-led growth” hypothesis (EMERY, 1967).

In addition to the two principal arguments in favour of the “export-led growth” hypothesis, i.e. the theory of comparative advantage and economies of scale, there are other strong logical and empirical arguments supporting this hypothesis. Export development generally means that the export industry must remain efficient and competitive in the international markets. Profitable export industries tend to stimulate additional investments, both domestic and foreign, and encourage an increased flow of technological and markets innovations, as well as managerial skills (Krueger, 1984).

## **2.3 Export Characteristics of Developing Countries**

Knowledge of the factor endowments of developing countries helps explain the kinds of goods they export and import, which are essentially primary products. Natural resources dictate the exports of the oil-rich countries on the Persian Gulf, Southeast Asia and Latin America, copper exporters such as Zambia, Zaire, Chile, and Peru and timber exporters like Malaysia and Ghana. Tropical climate may be viewed as a production factor that explains exports of foods like coffee, cocoa, bananas, vegetable oils and raw materials such as rubber and cotton. Abundant labour suggests export crops that can be produced efficiently with labour-intensive methods, for example coffee, tea, rice and tobacco and the labour-intensive manufacture of textiles, clothing and electronic components.

## **2.4 Objections to Primary Export-Led Growth**

Since the late 1950's, some economists and many third-world leaders have argued that primary exports, other than petroleum, cannot effectively lead the way to economic development: markets for primary products grow too slowly to generate growth and the prices for these commodities have been declining.

There are two main arguments against the primary export-led growth: Engel's law (see RIEDER AND ANWANDER, 1994; GILLIS ET AL., 1996), and the Prebisch-Singer thesis. In the nineteenth century, Ernst Engel discovered that as family incomes rose, the proportion of their budget spent on food declined. Since the main function of the agricultural sector is to produce food, it follows that demand for agricultural output would not grow as rapidly as the demand for industrial products and services and thus the share of agriculture in the national product would decline. The Prebisch-Singer thesis, developed by the Argentine economists Raul Prebisch and Hans Singer<sup>3</sup>, states that since developing countries are exporters of primary products and importers of manufactured goods, and since the prices for the former fall in relation to the latter, the developing countries must constantly produce greater quantities more simply merely to maintain their current position. This is also known as deteriorating terms of trade.

### **3. Côte d'Ivoire as a Case Study**

Côte d'Ivoire was one of the last additions to the French colonial empire. It was not until the 1890's that the French recognised its excellent agricultural possibilities and declared it a French colony in 1893. Afterwards, a typical colonial economy was established in Côte d'Ivoire (MUNDT, 1995).

#### **3.1 Côte d'Ivoire's Economy**

Since gaining independence in 1960, Côte d'Ivoire has experienced both the heights of economic growth and the depths of recession. Throughout the 1960's and 1970's, its gross domestic product (GDP hereafter) increased at an average annual rate of about 7.5 percent, which was close to the record for the top-performing developing countries: the "Ivorian Miracle". The miracle came to a sudden end in the 1980's, when Côte d'Ivoire found itself in the grips of a serious foreign payments crisis, from which it has not yet recovered (BERTHÉLEMY AND BOURGUIGNON, 1996).

The record growth performance in Côte d'Ivoire up until the late 1970's was attributable to exports, consisting mainly of agricultural products.

---

<sup>3</sup> Cited in OSTERFELD (1994)

Coffee and cocoa accounted for 60 to 80 percent of total value added in the export crop sector. Coffee production expanded rapidly during the 1950's and early 1960's. After 1965, the growth in coffee production gradually fell, whereas cocoa production grew rapidly. By the late 1970's, cocoa had replaced coffee as the main export crop and Côte d'Ivoire had become the world's leading cocoa producer and ranked third among the world's coffee producers (FAO, various years, Production Yearbook).

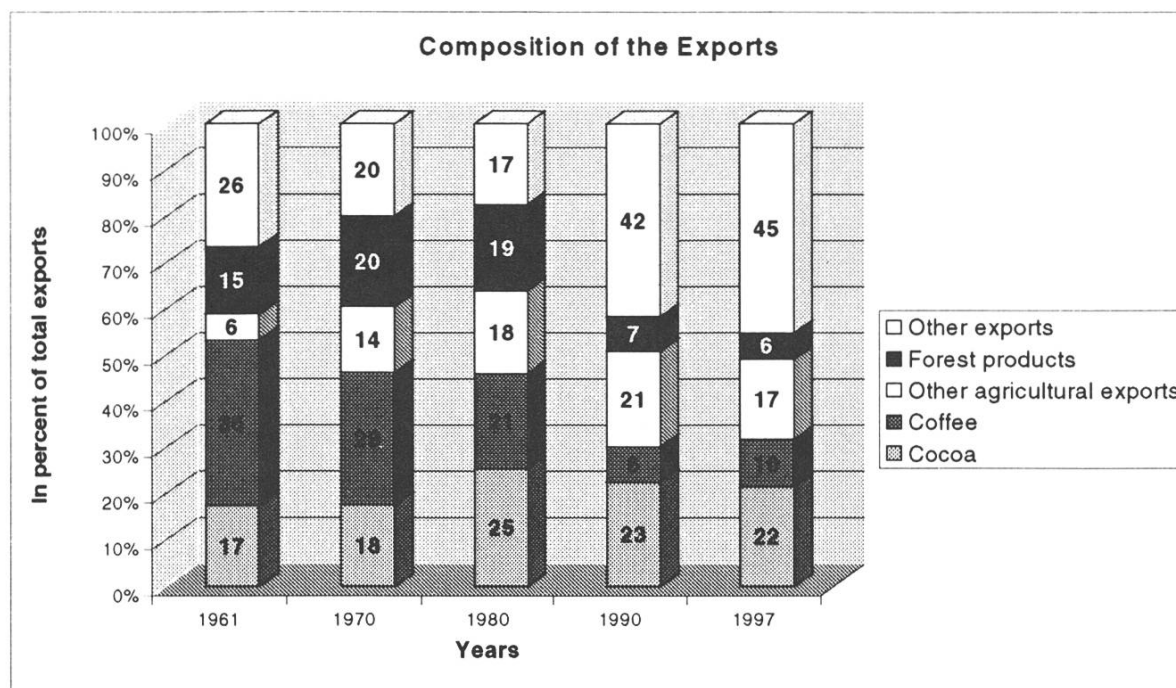
The manufacturing sector in Côte d'Ivoire is small and not very advanced. Most of Côte d'Ivoire's so-called industrial exports are in fact processed or semi-processed raw materials or agricultural products. The labour market in Côte d'Ivoire is overwhelmingly rural. In 1996, approximately 49 percent of the labour force was employed in agriculture (African Development Bank, 1998). Côte d'Ivoire is a member of the West African Monetary Union and as such benefits from free access to the relatively large capital market of the franc zone, which encompasses those areas of the world in which the French franc is standard currency. As member of the franc zone, countries of the West African Monetary Union benefit from the fixed parity of their common currency, the African Financial Community Franc (CFAF hereafter), with respect to the French franc (FF). The CFAF's value in relation to the French franc (CFAF50 = FF1) is guaranteed by the French Treasury. Since it is pegged to the French franc, the CFAF floats against other currencies, but these movements are completely independent of monetary and financial conditions within franc-area countries other than France. The fixed parity of the CFAF and French franc imposes serious constraints on West African monetary policies.

### **3.2 Export Performance of Côte d'Ivoire**

As mentioned earlier, a large proportion of Côte d'Ivoire's economy is based on the export sector. On average, the ratio of exports in GDP is over 30 percent, which is a much higher rate than for a low-income country, where it accounts for less than 20 percent.



Figure 1: Evolution of the Composition of Exports for Côte d'Ivoire.



Source: IMF. Various years. International Financial Statistics Yearbook.  
FAO. Various years. Trade Yearbook.

The composition of Côte d'Ivoire's export sector shows that exports concentrate heavily on primary products and in particular on agricultural products which accounted for 64 percent of total exports in 1980 (see Figure 1). As mentioned earlier, exports of cocoa and coffee are predominant among the agricultural products. The favourable climate and soil conditions form the basis of Côte d'Ivoire's comparative advantage in the production of these two traditional export crops. Other agricultural exports include cotton, rubber, oil palm and bananas. Even though Côte d'Ivoire's export sector is well developed, it is nevertheless very fragile, due to the concentration on cocoa and coffee. World prices for these products fluctuate far too much to ensure sustainable development for Côte d'Ivoire's economy.

### 3.3 Trade Policy of Côte d'Ivoire

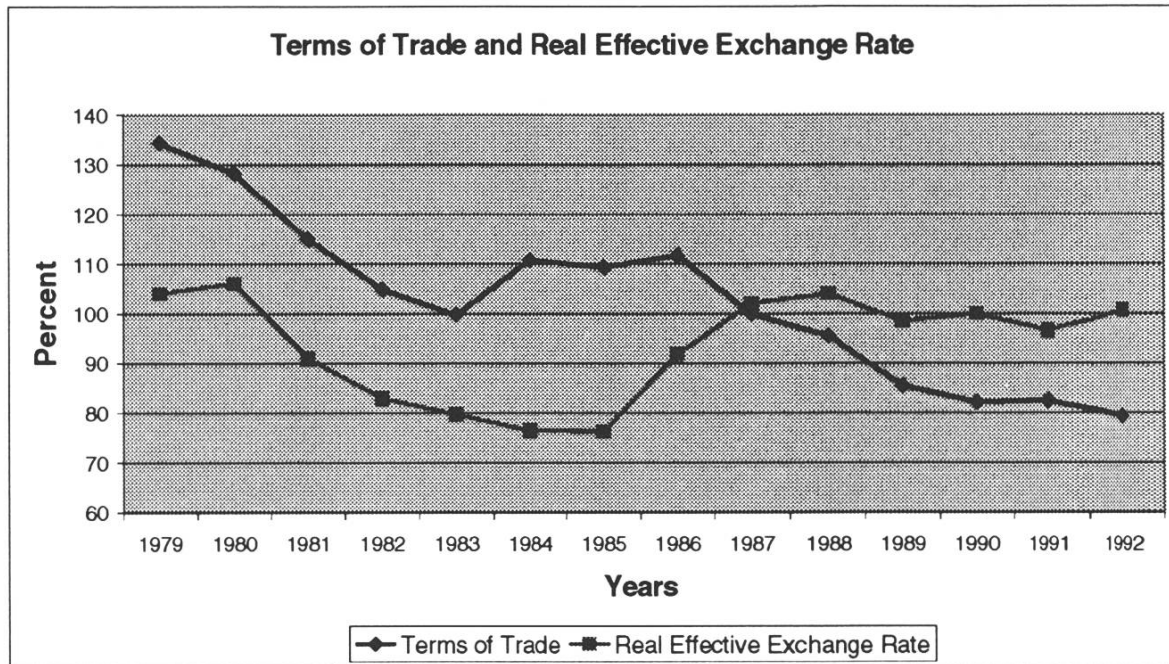
On the subject of trade policy, Côte d'Ivoire is atypical among the low-income countries due to its openness to foreign trade, as demonstrated by its large export and import shares. Although Côte d'Ivoire's economy is outward-orientated, the government has reduced the competitiveness of domestic industry with a complex system of quantitative restrictions



on imports to protect the import substitution industries (Schneider, 1992).

Two key indicators of the suitability of a trade policy are the terms of trade<sup>4</sup> and the real effective exchange rate (REER hereafter). They are both presented in Figure 2.

*Figure 2: Evolution of the Terms of Trade and Real Effective Exchange Rate for Côte d'Ivoire, 1979-92.*



Source: IMF. Various years. International Financial Statistics Yearbook.  
World Bank. Various years. World Tables.

Côte d'Ivoire is particularly susceptible to terms of trade losses for two main reasons. Firstly, it depends heavily on two main export crops, cocoa and coffee. Secondly, its exports constitute a significant share of total world trade in these commodities. At the end of the 1970's, Ivorian cocoa and coffee exports represented 16 percent and 8 percent of total world trade by volume (DEMERY, 1994).

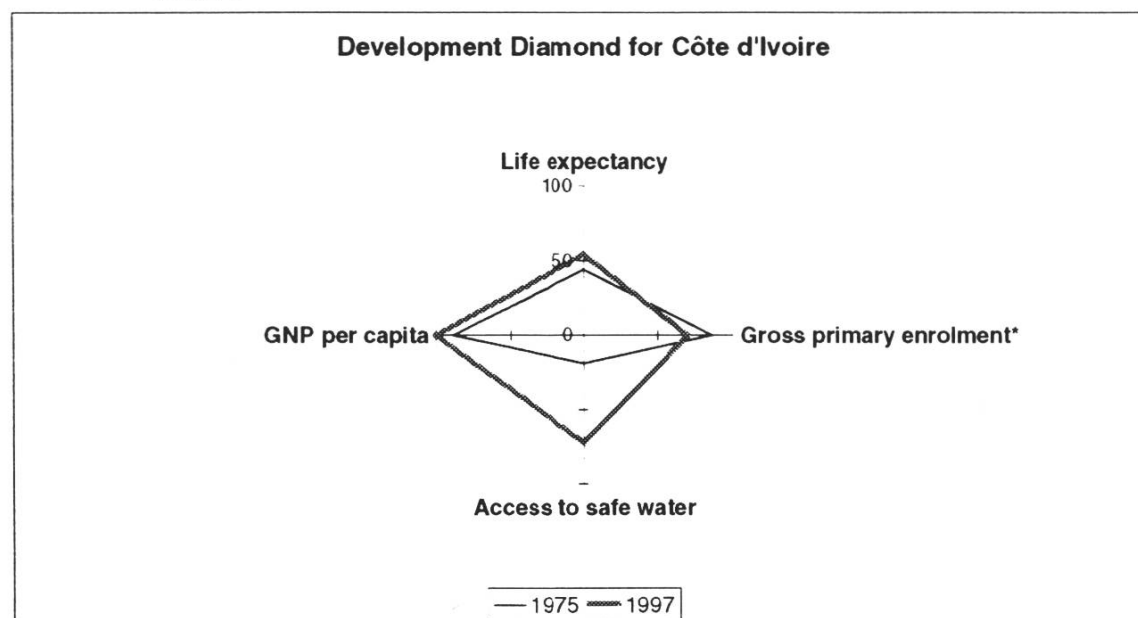
REER is not merely a measure of international competitiveness, it also reflects a key relative price that directs resource allocations in the economy. Normally, a real appreciation in the REER indicates resource

<sup>4</sup> The terms of trade are the ratio between average price of a country's exports and average price of a country's imports.

allocations away from the tradable sectors in general, agriculture and industry in the case of Côte d'Ivoire, toward non-tradable activities. The tradable sector grows faster during a period of real exchange rate depreciation. In 1987 for example, the REER appreciated for two reasons; firstly the French franc, to which the CFAF was tied, was stronger and secondly due to currency devaluation in competitor countries like Nigeria and Ghana. As can be seen in Figure 2, this real appreciation of the REER caused a sharp decline in the terms of trade, that is in a loss of international competitiveness for Côte d'Ivoire.

Finally, it is interesting to examine the evolution and development of some social indicators. Figure 3 reveals that the social indicators have all improved since 1975, with the exception of the gross primary enrolment ratio, which has decreased in recent years. Unfortunately, in spite of more than 20 years of adjustment credits, while there has been some progress, improvement in the social situation in Côte d'Ivoire has been very slowly.

*Figure 3: Evolution of Four Social Indicators for Côte d'Ivoire, 1975 and 1997.*



\* Gross primary enrolment ratio is the total number of pupils enrolled at primary level of education, expressed as a percentage of the population corresponding to the official school age of primary education.

Source: World Bank. Various years. World Development Report.

## 4. Empirical Analysis

### 4.1 Econometric Methodology and Data

In order to examine the “export-led growth” hypothesis, real GDP and non-export GDP (i.e. GDP less value of exports)<sup>5</sup> are estimated using three different models. In the first model, the relationship between real GDP, non-export real GDP and total exports of Côte d'Ivoire are investigated, by estimating the following co-integration regression by ordinary least squares:

$$LY_t = \alpha_0 + \alpha_1 LX_t + u_t \quad (1a)$$

$$LNY_t = \lambda_0 + \lambda_1 LX_t + u'_t \quad (1b)$$

where  $LX$ ,  $LY$  and  $LNY$  denote the natural logarithm of real exports, real GDP and non-export real GDP respectively.<sup>6</sup> The letter  $t$  denotes the time period in which the variable has been measured (here in years).

Then, the effects of agricultural exports on the growth of Côte d'Ivoire are estimated with the aid of the second model in which real agricultural exports ( $LX_A$ ) have replaced the aggregated total exports:

$$LY_t = \alpha_0 + \alpha_1 LX_{A_t} + u_t \quad (2a)$$

$$LNY_t = \lambda_0 + \lambda_1 LX_{A_t} + u'_t \quad (2b)$$

Finally, in the third model, the production function framework is used to measure the different effects of agricultural and non-agricultural exports on real GDP and real non-export GDP:

---

<sup>5</sup> Due to the national accounting identity and since the exports are themselves a component of GDP, the “economic influence” of exports on output must be separated from that incorporated in the “growth accounting” relationship (see MICHAELY, 1979; GHATAK ET AL., 1997)

<sup>6</sup> According to GHATAK ET AL. (1997), the natural logarithms of the variables under consideration will be used, since their first differences reflect the rate of change of each variable.

$$LY_t = \alpha_1 LL_t + \alpha_2 LK_t + \alpha_3 LX_{A_t} + \alpha_4 LX_{NA_t} + u_t \quad (3a)$$

$$LNY_t = \lambda_1 LL_t + \lambda_2 LK_t + \lambda_3 LX_{A_t} + \lambda_4 LX_{NA_t} + u'_t \quad (3b)$$

where  $LY_t$  and  $LNY_t$  represent real GDP and non-export real GDP respectively;  $LL_t$  and  $LK_t$  are measures of labour force and physical capital,  $LX_{A_t}$  and  $LX_{NA_t}$  represent real agricultural exports and non-agricultural real exports respectively.<sup>7</sup>

In order to avoid a spurious regression phenomenon, the econometric methodology is based on the co-integrating properties of the investigated time series.<sup>8</sup> For this purpose, the two-step estimation method of Engle and Granger is used (see ENGLE AND GRANGER, 1987). To start with, the integration properties of the different variables must be checked to test the stationarity properties of the time series. A time series is said to be stationary, if it has a constant mean and a constant variance, or in other words, if it fluctuates around a constant mean with a constant variance. Many economic time series are non-stationary. We apply the Augmented Dickey-Fuller test (ADF test hereafter), the integration level of the variables can be determined by checking the presence of a unit root. A time series  $y_t$  is said to be integrated of order 1 or  $I(1)$  if  $\Delta y_t$ , ( $y_t - y_{t-1}$ ) is a stationary time series. A stationary time series is said to be  $I(0)$ . In a regression model in time series, it is important to make sure that the different variables are integrated to the same degree. Otherwise, the equation does not make sense and leads to a spurious regression. We specify the regression model:

$$y_t = \beta x_t + u_t$$

If  $y_t$  and  $x_t$  are integrated of order 1 or  $I(1)$ , then  $y_t$  and  $x_t$  are said to be co-integrated if a  $\beta$  exists in such a form that the residuals  $u_t$  are  $I(0)$  or stationary. In this case,  $y_t$  and  $x_t$  do not drift too far apart over time and there is a long-equilibrium relationship between them. If  $y_t$  and  $x_t$  are not co-integrated, that is  $u_t$  is also  $I(1)$ , they can drift apart to an ever-

---

<sup>7</sup> Human capital, represented by school enrolment is normally used as an explanatory variable in other studies (see, for example, EDWARDS, 1992; GHATAK ET AL., 1997), but data on school enrolment ratio was not available in the case of Côte d'Ivoire.

<sup>8</sup> This section relies principally ON MADDALA (1992), ABDULAI (1994), AND STALDER (1997).

increasing degree as time goes on which means there is no long-run equilibrium relationship between them. The co-integration properties of variables can be tested by first running a regression of  $y_t$  on  $x_t$  using ordinary least squares, the co-integrating regression and by subsequently testing the stationarity properties of the residuals of the co-integrating regression using the ADF test.

As mentioned earlier, if  $y_t$  and  $x_t$  are co-integrated, there is a long-run relationship between them. The Error Correction Model (ECM hereafter) is commonly used to describe short-run dynamics.

If  $x_t \sim I(1)$ ,  $y_t \sim I(1)$ , and  $u_t = y_t - \beta x_t$  is  $I(0)$ , then  $x$  and  $y$  are said to be co-integrated. The error-correction model is of the form:

$$\begin{aligned}\Delta x_t &= \gamma_1 u_{t-1} + \text{lagged}(\Delta x_t, \Delta y_t) + \varepsilon_{1t} \\ \Delta y_t &= \gamma_2 u_{t-1} + \text{lagged}(\Delta x_t, \Delta y_t) + \varepsilon_{2t}\end{aligned}$$

where at least one of  $\gamma_1$  and  $\gamma_2$  is non-zero and  $\varepsilon_{1t}$  and  $\varepsilon_{2t}$  are white-noise errors. The variable  $u_{t-1}$  is known as the Error Correction Term (ECT), i.e. the value, one period lagged, of the residuals of the co-integrating regression. The changes of the lagged independent variables describe the short-run impact, while the error-correction term captures the long-run effect. Furthermore, in small samples and from an empirical point of view, statistically significant error-correction terms provide further evidence in favour of the presence of a "genuine" long-run relationship (GHATAK ET AL., 1997). Furthermore, the magnitude of the error-correction coefficient indicates the speed of adjustment of any disequilibrium towards this long-run equilibrium.

The whole procedure described above is known as the *Engle-Granger two-step estimation method*. To start with,  $\beta$  is estimated from the co-integrating regression using ordinary least squares, then the residuals  $u_t$  are taken from this estimate and these are lagged and used in the error-correction model (see ENGLE AND GRANGER, 1987).

The Granger causality test is used to test causality between exports and economic growth. The error-correction model introduces an additional channel through which Granger causality can be detected since if two variables are co-integrated there should be evidence of a causal relationship between them. This causal relationship between the two variables provides the short-run dynamics necessary to obtain long-run equilibrium. Thus, according to ENGLE AND GRANGER (1987), as long as



two or more variables are co-integrated, causality must exist in at least one direction. Moreover, in contrast to the standard Granger test for causality, the ECM allows for the finding that  $x_t$  Granger causes  $y_t$ , as long as the error-correction term  $u_{t-1}$  carries a significant coefficient with negative sign.<sup>9</sup>

From a practical point of view, testing for Granger causality is designed to check that the coefficient of the error-correction term differs significantly from zero and negative. However, causality does not necessarily imply unidirectional causality since causal relations may also be bi-directional. For example, higher exports could generate a profitably effect on GDP while, at the same time, a high GDP could contribute to improving the status of the export sector industry.

The Côte d'Ivoire data for GDP, non-export GDP and total exports used in this study are annual for the period 1960-97 and are taken from various yearbooks of the IMF International Financial Statistics Yearbooks. As in previous studies (UPKOLO, 1994; GHATAK ET AL., 1997), the data for physical capital has been proxied by the real Gross Domestic Investment (GDI) as a percentage of GDP, where the GDI is based on annual data for the period 1960-97 and obtained from the World Tables of the World Bank. The data relating to Côte d'Ivoire labour force, agricultural exports and non-agricultural exports is annual for the period 1961-97 and are taken from various issues of FAO Trade Yearbooks. We obtain real values for all the data by deflating it according to the consumer price index.

## 4.2 Empirical Results

Prior to estimating the co-integrating regressions, we must ensure that the different variables involved are non-stationary in levels, but stationary in first differences, or in other words, that they are all integrated of order 1. Firstly, visual inspection of the variables suggests that they are all  $I(1)$ <sup>10</sup>. We then apply the ADF test for unit roots as a formal test. The results of the ADF test are listed in Table 1, whereby it

---

<sup>9</sup> In order to avoid an explosive process, the coefficient of the ECT should assume a value between  $-1$  and  $0$ . (See GHATAK ET AL., 1997).

<sup>10</sup> The graphs of the variables are available from the author on request.



is apparent that the investigated variables are all integrated of order 1 (denoted as  $LY \sim I(1)$ ,  $LNy \sim I(1)$ ,  $LX \sim I(1)$ ,  $LX_A \sim I(1)$ ,  $LX_{NA} \sim I(1)$ ,  $LL \sim I(1)$ ,  $LK \sim I(1)$ ).<sup>11</sup>

*Table 1: ADF Test for Unit Roots in Levels and First Differences.*

<i>Variables</i>	<i>t-statistics</i>		<i>Critical values</i> <sup>†</sup>		
	<i>Levels</i>	<i>First differences</i>	<i>10%</i>	<i>5%</i>	<i>1%</i>
<i>LY</i>	-2.12	-3.61**	-2.61	-2.94	-3.62
<i>LNy</i>	-2.11	-3.67***	-2.61	-2.94	-3.62
<i>LX</i>	-1.98	-3.00**	-2.61	-2.94	-3.62
<i>LX<sub>A</sub></i>	-2.26	-3.61**	-2.61	-2.94	-3.62
<i>LX<sub>NA</sub></i>	-1.83	-3.36**	-2.61	-2.95	-3.64
<i>LL</i>	-1.44	-3.30**	-2.61	-2.95	-3.64
<i>LK</i>	-0.13	-2.96***	-1.62	-1.95	-2.63

\*\*\* means "significant at 1%". \*\* means "significant at 5%". \* means "significant at 10%".

<sup>†</sup> The reported critical values are obtained from MACKINNON (1991): critical values for rejection of hypothesis of a unit root.

Source: Computed by the author.

In accordance with our econometric methodology, the next step involves the estimation of the co-integrating regressions (1a), 1(b), (2a), (2b), (3a), and (3b) using ordinary least squares. Their respective residuals  $u_i$  and  $u'_i$  are then tested for stationarity using an ADF test.

<sup>11</sup> All the econometric computations in this study were carried out by EViews, version 2.0.

Table 2: Co-integration Test based on the ADF Test of the Residuals.

Co-integrating Regression	Residuals	Adjusted			Critical values <sup>†</sup>		
		$R^2$	DW	$t$ -statistics	10%	5%	1%
$LY = f(LX)$	$u_t$	0.27	1.94	-3.61**	-3.17	-3.52	-4.23
$LN Y = f(LX)$	$u'_t$	0.27	1.95	-3.63**	-3.17	-3.52	-4.23
$LY = f(LX_A)$	$u_t$	0.26	2.01	-3.45*	-3.17	-3.52	-4.23
$LN Y = f(LX_{NA})$	$u'_t$	0.26	2.04	-3.50*	-3.17	-3.52	-4.23
$LY = f(LL, LK, LX_A, LX_{NA})$	$u_t$	0.45	2.11	-5.09**	-4.52	-4.93	-5.80
$LN Y = f(LL, LK, LX_A, LX_{NA})$	$u'_t$	0.43	2.10	-4.90*	-4.52	-4.93	-5.80

<sup>†</sup> The critical values for rejection of the hypothesis of a unit root were obtained from MACKINNON (1991).

\*\* means "significant at 5% level". \* means "significant at 10% level".

Source: Computed by the author.

It is evident from Table 2 that real GDP and real non-export GDP are co-integrated with total exports and agricultural exports. As the co-integration analysis according to Engle-Granger assumes uniqueness of the co-integrating vector, we denote the relationship between LY, LN Y and the right hand side of equations (3a) and (3b) by "joint co-integration"<sup>12</sup>.

Having demonstrated that the variables are co-integrated, that is, there is a long-run relationship between the variables, the next step consists of modelling the short-run and testing for Granger causality by estimating the different ECMs. The ECMs for the first model, with total exports as independent variables, are as follows ( $t$ -statistics are in parenthesis):

<sup>12</sup> In this case, the Johansen Full Information Maximum Likelihood method could have been employed to examine the number of cointegrating vectors. However, this approach is beyond the scope of this study.

$$\Delta LY_t = -0.75 u_{t-1} + 0.27 \Delta LY_{t-1} + 0.28 \Delta LY_{t-2} + 0.59 \Delta LX_t - 0.21 \Delta LX_{t-1} - 0.29 \Delta LX_{t-2}$$

$(-3.56) \quad (1.41) \quad (1.77) \quad (5.19) \quad (-0.97) \quad (-1.49)$   
 $\bar{R}^2 = 0.57 \quad DW = 1.91$

(4a)

$$\Delta LNY_t = -0.75 u'_{t-1} + 0.28 \Delta LNY_{t-1} + 0.28 \Delta LNY_{t-2} + 0.40 \Delta LX_t - 0.20 \Delta LX_{t-1} - 0.29 \Delta LX_{t-2}$$

$(-3.56) \quad (1.45) \quad (1.77) \quad (2.33) \quad (-0.76) \quad (-1.21)$   
 $\bar{R}^2 = 0.40 \quad DW = 1.92$

(4b)

where  $u_{t-1}$  and  $u'_{t-1}$  represent the error-correction terms, i.e. the lagged value of the residuals of the co-integrating regressions equations (1a) and (1b). In the ECM which models the short-run, the error-correction term reintroduces the correction for the long-run equilibrium between the variables. The ECMs for the second model with agricultural exports as independent variables are:

$$\Delta LY_t = -0.56 u_{t-1} + 0.08 \Delta LY_{t-1} - 0.01 \Delta LY_{t-2} + 0.39 \Delta LX_{A_t} - 0.11 \Delta LX_{A_{t-1}} + 0.06 \Delta LX_{A_{t-2}}$$

$(-2.85) \quad (0.49) \quad (0.08) \quad (3.76) \quad (-0.63) \quad (0.39)$   
 $\bar{R}^2 = 0.46 \quad DW = 2.03$

(5a)

$$\Delta LNY_t = -0.60 u'_{t-1} + 0.09 \Delta LNY_{t-1} + 0.09 \Delta LNY_{t-2} + 0.26 \Delta LX_{A_t} - 0.16 \Delta LX_{A_{t-1}} + 0.09 \Delta LX_{A_{t-2}}$$

$(-2.93) \quad (0.53) \quad (0.63) \quad (1.89) \quad (-0.78) \quad (0.46)$   
 $\bar{R}^2 = 0.38 \quad DW = 2.04$

(5b)

Equations (4a), (4b), and (5a), (5b) reveal that the estimated coefficients of the error-correction terms,  $u_{t-1}$  and  $u'_{t-1}$ , are all negative and highly significant. As mentioned earlier, testing for Granger causality merely requires testing whether the coefficient of the error-correction term has negative sign and is significantly different from zero (GHATAK ET AL., 1997), that is  $LX$  and  $LX_A$  Granger cause  $LY$  and  $LNY$  respectively. Moreover, statistically significant error-correction terms provide further evidence in favour of the presence of a "genuine" long-run relationship.

The ECMs for the third model, i.e. with the production function framework, are listed in Table 3. The coefficients of the error-correction terms  $u_{t-1}$  and  $u'_{t-1}$  are both negative and statistically significant. Moreover, only the coefficient of  $\Delta LX_{Nat}$  carries a significant value. We will attempt to provide an economic interpretation to this finding in the next Section. The next step consists of testing whether Granger causality runs in one direction only, that is from exports to economic

growth, or if causality is bi-directional. For this purpose, the same econometric methodology is used, whereby the independent variables are transformed into dependent variables and vice-versa. The results (available from the author on request) demonstrate that causality is bi-directional.

*Table 3: Coefficient Estimates of Error-Correction Models of the Third Model*

<i>Inde- pendent Variables</i>	<i>Dependent variables</i>			
	$\Delta LY_t$		$\Delta LNY_t$	
	<i>Coefficients</i>	<i>t-statistics</i>	<i>Coefficients</i>	<i>t-statistics</i>
$u_{t-1}^\dagger$	-0.75***	-3.51	—	—
$u'_{t-1}^\dagger$	—	—	-0.76***	-3.78
$\Delta LY_{t-1}$	0.35	1.45	—	—
$\Delta LNY_{t-1}$	—	—	0.33	1.50
$\Delta LL_{t-1}$	0.14	0.25	0.29	0.35
$\Delta LK_{t-1}$	0.05	0.47	0.13	0.81
$\Delta LX_{At}$	0.13	1.34	-0.14	-0.92
$\Delta LX_{At-1}$	-0.13	-0.95	-0.12	-0.70
$\Delta LX_{Nat}$	0.32***	3.73	0.29**	2.27
$\Delta LX_{Nat-1}$	0.08	0.69	0.17	1.12
$\overline{R}^2 = 0.59$		$DW = 1.75$	$\overline{R}^2 = 0.45$	$DW = 1.74$

<sup>†</sup>  $u_{t-1}$  and  $u'_{t-1}$ , which represent the error-correction terms, are the lagged value of the difference of the residuals of the co-integrating regressions equations (3a) and (3b).

— means “not present in this ECM”. \*\*\* means “significant at 1%”. \*\* means “significant at 5%”.

Source: Computed by the author.

### 4.3 Economic Interpretations

These empirical results demonstrate that real GDP, on the one hand, and non-export real GDP, on the other hand, are co-integrated with total real exports and real agricultural exports in a unique co-integration relationship, and with labour force, physical capital, real agricultural exports and real non-agricultural exports in a joint co-integration relationship. Therefore, there is evidence of long-run relationships among these variables. These findings support the “export-led growth” hypothesis. Furthermore, analysis of these relationships in the short-run, modelled by the estimation of error-correction models, indicates that the growth rate of total real exports, and, although to a lesser extent, the agricultural real exports growth ratio have a strong and significant effect on the growth ratio of real GDP and non-export real GDP. The empirical results of the third model, using the production function framework, indicate that the rate of change of agricultural real exports does not exert any significant influence on the economic growth ratio of Côte d’Ivoire. In contrast, the growth rate of non-agricultural exports leads to significant changes in the growth ratio of real GDP and non-export real GDP. If labour force and physical capital belong to the joint co-integration of the third model, the rates of their change do not influence the economic growth rate of Côte d’Ivoire significantly. Finally, the analysis of Granger causality in the first and second models demonstrates that causality relations between the variables are in both cases positive and bi-directional. This means that the variables are so closely associated that total real exports, respectively real agricultural exports, Granger cause real GDP and non-export real GDP. In addition, in a feedback causal relationship, real GDP and non-export real GDP Granger cause total real exports as well as real agricultural exports.

## 5. Conclusion and Policy Implications

The object of this study was to examine the “export-led growth” hypothesis taking Côte d’Ivoire’s economy as a case study. Several conclusions can be drawn. Firstly, the benefits of an outward-orientated strategy for the developing world were presented in the theoretical considerations. However, although the export sector of a developing country may well be capable of generating economic growth, this does not necessarily apply to all exports. Primary exports, which account for a



large part in the trade sector of developing countries, are clearly a weak engine for economic growth when compared to manufactured exports.

The analysis of Côte d'Ivoire's economy has revealed the large share held by the export sector in the economy and its marked dependence on world prices for cocoa and coffee. Moreover, although Côte d'Ivoire has adopted an outward-orientated strategy, we have observed that an appreciation of the real effective exchange rate has negative effects on the terms of trade which could provoke trade distortions and a loss of competitiveness for the export industry. The CFAF, which is pegged to the French Franc, play a major role in this appreciation of the REER. Therefore, in future, special attention must be paid to the evolution of the REER with a view to enhancing the competitiveness of the Côte d'Ivoire's export industry.

In this empirical analysis, we find support for the "export-led growth" hypothesis with total exports, as well as with agricultural exports as explaining variables. This is not merely due to the "accounting" effects, since we also used non-export real GDP as a dependent variable. We cannot demonstrate any strictly unidirectional causality from total exports, respectively agricultural exports, to economic growth, i.e. the causality is bi-directional, the measured feedback causal relationship indicates a "genuine" relationship in the long-run, as well as in the short-run. These findings lead to the conclusion that exports of agricultural products should not be reduced in the future, but diversified so that they are less sensitive to fluctuations in world prices for cocoa and coffee. Furthermore, in the third model which uses a production function framework, non-agricultural exports, considered in competition with agricultural exports, reveal themselves to be a more effective engine for the growth of Côte d'Ivoire's economy. These results are consistent, since the added value of manufactured exports is much higher than that of agricultural exports. Furthermore, manufactured exports influence the output growth of Côte d'Ivoire through a wider range of channels than agricultural exports. In the context of Côte d'Ivoire's future development, particular efforts must be made to increase the share of manufactured exports in total exports.

Finally, the importance of trade for economic development has been demonstrated, not only for Côte d'Ivoire, but also for all the other Sub-Saharan African countries which are faced with a similar economic situation. Therefore, an outward-orientated strategy incorporating trade liberalisation, high terms of trade, as well as a low REER designed to



reduce exchange distortions, would be the most suitable policy for promoting economic growth. It would further poverty alleviation and lead to an improvement in the standards of living in these countries.

Subsequent works in this direction should examine the “export-led growth” hypothesis taking other Sub-Saharan African countries as case studies, in order to reinforce the evidence for the developing world. In these future studies, special attention must be paid to the long-run properties of the variables involved and to the consideration of other factors which could exert a significant influence on the results of these empirical analyses.

## **Zusammenfassung**

**Das Ziel dieser Studie ist es, die “export-led growth” Hypothese zu untersuchen. Diese Hypothese behauptet, dass Exporte einen positiven Einfluss auf das Wirtschaftswachstum eines Landes ausüben. Die Methode der Kointegration wird auf Zeitreihen angewendet, wobei die Elfenbeinküste als Fallstudie ausgewählt wurde.**

**Diese Studie unterstützt die “export-led growth” Hypothese im Falle der Elfenbeinküste. Die totalen Exporte stehen in einer langfristigen sowie kurzfristigen Beziehung zum Bruttoinlandprodukt. Die Agrarexporte weisen ebenfalls eine ähnliche Beziehung zum Bruttoinlandprodukt auf. Die Wirkung der Agrarexporte auf das wirtschaftliche Wachstum der Elfenbeinküste ist jedoch weniger bedeutend, wenn sich die Agrarexporte im Wettbewerb mit Exporten aus den nicht landwirtschaftlichen Sektoren befinden.**

**Deshalb muss für die weitere Entwicklung der Elfenbeinküste die Aussenhandelspolitik genau betrachtet werden. Die Agrarexporte sollten nicht gekürzt, der Anteil der Industriegüter im Exportsektor hingegen erhöht werden. Die Regierung der Elfenbeinküste sollte in Zukunft eine Liberalisierung des Aussenhandels und einen tiefstmöglichen effektiven Wechselkurs anstreben, um Verzerrungen im Aussenhandel zu verhindern und die Wettbewerbsfähigkeit der Exportindustrie zu fördern. Diese Strategie sollte zu einem stärkerem Wachstum der Wirtschaft und damit zu einer Verminderung der Armut führen.**

**Schlüsselwörter: “Export-led growth” Hypothese, Elfenbeinküste, Sub-Saharan Afrika, Kointegrationsanalyse, Granger Kausalität.**

## References

- ABDULAI, A. (1994). The Impacts of Policy Environment on Rural-Urban Linkages. The Case of Ghana. Unpublished PhD. Dissertation. Swiss Federal Institute of Technology, Zürich.
- AFRICAN DEVELOPMENT BANK. (1998). African Development Report 1998. Oxford University Press, New York.
- BERTHÉLEMY, J.C., AND BOURGUIGNON, F. (1996). Growth and Crisis in Côte d'Ivoire. A World Bank Comparative Macroeconomic Study. World Bank, Washington, D. C.
- DEMERY, L. (1994). Côte d'Ivoire: Fettered Adjustment, in: Husain, I. and Faruquee, R. (1994). Adjustment in Africa. Lessons from Country Case Studies. World Bank, Washington, D. C.
- EDWARDS, S. (1992). Trade Orientation, Distortions and Growth in Developing Countries. *Journal of Development Economics*, **39**, 31-57.
- EMERY, R. F. (1967). The Relation of Exports and Economic Growth. *Kyklos*, **20** (2), 470 –486.
- ENGLE, R. F. AND GRANGER, C. W. J. (1987). Cointegration and Error Correction: Representation, Estimation, and Testing, in: ENGLE, R. F. AND GRANGER, C. W. J. (1991). Long-Run Economic Relationships. Readings in Cointegration. Oxford University Press, New York.
- FAO. Various years. Trade Yearbook. Food and Agriculture Organisation of the United Nations, Rome.
- FAO. Various years. Production Yearbook. Food and Agriculture Organisation of the United Nations, Rome.
- GHATAK, S., MILNER, C. AND UTKULU U. (1997). Exports, Export Composition and Growth: Cointegration and Causality Evidence for Malaysia. *Applied Economics*, **29**, 213-223.
- GILLIS, M., PERKINS, D. H., ROEMER, M., SNODGRASS, D. R. (1996). Economics of Development; 4<sup>th</sup> edition. W.W. Norton Company, Inc, New York.
- IMF, Various years. International Financial Statistics Yearbook. International Monetary Fund, Washington, D. C.
- JACQUET P. (1999), the effects of the Export Sector on the Economic Growth of Côte d'Ivoire: A Cointegration Analysis, Unpublished Diploma Thesis. Swiss federal Institute of Technology, Zurich
- KRAUSS, M. B. (1979). The New Protectionism. The Welfare State and International Trade. The International Centre for Economic Policy Studies, Oxford.
- KRUEGER, A. O. (1984). Comparative Advantage and Development Policy Twenty Years Later, in: KRUEGER, A. O. (1990). Perspectives on Trade and Development. The University of Chicago Press, Chicago.

- MACKINNON, J. G. (1991). Critical Values for Cointegration Tests, in: Engle, R. F. and Granger, C. W. J. (1991). Long-Run Economic Relationships. Readings in Cointegration. Oxford University Press, New York.
- MADDALA, G. S. (1992). Introduction to Econometrics, 2<sup>nd</sup> edition. Prentice-Hall, New Jersey.
- MICHAELY, M. (1979). Exports and Growth: A Reply. Journal of Development Economics, **6**, 141-143.
- MUNDT, R. J. (1995). Historical Dictionary of Côte d'Ivoire, 2<sup>nd</sup> edition. Scarecrow Press, Boston.
- OECD, Development Assistance Committee. (1996). Shaping the 21<sup>st</sup> Century : The Contribution of Development Co-operation. OECD, Paris.
- OSTERFELD, D. (1994). The Liberating Potential of Multinational Corporations, in: BANDOW, D. AND VASQUEZ, I. (1994). Perpetuating Poverty: the World Bank, the IMF, and the Developing World. Cato Institute, Washington, D. C.
- RIEDER P., ANWANDER S. (1994). Grundlagen der Agrarmarktpolitik, 4. Auflage. Hochschulverlag AG, Zürich.
- SCHNEIDER, H. ET AL. (1992). Adjustment and Equity in Côte d'Ivoire. OECD, Paris.
- STALDER, P. (1997). Vorlesungsunterlagen: Ökonometrie für Agrarwirtschaftler I + II. ETH, Zürich.
- UPKOLO, V. (1994). Export Composition and Growth of Selected Low-Income African Countries: Evidence from Time Series Data. Applied Economics, **26**, 445-449.
- World Bank. Various years. World Tables. Oxford University Press, New York.
- World Bank. (1985). World Development Report 1985. Oxford University Press, New York.
- World Bank. (1990). World Development Report 1990. Oxford University Press, New York.
- World Bank. (1999). World Development Report 1998/99. Oxford University Press, New York.

Author's Address:

Philippe Jaquet  
Department of Agricultural Economics  
Swiss Federal Institute of Technology  
Sonneggstrasse 33  
CH-8092 Zurich

e-mail: philippe.jaquet@iaw.agrl.ethz.ch