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# Tourism and Economic Growth

African Evidence from Panel Vector Autoregressive Framework

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## Abstract

Using a panel vector autoregressive model this paper investigates the dynamic and endogeneous contribution of tourism to output based on a sample of 40 African countries for the period 1990–2006. Results from the study confirm tourism to be an important ingredient of African development although private investment, openness, and human capital remain the main drivers. Further analysis reveals the existence of a reverse causation from national income to tourism development, thus confirming both tourism-led economic development and economic-driven tourism growth. Tourism is also observed to enhance private investment and the presence of bicausality between private investment, education, and income level is observed.

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# 1 Introduction

Tourism remains the world's largest industry and one of the fastest growing sectors, accounting for over one-third of the value of total worldwide services trade (UNWTO 2006b).[1] Worldwide tourism grew phenomenally from 25 million arrivals in 1950 to more than 825 million in 2006, with an average annual growth rate of 6.5 per cent (UNWTO 2007). The contribution of travel and tourism to gross domestic product (GDP) is expected to rise from 9.5 per cent to 10.5 per cent by 2018[2] and the contribution of the travel and tourism economy to total employment is expected to rise from 8.4 per cent to 9.2 per cent or to one in every 10.8 jobs by 2018.

Pioneering studies from Lea (1988) and Sinclair (1998) have highlighted the potential of the tourism sector in promoting growth, creating jobs, and generating revenue for the government. In fact the tourism-led growth hypothesis postulates that international tourism is considered as a potential strategic factor for economic growth.[3] Tourist spending, as an alternative form of exports, is believed to contribute to the balance of payments through foreign exchange earnings and proceeds generated from tourism expansion and can represent a significant income source for a national economy (Balaguer and Cantavella-Jordá 2002). Foreign exchange earnings from tourism can subsequently also be used to import capital goods to produce goods and services, which in turn lead to economic growth (McKinnon 1964). Other economic benefits derived from tourism activity include tax revenues, employments (it tends to be labour-intensive), and additional sources of income (Archer 1995; Durbarry 2002; Khan, Seng, and Cheong 1990; Uysal and Gitelson 1994). Theoretical analysis tends to posit that tourism expansion should have a positive contribution to economic growth (Balaguer and Cantavella-Jordá 2002; Dritsakis 2004).

This issue has attracted great interest only recently and there are a number of empirical papers confirming the tourism industry's contribution to a country's economic growth (see Balaguer and Cantavella-Jordá 2002; Dritsakis 2004; Gunduz and Hatemi-J 2005; Kim, Chen, and Jan 2006; Noriko and Motosugu 2007). Similarly, Soukiazis and Proença (2005) examined the impact of tourism at the regional level and Shan and Wilson (2001) study the causality between tourism and trade. However, it should also be pointed out that few authors could not establish any positive link between tourism and economic growth (see Chen and Devereux 1999; Lee and Chang 2008; Oh 2005).

Despite the belief in tourism-led economic development, relatively speaking not many studies have rigorously investigated a causal relationship between tourism and economic growth.[4] Moroever, most studies have indeed been dealing with samples of developed countries and despite the increasing importance of tourism for African

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[1] In 2005, the tourism sector accounted for 3 to 10 per cent of the GDP of developing countries (UNWTO 2005).

[2] Real GDP growth for the travel and tourism economy is expected to be 3.0 per cent in 2008, down from 4.1 per cent in 2007, but to average 4.0 per cent per annum over the coming ten years.

[3] Refer to Sinclair and Stabler (2002) for a good theoretical treatment.

[4] Oh (2005) argued that it is necessary to investigate the hypothesis in numerous destination countries for the purpose of generalization.

economies, yet even lesser not to say no studies[5] have been found to rigorously assess the relationship. We have not come across any research analysing the role of tourism on economic performance focusing exclusively on rigorous cross-sectional and panel data analysis for developing country cases, particularly for the case of Africa. Furthermore, most of the related studies have failed to take into account the endogeneity issues and indirect benefits from tourism.

The aim of the paper is to supplement the literature by establishing the empirical link of the extent to which the tourism industry can spur economic growth while accounting for the conventional sources of economic growth using standard theory for a sample of African economies. In an attempt to attain this objective, our study makes use of data from 40 economies[6] over a period of 17 years (1990–2006). The basis for the selection of sample is purely based on existence and availability of comparable data. Another research contribution of this study lies in the fact that so far we have not come across any research which has adequately dealt with the issues of dynamics, causality, and endogeneity in the tourism development and economic growth link. The study thus innovatively adopts a panel vector autoregression (VAR) framework to account for the above largely ignored issues, while at the same time allowing for country-specific unobserved heterogeneity in the levels of the variables. Empirical studies of this nature certainly add to the growing body of literature in the debate of tourism development and growth, and as such also bring new evidence from the sample of African economies.

The rest of the paper is organized as follows. Section 2 provides a review of selected literature and Section 3 an overview of tourism in Africa. In Section 4, we specify an augmented Solow growth model which incorporates tourism as one of the sources of growth. It also presents the results from the panel VAR which reflects both the dynamic nature of the data and endogeneity of some of the conventional growth sources. The last section summarizes the results and draws the conclusions.


## 2    Related literature

Research analysing the relationship between tourism activity and economic growth has been flourishing recently. For instance, using Spanish data from 1975 to 1997, Balaguer and Cantavella-Jordá (2002) discovered a stable long-run relationship between tourism and economic growth. Dritsakis (2004) examined the impact of tourism on the long-run economic growth of Greece using Granger causality tests based on error correction models and also found a strong causal relationship between international tourism earnings and economic growth and also a causal relationship between economic growth and international tourism earnings thus supporting both tourism-led economic development and economic-driven tourism growth.

Tosun (1999) and Gunduz and Hatemi (2005), for the case of Turkey confirmed empirical support for the tourism-led growth hypothesis. Using a cointegration, Kim, Chen, and Jang (2006) reported similar results for Taiwan and further found a bi-

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5   Studies on developing countries and Africa have mostly focused on the examination of the tourism sector by estimating and forecasting tourism demand and income generation via the multiplier process (Sinclair 1998; Bezmen 2006).

6   The list of the selected countries is given in Appendix 1.

directional causality between the two factors. Brida, Carrera, and Riss (2007) also confirmed the tourism-led growth hypothesis through cointegration and causality testing for the case of Mexico. In other words tourism and economic development reinforce each other. Durbarry (2004) is among the very few who focused on the case study of an African state, namely Mauritius. Using cointegration and causality tests, the author's results lend support to the contention that tourism has promoted growth and development.

At the regional level for the Portuguese case, employing the convergence approach based on Barro and Sala-i-Martin (1992) type analysis, Soukiazis and Proença (2005) drew the conclusion that tourism can be considered as an alternative solution for enhancing regional growth in Portugal. Cortes-Jimenez (2006) also found that both domestic and international tourism have a significant and positive role in regional economic growth for the Spanish and Italian regions. Other studies using various samples of countries also reported positive contribution of tourism on growth. For instance, Cunado and Perez de Garcia (2006) found some evidence of conditional convergence toward the African regional average and the US average for some countries in their African sample. Brau, Lanza, and Pigliaru (2003) compared the relative growth performance of 14 'tourism countries' within a sample of 143 countries and interestingly documented that tourism countries grow faster than all the subgroups. Eugenio-Martin, Morales, and Scarpa (2004) also analysed the relationship for the case of Latin America for the period 1985 to 1998. The author showed that the tourism sector is adequate for the economic growth of medium- or low-income countries, though not necessarily for developed countries.

It is noteworthy that a few studies could not establish the viable contribution of tourism to economic growth as well. Lee (2008), for instance, using the bounds test developed by Pesaran, Shin, and Smith (2001) is among those who could not find a cointegrating relationship between tourism and economic growth but rather found support of growth-led tourism hypothesis. Oh (2005) also disagreed with the tourism-led growth theory and using South Korean data in a cointegration analysis, the author rejected any long-run link between tourism receipts and economic growth over the period from 1975 to 2001. Chen and Devereux (1999) yet argued that tourism may reduce welfare for trade regimes dominated by export taxes, or import subsidies. Using a theoretical framework, they demonstrated that foreign direct investment (FDI) in the form of tourism is, for the most part, beneficial while tourist immiserization is still possible in Sub-Saharan Africa (SSA). Based on panel data analysis, Sequeira and Campos (2005) also accounted for the endogeneity problem and concluded that tourism, on its own, cannot explain the higher growth rates of the sample of countries.


## 3    Tourism in Africa

While tourism arrivals have reached more than 825 million in 2006, with an average annual growth rate of 6.5 per cent (WTO 2007), tourist arrivals in Africa for the same period registered only around 40 million, representing around 5 per cent of world share. This compares with 55 per cent arrivals in Europe, 19 per cent in Asia/Pacific, 16 per cent in the Americas, and around 5 per cent in the Middle East. In terms of tourism receipts, it was US$18.3 billion (2.9 per cent of world share) for Africa compared to US$326.7 billion for Europe (52.5 per cent), US$131.7 billion for Asia/Pacific, and

US$21 billion (3.4 per cent) for the Middle East. Tables 1 and 2 show a comprehensive trend.

Table 1: International tourist arrivals and market share by regions

| Regions | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Share(%) (2000) | Share(%) (2005) |
|---|---|---|---|---|---|---|---|---|
| World | 689 | 688 | 709 | 697 | 766 | 808 | 100 | 100 |
| Europe | 396.2 | 395.8 | 407.4 | 408.6 | 425.6 | 443.9 | 57.5 | 54.9 |
| Mid/East | 140.8 | 143.7 | 147.6 | 147.7 | 149.5 | 158.8 | 20.4 | 19.8 |
| Asia/Pacific | 111.4 | 116.6 | 126.1 | 114.2 | 145.4 | 156.2 | 16.2 | 19.3 |
| Americas | 128.2 | 122.2 | 116.7 | 113.1 | 125.8 | 133.1 | 18.6 | 16.5 |
| Africa | 28.2 | 28.9 | 29.5 | 30.7 | 33.3 | 36.7 | 4.1 | 4.5 |
| North-Africa | 10.2 | 10.7 | 10.4 | 11.1 | 12.8 | 13.6 | 1.5 | 1.7 |
| Sub-Saharan Africa | 18 | 18.2 | 19.1 | 19.6 | 20.5 | 23.1 | 2.6 | 2.9 |

Source: UNWTO (2006a).

Table 2: International tourism receipt by region

| | 2003 (US$bill.) | 2004 (US$bill. | Share (%) | Receipts/ Arrival-2004 |
|---|---|---|---|---|
| World | 524 | 626 | 100% | 820 |
| Europe | 282.7 | 326.7 | 52.5 | 780 |
| Americas | 114.1 | 131.7 | 21.1 | 1.050 |
| Asia/ Pacific | 94.9 | 125 | 20.1 | 820 |
| Middle East | 16.8 | 21.0 | 3.4 | 590 |
| Africa | 15.5 | 18.3 | 2.9 | 550 |

Source: UNWTO (2006a).

In terms of contribution to GDP, it is noteworthy that Africa has been registering a steady increase in the travel and tourism GDP over the years, with an average 50 per cent increase since 2003 in real terms (although to a lesser extent for the case of direct industry GDP). This compares to an average increase of around 25 per cent for the world in real term. The ten-year continent's annualized growth of this sector average around 5 per cent (more or less comparable to other parts of the world). Figures 1 and 2 show the contribution of tourism in GDP at constant prices (2000) since the year 2003 for both Africa and the world.

Figure 1: Travel and tourism GDP (Africa)

**AFRICA**
Travel & Tourism Gross Domestic Product
(2000 constant US$ bn)
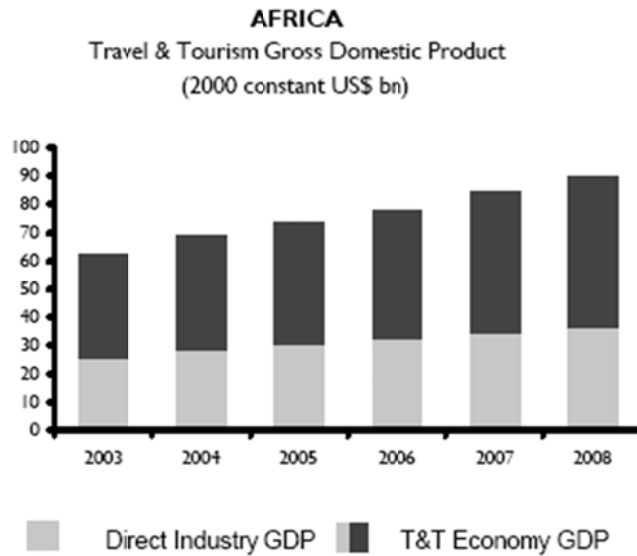


Source: WTTC (2008).


Figure 2: Travel and tourism GDP (World wide)

**WORLDWIDE**
Travel & Tourism Gross Domestic Product
(2000 constant US$ bn)
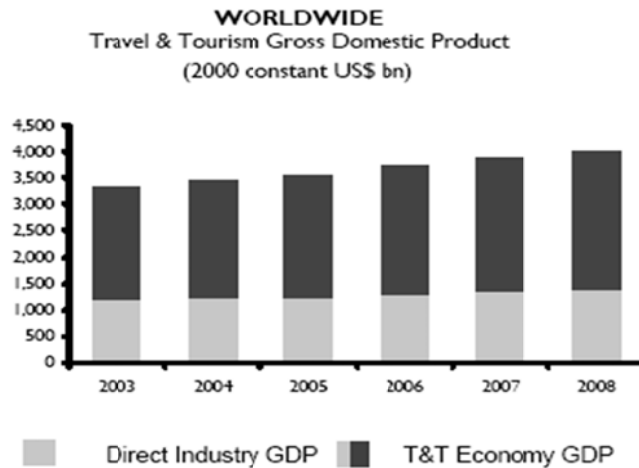


Source: WTTC (2008).


The importance of tourism sector as a contribution to GDP is high. This sector accounts for at least 21 per cent of GDP in Africa (with North Africa registering 13.3 per cent and 8 per cent for SSA) compared to 9 per cent for Europe and 6.8 per cent for Latin America, and 10.2 per cent for North America (Table 3). Tourism has also been an important job provider for the continent. It can be observed from Figure 3 that jobs in this sector have increased from 13 million to 16 million over the period 2003–8, with an annualized average growth of around 2 per cent (see Table 4).

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Table 3: WTTC table extract: tourism economy employment (10-year real growth annualized, %)

| WTTC League Table Extract | | 2008 |
| Travel & Tourism Economy GDP | | % of total GDP |
|---|---|---|
| 0 | World | 5,889.8 |
| 2 | North Africa | 13.3 |
| 3 | Oceania | 11.7 |
| 4 | Middle East | 11.1 |
| 5 | Other Western Europe | 10.5 |
| 8 | European Union | 10.2 |
| 9 | North America | 10.2 |
| 10 | Central & Eastern Europe | 8.1 |
| 11 | Sub Saharan Africa | 7.9 |
| 12 | Latin America | 6.8 |

Source: WTTC (2008).

Figure 3: Travel and tourism employment (Africa)
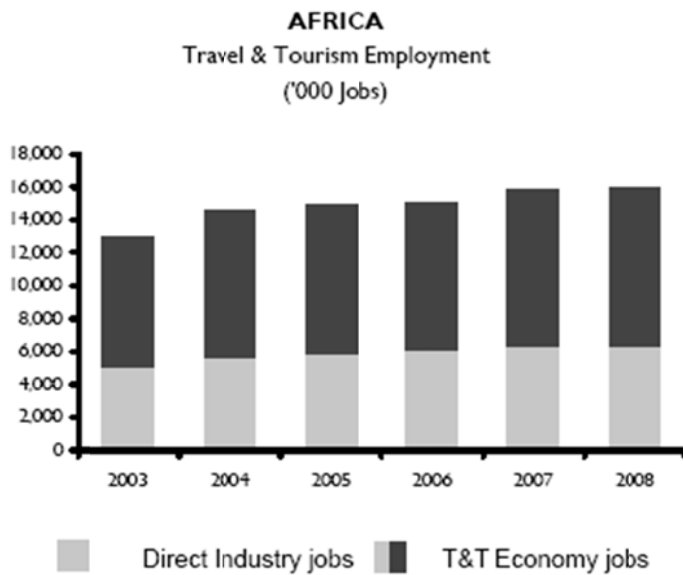


Source: WTTC (2008).

Table 4: WTTC table extract: tourism economy employment (10-year real growth annualized, %)

| WTTC League Table Extract Travel & Tourism Economy Employment | | 10-Yr Real Growth Annualised, % |
|---|---|---|
| 0 | World | 3.0 |
| 1 | North Africa | 3.1 |
| 2 | Latin America | 2.9 |
| 3 | Middle East | 2.8 |
| 8 | Oceania | 1.6 |
| 9 | European Union | 1.1 |
| 10 | Sub Saharan Africa | 1.0 |
| 11 | North America | 1.0 |
| 12 | Central & Eastern Europe | 0.8 |
| 13 | Other Western Europe | 0.7 |

Source: WTTC (2008).

## 4    Econometric framework and data sources

### 4.1  Economic model

Based on the principles of some earlier growth studies (see Barro and Lee 1994, Temple 1999, Levine, Loayza, and Beck 2000, Wachtel 2001, Eugenio-Martin, Morales, and Scarpa 2004 and Durbarry 2004 and Seetanah 2008 for the case of an African country), we adopted an augmented Solow growth model in this study. We thus include the conventional sources of economic growth, namely investment in physical capital (*IVTGDP*), human capital (*EDU*), and a measure of the openness of the economy (*OPEN*). The economic model is augmented to include a proxy for economic freedom (political, economic, and social stability) (*EF*) and tourism development (*TOUR*).

The model takes the following functional form[7]

$$Y = f(IVTGDP, OPEN, EDU, EF, TOUR) \tag{1}$$

In the growth literature there exist a unanimous consensus (see De Long and Summers 1990, 1994; Reinhart 1989, and more recently Arin 2004) of the role of private investment (*IVTGDP*) in promoting economic performance, possibly because technological change is embodied in recent vintages of capital. The gross fixed capital formation as a per cent of real GDP is used as a proxy for investment in physical capital. *OPEN,* which proxies for the level of openness of the country is also included in the economic model following the work of Dollar (1992), Sachs and Warner (1995), and Edwards (1998). These authors supported the idea that increased trade openness raised economic growth through access for a country to the advances of technological

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[7]  In a separate specification, not reported here, we also estimate the Arellano-Bond dynamic panel data model by including year dummies to capture the effect of time trend. The results do not differ. Moreover, we also included FDI in an alternative specification and again the results were more or less the same.

knowledge of its trade partners, access to bigger markets, and encouraging the development of R&D through increasing returns to innovation and also through providing developing countries with access to investment and intermediate goods that are vital to their development processes. *OPEN* is the ratio of the export plus import to GDP. Finally we added a measure of education (*EDU*) to account for the quality of labour. This follows the arguments and empirical evidences of Mankiw, Romer, and Weil (1992), Barro (1998), and more recently Temple (2001). Human capital can be thought of as affecting economic growth in the sense that workers with higher levels of education or skills should, ceteris paribus, be more productive and more inventive and innovative. Higher levels of human capital may also encourage capital accumulation, or may raise the rate of technological catch-up for follower countries (Temple 2001). Secondary school enrolment is used to capture the above.

Owen (1987) and Sen (1999) argued that freedom—political, economic, social, transparency, and security—is a necessary condition for economic growth. This is measured by the economic freedom index obtained from the Holmes, Feulner, and O'Grady (2008).[8] We expect the sign of the economic freedom index to be positive as higher level of freedom is more growth conducive.

The variable of interest to the study is *TOUR* which is a measure of tourism development. The total tourist arrivals are utilized as a proxy of tourism expansion (this is consistent with previous works form Wang and Godbey 1994 and Kim, Chen, and Jan 2006). As a robustness test we also employed another commonly used tourism proxy namely tourism receipt per capita. All data were obtained from the World Bank Development Indicators (WDI 2007) CDROM, except *EF*, (which is taken from the Heritage Foundation) and data on tourism (available from the World Tourism Organization).

The econometric specification can be written as follows

$$y_{it} = \beta_0 + \beta_1 ivtgdp_{it} + \beta_2 xmgdp_{it} + \beta_3 ser_{it} + \beta_4 EF_{it} + \beta_5 tour_{it} + \varepsilon_{it}$$

where *i* denotes the different countries in the sample and *t* denotes the time dimension. The small letters denote the natural logarithm of the variables implying a double log-linear specification for ease of interpretation (that is in percentage terms). The sample comprises of 40 African economies for the period 1990–2006.

Often ignored in the literature, we first of all applied the Im, Pesaran, and Shin (1995) panel unit root tests, on the dependent and independent variables. Im, Pesaran, and Shin (1995) developed a panel unit root test for the joint null hypothesis that every time series in the panel is non-stationary. This approach is based on the average of individual series ADF test and has a standard normal distribution once adjusted in a particular manner. Results of this test applied on our time series in levels reject a unit root in favour of stationarity (the results were also confirmed by the Fisher-ADF and Fisher-PP

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8     The economic freedom index is calculated as the weighted average of ten economic freedoms related namely to business, trade, fiscal, government size, monetary, investment, financial, property rights, corruption, and labour freedoms. It is measured on a scale of 0 to 100 with the higher the scale, the higher the level of freedom.

panel unit root tests) at the 5 per cent significance level for each variable. It was judged safe to continue with the panel data estimates of the above econometric specifications.

## 4.2 Endogeneity issues and the panel vector autoregressive model

It is also likely that there may exist bicausal and indirect effects together with dynamic feedbacks among the variables in a growth function, particularly of the tourism variable concerned to us. Including the above issues are essential to the modelling of our hypotheses and this has been crucially ignored in the literature.

Indeed, there might still be the possibility of loss of dynamic information even in panel data framework as the dependent variable may have something to do in explaining itself as well (Levine, Loayza, and Beck 2000). Moreover, the possibility of a reverse causation also theoretically exists as output level may be a reflection of economic well-being and level of development and this may be essential in attracting tourists as well. Indeed as Cohen (1972) and Mo, Howard, and Havitz[9] (1993) argued, tourists prefer—especially from developed countries—to maintain essentially the same comforts as at home while travelling. Thus tourism and economic development may reinforce each other. This is consistent with theoretical discussion and results obtained from Dritsakis (2004), Oh (2005), Kim, Chen, and Jang (2006) and Lee (2008).[10] In addition, there are also other indirect links and reinforcing effects which may exist that ultimately impact on the level of income. For instance, it is suspected that level of investment may promote tourism as it increases tourism capacity. As such more tourists may encourage more investment and probably in the tourism infrastructure and industry. Education level, social, political, and economic freedom may also yet be other elements for successful tourism development.

To account for the existence of the above links related to endogeneity and causality issues, we use VAR on panel data which enable us to consider the complex relationship between the various growth determinants and output level, with particular emphasis on tourism.[11] Moreover panel VARs also allow for a firm-specific unobserved heterogeneity in the levels of the variables. Panel data VAR combines the traditional VAR approach, which treats all the variables in the system as endogenous, with the panel data approach, which allows for unobserved individual heterogeneity. We specify a first order VAR model as follows

$$Z_{it} = \Gamma_0 + \Gamma_1 Z_{it-1} + \mu_i + \varepsilon_t \tag{2}$$

where $z_t$ is a six variable vector *(y, ivtgdp, open, edu, ef, tour)* and the variables are as defined previously.

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[9] From their survey, Mo, Howard, and Havitz (1993) found that tourists gave more preference to travel to countries where they have the similar infrastructure as in their own country.

[10] This argument has also been confirmed in the literature related to the determinants of tourist arrivals (see Witt and Witt 1995; Naudé and Sayman 2004; Khadaroo and Seetanah 2008).

[11] Powell, Selman, and Wragg (2002) and Love and Zicchino (2006) used a similar approach in their respective study. The former studied the interrelationships between inflows and outflows of capital and other macro variables and the later that of financial development and dynamic investment behaviour.

In applying the VAR procedure to panel data, we need to impose the restriction that the underlying structure is the same for each cross-sectional unit. Since this constraint is likely to be violated in practice, one way to overcome the restriction on parameters is to allow for 'individual heterogeneity' in the levels of the variables by introducing fixed effects, denoted by $\mu_i$ in the model (Love and Zicchino 2006). Since the fixed effects are correlated with the regressors due to lags of the dependent variables, the mean differencing procedure commonly used to eliminate fixed effects would create biased coefficients. To avoid this problem we use forward mean differencing, also referred to as the 'Helmert procedure' (see Arellano and Bover 1995). This procedure removes only the forward mean, i.e. the mean of all the future observations available for each firm year. This transformation preserves the orthogonality between transformed variables and lagged regressors, so we can use lagged regressors as instruments and estimate the coefficients by the system of generalized method of moments (GMM).[12]

### 4.3 Estimation and analysis

We estimate the coefficients of the system given in (2) after the fixed effects have been removed and Table 5 report the results of the model.

Table 5: Results from the VAR model (1990–2006)

| Response to → | | | | | | | |
|---|---|---|---|---|---|---|---|
| Response of ↓ | Constant | $y_{t-1}$ | $ivtgdp_{t-1}$ | $xmgdp_{t-1}$ | $ser_{t-1}$ | $ef_{t-1}$ | $tour_{t-1}$ |
| y | -0.53 | 0.33 | 0.46 | 0.27 | 0.19 | 0.14 | 0.15 |
| | (1.53) | (2.23)** | (2.11)** | (2.31)*** | (1.98)* | (1.86)* | (1.98)* |
| ivtgdp | 0.43 | 0.23 | 0.58 | 0.09 | 0.12 | 0.11 | 0.30 |
| | (1.86)* | (2.15)** | (2.21)** | (1.01) | (1.71)* | (1.89)* | (1.82)* |
| xmgdp | 0.54 | 0.11 | 0.07 | 0.66 | 0.04 | 0.11 | 0.05 |
| | (1.91)* | (2.18)** | (1.13) | (1.99)* | (1.78)* | (1.21) | (0.65) |
| ser | 1.12 | 0.14 | 0.09 | 0.04 | 0.56 | 0.03 | 0.04 |
| | (1.87)* | (2.33)** | (1.23) | (0.55) | (1.98)* | (0.32) | (1.02) |
| ef | -0.34 | 0.09 | 0.03 | 0.10 | 0.15 | 0.51 | 0.06 |
| | (1.23) | (1.78)* | (1.12) | (1.54) | (2.15)** | (1.99)* | (1.01) |
| tour | 0.61 | 0.12 | 0.11 | 0.06 | 0.15 | 0.13 | 0.45 |
| | (1.69)* | (2.25)** | (1.94)* | (1.24) | (1.99)* | (2.02)* | (2.45)*** |
| | | | | | | | |
| No. of obs | 680 | | | | | | |
| | | | | | | | |
| No of countries | 40 | | | | | | |

Note: The VAR model is estimated by GMM and fixed effects are removed prior to estimation. Reported numbers show the coefficients of regressing the row variables on lags of the column variables. Heteroskedasticity adjusted t-statistics are in parentheses. *** significant at the 1% level, ** at 5%, and *** at 10%, respectively. The small letters denotes variables in natural logarithmic and t-values are in parentheses.

Source: Authors' calculation.

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[12] In our case the model is 'just identified', i.e. the number of regressors equals the number of instruments, therefore system GMM is numerically equivalent to equation-by-equation 2SLS.

## 4.4 Analysis

Referring to the output equation, it is seen that tourism, as proxied by the number of tourist arrival, has had a positive important contribution to economic growth of African countries. In fact, the coefficient of 0.15, a measure of output elasticity, denotes that a 1 per cent increase in tourist arrival contributed to a 0.15 per cent increase in the GDP of African economies and this is the direct effect. These results are consistent to those of Dritsakis (2004), Kim, Chen, and Jang (2006), and Eugenio-Martin, Morales and Scarpa (2004) for the case of Latin America. The rest of the growth explanatory variables turned out to be also significant and have the expected signs. It should be, however, noted that the magnitude of the tourism coefficient remains relatively smaller than for instance private investment and openness which remains the major growth drivers in Africa according to this study.

The VAR framework, as discussed before, enables us to gauge more interesting insights on endogeneity issues and indirect effects as well. While it has been shown that tourist influences growth (tourism-led growth), referring to the 'tour' equation, it is interestingly observed that a reverse causation exists as well as output appears to be also a determinant of tourism thus supporting a bicausal and reinforcing relationship. In other words, output level which proxies economic well-being and level of development, may play an important role attracting tourists as well. These results are consistent with those obtained from Dritsakis (2004), Oh (2005), Kim, Chen, and Jang (2006), and Lee (2008). The 'tour' equation can also be viewed as a tourist demand equation with, in addition to income level, education attainment, social, political, and economic freedom and investment level being other determinants. Thus enhancing these determinants would also imply a fostering in the level of tourist which may thus have indirect impact on growth.

Referring to the 'investment equation', positive indirect effects of tourist on private investment are noted. This confirms the view that additional tourism encourages private investment, probably in the sector, for instance hotels, restaurants, and other tourism amenities. An elasticity value of 0.1 denotes that a percentage increase in tourist would lead to a 0.3 increase in private investment. Given that the direct effect is to the order of 0.43 per cent increase in the GDP for a 1 percentage increase in private investment, put together this leads to a 0.3 x 0.43 (0.12) percentage increase in the output after two years. This is an estimate of the indirect effect of tourist on output via the private capital channel. Finally, the presence of bicausality between private investment, education, and income level is found.

Orthogonalized, impulse-response functions analysis[13] and variance decompositions[14] overall produced equivalent results. Details are available from the corresponding author upon request.

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[13] The impulse-response functions describe the reaction of one variable to the innovations in another variable in the system, while holding all other shocks equal to zero. Impulse-response functions are orthogonalized since the actual variance–covariance matrix of the errors is unlikely to be diagonal.

[14] This shows the per cent of the variation in one variable that is explained by the shock to another variable, accumulated over time. The variance decompositions show the magnitude of the total effect.

## 5    Summary and policy implications

Using a panel VAR model to take into account for indirect effects, causality and endogeneity issues, this paper investigated whether tourism, as measured by the number of tourists' arrivals, has contributed to the national income of a sample of 40 African countries over the period 1990–2006.

Results from the study confirm tourism to be an important element of African development although private investment, openness, and human capital remain the main drivers. While the tourist-led growth hypothesis is confirmed, interestingly a reverse causation exists as output level is seen to be also a determinant of tourism thus supporting a bicausal and reinforcing relationship. Thus output level which relates to economic well-being and level of development is important in attracting tourist as well. These results are consistent with those obtained from Dritsakis (2004), Oh (2005), Kim, Chen, and Jang (2006), and Lee (2008). Moreover, in addition to income level, enhancing education attainment, social, political, and economic freedom and investment level would also imply a fostering in the level of tourism which may thus have indirect impact on growth. Additional tourism is positively linked to private investment and this presents another interesting indirect avenue for economic growth. Finally, the presence of bicausality between private investment, education, and income level is found.

A broad policy implication which may be drawn from this study is that African economies can improve their economic growth performance, not only by investing in the traditional sources of growth such as investment in physical and human capital and trade which remain the main ingredients, but also by strategically encouraging the tourism industry.

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**Appendix**

List of Sub-Saharan African countries

Algeria, Angola, Benin, Botswana, Burundi, Cameroon , Congo, Central Africa, Côte D'Ivoire, Gabon, Gambia, Ghana, Guinea-Bissau, Egypt, Ethiopia, Kenya, Lesotho, Libya, Madagascar, Mauritania, Mauritius, Mozambique, Malawi, Mali, Morocco, Namibia, Niger, Nigeria, Rwanda, Senegal, Seychelles, South Africa, Sudan, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe.