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# Productivity growth and biased technological change: The case of Moroccan hotels

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ABSTRACT

This paper proposes a procedure to analyze Moroccan hotels productivity, based on Luenberger productivity indicator to estimate and decompose productivity change into efficiency change and technological change. This paper enlarges the procedure and further decomposes technological change to study the sources of bias in technological change. Therefore, a clearer and more enlightening view of tourism productivity change emerges. Policy implications are developed.



## 1. Introduction

In many countries of the world, the importance of tourism in terms of policy can be explained by its economic repercussions. It is the case of Morocco which intends to contribute to its economic development by stimulating its tourism industry. Along this line, the plan "Vision 2010" consisted to reach some scores in 2010. Among others, it can be stated the following: (i) 10 million of tourist arrivals; (ii) 7 million of tourists lodged in hotels (1–5 stars); (iii) construction of 80,000 rooms. These findings underline that tourism, and particularly the hospitality sector, becomes a very important strategic tool in Morocco in terms of economic development and policy. There are none recent studies about the hospitality sector in Morocco and then a natural question is first to analyze the efficiency and productivity of this last.

In this paper we analyze the efficiency and productivity change of a sample of Moroccan hotels by using the Luenberger productivity indicator. First, we decompose the productivity into technical efficiency variation and technological change. Second, we decompose the technological change component in order to test their source, which can be neutral or biased. The methodology used encompasses the traditional exercise of efficiency and productivity measurement by analyzing the nature of the technological change. It is of a great interest in the case where productivity variations between two time periods are driven by the technological change. We follow the recent theoretical contribution by Briec et al. (2006) about parallel neutrality.

The paper unfolds as follows. In the next section, the tourism context in Morocco as well as the hotel sector will be described and analyzed. In Section 3, we propose a survey in efficiency measures in the hotel industry. The Section 4 exposes the method. The empirical results, which illustrate the usefulness of our approach, are presented and analyzed in Section 5. Finally, Section 6 concludes.

## 2. Contextual setting

Morocco is characterized by a big variety of landscapes. The country is lined by the Atlantic Ocean and the Mediterranean Sea (that is 3500 km of coast) and it is dominated by the Atlas Chain which ends in the South towards the Desert. This variety allows Morocco to be a privileged destination by the tourists. The Moroccan tourism product is rich, diverse and complete; thus, it could satisfy the tourist needs (balneal, cultural, adventure, business, rural, and mountains). In last years, the tourism became the main source of investment and creation of employment in Morocco. It represents 8% of the GDP (Gross Domestic Product).[1] The global crisis which started in the U.S. in November 2008 invaded almost all sectors. It was therefore necessary to manage the situation in order to limit the damage and to attenuate the effects of this crisis. As far as the tourism industry, Morocco is positioned well compared to some rival countries. It is in 27th place worldwide with 8.4 million tourists in front of Tunisia, which comes in 34th place with 6.8 million tourists.Concerning the hospitality sector, the country has more than 1540 tourist establishments with 16% of hotels from 1 to 3 stars, 25% of 4 star hotels, 24% of five stars hotels within 3% of Luxury. The international chains are present

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[1] All the data presented here are extracted from the "Annuaire Statistique du Tourisme au Maroc (2008)".

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in all the main cities of the Kingdom such as Accor, Best Western, Palaces and Traditions, Ramada. In 2008, there are 68,500 rooms in the country and the number of beds has reached to 153,000, representing a growth by 61% since 2000. Hotels from 1 to 5 stars concentrate 73% of the total capacity in terms of beds. The two main cities are Marrakech and Agadir with 57% of the bed capacity which represent respectively 46,000 and 30,000 beds. The other main regions are Fes–Meknes–Boulemane–Tafilalet, Rabat–Zemmour–Zaer–Casablanca, and Tangier–Tetouan.At the present time, many strategies and projects from operators and professionals are under development following the plan "Vision 2010". The tourism strategy within the framework of the Plan "Vision 2010" consists, among others, in reaching 10 million of tourist arrivals in Morocco. In 2008 the number of tourists exceeded 8 millions, which represents an increase by 7% relative to the previous year and a growth by 13% compared to 2006. However, in the last months, it can be concluded that the tourists spend less, tourism receipts have fallen by 14% in the first half of 2009 compared to the same period in 2008 and correspond to 21 billion Dirhams (2 billion euros). Then there are more tourists but fewer receipts in the country. How to explain this phenomenon which is similar to the French paradox?Another observation is that rentals of apartments and houses are increasing and many agencies on the Net are specialized in this type of stay. This practice is to the detriment of the hotels and the traditional trips in Morocco. Then the question about efficiency in the hospitality sector is again of a great interest.

## 3. Efficiency measures in tourism industry

There are two main approaches to measure efficiency and both are observed in tourism industry: First, the econometric or parametric approach such as the stochastic frontier analysis. This includes for example the use of stochastic cost frontier (Barros, 2004, 2006; Assaf, 2010) or Bayesian random stochastic frontier (Assaf, 2009). The second is the DEA (Data Envelopment Analysis) approach which is a non-parametric method. Examples of empirical contributions using methods derived from DEA are Barros and Alves (2004), Barros (2005) and Botti et al. (2009). In order to save space and to avoid some repetitions of recent works, we refer directly to the recent contribution by Barros and Dieke (2008) for a full literature review about papers using frontier models in tourism industry and more precisely in the hotel sector. What is clear from the existing literature is that none of the existing papers has adopted the Luenberger productivity indicator to estimate productivity and to analyze the nature of the technological change. The focus on Moroccan hotels has also been ignored in the literature. Therefore the present research is innovative in this context.

Barros and Dieke (2008) also underline that there is few papers in tourism economics and management which use frontier models in order to asses the performance of the tourism industry. With the present paper, we seek to enlarge the existing literature by using an innovative methodology and we will apply it to a sample of Moroccan hotels from 3 to 5 stars under the period 2006–2008. Table 1 presents the general characteristics of the hotels of our sample. Note that the directors of each hotel asked the anonymity; so we indicate only the origin city of each hotel and its number of stars.

**Table 1**
Characteristics of the Moroccan hotels in 2008.

| No. | Hotel's city | Number of stars | Sales[a] |
|---|---|---|---|
| 1 | Tetouan | 3 | 2,845,350 |
| 2 | Fes | 3 | 2,300,694 |
| 3 | Rabat | 3 | 4,750,650 |
| 4 | Tetouan | 4 | 10,704,263.4 |
| 5 | Marrakech | 4 | 73,108,304 |
| 6 | Fes | 4 | 7,648,704 |
| 7 | Agadir | 4 | 6,209,280 |
| 8 | Marrakech | 5 | 9,147,572 |
| 9 | Rabat | 5 | 4,428,309 |
| 10 | Marrakech | 3 | 4,002,350 |
| 11 | Ouarzazate | 3 | 5,084,266.5 |
| 12 | Tetouan | 4 | 3,688,750 |
| 13 | Tetouan | 3 | 920,000 |
| 14 | Agadir | 4 | 8,393,600 |
| 15 | Tanger | 4 | 10,030,000 |

[a] Annual values are in Moroccan Dirham.

## 4. Methodology

### 4.1. The Luenberger productivity indicator

Our theoretical framework is based on productivity measurement using the Directional Distance Function (Chambers et al., 1996) and the Luenberger productivity indicator (Chambers, 1996). The Directional Distance Function generalizes the traditional Shephard's Distance Function (1970) and plays a meaningful role in production theory. As its name indicates, the Directional Distance Function projects input and/or output vector from itself to the technology frontier in a pre-assigned direction. It determines a shortcut in one direction which permits to an observed DMU to reach the production frontier. In a tourism framework, this efficiency measure has been presented by Peypoch and Solonandrasana (2006, 2008) and Peypoch (2007).

To use this function, we have to find the technology for transforming a vector of $N$ inputs, denoted with $x$, into a vector of $M$ outputs, denoted with $y$. This technology can be described by a set $T \subseteq R_+^N \times R_+^M$ defined by

$$T_t = \{(x_t, y_t) : \ x_t \ \text{can produce} \ y_t\}, \tag{1}$$

where $x_t \in R_+^N$ is a vector of inputs and $y_t \in R_+^M$ is a vector of outputs at the time period $t$.

Throughout this paper, the technology satisfies the following conventional assumptions:

A1: $(0,0) \in T_t, (0, y_t) \in T_t \Rightarrow y_t = 0$, i.e., no free lunch;
A2: the set $A(x_t) = \{(u_t, y_t) \in T_t; u_t \leq x_t\}$ of dominating observations is bounded $\forall x_t \in R_+^N$, i.e., infinite outputs are not allowed with a finite input vector;
A3: $T_t$ is closed;
A4: $\forall (x_t, y_t) \in T_t, (x_t, -y_t) \leq (u_t, -v_t) \Rightarrow (u_t, v_t) \in T_t$, i.e., fewer outputs can always be produced with more inputs, and inversely (strong disposal of inputs and outputs);
A5: $T_t$ is convex.

The *Directional Distance Function* is defined as follows. The function $D_t : R^{n+p} \times R^{n+p} \to R \cup \{-\infty\} \cup \{+\infty\}$ defined by:

$$D_t(x_t, y_t; g) = \begin{cases} \sup\{\delta : (x_t - \delta h; y_t + \delta k) \in T_t\} \\ \text{if } (x_t - \delta h; y_t + \delta k) \in T_t, \delta \in R \\ -\infty \qquad\qquad\qquad\qquad \text{otherwise} \end{cases} \tag{2}$$

is called directional distance function in the direction of $g = (h, k)$. Indeed, in order to make more operational this approach, it is necessary to take an appropriate direction (Briec, 1997).[2] We do this by considering the direction $g = (x, y)$.

Suppose that the hotel represented by a production vector $(x_t, y_t)$ with the corresponding technology $T_t$ is changed to $(x_{t+1}, y_{t+1})$ with the corresponding technology $T_{t+1}$.

Along this line, the Luenberger productivity indicator, proposed by Chambers (1996), is defined as (3). We simplify the notations by

[2] See also Fried et al. (2008) for a full discussion about the choice of the direction.