PRODUCTIVITY MEASUREMENT: THE CASE OF NATURE TOURISM FIRMS IN PORTUGAL

Eleonora Santos[1]
Alexandra I. Correia[2]
Fernanda A. Ferreira[3]
Alcina Maria Nunes[4]
Cláudia Miranda Veloso[5]
Elvira Vieira[6]
Goretti Silva[7]
Manuel Fonseca[8]
Paulo Carrança[9]
Paula Odete Fernandes[10]

ABSTRACT

Productivity measurement in the tourism sector has been raising increasing interest among researchers and is recognised as an important indicator for understanding the strengths and weaknesses of the sector and for enhancing its spillover effects on the economy. However, studies for Portugal and the particular activities included in the set of nature tourism activities are scarce. To overcome this research gap, this paper calculates the labour productivity and total factor productivity (TFP) measures of nature tourism firms to compare firms' productivity performance across NUTS II regions in mainland Portugal during 2014–2017. Using data from SABI, *Quadros do Pessoal*, INE and the National Tourism Registry, the sample consists of 369 firms, representing 55% of firms operating in nature tourism in the mainland. Results show that the levels of TFP, unlike to labour productivity, are uneven over time and space. In 2015, a year of change in the business cycle, all regions experienced a negative increase in TFP except the Metropolitan Region of Lisbon, which seems to indicate that nature tourism in most of the country is less resilient to external economic shocks, performing better in periods of prosperity. Labour productivity growth does not present, in general, consistently positive results.

Keywords: Labour Productivity, Total Factor Productivity, Tourism Sector, Nature Tourism, Regional Analysis, Portugal.

JEL Classification: L83, O10, O47, R11

[1] CeBER | Universidade de Coimbra (eandreasantos@gmail.com)
[2] UNIAG | Instituto Politécnico de Viana do Castelo (acorreia@estg.ipvc.pt)
[3] UNIAG | Instituto Politécnico do Porto (faf@esht.ipp.pt)
[4] UNIAG | Instituto Politécnico de Bragança (alcina@ipb.pt)
[5] GOVCOPP | Universidade de Aveiro (cmv@ua.pt)
[6] UNIAG | Instituto Politécnico de Viana do Castelo (evieira@esce.ipvc.pt)
[7] UNIAG | Instituto Politécnico de Viana do Castelo (goretti@estg.ipvc.pt)
[8] UNIAG | Instituto Politécnico de Viana do Castelo (manuelfonseca@esce.ipvc.pt)
[9] Turismo Porto e Norte de Portugal (paulo.carranca@portoenorte.pt)
[10] UNIAG | Instituto Politécnico de Bragança (pof@ipb.pt)

1. INTRODUCTION

The tourism sector involves an increasingly wide range of stakeholders and different activities and types of enterprises, which include multinationals and small and medium-sized businesses (which constitute most of the companies in the sector). It accounts for an important share of economic activity in most countries (UNWTO, 2014; Tourism of Portugal, 2018) being an essential source of revenue and positively impacting the balance of payment and the living standard of the populations (Nunkoo et al., 2020). In 2018, for example, with nearly 25 million guests, Portugal presented historical results for national tourism in the following indicators: overnight stays, revenues, guests, employment and exports; and tourism was considered the largest export economic activity in the country, with an 8.2% contribution to GDP (Tourism of Portugal, 2018). Based on the Travel & Tourism Competitiveness Index 2017 and World Tourism Barometer, Portugal is considered the 14th most competitive destination in the world (Tourism of Portugal, 2018). Considering the importance of tourism for the world economy and for economic growth, several studies have been published regarding productivity measurement. Such measurement has been raising increasing interest in academia and is recognised as critically important, since it is an essential indicator for understanding the strengths and weaknesses of the tourism sector.

According to Schreyer (2001: 11), productivity is commonly defined as a 'ratio of a volume measure of output to a volume measure of input use'. In tourism, productivity measures how efficiently and effectively specific production inputs are used in an economy to produce a given level of output, by relating the number of inputs, notably employment of labour and capital, to outputs (Blake et al., 2006). However, measuring productivity in tourism, a service-based sector where in many cases personal contact is required, is complex, given the different tools and measures of inputs and outputs. Because increased productivity can lead to economic growth without any additional inputs, tourism firms aim at increasing their productivity to earn higher income through the generation of greater outputs. At the same time, governments are interested in improving the productivity of their tourism markets to achieve higher levels of economic growth. Finally, scholars are interested in how tourism productivity affects economic growth. Thus, the research agenda of the United Nations World Tourism Organization has paid particular attention to tourism productivity (Assaf & Dwyer, 2013). However, Milio (2014) observed that, after the international financial crisis started in 2007, regions highly specialised in tourism have shown a lack of resilience difficulties, and an ability to recover their trajectories of economic growth. Furthermore, European regions with high specialisation in tourism (measured by the share of the employment in this sector in the regional labour force) tend to exhibit lower levels of gross value added, along with lower levels of education (Romão & Neuts, 2017).

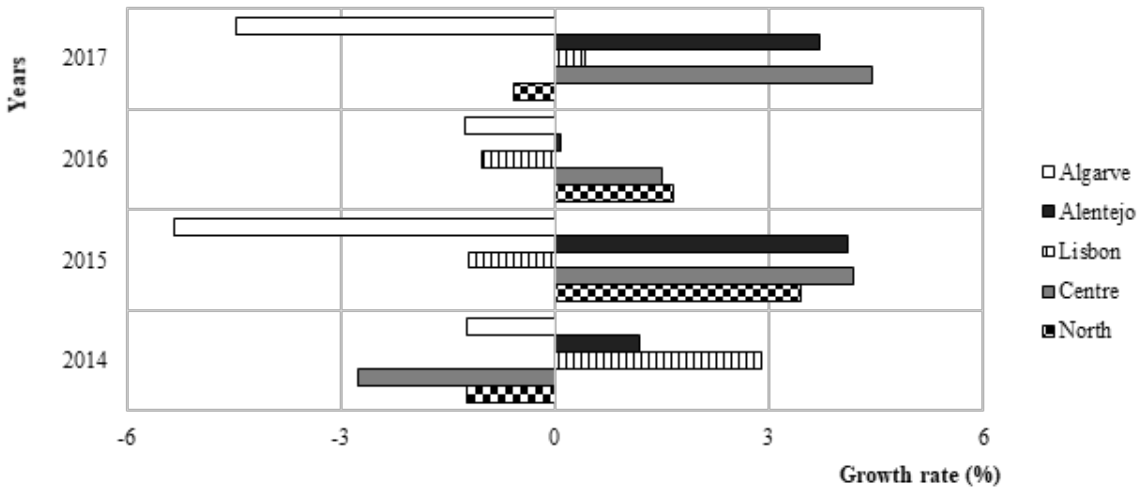
Tourism in Portugal has been critical for the national economy, and the results obtained in the last year confirm the growth trend, reinforcing the importance of the sector (Tourism of Portugal, 2018). Given the focus on the quality of the tourist experience and given Amusement and Recreation Activities' contribution to the establishment of visitors/tourists relations, job creation and destination development (National Observatory of Tourist Animation, 2013, cited in Leite, 2018). Furthermore, Amusement and Recreation Activities play a decisive role in projecting local identities, underpinning the economic development of the regions (Leite, 2018). Amusement and Recreation Activities refers to a set of activities aimed at transforming leisure into dynamic, participatory and creative activities, making it possible to reconcile tourism, sports and nature, and allowing tourists to enjoy activities amid the richness of the environment (Leite, 2018). According to the legislation in force (Decree-Law No. 186/2015 of 3 September), Amusement and Recreation Activities include recreational activities, sports or cultural activities, which are configured as outdoor tourism

activities or cultural tourism and are of interest to tourism for the region in which they occur (Ministério da Economia, 2015).

As described in *Ministério da Economia* (2015), 'open-air tourism activities', are also known as 'outdoor activities', 'active tourism' and 'adventure tourism', and they refer to activities that cumulatively: (i) predominantly take place in natural spaces, resulting in diversified experiences of enjoyment, experimentation and discovery of nature and landscape, whether or not in physically equipped facilities; (ii) assume logistical organisation and/or supervision by the provider; and (iii) imply a physical interaction of the participants with the surroundings. In turn, 'cultural tourism activities' refers to pedestrian and transport activities, which promote contact with the cultural and natural heritage through mediation between the recipient of the service and the cultural good enjoyed, for the purpose knowledge sharing. The before-mentioned activities imply physical effort to a greater or lesser extent, and range from passive (e.g. sitting, relaxing, enjoying a view) to active, (e.g. skiing, mountain biking, horse riding). They can be undertaken by individuals alone or in groups of family and friends (Bell et al., 2007). When the focus is on the adventure, it also involves challenge and risk-taking (Houge & Kerr, 2016). Based on Beedie and Hudson (2003), these activities can be distinguished between 'hard' and 'soft'. Activities like rafting, scuba diving, mountain biking, rappelling, cliff jumping, river crossing, paragliding, rock climbing, and bouldering can be considered 'hard', whereas 'soft' outdoor activities include walking, cycling, camping, hiking, biking, animal watching, horseback riding, canoeing, and water skiing. In recent years, these activities have become increasingly important for visited regions, given their economic implications. Therefore, different forms of tourism have grown in popularity and have captured practitioners' interest (Bell et al., 2007). This recognition creates opportunities to extend the existing knowledge about the impacts of outdoor tourism activities by approaching these activities from a supply perspective.

The potential effect of tourism on productivity growth, particularly of nature tourism activities, is yet to be uncovered. Given that in 2015 and 2016 the North of Portugal contained the two regions in Portugal's mainland that grew the most in terms of number of guests (see Figure 1), the goal of this paper is to assess how this translates into increases in productivity.

Figure 1. Annual Increase in Tourism Demand (guests) Across NUTS II Regions, 2014–2017



Source: Own elaboration based on Estatísticas do Turismo 2013–2017, INE

Assuming underemployment, if firms' turnover increases due to increased demand and it is not necessary to increase the production factors in the short run, then total factor productivity will increase. Thus, using two productivity measures, this study examines the relative position of the NUTS II regions of mainland Portugal, in 2014–2017. Thus, this study contributes to an in-depth understanding of tourism firms' contribution to regional productivity in mainland Portugal, which has not been fully revealed in the previous literature.

Following the introduction, a literature review on the tourism firms' productivity is performed. In section 3, information on the data source and methodology is provided. Section 4 presents and discusses the results, and section 5 concludes.

2. LITERATURE REVIEW

Tourism is a component of aggregate demand that generates domestic output (Lin et al., 2018) and it is regarded as a form of export that can inject cash-flow into the economy (Chou, 2013). Accordingly, a considerable amount of literature on tourism has been focused on macroeconomic-level issues. Early studies that aimed to calculate the total economic impact of tourism focused on estimating tourism's income or the expenditure multiplier effect (Archer, 1984) through cost-benefit analysis (Dwyer & Forsyth, 1998) and input-output analysis (Frechtling & Horváth, 2016). Subsequently, targeting more accurate measurements, authors used computable general equilibrium models (Inchausti-Sintes, 2015; Njoya & Seetaram, 2018). More recently, most empirical studies have tested the tourism-led growth hypothesis (Carmignani & Moyle, 2018; Zuo & Huang, 2018). Although tourism development is positively related to economic growth (Pablo-Romero & Molina, 2013; Brida et al., 2016), few studies have examined how tourism productivity affects the whole economy.

In tourism, the areas in which productivity has been studied are hotels (e.g. Barros & Alves, 2004; Cordero & Tzeremes, 2018; Liu & Tsai, 2018; Chatzimichael & Liasidou, 2019; Tzeremes, 2019), restaurants (Reynolds & Biel, 2007; Kukanja & Planinc, 2018; Kim & Jang, 2019) and travel agencies (Botti et al., 2010; Fuentes & Alvarez-Suarez, 2012; Díaz-Chao et al., 2016; Zuo & Li, 2018). However, to our knowledge, only one study (Kinfemichael & Morshed, 2019) included Amusement and Recreation Activities in the analysis.

For example, Barros and Alves (2004) analysed the efficiency of a Portuguese public-owned hotel chain, based on a sample of 126 observations, for the period 1999–2000. They used an output-oriented Malmquist-productivity index and Data Envelopment Analysis (DEA), a nonparametric technique, to estimate the total factor productivity (TFP) change. This index made it possible to break down TFP into a pure-efficient change index and scale-efficient change index. Barros and Alves (2004) found mixed results, that is, some hotels obtained gains in both areas and others obtained gains in one area while experiencing losses in the other. Only a small number of hotels achieved TFP improvements, with a more significant fraction achieving improvements in technical efficiency and only a small fraction achieving improvements in technological change.

Using a sample of 820 Spanish hotels from Balearic and Canary Islands, Cordero and Tzeremes (2018) analyse hotels' labour productivity growth in 2007–2012. They decompose labour productivity into technological change, technological catch-up (efficiency improvement/convergence), and capital deepening. Their results suggest that hotels' labour productivity is resilient in terms of facing the financial crisis. Using a Hicks–Moorsteen index approach, Liu and Tsai (2018) investigate TFP growth, technological progress, pure technical efficiency change, scale efficiency change, and mix efficiency change of star-rated

hotels in China, in 2001–2015. Their results show that the annual average growth rate of TFP was 13.11%, mainly attributed to an average yearly growth rate of operational efficiency of 21.85% and a mix efficiency growth rate of 13.52%.

Chatzimichael and Liasidou (2019) decompose hotel-sector TFP growth into components attributable to changes in technical efficiency, scale effect, and technological change. The hotel-sector production Frontier is approximated parametrically using an approach that does not requires data on prices. The study uses a translog production function to estimate productivity growth and its components in a sample of 25 European countries, in 2008–2015. In turn, Tzeremes (2019) applied the robust Luenberger productivity index (LPIs) alongside their main components to a sample of 176 hotels in the Canary Islands, Spain, from 2004 to 2013. The analysis was performed over several sub-periods during the Global Financial Crisis (GFC). The results indicated that hotels increased their productivity levels during the period and, also, that they have demonstrated strong resilience during the global financial crisis. In Tzeremes (2019) research, they obtained a contradiction when comparing the robust and original LPIs. Their findings suggest that the original LPIs underestimate hotel productivity levels due to the presence of outliers in the sample.

Reynolds and Biel (2007) suggest that productivity analysis through maximising operational outcomes, in addition to minimising expenses, might be possible through the application of a holistic productivity metric that includes traditional operational variables (revenue, profit, food cost, and labour cost) and new variables such as guest and employee satisfaction and retention equity. Through data from a chain's 36 corporate-owned restaurants located in the United States, they found that factors leading to maximum outputs, such as controllable profit and retention equity, include employee satisfaction in addition to expected variables such as cost of goods sold and the number of seats.

Kukanja and Planinc (2018) used DEA, based on secondary-financial data provided by the national tax authorities, to analyse the efficiency of 142 small and medium-sized Slovenian restaurants in 2017. Results showed that the average efficiency score is 85%, which indicates that, on average, restaurants have to increase their efficiency level by 15% in order to improve their efficiency according to the most efficient (best-performing) units under comparison.

Based on the equity theory and the fair-wage hypothesis, Kim and Jang (2019) investigate the relationship between the minimum wage and restaurant productivity in the US, for 1980–2014. The sample of 1,926 firm-year panel data for 242 restaurants comes from the Department of Labour website and the COMPUSTAT annual database for the federal minimum wage rate and company financials, respectively. The results revealed that increasing the minimum wage enhances restaurant productivity for up to two years. The results further indicated that both full-service restaurants and low-wage restaurants benefit from the positive effect, while there is no significant effect on limited-service restaurants and high-wage restaurants.

Botti et al. (2010) use a procedure based on the Luenberger productivity indicator for estimating and decomposing productivity change into efficiency change and technological change in the Portuguese travel agency sector for 2000–2004. They use sales and profits as proxies of output; and wages, capital, total operational cost, excluding wages and book value of premises, as proxies of inputs. Nominal variables are deflated using the GDP deflator. Data are obtained from reports published annually by the newspaper *Diário de Notícias* on the 1,000 largest firms in Portugal; the results show that productivity has increased for most of the travel agencies, almost always explained by an improvement in technological change. Fuentes and Alvarez-Suarez (2012) analyse the productivity of 22 travel agencies located in Alicante (Spain), in 2004–2007, to obtain results on efficiency. They use Malmquist indices and the smoothed bootstrap method; and the Mann-Whitney U test is adopted to study the

relationships between levels of productivity, ownership type, location, and experience. The results do not present an optimistic view regarding the evolution of the economic activity of the agencies.

Using survey data for 120 small and medium-sized travel agencies based in Catalonia (Spain) and partial least square–structural equation modelling (PLS–SEM) estimation techniques, Díaz-Chao et al. (2016) examine new co-innovative sources of firm labour productivity. They find that labour productivity is directly explained by those agencies' capacity to exploit their assets, use local networks, and make international transactions.

Co-innovation practices have a negative impact that may be related to difficulties in terms of securing productivity improvements in the short term. Based on cross-sector, cross-regional panel data collected from 2001 to 2014, Zuo and Li (2018) focus on accommodations, travel agencies, and tourist attractions to study the relationship between resource reallocation and changes in sectoral productivity. They use a sequential Data Envelope Analysis model to measure the heterogeneous productivity changes. They find deterioration of the allocative efficiency in China. Kinfemichael and Morshed (2019) use disaggregated data for the period 1987–2015 from the US Bureau of Economic Analysis to examine sectoral unconditional convergence in labour productivity in the United States. Their results show a general slowing down in the rate of convergence of labour productivity in recent years. The authors uncovered a new catching-up process for some subsectors, such as accommodations, amusement, gambling, and recreation services.

For the tourism industry, Pham (2019) developed a framework that integrates the principles of the growth accounting framework and the tourism satellite account (TSA) to provide a holistic approach to calculate the three largest productivity measures: capital productivity, labour productivity and multifactor productivity, for the Australian tourism industry. Using two sources of information, one of which provides three series: hours worked, capital services and real GVA indices for all conventional industries. Three tourism indexes are calculated as the weighted sum of these series using the corresponding shares. The series of hours worked is aggregated using the compensation of employees (COE) shares; capital services are aggregated using the gross operating surplus (GOS) shares and the gross value added (GVA) is aggregated by using the GVA shares. The shares were calculated based on nominal values to reflect the Laspeyres chain volume index closely; and the productivity measures capture around 80% of the entire tourism industry. The conclusion is that, in Australia, tourism is a reservoir designed to accommodate fluctuations in demand for labour in the economy.

From the studies mentioned above, among all possible types of productivity measures, the most used are labour productivity (LP), which measures the growth in value-added output per unit of labour used, and multifactor productivity (MFP), calculated through a growth accounting framework. The inputs used are usually labour, raw materials, capital, or a combination of all three. At the same time, the output is often either turnover, gross value added (GVA), or gross domestic product (GDP). The components of tourism productivity may be the number of jobs directly attributable to tourism (direct tourism jobs), as the input; and the gross value added (GVA) directly due to tourism (tourism direct GVA (TDGVA)), as the output. The approaches to measuring tourism productivity are the Data Envelopment Analysis, the Stochastic Frontier Analysis (SFA), and occasionally the Malmquist index and Luenberger productivity indicators (LPIs). The LPI takes the value of 0 if there is not any productivity change among periods t and t + 1. However, positive values mean progress of productivity levels, whereas negative values suggest a decline of productivity levels. These indicators can be estimated either by parametric or nonparametric methods. Also, growth regressions and Growth Accounting Frameworks are used.

Despite the recognised importance and the number of existing papers that provide an overview of productivity, its measurement, and the tourism-specific challenges (Joppe & Li, 2016), productivity is still under-researched with regard to tourism firms (Blake et al., 2006; Joppe & Li, 2016). Especially underresearched is the attempt to address productivity within one of tourism's sub-sectors, such as Amusement and Recreation Activities (code 93.2 NACE revision 2) in Portugal.

3. METHODOLOGY

3.1 Data Sources

This paper constructs two measures of productivity of nature tourism firms, namely, labour productivity and total factor productivity, and compares firms' performance across NUTS II regions in mainland Portugal during 2014–2017. The identification of firms operating exclusively in nature tourism was obtained from the National Tourism Registry (RNAAT). The database from RNAAT showed 1,023 tourist agents. Subsequently, there was a need to collect financial data from the SABI database financial reports. Bureau van Dijk (BvD) collects and harmonises the data from the mandated firm reports. In particular, for the Portuguese case, financial data come from *Informação Empresarial Simplificada* (IES).

This information is collected massively by Coface, BvD's partner for Portugal, which sends it to BvD for consequent upload in the SABI database. However, since SABI does not provide financial reports of entrepreneurs, 343 tourism agents were withdrawn, and 428 firm reports have been obtained via the SABI database. Afterwards, 14 firms that were located in the Islands (Madeira and Azores) were removed because the published statistics of *Quadros do Pessoal* only provide information on employees, according to qualification level, for mainland Portugal. After cleaning data regarding firms with missing values for all years, the sample is comprised of 369 nature-based Amusement and Recreation Activities firms (code 93.2 NACE revision 2). Thus, the sample represents 55% of total firms operating in nature tourism in the mainland from 2014 to 2017 (Table 1), and grants the reliability of conclusions at a 95% level of confidence.

Table 1. Percentual Representation of the Sample, by NUTS II

NUTS II	RNAAT	Sample	Representation of the sample (%)
North	135	79	59
Centre	116	64	55
Lisbon	200	101	51
Alentejo	70	45	64
Algarve	145	80	55
Total	**666**	**369**	**55**

Source: Own Elaboration

To calculate the variable human capital (w) for the estimation of TFP, the number of employees of each firm was multiplied by the regional coefficient (Table 2). This coefficient is the share of employees with at least a degree in total, by NUTS II regions, obtained from *Quadros do Pessoal* for the period 2014–2017. Subsequently, the missing values in the sample were attempted to be filled through multiple imputation, an iterative method of addressing missing data and fittingly reproducing the variance/covariance matrix one would

have observed. In this process, the distribution of the observed data is used to estimate multiple values that reflect the uncertainty around the true value. These values are then used in an ordinary least squares (OLS) model, and the results are combined.

Table 2. Regional Coefficients for the Calculation of Human Capital (variable)

NUTS II region	2014	2015	2016	2017
North	13.47	14.05	14.69	15.07
Centre	13.33	14.00	14.53	14.95
Lisbon	23.43	24.14	24.33	24.97
Alentejo	11.69	12.36	12.51	12.72
Algarve	11.20	11.61	11.69	11.99

Source: Own Elaboration

3.2 Empirical Strategy

In the empirical research two measures of productivity have been used—labour productivity and total factor productivity—to assess the relative performance of nature tourism firms across NUTS II regions in mainland Portugal, from 2014 to 2017. For this purpose, labour productivity is calculated as the ratio between turnover and number of employees. The level of TFP, rather than the output per capita, has been estimated using an augmented Solow Model type of equation. According to Griliches and Mairesse (1995), estimating growth equations with firm-level panel data can lead to specification problems as well as to the invalidity of instruments for capital and employment at the firm level. A way of addressing the issue of endogeneity in capital and the possibility of productivity shocks is to use a two-step approach and estimate TFP using the Wooldridge (2009) modifications to the original Levinsohn-Petrin (LP) (2003) value-added approach, according to equation (1):

$$\mathbf{Y_{It} = A_{It} K_{It}^{\beta^k} L_{It}^{\beta^l} M_{It}^{\beta^m}} \quad (1)$$

In this equation, Y_{it} represents the physical output of firm i at period t, and K_{it}, L_{it} and M_{it} are the inputs of capital, labour, and materials, respectively. A_{it} is the Hicksian neutral efficiency level (the proxy to the total factor productivity—TFP) of firm i in period t. For a given level of A, higher output levels demand higher inputs (K, L, and M) levels.

It is assumed that $L = L^P + L^{NP}$, where L^P stands for production worker (unskilled) labour and L^{NP} stands for non-production worker (skilled) labour. L^{NP} is constructed as explained in section 3.1, since there is no information for individual firms.

Although it is possible to observe Y_{it}, K_{it}, L_{it}, and M_{it}, A_{it} is not observable and therefore needs to be estimated. The estimation of $A_{it,}$ depends on several different components such as skills, knowledge and firm-level capabilities, including managerial and organisational competences. We assume that A_{it} or TFP in logs is given by equation (2), where β_0 measures the mean efficiency level across firms over time, and ε_{it} is the time- and producer-specific deviation from that mean:

$$\mathbf{\ln(A_{It}) = \beta_0 + \varepsilon_{It}} \quad (2)$$

Taking the natural logs of equation (1) and inserting equation (2) obtains a linear production function, presented in equation (3):

$$y_{it} = \beta_0 + \beta_k k_{it} + \beta_{lP} l^P_{it} + \beta_{lNP} l^{NP}_{it} + \beta_m m_{it} + \varepsilon_{it} \quad (3)$$

In equation 3, lower-case letters refer to natural logarithms. The error term ε_{it} can be further decomposed into an observable (or at least predictable) and an unobservable i.i.d. component, representing unexpected deviations from the mean due to measurement error, unexpected delays or other external circumstances, i.e, $\varepsilon_{it} = v_i + u^q_{it}$. Hence, equation (3) becomes equation (4):

$$y_{it} = \beta_0 + \beta_k k_{it} + \beta_{lP} l^P_{it} + \beta_{lNP} l^{NP}_{it} + \beta_m m_{it} + v_{it} + u^q_{it} \quad (4)$$

Since the firm-level productivity[11] is $tfp_{it} = \beta_0 + v_{it}$, rearranging the terms of equation (2) obtains equation (5):

$$tfp_{it} = y_{it} - (\beta_k k_{it} + \beta_{lP} l^P_{it} + \beta_{lNP} l^{NP}_{it} + \beta_m m_{it}) - u^q_{it} \quad (5)$$

And the estimated productivity is given by equation (6):

$$\widehat{tfp} = tfp_{it} + u^q_{it} \quad (6)$$

This empirical model makes it possible to address the simultaneity bias in traditional OLS regression techniques to estimate TFP when unobserved productivity or TFP shocks, *i* and *t*, are correlated to the choice of inputs. Since the Olley-Pakes (1996) and Levinsohn-Petrin (LP) (2003) techniques, while controlling for the simultaneity bias, suffer from collinearity problems (Ackerberg et al., 2007), Wooldridge (2009) suggested modifications to the original LP approach aiming to correct the collinearity issue. Defining the value added as $va_{it} = y_{it} - \beta_m m_{it}$, it can then be estimated through equation (4) as a residual

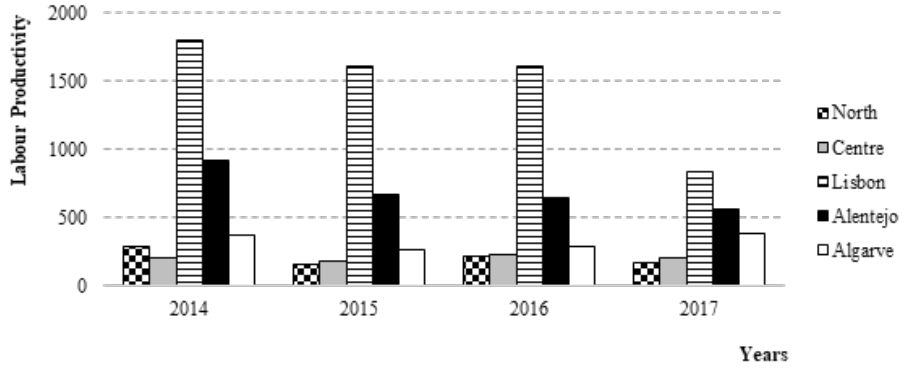
$$\widehat{tfp_{it}} = va_{it} - \left(\widehat{\varepsilon^v_p} l^P_{it} + \widehat{\varepsilon^v_{NP}} l^{NP}_{it} + \widehat{\varepsilon^v_K} K_{it}\right) \quad (7)$$

4. RESULTS

Results, shown in Figure 2, reveal that the labour productivity of firms operating nature-based activities in the Metropolitan region of Lisbon is highest, followed by the labour productivity of firms in Alentejo and Algarve. The northern region ranked in the fourth position in 2014 but dropped to the last position in the following two years.

[11] The productivity term is identified assuming that tfp_{it} is a state variable in the firm's decision problem (i.e. it is a determinant of both firm selection and input demand decisions), although u^q_{it} is either the measurement error or a non-predictable productivity shock (Olley & Pakes, 1996).

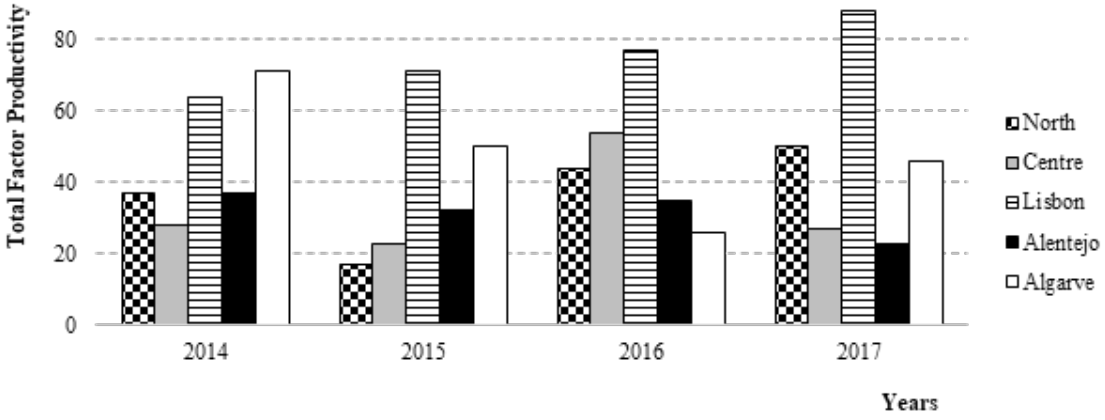
Figure 2. Labour Productivity Across NUTS II Regions, 2014–2017



Source: Own Elaboration

Regarding TFP, according to Figure 3, the higher level was recorded in firms operating in Algarve in 2014 and in the Metropolitan region of Lisbon in the following years. Firms in the northern region and Alentejo ranked in the third position in 2014. In 2015, the northern region ranked in the last position but in 2016 ranked in the third position. This may be explained by the annual increases in tourism demand (guests) in 2015 and 2016 (see Figure 1). Surprisingly, firms in Algarve show the worst position regarding TFP in 2016, although they recovered in 2017, rising to the third position. Although the central region shows the worst performance regarding TFP, in 2016, firms ranked second. Once again, this can be explained by the annual increases in tourism demand (guests) in 2015 and 2016. However, in the following year, those firms recorded levels of TFP in line with those recorded in 2014–2015.

Figure 3. Total Factor Productivity Across NUTS II Regions, 2014–2017

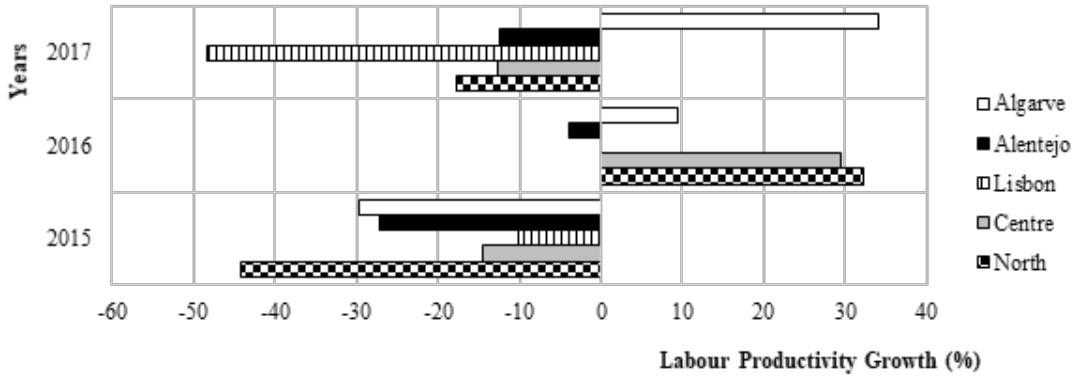


Source: Own Elaboration

These results seem to indicate that the levels of TFP, unlike labour productivity, are very uneven over time and space. The exception is the metropolitan region of Lisbon. This can be explained by the fact that the calculation of TFP requires a higher number of production factors than labour, which can suffer impacts from various factors both internal and external to the firms. However, these results should be read with caution, since the calculation of TFP did not accounted not for the real human capital in each firm but for an estimate of the amount of *w*, considering that firms operating in amusement and recreation activities hire the same amount of skilled labour (measured as employees with at least a degree) as the

mean for the whole region. Next, the labour productivity and TFP growth is analysed (see Figures 4 and 5, respectively).

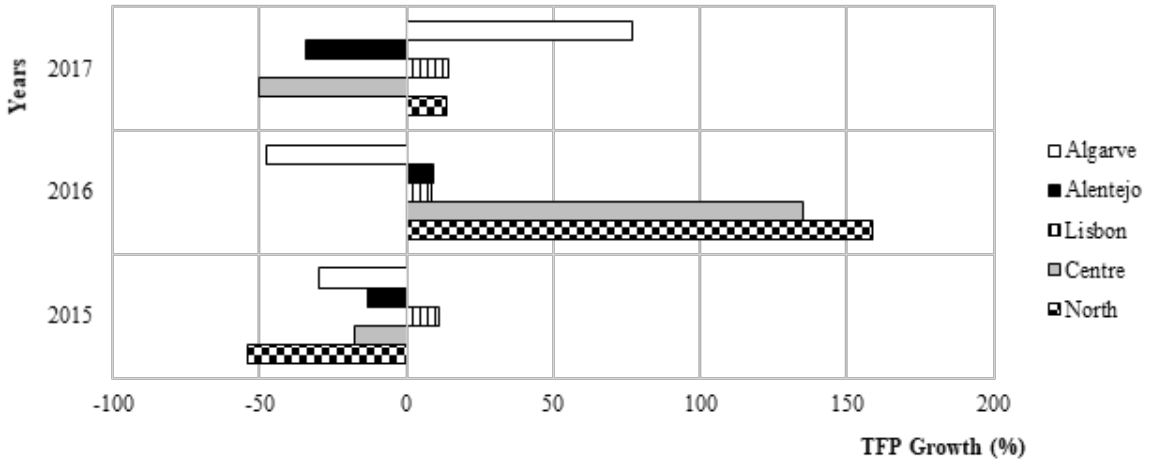
Figure 4. Growth of Labour Productivity Across NUTS II Regions, 2015–2017



Source: Own Elaboration

Results in terms of labour productivity growth (Figure 4) show that labour productivity increases in 2015–2017 were generally negative, except in 2016 for the northern and central regions (which grew 32% and 29% respectively) and in 2016 and 2017 for the Algarve region (10% and 34%, respectively).

Figure 5. Growth of TFP Across NUTS II Regions, 2015–2017



Source: Own Elaboration

The results on TFP growth (Figure 5) show, once again, that 2016 was favourable for the productivity of nature tourism firms operating in northern and central Portugal, with TFP increases of 159% and 135% respectively. The Metropolitan Region of Lisbon recorded increases in TFP during the whole period, although these were not uniform. Indeed, TFP grew more in 2015 and 2017. Firms in Alentejo only experienced positive TFP growth in 2016 (9%), while firms in Algarve only recorded positive TFP growth in 2017, albeit of great magnitude (77%). It should be noted that in 2015, all regions experienced a negative increase in TFP, except the Metropolitan Region of Lisbon, which seems to indicate that nature tourism firms in this region are more productive and resilient to external shocks.

5. CONCLUSION

Tourism is characterised by including intangibility, simultaneous production and consumption, perishability, and heterogeneity, which compound the complexity of capturing productivity in services (Joppe & Li, 2016). Also, and apart from the specific features of the sector, the combination of other measures, considered as inputs and outputs, than expected ones (e.g. costs) has already been highlighted. These measures include for example, the involvement of consumers in the value creation process, service quality, value-added to services through experiences, innovation, human capital (Joppe & Li, 2016), employee satisfaction, and controllable profit and retention equity (Reynolds & Biel, 2007). Adding to the complexity of measuring productivity in tourism is the recognition that the volume and structure of the tourism sector are defined on the basis of consumption generated by tourists rather than residents. Isolating and distinguishing consumption by tourists from that by non-tourists (e.g. residents) or by those who are not final consumers (e.g. tour operators), is not an easy task (Joppe & Li, 2016).

Productivity improvement in the tourism industry is related to service innovations that improve the experiences of tourists, unlike the manufacturing industry, which can improve productivity by introducing new technology into the production process (Chen & Soo, 2007). In addition, because productivity is not exogenous, new growth theory suggests that it can be assisted by knowledge spillover effects in human capital and public investment (Romer, 1986), which is more consistent with the more labour-intensive, less physical capital-intensive features of the tourism sector. Tourism can absorb underemployed labour to increase overall economic productivity due to its strong forward and backward sectorial linkages (Blake et al., 2006). When labour and other production factors move from a less productive sector such as agriculture to a more productive service sector like tourism, this structural change process with productivity growth may represent a mechanism through which tourism, can generate domestic output and contribute to economic growth.

In Portugal, more and more tourism entertainment/animation companies are emerging and organising recreational, recreational, sports, and/or cultural activities, which are directed at visitors/tourists (Tourism of Portugal, 2013). These activities are becoming increasingly important in meeting the needs of people looking for participatory and active tourism, with various emotions, experiences, and fun. Thus, these tourist activities contribute to increasing visitors' satisfaction level. In 2018, Portugal reached created a record 2,107 new tourist animation/entertainment companies. In total, during the last ten years a total of 8,952 new businesses were registered in Portugal (Tourism of Portugal, 2019).

Empirically, the overall results confirm that the levels of TFP of nature-based firms, contrary to labour productivity, are very uneven over time and space. The exception is the metropolitan region of Lisbon. Besides, labour productivity analysis reveals that Lisbon companies have higher productivity rates. Furthermore, firms' performance in this region in 2015, in terms of TFP growth, seems to indicate that nature tourism firms are more productive and resilient to external shocks.

The results from crossing the data on changes in tourism demand (number of guests) with firms' performance regarding productivity, especially for the northern and central regions, seem to indicate that increased tourism demand is immediately and directly reflected in the levels of labour productivity. This relationship is consistent with the levels of TFP growth with a one-year lag.

In terms of regional development, these results imply that policy measures to increase tourism and the productivity of tourism firms in the northern region as well as in other regions, excepting the Metropolitan region of Lisbon, are required. How well firms react to challenges in their operating environments depends on the capability of their employees

and of the systems that support them. Thus, investment in human capital development is vital to innovation and the productivity increases associated therewith. The demands of the 'information age' require higher-level skills gained through formal education and training. However, the innovation that is likely to increase firms' productivity commonly arises from the absorption and application of knowledge generated externally (Santos & Khan, 2019). Hence, policy measures aimed at improving firms' productivity may include supporting partnerships between firms. Several measures can be taken to achieve this end, for instance, (i) providing linkage information in seminars, exhibitions, and missions, and sponsoring fairs and conferences; (ii) organising meetings; (iii) promoting associations; and (iv) providing advice regarding deals. Other measures include regulatory regimes for business and foreign investment as vehicles of knowledge transfer.

ACKNOWLEDGEMENTS

This research is a part of a project title "TURNOUT: Outdoor Tourism Development in the Northern Region of Portugal", with the reference POCI-01-0145-FEDER-032289; funded by the European Regional Development Fund and by the Portuguese Foundation for the Development of Science and Technology, of the Ministry of Science, Technology and Higher Education.

UNIAG, R&D unit funded by the FCT–Portuguese Foundation for the Development of Science and Technology, Ministry of Science, Technology and Higher Education, under the project no. UIDB/04752/2020.

The SABI database was made available by the Applied Management Research Unit (UNIAG), according to the protocol between UNIAG and COFACE.

REFERENCES

Ackerberg, D., Benkard, C. L., Berry, S., & Pakes, A. (2007). Econometric tools for analysing market outcomes. *Handbook of Econometrics*, 6, 4171-4276.

Archer, E. (1984). Estimating the relationship between tourism and economic growth in Barbados. *Journal of Travel Research*, 22(4), 8-12. doi: 10.1177/004728758402200402

Assaf, A. G., & Dwyer, L. (2013). Benchmarking international tourism destinations. *Tourism Economics*, 19(6), 1233-1247. doi: 10.5367/te.2013.0354

Barros, C. P., & Alves F. P. (2004). Productivity in the tourism industry. *International Advances in Economic Research*, 10(3), 215-25. doi: 10.1007/BF02296216

Beedie, P., & Hudson, S. (2003). Emergence of mountain-based adventure tourism. *Annals of Tourism Research*, 30(3), 625-643. doi: 10.1016/S0160-7383(03)00043-4

Bell, S., Tyrvainen, L., Sievanen, T., Probstl, U., & Simpson, M. (2007). Outdoor recreation and nature tourism: a European perspective. *Living Reviews in Landscape Research*, 1(2), 1-46. doi: 10.12942/lrlr-2007-2

Blake, A., Sinclair, M., & Soria, J. (2006). Tourism productivity: evidence from the United Kingdom. *Annals of Tourism Research*, 33(4), 1099–1120. doi: 10.1016/j.annals.2006.06.001

Botti, L., Briec, W., Peypoch, N., & Solonandrasana, B. (2010). Productivity growth and sources of technological change in travel agencies. *Tourism Economics*, 16(2), 273-285. doi: 10.5367/000000010791305617

Brida, J. G., Cortes-Jimenez, I., & Pulina, M. (2016). Has the tourism-led growth hypothesis been validated? A literature review. *Current Issues in Tourism*, 19(5), 394-430. doi: 10.1080/13683500.2013.868414

Carmignani, F., & Moyle, C. L. (2019). Tourism and the output gap. *Journal of Travel Research*, 58(4), 608-621. doi: 10.1177/0047287518769760

Chatzimichael, K., & Liasidou, S. (2019). A parametric decomposition of hotel-sector productivity growth. *International Journal of Hospitality Management*, 76, 206-215. doi: 10.1016/j.ijhm.2018.05.010

Chen, C. F., & Soo, K. T. (2007). Cost structure and productivity growth of the Taiwanese international tourist hotels. *Tourism Management*, 28(6), 1400-1407. doi: 10.1016/j.tourman.2007.01.004

Chou, M. C. (2013). Does tourism development promote economic growth in transition countries? A panel data analysis. *Economic Modelling*, 33, 226-232. doi: 10.1016/j.econmod.2013.04.024

Cordero, J. M., & Tzeremes, N. G. (2018). Financial crisis and hotels' labour productivity growth: evidence from Spanish islands. *Applied Economics Letters*, 25(19), 1376-1382. doi: 10.1080/13504851.2017.1420884

Díaz-Chao, Á., Miralbell-Izard, O., & Torrent-Sellens, J. (2016). Information and communication technologies, innovation, and firm productivity in small and medium-sized travel agencies: New evidence from Spain. *Journal of Travel Research*, 55(7), 862-873. doi: 10.1177/0047287515583357

Dwyer, L., & Forsyth, P. (1998). Estimating the employment impacts of tourism to a nation. *Tourism Recreation Research*, 23(2), 3-12. doi: 10.1080/02508281.1998.11014833

Frechtling, D. C., & Horváth, E. (1999) Estimating the Multiplier Effects of Tourism Expenditures on a Local Economy through a Regional Input-Output Model. *Journal of Travel Research*, 37(4), 324-332. doi: 10.1177/004728759903700402

Fuentes, R., & Alvarez-Suarez, A. (2012). Productivity of travel agencies in Spain: the case of Alicante. *The Service Industries Journal*, 32(16), 2623-2640. doi: 10.1080/02642069.2011.596930

Griliches, Z., & Mairesse, J. (1995). Production functions: the search for identification (No. w5067). *National Bureau of Economic Research*. Retrieved from http://www.nber.org/papers/w5067

Houge M. S., & Kerr, J. H. (2016). Positive motivational experience over a three-day outdoor adventure trek in Peru. *Journal of Adventure Education and Outdoor Learning*, 9679(June), 1-14. doi: 10.1080/14729679.2016.1189837

Inchausti-Sintes, F. (2015). Tourism: economic growth, employment and Dutch disease. *Annals of Tourism Research*, 54, 172-189. doi: 10.1016/j.annals.2015.07.007

Joppe, M., & Li, X. P. (2016). Productivity measurement in tourism: the need for better tools. *Journal of Travel Research*, 55(2), 139–149. doi: 10.1177/0047287514546227

Kim, H. S., & Jang, S. S. (2019). Minimum wage increase and firm productivity: evidence from the restaurant industry. *Tourism Management*, 71, 378-388. doi: 10.1016/j.tourman.2018.10.029

Kinfemichael, B., & Morshed, A. M. (2019). Unconditional convergence of labor productivity in the service sector. *Journal of Macroeconomics*, 59, 217-229. doi: 10.1016/j.jmacro.2018.12.005

Kukanja, M., & Planinc, T. (2018). Efficiency analysis of restaurants in a small economy after the implementation of fiscal cash registers: the case of Slovenia. *Organizacija*, 51(4), 239-253. doi: 10.2478/orga-2018-0022

Leite, D. F. T. (2018). A cultura profissional dos técnicos de atividades de animação turística e de turismo de ar livre no distrito de Coimbra (Doctoral dissertation). Retrieved from http://hdl.handle.net/10400.26/28105

Levinsohn, J., & Petrin, A. (2003). Estimating production functions using inputs to control for unobservables. *The Review of Economic Studies*, 70(2), 317-341. doi: 10.1111/1467-937X.00246

Lin, V. S., Yang, Y., & Li, G. (2019). Where can tourism-led growth and economy-driven tourism growth occur?. *Journal of Travel Research*, 58(5), 760-773. doi: 10.1177/0047287518773919

Liu, H., & Tsai, H. (2018). Total factor productivity growth and regional competitive analysis of China's star-rated hotels. *Tourism Economics*, 24(6), 625-644. doi: 10.1177/1354816618768314

Milio, S. (2014). Impact of the economic crisis on social, economic and territorial cohesion of the European Union (Vol. 1). Brussels: Directorate-General for Internal Policies, Policy Department B (Structural and Cohesion Policies).

Ministério da Economia (2015). Decreto-Lei n.º 186/2015, de 3 de setembro. Diário da República, 1ª série, N.º 172, 6947-6982.

Njoya, E. T., & Seetaram, N. (2018). Tourism contribution to poverty alleviation in Kenya: A dynamic computable general equilibrium analysis. *Journal of Travel Research*, 57(4), 513-524. doi: 10.1177/0047287517700317

Nunkoo, R., Seetanah, B., Jaffur, Z. R. K., Moraghen, P. G. W., & Sannassee, R. V. (2020). Tourism and economic growth: A meta-regression analysis. *Journal of Travel Research*, 59(3), 404-423. doi: 10.1177/0047287519844833

Olley, S., & Pakes, A. (1996). The dynamics of productivity in the Telecommunications Equipment Industry. *Econometrica*, 64(6), 1263-1297. doi: 10.2307/2171831

Pablo-Romero, M. D. P., & Molina, J. A. (2013). Tourism and economic growth: a review of empirical literature. *Tourism Management Perspectives*, 8, 28-41. doi: 10.1016/j.tmp.2013.05.006

Pham, T. D. (2019). Tourism productivity theory and measurement for policy implications: the case of Australia. *Journal of Travel Research*, 1-20. doi: 10.1177/0047287519835972

Reynolds, D., & Biel, D. (2007). Incorporating satisfaction measures into a restaurant productivity index. *International Journal of Hospitality Management*, 26, 352-361. doi: 10.1016/j.ijhm.2006.01.003

Romão, J., & Neuts, B. (2017). Territorial capital, smart tourism specialisation and sustainable regional development: Experiences from Europe. *Habitat International*, 68, 64-74. doi: 10.1016/j.habitatint.2017.04.006

Romer, P. M. (1986). Increasing returns and long-run growth. *Journal of Political Economy*, 94(5), 1002-1037. doi: 10.1086/261420

Santos, E., & Khan, S. (2019). FDI policies and catching-up. *Journal of Applied Economic Sciences*, 13(7 (61)), 1821-1853.

Schreyer, P. (2001). The OECD productivity manual: a guide to the measurement of industry-level and aggregate productivity. *International Productivity Monitor*, 2(2), 37-51. Retrieved from https://www.researchgate.net/publication/227353774_Measuring_productivity

Tourism of Portugal (2013). *Plano estratégico nacional do turismo: revisão e objetivos 2013-2015*. Lisboa: Turismo de Portugal. Retrieved from http://travelbi.turismodeportugal.pt/pt-pt/Paginas/plano-estrategico-nacional-do-turismo-2013-2015.aspx

Tourism of Portugal (2018). *Turismo em Portugal 2018*. Retrieved from https://travelbi.turismodeportugal.pt/pt-pt/Paginas/turismo-em-portugal-2018.aspx.

Tourism of Portugal (2019). *Registo Nacional de Turismo: Consulta ao Registo*. Retrieved from https://rnt.turismodeportugal.pt/RNAAT/ConsultaRegisto.aspx?FiltroVisivel=True%20Turismo.

Tzeremes, N. G. (2019). Hotel productivity: a robust Luenberger productivity indicator. *Tourism Economics*, 25(6), 987-996. doi: 10.1177/1354816618821271

UNWTO (2014). *Measuring Employment in the Tourism Industries – Guide with Best Practices*. World Tourism Organization and International Labour Organization. UNWTO: Madrid. doi: 10.18111/9789284416158

Weber, K. (2001). Outdoor adventure tourism a review of research approaches. *Annals of Tourism Research*, 28(2), 360-377. doi: 10.1016/S0160-7383(00)00051-7

Wooldridge, J. M. (2009). On estimating firm-level production functions using proxy variables to control for unobservables. *Economics Letters*, 104(3), 112-114. doi: 10.1016/j.econlet.2009.04.026

Zuo, B., & Huang, S. (2018). Revisiting the tourism-led economic growth hypothesis: the case of China. *Journal of Travel Research*, 57(2), 151-163. doi: 10.1177/0047287516686725

Zuo, B., & Li, L. (2018). Resource reallocation and heterogeneous productivity growth in the tourism industry. *Journal of China Tourism Research*, 14(3), 370-391. doi: 10.1080/19388160.2018.1510352