Digital Technologies and Tourism as Drivers of Economic Growth in Europe and Central Asia

Conceição Castro¹, Fernanda A. Ferreira², and Pedro Nunes³

¹ CEOS.PP, ISCAP, Polytechnic of Porto, CEPESSE, Porto Accounting and Business, Rua Jaime Lopes Amorim, 4465-004 S. Mamede de Infesta, Portugal mariacastro@iscap.ipp.pt
² School of Hospitality and Tourism, Applied Management Research Unit (UNIAG), Polytechnic Institute of Porto, Rua D. Sancho I, 981, 4480-876 Vila do Conde, Portugal faf@esht.ipp.pt
³ CEPESE, Polytechnic Institute of Câvado and Ave, Lugar do Aldão, Vila Frescainha, Portugal pnunes@ipca.pt

Abstract. Advances in Information and Communication Technologies (ICT) are rapidly transforming the world, promoting social and economic development. At the same time, tourism is one of the fastest growing economic sectors and can play an important role in boosting a country’s economy. This paper aims to analyse the impact of ICT and tourism on economic growth in European and Central Asian countries. The analysis is based on a sample of 42 countries over the period 1995–2018. Using panel data estimation techniques, the results suggest that ICT (a composed index of internet users, fixed broadband and mobile cellular subscriptions) and tourism are important determinants of economic growth. The results also reveal that an increase in the burden caused by non-working people on a nation’s working-age population has adverse effects on economic growth, while urbanization and inflation are insignificant. Promoting technology advancements, ICT diffusion and tourism expansion can foster economic growth.

Keywords: Economic growth · Information and Communication Technologies · Tourism

1 Introduction

Economic growth in Europe and Central Asia has undergone many changes over recent decades. While some countries have experienced accelerated growth in the period 2000–2018 (e.g. Azerbaijan and Armenia), others have had low growth rates (e.g. Italy and Greece). The financial and economic crises that hit the global economy after summer 2007, one of the deepest crises, affected profoundly economic growth. While this great recession started in the USA and spread around the world, the ensuing sovereign debt crisis began in Europe and particularly in Greece. Due to the European
debt crisis, most of the eurozone countries re-entered into recession and only a few years after, the world is once more facing an unpredictable crisis due to the COVID-19 pandemic. In this context, more attention should be given to the determinants of economic growth.

In recent years it has been recognized the important role of the information society, where ICT provides means to accelerate social, economic, and environmentally sustainable growth [1]. To guarantee countries to achieve sustained economic growth, governments in the European Union have made investments to develop the ICT infrastructure [2]. Central Asian countries are also making efforts to promote technological progress in the ICT and service sectors to improve economic performance [3]. However, the success of ICT to improve macroeconomic performance is still under debate. Also, tourism is perceived widely as a driver of economic growth [4, 5]. It is an industry that is highly interdependent with other activities necessary to offer the tourist product and therefore has spillover effects. Europe, the global leader in international tourism, recorded a total contribution to Gross Domestic Product (GDP) of 9.1% in 2019 (a growth of 2.4%), and Central Asia a total contribution of 5.2% (a growth of 7.3%) [6, 7]. The economic crises aforementioned were felt generally in all sectors of activity, namely on tourism, but this sector has proven its resilience [4]. Now, the world is facing an unprecedented crisis caused by the COVID-19 pandemic which is the largest economic shock the world has experienced in decades. Europe is also experiencing important demographic changes that may have long-run economic consequences. The increase in the elderly population and a decrease in the labor force can slacken economic growth.

This paper aims to analyze the determinants of economic growth in Europe and Central Asia, particularly the effects of ICT diffusion and tourism on economic growth, controlled by several variables such as age dependency, investment, urbanization, and inflation.

2 Literature Review

2.1 ICT and Economic Growth

Technological changes, including ITC, are beneficial to economic growth [8] and is known as the Supply-Leading Hypothesis. ICT changes the way how transactions are made, enables access to the global market, reduces the costs of doing business, allows enterprises to produce better and helps in decision-making, creates important spillovers, enhances market transparency, and is a factor of competitiveness [9–11]. Furthermore, ICT supports human capital development through training and education which is favorable to economic growth [12, 13]. Hofman et al. [14] state that ICT fulfills the demand for digital products and increase the productivity and investments in sectors that use ICT, contributing to economic growth. In the field of tourism, ICT was a crucial element of development and competitiveness [15]. Nevertheless, empirical research leads to mixed results. Myovella et al. [13] found a positive contribution of ICT to economic growth in the two groups studied, 41 Sub Saharanian Africa and 33 OECD countries. For a sample of European countries, over the period 1961–2016,
Pradhan et al. [16] show evidence that ICT penetration stimulates economic growth in the long run, but in the short run in some situations the effect is bidirectional, while it is unidirectional (either direction) in other situations, depending on the proxies used for ICT penetration. Raheem et al. [17] refer that ICT can promote industrialization, which in turn drives economic growth, but due to the increase in industrialization also harms the environment. In the study, they explore the role of ICT on economic growth for the G7 countries for the period 1990 to 2014 and found that ICT has no meaningful effect on economic growth. Pradhan et al. [8] based on data from 25 European countries between 1989 and 2016, examine the dynamics among a diffusion of innovation, ITC penetration on economic growth and the results suggest that internet usage and late-stage venture capital impact economic growth in the long run, and that there strong inter-linkages between the variables in the short run.

2.2 Tourism and Economic Growth

Tourism is regarded as an important engine for economic growth and development of countries, either in developed and developing countries. Tourism creates new direct and indirect jobs, has spillover effects on other sectors, improves infrastructures, contributes positively to current account through foreign exchange income that generates, increases tax revenues, and leads to economies of scale, thus reducing production costs [4, 5, 18]. However, empirical results have shown inconsistent results on the effect of tourism on economic growth. On a review of 346 papers published between 2000 and 2014, Li et al. [18] have found that about 69.27% of the articles confirmed a positive impact of tourism on economic growth, about 8.94% a negative effect and 10.62% a weak or unclear impact, and those results hold across different income groups. Concerning papers that found a negative impact, the presence of shocking events (e.g. terrorist attacks, Iraq War, and SARS), inefficient tourism policies, environment factors, and diminishing marginal effects are among the explanations for those effects.

In Europe, previous studies have reported positive effects in European Union countries [5], Eastern and Western European Union countries [19], Mediterranean countries [20], European countries along the Mediterranean Basin [4], Western Balkan countries [21], among others. Sokhanvar [22] for a sample of seven European countries found a causality from tourism receipts to economic growth in Bulgaria, Estonia and Spain, but no causality in Croatia and Portugal. Antonakakis et al. [23] for 10 EU member states found that the magnitude and the direction of causality between tourism and economic growth varied over time and the effects of economic crises such as Great Recession and Euro-zone debt crisis on that relationship were more pronounced in countries that had economic recessions more serious. For Central Europe, Romão and Nijkamp [24] consider that this region has high productivity in economic services, although this is not a predominant sector in the regional economy.

In Central Asia, the tourism sector started to increase its activity in 2000. Hasanli et al. [25] in a study for Kazakhstan and Azerbaijan concluded that investment in the tourism sector has a positive impact on the country’s economy.
2.3 Other Determinants of Economic Growth

Urbanization is a sign of development and generally been a positive force for economic growth, poverty reduction, and human development [26]. Urban areas allow for more opportunities to education, health and employment [27], economies of scale and better market structures, and increase workers’ productivity and earnings [28] and may have positive effects on economic growth. But the rapid urbanization is also related to environmental degradation and other hindrances to productivity [29]. It is recognized in the literature that urbanization impacts economic growth [30]. Wang et al. [30] analysed the links between urbanization and economic growth in a sample of 170 countries, over the period 1980 to 2011, and the results suggest a long-run relationship from urbanization to economic growth in high income and lower-middle-income countries, but no causal relationship in upper-middle-income countries, and low income a long-run and short-run bidirectional Granger causality. For the EU Member States and candidate countries during the period 1992–2010, Kasman and Duman [31] did not find a long-run relationship, but in the short run, urbanization impacts economic growth. Henderson [32] question if there is an optimal level of urbanization and if a deviation from the optimal could imply economic losses. In its paper, he found no little support that urbanization promotes economic growth. For regions in a sample of European countries, Akçomak and Weel [33] concluded that urbanization was a significant determinant of economic growth.

Demographic variables also affect economic growth and age dependency, which represents the age structure of a population, is one of the variables that capture the overall impact of demographic changes on economic performance [34]. A higher dependency ratio may reduce productive capacity and lead to a lower rate of economic growth [35]. Other variables traditionally are recognized in the literature to influence economic performance such as investment in physical capital [36, 37] and economic instability.

3 Methodology

The empirical investigation on the impact of ICT and tourism on economic growth is examined for 42 European and Central Asian countries, for which all the necessary information was available, in a period of 24 year (1995–2018). Besides the 28 State-Members of EU (including the United Kingdom that left the EU in January 2020), the sample also includes Albania, Armenia, Azerbaijan, Belarus, Iceland, Kazakhstan, Kyrgyz Republic, Moldova, North Macedonia, Norway, Russian Federation, Turkey, Switzerland and Ukraine. The empirical analysis will be conducted employing alternative econometric techniques, such as pooled OLS, fixed effects, and random effects models. It will be performed diagnostic tests to decide between pooled or panel data, and the Hausman test will be used to determine the appropriate model to use (fixed or random effects model). Model specification with static panel data, according to the identified variables in the literature is indicated by the Eq. (1):

$$\ln GDP_{pc,i,t} = \beta_0 + \beta_1 ICT_{i,t} + \beta_2 TT_{i,t} + \beta_3 URB_{i,t} + \beta_4 \ln INV_{i,t} + \beta_5 AGED_{i,t} + \beta_6 INF_{i,t} + \varepsilon_{i,t}$$

(1)
where $i = 1, \ldots, 42$ represents the number of countries and $t = 1, \ldots, 24$ the number of time periods; $\beta_j$ are the coefficients of the independent variables, and $\varepsilon_{i,t}$ is a normally distributed random variable with zero mean and constant variance that represents the error term.

GDPpc represents the GDP per capita in constant 2010 USD and data were collected from the World Development Indicators (WDI) database published by the World Bank (WB). To analyse the impact of ICT on economic growth it was established an index (ICT) through an unweighted average of three indicators: the number of internet users, fixed broadband subscriptions and mobile cellular subscriptions, all per 100 inhabitants. Data were collected from the International Telecommunication Union. Tourism (TT) was measured by the Travel and Tourism direct contribution to GDP (DCTT), i.e. the GDP generated by industries that deal directly with tourists, including hotels, travel agents, airlines and other passenger transport services, as well as the activities of restaurant and leisure industries, and data was obtained from the World Travel and Tourism Council (WTTC). The DCTT reflects the total internal Travel and Tourism spending in a country less the purchases made by those industries (in % of GDP). To analyse the robustness of the impact of tourism on economic growth it was also used the receipts of international tourism (IR) (in USD).

The model includes other variables that potentially influence economic growth. Investment is measured by gross fixed capital formation (INV). Economic instability is proxied by inflation measured by the growth rate of the Consumer Price Index (INF). The degree of urbanization is measured by the ratio of the urban population in the total population (URB), where the urban population refers to people living in urban areas. Demographic variables were measured by the ratio of dependents (AGED) - people younger than 15 or older than 64 - to the working-age population (ages 15–64) (proportion of dependents per 100 working-age population). Data on receipts of international tourism, investment, inflation, urbanization and age dependency were gathered from the WDI of the WB. We hypothesized that ICT, tourism, urbanization and investment positively foster economic growth, while the age dependency ratio and inflation negatively impact economic growth.

4 Results

The results of the descriptive statistics (see Table 1) show that the average for GDP per capita is USD 26260, ranging from a minimum of USD 535 (Kyrgyz Republic, 1995) to a maximum of USD 111970 (Luxemburg, 2007). For ICT, the highest observed value is 97.48% (Finland, 2012) and the minimum is 0.002% (Moldova, 1995), with an average of 47.08%. Malta reported in 1995 the highest percentage of the direct contribution of Travel and Tourism to GDP (17%) and Belarus the minimum in 1995 (0.09%). In the sample, the direct contribution of Travel and Tourism for GDP was 3.1% in the EU28, 2.8% in other European countries, and 2.4% in Central Asia, on average, over the period 1995–2018. Tourism international receipts were maximum in France in 2017 (69894 million USD) and the lowest in the Kyrgyz Republic in 1996 (4 million USD).
As reported in Fig. 1, in general, there is a positive relationship between ICT and the ln of GDP per capita.

The panel data regression was run for pooled ordinary least squares (OLS), fixed effects (FE) and random effects (RE). To determine the appropriate estimation method the usual diagnostic tests were applied, the F-test, the Breusch-Pagan test and the Hausman test. The results of the F-test and Breusch-Pagan showed that panel data is more appropriate (F(41, 947) = 1512.59, p = 0.000, and $\chi^2 = 8811.93$, p = 0.000 in the model where tourism was proxied by DCTT; F(41, 908) = 1574.08, p = 0.000, and $\chi^2 = 7962.35$, p = 0.000, in the model with IR). Since both the fixed and random effects are more appropriate than OLS, it was performed the Hausman test to guide the choice between the two, which led to reject the null hypothesis ($\chi^2 = 185.43$, with p = 0.000, in model with DCTT and $\chi^2 = 199.154$, with p = 0.000, in the model with

### Table 1. Descriptive statistics

| Variable        | Mean    | Median  | Standard deviation | Minimum | Maximum |
|-----------------|---------|---------|--------------------|---------|---------|
| GDPpc (USD)     | 26260   | 19071   | 23583              | 535     | 111970  |
| ICT (%)         | 47.08   | 53.1    | 29.26              | 0.00189 | 97.48   |
| DCTT (%)        | 3.47    | 2.69    | 2.48               | 0.09    | 17.00   |
| IR (million USD)| 9813    | 3772    | 14528              | 4       | 69894   |
| URB (%)         | 68.97   | 68.63   | 13.81              | 35.28   | 98.00   |
| INV (million USD)| 98599  | 33081   | 157750             | 430     | 811300  |
| AGED (%)        | 49.15   | 48.90   | 5.27               | 34.76   | 75.56   |
| INF (%)         | 9.56    | 2.53    | 47.29              | –8.53   | 1058.4  |

As reported in Fig. 1, in general, there is a positive relationship between ICT and the ln of GDP per capita.
IR), and so the FE is the most appropriate methodology for our model. The discussion of the results is based on the findings of the FE model, which are reported in Table 2.

**Table 2.** Results of panel data regression analysis Model FE, considering the robust covariance matrix computed with the Arellano method

Dependent variable: ln GDP per capita

| Variables | (1)     | VIF | (2)     | VIF |
|----------|--------|-----|--------|-----|
| Constant | 1.699  | *** | 1.363  | *   |
|          | (2.804)|     | (1.982)|     |
| ICT      | 0.004  | *** | 1.262  | 0.003 | *** |
|          | (9.298)|     | (5.301)|     |
| TT       |        |     |        |      |
| DCTT     | 0.029  | *** | 1.066  |      |
|          | (2.972)|     |        |      |
| ln IR    |        |     | 0.080  | **  |
|          |        |     | (2.601)|     |
| URB      | -0.006 | 1.365| -0.005 | 1.332|
|          | (-1.321)|    | (-1.182)|    |
| ln INV   | 0.351  | *** | 1.271  | 0.294 | *** |
|          | (13.750)|   | (12.160)|   |
| AGED     | -0.007 | *   | 1.037  | -0.006 | * |
|          | (-1.846)|  | (-1.696)|  |
| INF      | -2.75E-05| 1.065| 2.64E-05| 1.073|
|          | (-0.183)|    | (0.196)|    |

Number of observations 995 956
Adjusted R² 0.881 0.892
F test 120.351 131.858
p-value (F test) 0.0000 0.0000

Notes: The t-ratios are in parentheses; ***, **, and * indicate significance at 1%, 5% and 10% levels, respectively.

The model, as measured by the adjusted R-squared, shows that 88% to 89% of the variance in the ln of GDP per capita is explained by the variables included in the analysis. The F-ratio is significant at the 0.01 level. All Variance Inflation Factors (VIF) are under the threshold of 10, denoting that there are no serious problems of multicollinearity.
The estimated coefficients of ICT are positive and statistically significant. The findings suggest that an increase of 1 percentage point (pp.) in this indicator enhances GDP per capita by 0.30% to 0.40% \((e^{0.01} - 1) \times 100\), demonstrating that countries can benefit from the diffusion of ICT, which supports the Supply-Leading Hypothesis. Also, several authors [e.g. 8, 13] found positive effects of ICT on economic performance. As predicted by theory, tourism is an important engine of economic growth. According to the results, GDP per capita could increase by 2.94% for each increase in 1 pp. in the direct contribution of Travel and Tourism in ratio of GDP. These results are robust when tourism is measured by the International receipts of tourism. If these receipts increase 1% GDP per capita will grow by 0.08%. Regardless of how tourism was measured its effect on economic growth is always positive.

Among the variables used for control, the estimated coefficients for investment are significant in the model at the level of 1%, and the age dependency ratio is significant at the 10% level and have the expected sign. An increase in the ratio of too young or old people to work on labour force decreases GDP per capita. If the dependency ratio increases 1 pp., GDP per capita decreases by 0.6% to 0.7%. A higher dependency decreases productivity, which reduces economic growth and these results are in line with Wei and Hao [35]. Empirical results also show that the level of inflation and urbanization are not statistically significant.

5 Conclusions

Advances in ICT deliver significant economic benefits, and transform the way people work, and how organizations conduct businesses. ICT can be regarded as an engine of productivity and economic growth, and the results of this paper reiterate this. In the current context of the COVID-19 pandemic, with the adoption of social distancing measures, ICT has proved to be decisive, allowing the continuity of many activities, which reinforces the importance of an interconnected world. The results of this paper also suggest the important role of tourism on economic growth, and therefore the adverse effects that the sharp fall in tourism during the outbreak will have on economic growth. Additionally, besides the positive influence of investment, our findings also reveal that changes in the age dependency ratio influence GDP per capita inversely. In future research, it would be important to analyse the economic impact of COVID-19 pandemic as well as the channels through which the impact is felt. It would also be important to analyse if there are different responses of economic growth in different points of the conditional growth distribution to ICT and tourism development through a quantile regression approach.

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