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Publication bias and genuine effects: the case of Granger causality between tourism and income

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ABSTRACT

Several studies have analysed the relationships between tourism and economic growth by means of tests of Granger causality. However, no consensus has been reached. In this paper our purpose is to synthesize the literature available through a meta-regression analysis. Our results suggest that there is evidence of publication bias and that the empirical effects reported in the literature are non-genuine. Concomitantly, we find that some methodological choices are positively or negatively correlated with the size of the empirical effects. Nevertheless, purged from publication bias, we confirm previous assertions that the variability of the empirical effects can be explained by the degree of tourism specialization, by the level of economic development and by the size of the countries analysed, even though, in some respects, in a different way than expected.

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Meta-regression; tourism-led growth hypothesis; Granger causality; publication bias

1. Introduction

In this paper, we present a meta-analysis of the results concerned to the tests of Granger causality between tourism and income (Brida, Cortes-Jimenez, & Pulina, 2016; Pablo-Romero & Molina, 2013), taking into account the problem of publication bias (Humphreys, Reigel, & Epstein, 1955; Sterling, 1959), in the light of the paradigm of meta-regression analysis developed by Stanley and his co-authors (Stanley, 2001; Stanley et al., 2013; Stanley & Doucouliagos, 2012; Stanley & Jarrell, 1989). Therefore, we pursue an answer to the following question: is the causal empirical effect systematically found between tourism and income genuine or is it a mere by-product of the publication bias?

The presence of publication bias in a strand of literature means that there might be a preference for the presentation and publication of research results of a certain type, namely results in accordance with the validation of a specific hypothesis, leaving aside studies that don't validate such hypothesis. In those cases, the literature will exhibit a sort of false or inflated consensus around the hypothesis under analysis, and the empirical effect found will appear much larger than it really is.

Specifically, we aim to answer to the following research questions: are there any issues of publication bias in the literature? Are there genuine empirical effects between tourism and income? To what extent the introduction of variables potentially correlated with publication bias changes the answers to these questions? What's the role of the economic and demographic variables in the explanation of the heterogeneity of the empirical effects?

We are motivated by empirical considerations. As such, we intend to take stock, in the form of a quantitative synthesis, of almost a decade and a half of research. Since the pioneering contribution of Balaguer and Cantavella-Jorda (2002), more than a hundred works came into light, accompanied with

the multiplication of analytical methods and the dispersion of conclusions, very often contradictory even for the same country analysed. In fact, although most of the papers validate the presence of some type of Granger causality between tourism and income, the contradictions found in the literature are serious enough so that we can discard the existence of a consensus.

The work developed throughout this article distinguishes itself from previous reviews concerned with the same line of investigation in virtue of its quantitative focus. In this sense, we offer an analysis of issues related to the presence of publication bias in the literature. We also contribute to the literature by giving a quantitative evaluation of the importance of the factors usually considered as explanatory of the differences between the results of the studies reviewed. To the best of our knowledge, ours is the first work devoted to these issues in the context of this literature.

In the meta-analyses carried out throughout this work, we scrutinize the two fundamental hypotheses underlying the revised literature: the tourism-led growth hypothesis (or more correctly, the Granger causality hypothesis from tourism to income) and the growth-led tourism hypothesis (or rather, the Granger causality hypothesis from income to tourism). Given the nature of the dependent variable we chose, a continuous variable associated with the level of significance of the test statistic applied, each hypothesis will be analysed separately. Our continuous variable converts those levels of significance into normal variables that represent the probability of accepting each one of the hypotheses.

In turn, our own basic hypothesis, tested throughout the meta-analysis, is that the variation from study to study of the probability of acceptance of each of the causal hypotheses is a function of two sets of factors. The first set includes variables associated with publication bias, such as the characteristics of the study, the characteristics of the data, the type of variables chosen to represent income and tourism, and the type of statistical techniques employed. The second set of factors relates to the variables most likely to explain the genuine variation of the empirical effect, that is, the genuine variation in the probability of accepting the causal hypothesis under analysis. This set includes the variables already suggested by previous literature (Brida et al., 2016; Brida, Pereyra, Pulina, & Such-Devesa, 2013; Pablo-Romero & Molina, 2013), namely the level of economic development, the degree of tourism specialization and the size of the countries analysed.

The remaining of this article is divided into four more sections. In the following section, we present the methodology that will be applied to achieve our aims. The sources, data, and methods that allowed the construction of the meta-dependent and meta-independent variables, as well as their descriptive statistical analyses, are presented in section 3. The meta-regression analyses themselves, and the discussion of the results are carried out along Section 4. Section 5 presents the main conclusions of our meta-analysis, together with some paths for future research and lessons with some relevance to economic policy.

2. Meta-regression methodology

2.1. Size of the empirical effect

Stanley and Jarrell (1989), along with Stanley and Doucouliagos (2012) and Stanley et al. (2013) provided us with a specific framework for the application of meta-regression analyses in Economics. In this context, the dependent variable, called empirical effect, is a regression coefficient or, due to problems of heteroscedasticity, the corresponding t statistic. However, when the meta-analysis refers to the results of Granger causality tests, this option is no longer available because the statistics associated with them result from F or Chi-square tests and not from t-tests.

One solution is to transform the probabilities of significance of the original test statistics into standardized normal variables, as suggested by Abramowitz and Stegun (1964) and recognized by Stanley (2005b). We follow Bruns, Gross, and Stern (2014) and convert the probabilities of significance of the F and Chi-square tests through a *probit* function, that corresponds to the inverse of the standard normal distribution. This transformation converts the probabilities of significance lower than 0.5

The methodology chosen for the application of the Granger causality tests is also slightly associated with the value of the empirical effects. In both cases, namely $-probit(p_{i1})$ and $-probit(p_{i2})$, there are some meta-regressions (respectively three and two) whose coefficients of the variable *VECM* are negative and statistically significant, at the significance levels of 5% or 10%. Therefore, the application of different types of tests of Granger causality might be associated with obtaining larger or smaller empirical effects.

4.3. Heterogeneity related with the profile of the countries

4.3.1. Level of economic development

Differences regarding the initial levels of economic development are helpful in the explanation of the heterogeneity of the empirical effect $-probit(p_{i2})$, since in two of the preferred three final meta-regressions, the coefficient of the variable *Economic development* is positive and statistically significant. It happens the same in more than half of the initial meta-regressions and in little more than a quarter of the other final meta-regressions. In the case of the empirical effect $-probit(p_{i1})$ the coefficient of *Economic development* never become statistically significant. We conclude that the higher the initial level of development of countries, the greater the empirical effect associated with the Granger causality from income to tourism.

4.3.2. Degree of tourism specialization

Both empirical effects are larger for the countries that depart from higher degrees of specialization in tourism. The coefficient of the variable *Tourism specialization* is positive and statistically significant in one of the three preferred final meta-regressions when the empirical effect is $-probit(p_{i1})$ and in all preferred final meta-regressions when the empirical effect is $-probit(p_{i2})$. In the remaining meta-regressions, the percentage of occasions in which this coefficient is positive and statistically significant ranges from more than 70% to more than 80%.

Given the features of the variables usually chosen to represent tourism and the income, respectively tourist receipts and real GDP, this is a predictable result. The greater the weight of tourism in the economic activity of a country, the more likely it is to find a Granger causal relationship among those variables.

4.3.3. Country size

Surprisingly, the empirical effect associated with the hypothesis of Granger causality from tourism to income is larger the bigger the population size of the countries analysed. The coefficient of the variable *Country size* is positive and statistically significant for a 5% level of significance in all the preferred final meta-regressions concerned with the empirical effect $-probit(p_{i1})$ and in more than 70% of the additional meta-regressions. This is an unexpected result and contradicts the assertion, common in the literature on the study on the role of tourism in economic growth, that the countries with high rates of economic growth that specialize in tourism are small. The coefficient of *Country size* never becomes statistically significant in the meta-regressions concerning the empirical effect $-probit(p_{i2})$.

5. Conclusion

In this article, we presented a meta-regression analysis of the literature concerned with the study of the Granger causal relationships between tourism and income. We intended to accomplish several and interrelated aims. Firstly, we aimed to investigate the presence of publication bias and of genuine empirical effects in the literature. Secondly, we sought to find out the role played by variables correlated with the research design and, concomitantly, with the publication bias. Thirdly, we aimed to study to what extent the economic and demographic variables are helpful in the explanation of the empirical association between tourism and income.

We concluded for the presence of publication bias concerning the empirical effect associated with the hypothesis of Granger causality from tourism to income. That is, the evidence suggests that the published studies tend to report the existence of a relation of Granger causality from tourism to income. We have also found that the empirical effects associated with both hypotheses of Granger causality, from tourism to income and vice-versa, are not genuine. Thus, the analysis of shorter samples increases the chances of obtaining higher empirical effects and, by this way, the chances of publication.

The presence of publication bias and the lack of genuineness of the empirical effect cast serious doubts on the usual implications of economic policy presented in the studies we reviewed. These conclusions often suggest the need to channel additional resources to the development of the tourism sector in order to promote long-term economic growth. But if the literature is indeed infested with problems of publication bias, that suggestion can hardly be extrapolated to countries out of the set of cases already analysed and published. On the other hand, if this causal association is indeed confined to the short-run, it is unlikely that the promotion of tourism development is an effective strategy for long-term economic growth. Obviously, the existence of publication bias does not diminish the value of individual studies where statistically significant effects were appropriately detected; those studies do offer useful policy or managerial implications for the specific countries or regions analysed.

We also found empirical support for the conclusion of Brida, Pereyra, et al. (2013) on the sensitivity of Granger causality tests to the features of the research design, notably the choice of the variable that represents income. Other relevant but less obvious choices are the type of cointegration and Granger causality tests.

We conclude that the initial level of development, the initial degree of initial specialization in tourism, and the geographic dimension of the countries are relevant for the explanation of the size of the empirical effect. Thus, the empirical effect associated with the hypothesis of Granger causality from income to tourism is greater the higher the initial level of economic development. This conclusion could be justified by the hypothesis of the growth-led tourism development, but it still lacks a more rigorous formalization. As a preliminary point, and with some relevance for tourism policymakers, it seems that the more developed countries are those where the evolution of economic activity precedes the evolution of tourism activity. In other words, although with some abuse, those are countries where the tourism activity evolves downstream of economic activity. If it is the case, we need to understand why it happens.

Unsurprisingly, we conclude that Granger causal relationships between tourism and income, in both directions, are all the stronger, the greater the initial degree of specialization in tourism. All previous literature reviews point in this direction, and we now offer a quantitative confirmation. In fact, if the economic activity of a country were totally confined to tourism, it is natural (or obvious) to detect the presence of Granger causal relations from tourism to income and vice versa. This is a mere statistical fact with no major implications for economic policymakers, except that a high degree of tourism specialization raises high challenges and risks associated with the economic dependence on a single and so volatile economic activity.

Surprising, however, is the fact that the empirical effect associated with the Granger causality from tourism to income is larger, the larger the population size of the countries, not happening the same in the case of reverse Granger causality. This conclusion is in contradiction with some theoretical models that suggest that the relationship between the development of the tourism sector and the expansion of the economic activity is more pronounced in the case of smaller countries. They assert that being smaller, those countries are more likely to develop a comparative advantage in tourism and reap the economic benefits due to the specialization in this activity. The empirical evidence we have found regarding the role of geographic dimension in the Granger causal relationship from tourism to income is not only difficult to justify but is also quite robust. Therefore, we have here another empirical fact deserving of more in-depth inquiries in the future.

As usual in the empirical work with secondary data, we are strongly limited by their availability and this situation is unavoidable until more complete and better databases are available. Thus, future studies should also replicate our analysis as soon as more studies and more complete datasets become available.

Disclosure statement

No potential conflict of interest was reported by the authors.

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