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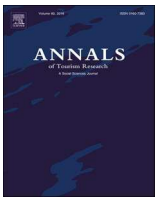

Does tourism affect the informal sector?

Zhike Lv

School of Business, Xiangtan University, Xiangtan 411105, China

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ABSTRACT

The effect of tourism on economic growth has largely been investigated in the literature. However, it is still poorly understood about how the impact of tourism on the size of the informal economy. The present study attempts to fill the research gaps in this field, and thus applies panel regression techniques to examine the relationship between tourism development and the size of the underground economy across 96 countries over the period 2000–2007. The estimation results show that tourism exhibits a U-shaped relation with informality. Specifically, the share of informal sector first decreases in the early stages of tourism development and then increases as tourism continues. Some policy implications, limitations, and future research directions are also discussed.

Introduction

The informal sector or economy, also known as the informal, hidden, shadow, underground or black-market economy, is an inevitable part of the official economy (Alm & Embaye, 2013). Recent estimates reported by Schneider, Buehn, and Montenegro (2010) put the weighted average size of the informal economy as a percentage of GDP at nearly 38% in sub-Saharan Africa, 36% in Europe and Central Asia, and 13% in the OECD. Particularly in some developing nations, such as Panama and Bolivia, as much as 65% of production occurs underground. Although informality is a widespread phenomenon and brings a profound impact on economy, politics and social development across the world, many issues about its nature and consequences still remain largely under-explored or unresolved.[1] For these reasons, the causes and effects of informal economy activities have been a topic of extensive research.

In the existing informal economy literature, there is a large number of works focusing on public finance (such as the tax burden) and/or public administration aspects (such as intensity of regulations) that may affect the size of informality (e.g., see Dreher, Kotsogiannis, & McCorriston, 2009; Dreher & Schneider, 2010; Blackburn, Bose, & Capasso, 2012; Gillanders & Parviainen, 2018). However, surprisingly, to the best of my knowledge, no empirical studies have explored the influence of tourism on the informal economy. Despite tourism has been shown to have significant impacts on economic growth, income inequality, poverty alleviation, and trade (e.g., see Schubert, Brida, & Risso, 2011; Santana-Gallego, Ledesma-Rodríguez, & Pérez-Rodríguez, 2011; De Vita & Kyaw, 2016; Li, Chen, Li, & Goh, 2016; Njoya & Seetaram, 2018; Mahadevan & Suardi, 2019; Nunkoo, Seetanah, Jaffur, Moraghen, & Sannassee, 2019), its impacts on the size of informal economy are less well understood.

In light of the situation above, the aim of this study is to fill this research gap by analyzing the role of tourism in the size of the informal economy. To that end, I analyze the effect of tourism on the informal economy by employing panel data techniques for 96

E-mail address: zhike2016@xtu.edu.cn.

[1] For instance, the role of informality in economic development remains controversial. Some like De Soto (2000), see informality as pent-up potential. Others like Levy (2010), view that informality is a parasitic organizational form that hinders economic growth. Consistent with Lewis's (1954) dual view of informality, still other argues that the formal and informal economies as largely segregated (La Porta & Shleifer, 2014). A recent study by Duarte (2017) argues that the different perspectives on informality are depending on the method used to estimate the size of the informal economy.

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countries over the time period from 2000 to 2007. My analysis incorporates the benchmark control variables of the associated informal economy literature, and this study makes three distinct contributions to the extant literature. First, and most importantly, I identify a novel relationship between tourism and the informal economy that has not previously been identified and accounted for in the literature. Specifically, my estimation results show that tourism exhibits a U-shaped relation with informality, which implies that the informal economy initially decreases and then increase with tourism development. Moreover, this result is robust to a series of various robustness checks. Second, to better measure tourism development, this paper employs the principal component analysis to build the tourism development comprehensive index, which is the amalgamation of tourism expenditures, tourism receipts and the total number of tourist arrivals. Finally, to circumvent possible misspecification of parameter model and the presence of potential reverse causality between tourism and informality, I employ the semiparametric panel model and dynamic panel model to solve these problems, respectively.

The remainder of the present paper is organized as follows: I begin with a presentation of the relationship between tourism and the informal economy. Then, I describe the data and methodology, and proceed with the presentation of my results. In order to check the robustness of the results, I subsequently conduct a series of robustness checks. Lastly, some policy implications, limitations, and future research directions are also provided.

Tourism and the informal economy

As yet, there are no theoretical analyses that give fully worked-out examples of how the development of tourism might be connected to the size of the underground economy. To better understand the linkage between tourism and informality, here we can use a standard two-sector growth model — namely, informal and formal sectors — where firms and individuals have the capacity to escape from the formal sector to the informal sector (Loayza, 2016). The informal sector comprises workers and businesses which are not registered by the state, and they operate outside the legal and regulatory frameworks. The direct incentive to the underground by individuals and firms is determined by the cost-benefit differential between the two sectors. For instance, the regulatory and tax burdens imposed in the formal sector usually compel economic actors to evade these by utilizing their resources in the informal economy (Schneider, 2011). As a consequence, rational individuals and firms evaluate the benefits of engaging in the informal activities (e.g., avoiding regulation and burdensome taxes) and against the direct costs (e.g., registration fees, or licensing fees) and indirect costs (e.g., forgone use of official sector institutions such as tourism system).

It is a stylized fact that tourism plays an important role in the development and growth of many countries by creating tax revenues, foreign currency earnings, and employment opportunities for the target country (Alam & Paramati, 2016). Although no existing theoretical argument has proposed the coexistence of both a negative and a positive relationship between tourism and informality, I argue this is also quite possible. Intuitively, the scale of tourism is relatively small at the early stage of tourism development. Thus, tourism development is greatly in need of a large number of tourism professionals of work in the tourism sector, which provides many jobs. A negative relationship between tourism and informality will naturally emerge under this situation, as an increase in tourism encourages more people engaged in formal activity. Moreover, at a low level of tourism development, the governments usually formulate and implement a series of preferential policies to stimulate the development of tourism, such as reducing taxes and lowering the threshold for individuals and enterprises to move into the tourism sector, which might also encourage tourism businesses to engage in the formal activity. On the other hand, when the tourism industry develops to a certain extent, the tourism-related sectors are jam-packed and overflowing, which cannot provide more jobs. More importantly, with the development of the tourism industry, the tourism-related sectors, like catering, wholesale and retail, hotel services, and transportation industries, have become more and more furious, and thus profit margins are shrinking. Under these circumstances, some of the self-employed and firms choose to operate underground in order to avoid paying taxes and registration fees, and thus some informal activities are often observed in tourist sites, such as beach girls who try to befriend tourists as guides, and street vendors who cluster around tourist coaches and try to sell their goods. Consequently, a positive link between tourism and the underground economy will arise.

Based on the above arguments, I put the following hypothesis to an empirical test:

Tourism has a non-linear impact on the informal economy. Specifically, the size of the informal economy first decreases in the early stages of tourism development and then increases as tourism continues.

Data and methodology

Data

My sample covers 96 countries over the period 2000–2007, which are selected solely due to data availability. The dependent variable in this study is the informal economy. Since measuring the size of the informal economy is not easy, most cross-country researches have adopted indirect methods, which center on macroeconomic indicators to get information about the informal economy. The most common approach is the multiple indicators multiple causes modeling. This approach treats the informal economy as a latent variable, quantifying its size based on the main causes and indicators of informal activity in the economy.[2] In the present study, I utilize the data from Schneider et al. (2010), who use this approach to estimate the size of the informal economy.

[2] For more detail, see Appendix B in the Supplementary materials.

Table 1
Descriptive statistics.

Variable	Obs	Mean	Std. dev.	Min	Max
Informality	768	30.937	12.866	8.4	67.7
Tourism (logged)	768	21.255	1.912	16.54	25.719
GDP per capita (logged)	768	9.315	1.153	6.625	11.491
Government size	768	6.254	1.455	2.363	9.695
Unemployment	768	7.986	4.997	0.69	29.77
Corruption	744	4.128	1.206	1	6.5
Credit market regulation	768	7.694	1.388	2.262	9.953
Labour market regulation	552	5.254	1.207	2.491	8.371

Many studies also use these data to measure the size of the informal economy in their empirical studies (e.g., see Elbahnasawy, Ellis, & Adom, 2016; Berdiev & Saunoris, 2018). In addition, as a robustness test, I also use other two different measures of the informal economy, one is obtained from Elgin and Oztunali (2012) who construct a measure of the informal economy using a two-sector dynamic general equilibrium model, and the other is collected from Medina and Schneider (2018) who estimate the size of the informal economy using a rich structural equation model.

To measure tourism development, previous studies mainly adopted tourism expenditures (TE), tourism receipts (TR), or the total number of tourist arrivals (TA). In accordance with the studies of Zaman, Shahbaz, Loganathan, and Raza (2016) and Lv (2019), this paper employs the principal component analysis to build the tourism development comprehensive index, which is the weighted index of the three tourism development indicators (namely, TE, TR, and TA). Based on the results of the principal component analysis for tourism development index in Table A1 in Appendix A, I extract the PC1, which can capture 84.38% of the information from the original dataset. Moreover, the PC1 is the only one with an eigenvalue greater than one, so I adopt PC1 factor loading for construction tourism development index.

In addition, I also include some control variables in Eq. (1) according to the extant literature (Berdiev & Saunoris, 2018; Goel & Nelson, 2016; Mauleón & Sardà, 2017). (i) I use the real GDP per capita (logged) to account for the level of prosperity, since wealthier countries tend to have better means of monitoring the informal activities; (ii) I also control for the effect government size on the informal economy, and the relationship between government size and informality may have contradictory effects. On the one hand, larger governments possess greater resources to combat informal activities, but on the other hand, larger governments proxy for an increase in government overreach that could encourage migration to the underground economy; (iii) I additionally account for unemployment, as unemployment usually moves counter to contractions and expansions in economic activity. Thus, when the economy experiences significant contractions and the unemployment rate increases, this unemployed labour may resurface as clandestine employment in the informal economy; (iv) generally, the corruption level in a country is expected to affect the informal economy, but the existing empirical evidence on corruption–informality nexus is still inconclusive. Here I use the International Country Risk Guide index compiled by the Political Risk Service to measure the degree of corruption. For the purpose of simplifying the interpretation, corruption indices have been reversed so that 1 now represents the lowest level of corruption and 7 the highest level; (v) finally, I control for the effect of credit market regulation, and labour market regulation on the informal economy, as more burdensome regulations often induce individuals and firms to engage in underground activities. All these data are extracted from the World Bank, International Country Risk Guide corruption data sets, and Gwartney, Lawson, and Hall (2012), and Table 1 displays the descriptive statistics.

Methodology

To explore the effect of tourism on the informal economy and verify the hypothesis in Section 0, this paper applies a two-way fixed-effect panel regression model.[3] I start by specifying that the informal economy is a quadratic function of *tourism*, and then I further add some controls variables based on previous literature. That is

$$Informality_{it} = \beta_0 + \beta_1 Tourism_{it} + \beta_2 Tourism_{it}^2 + \boldsymbol{\gamma}^T \mathbf{CV}_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

where $Informality_{it}$ is the informal economy for country i in period t. *Tourism* is the key independent variable representing the natural logarithm of the tourism index, and ***CV*** represents control variables (i.e., GDP per capita, government size, unemployment, corruption, credit market regulation, and labour market regulation). μ_i captures unobserved country characteristics, such as unobserved cultural or institutional factors, while λ_t captures time-specific shocks common to all countries, like economic crisis, and ε_{it} denotes the error term. Evidence supports the U-shaped relationship between tourism and the informal economy if $\beta_1 < 0$ and $\beta_2 > 0$. Next, to obtain the level of tourism development where the informal economy begins to rise, I estimate the turning point (or threshold) of the parabolic relationship, which is calculated by

$$\theta^* = -\frac{\beta_1}{2\beta_2} \quad (2)$$

[3] The Hausman test result (p = .000) suggests the use of the fixed-effects model.

where θ^* is the turning point level of tourism development. β_1 and β_2 represent the coefficients of the linear and quadratic term of *tourism*, respectively.

However, to prove the U-shaped relation, Lind and Mehlum (2010) argue that taking the linear and quadratic term of the explanatory variable is a necessary condition, but not a sufficient condition. This criterion that relies on the significance of the quadratic term is too weak, because if the true relationship is convex but monotone, then the quadratic approximation may erroneously yield an extreme point. Furthermore, they argue that the traditional econometric model is no longer appropriate to test the composite null hypothesis that the dependent variable is increasing at the right side of the interval relationship and decreasing at the left side of the interval, or vice-versa. As a result, to further assess the validity of the U-shaped relationship between tourism and the informal economy, I also employ the *U* test introduced by Lind and Mehlum (2010), known as the Sufficient Condition for a Quadratic Relationship. Following their method, I test monotonicity against the alternative hypothesis that the first derivative of informality with respect to tourism is negative at the latter's minimum, $Tourism_{\min}$, and positive at its maximum, $Tourism_{\max}$:

$$H_0: \beta_1 + 2\beta_2 Tourism_{min} \geq 0 \text{ and/or } \beta_1 + 2\beta_2 Tourism_{max} \leq 0$$

v.s.

$$H_1: \beta_1 + 2\beta_2 Tourism_{min} < 0 \text{ and } \beta_1 + 2\beta_2 Tourism_{max} > 0.$$

If H_0 is rejected, this supports the existence of the U-shape, which confirms my hypothesis.

Results

Table 2 firstly gives the main regression results. Without any additional control variables, β_1 is negative and β_2 is positive, and both are highly significant (column 1), implying a U-shaped relationship between tourism and the informal economy. Columns (2)–(7) assess the relationship conditional on other control variables, i.e., GDP per capita, government size, unemployment, corruption, credit market regulation, and labour market regulation. Both the estimated coefficients of tourism and squared tourism preserve the same signs and significance level as in column (1). These results further support that the relationship between tourism and informality is nonlinear. More specifically, it exhibits a U-shaped nexus, which implies that the informal economy reduces initially but then increases with the development of tourism. In addition, based on the results of a U-shaped linkage between the informal economy and tourism, I further calculate the turning point at which the informal economy changes direction (see the last row of Table 2) on the basis of Eq. (2). The estimated tourism turning point at which the informal economy starts to rise is approximately 23, which implies that the informal economy decreases till tourism reaches its scale of 23, and after the threshold point, a high level of tourism increases the informal economy. Or, to put it a different way, tourism development decreases the informal economy at a low level but increases the informal economy when the level of tourism development is high. In terms of control variables, the estimates show that: economic development reduces the informal economy, while government size, unemployment rate, and labour market regulation have a positive influence on the informal economy. However, my results show that both corruption and credit market regulation has no impact on the informal economy.

Next, to explore further I examine the marginal effect of tourism on the informal economy. Following the estimation of my

Table 2
Main results.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tourism	−3.291***	−5.592***	−4.796***	−4.328***	−5.551***	−5.476***	−9.147***
	(1.132)	(1.022)	(1.013)	(1.010)	(1.033)	(1.041)	(1.427)
Tourism Sq.	0.058**	0.127***	0.106***	0.096***	0.126***	0.125***	0.196***
	(0.028)	(0.025)	(0.025)	(0.025)	(0.025)	(0.026)	(0.033)
Log GDP per capita		−6.076***	−6.053***	−5.455***	−5.073***	−5.019***	−1.924***
		(0.458)	(0.450)	(0.471)	(0.454)	(0.463)	(0.563)
Government size			0.279***	0.269***	0.242***	0.240***	0.218***
			(0.053)	(0.053)	(0.052)	(0.052)	(0.055)
Unemployment				0.070***	0.067***	0.067***	0.141***
				(0.018)	(0.017)	(0.017)	(0.020)
Corruption					−0.079	−0.082	0.033
					(0.057)	(0.057)	(0.057)
Credit market regulation						−0.026	−0.029
						(0.045)	(0.048)
Labour market regulation							0.246***
							(0.049)
Constant	75.175***	148.910***	139.555***	128.055***	137.076***	135.938***	150.522***
	(11.684)	(11.791)	(11.698)	(11.957)	(11.913)	(12.074)	(15.346)
# of countries	96	96	96	96	95	95	69
Threshold	28.37	22.02	22.62	22.54	22.02	21.9	23.33

Notes: Standard errors are in parenthesis.
*** $p < .01$.
** $p < .05$.

Table 3
Average marginal effects of tourism on the informal economy at the minimum, mean and maximum levels of tourism.

Level	$\partial Informality_{it}/\partial Tourism_{it}$	Std. err.	p-Value
Minimum (16.54)	−2.675	0.356	0.000
Mean (21.25)	−0.832	0.167	0.000
Threshold (23)	−0.148	0.203	0.467
Maximum (25.72)	0.917	0.340	0.000

Notes: the marginal effect of tourism on the informal economy can be calculated by examining the following partial derivative in Eq. (1): $\partial Informality_{it}/\partial Tourism_{it} = \beta_1 + 2\beta_2 Tourism_{it}$.

Table 4
Lind–Mehlum test for U-shaped relationships.

	(1)
Slope at $tourism_{min}$	−2.675***
	(−7.506)
Slope at $tourism_{Max}$	0.916***
	(2.694)
U-shape overall test	2.690***
p value	0.003

Notes: t-Values are in parenthesis.
*** $p < .01$.

baseline model (i.e., column 7 in Table 2), I calculate the slope for the informal economy on tourism at four different levels of tourism, i.e., minimum, mean, threshold (or the turning point) and maximum level of tourism. Table 3 provides the results, as expected, the effect of tourism on the informal economy is statistically insignificant at the turning point, but has the expected signs and highly significant below (and above) the turning point. To be more precise, tourism decreases the informal economy and the effect is maximum at a low level of tourism, however, it increases the informal economy when tourism is at its maximum. To give an example, at the minimum level of tourism (16.54 in this study), a one standard deviation increase in tourism decreases the informal economy by about 0.398 standard deviations. When tourism is at its highest level of 25.72, a one standard deviation increase in tourism increases the informal economy by about 0.136 standard deviations.

Finally, to further confirm my finding of a U-shaped relationship, I also apply the *U* test developed by Lind and Mehlum (2010), and the results of U test are reported in Table 4. The lower bound slope of tourism appears as negative while the upper bound slope of tourism is positive. Both slopes are highly significant, implying that H_0 is rejected. This further suggests that my findings are in accordance with the presence of a U-shaped link between tourism and the informal economy.

Robustness checks

In this section, I perform a number of additional analyses to check the robustness of my results. These include: different measures of tourism and the informal economy, estimation approach, alternative model specifications, and various sub-samples.

First, I check whether my results are driven by the choice of tourism indicators, so I use TE, TA, and TR as alternative measures of tourism development, respectively. Overall, the results are comparable to earlier findings (see columns 1–3 in Table 5). In addition, there is no direct method to estimate the size of the informal economy at present, all estimation attempts need to follow an indirect method. As a robustness check, I also use the other two different measures. One is obtained from Elgin and Oztunali (2012) who construct a measure of the informal economy using a two-sector dynamic general equilibrium model, and the other is collected from Medina and Schneider (2018) who estimate the informal economy using a rich structural equation model, columns (4) and (5) in Table 5 report the results from re-estimating Eq. (1) using alternative estimate for the informal economy. The results indicate that both the estimated coefficients of tourism and squared tourism preserve the same signs and significance level as in previous results. These results also support the relationship between tourism and informality is nonlinear and exhibits a U-shaped nexus.

Next, although the parametric panel model (1) has the advantage that it directly verifies the existence of a U-shaped relationship between tourism and the informal economy, by simply using two order terms to investigate a possibly nonlinear relationship we place a strict restriction on the possible link between tourism and the informal economy that may not reflect the true potential relationship. Thus, to circumvent possible misspecification of the functional form of tourism in Eq. (1), I further use a more flexible semiparametric method to reexamine the effect of tourism on the informal economy,[4]

$$Informality_{it} = \beta_0 + f(Tourism_{it}) + \boldsymbol{\gamma}^T \mathbf{CV}_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (3)$$

[4] For more detail about the discussion of semiparametric methods, please see Ruppert, Wand, and Carroll (2003).

Table 5
Robustness tests: alternatives measures of tourism development and the informal economy.

	(1) TE	(2) TA	(3) TR	(4)EO	(5)MS
Tourism	−8.526***	−7.929***	−7.602***	−1.949	−20.141***
	(1.313)	(1.551)	(1.338)	(1.206)	(3.013)
Tourism Sq.	0.195***	0.228***	0.158***	0.050*	0.449***
	(0.031)	(0.052)	(0.031)	(0.028)	(0.070)
Control	Yes	Yes	Yes	Yes	Yes
# of countries	69	69	69	67	68

Notes: A constant and all other control variables in Table 2 are included in the estimations but the results are not reported to conserve space. EO means the informal economy from Elgin and Oztunali (2012), MS denotes the informal economy from Medina and Schneider (2018); Standard errors are in parenthesis.
*** $p < .01$.
* $p < .1$.

Table 6
Robustness tests: semiparametric panel model.

	(1)
Log GDP per capita	−6.946***
	(1.283)
Government size	0.084***
	(0.028)
Unemployment	0.086***
	(0.026)
Corruption	−0.040
	(0.034)
Credit market regulation	−0.043
	(0.046)
Labour market regulation	0.040
	(0.031)
# of countries	69

Notes: Standard errors are in parenthesis.
*** $p < .01$.

where the functional form f(·) is unknown. To estimate Eq. (3), I use the approach introduced by Baltagi and Li (2002).[5] Table 6 reports the estimated results of the parametric part of Eq. (3). As can see from Table 6, the signs and significances of the coefficients of the control variables are roughly similar to the results in Table 2. The graph in Fig. 1 reveals a U-shaped relationship, which further confirms my findings.

Additionally, it is likely that there exists the reverse causality between tourism and the underground economy, and the informal economy is persistent, then the previous results based on static panel model would be biased. To resolve these problems, I adopt a dynamic model to examine the link between tourism and informality. Specifically, I treat them as potentially endogenous variables. Both the system-GMM estimators (Blundell & Bond, 1998) and differences-GMM (Arellano & Bond, 1991) are used here. Table 7 presents the results. Both AR(1) and AR(2) tests corroborate the validity of the model specification, and the Hansen test of over-identification restrictions also supports the validity of instruments in the models. The lagged informal economy variable is positive and statistically significant. This reveals that the current informal economy is strongly affected by its recent experience, and the magnitude of its coefficient is very high, suggesting considerable persistence. Again, a U-shaped curve link between tourism and the underground economy does still hold.

Finally, considering a large number of countries with different levels of economic development in this study, tourism–the informal economy nexus may change with the level of GDP per capita. To explore this possibility, I investigate to what degree my main results vary with the level of economic development by re-estimating Eq. (1) for the following three subsamples: (i) high-income countries; (ii) upper-middle-income countries; and (iii) lower-middle-income countries.[6] Columns (1)–(3) in Table 8 give the results. The U-shaped link between tourism and the informal economy does still hold, which suggests that my finding does not change with the level of GDP per capita. In addition, I also split my sample into different regional panels. I have: a panel of 14 Asian countries; a panel of 4 African countries; a panel of 28 Europe countries; and a panel of 22 America countries. Columns (4), (6), (8), and (9) in Table 8 give the results, respectively. As for European and American countries, my finding does still hold. However, my finding does not hold for Asian and African countries. One possible explanation is that in these countries, the level of tourism is relatively low, and thus the

[5] For more detail about this approach, please see Baltagi and Li (2002).
[6] Due to the unavailability of reliable data on various indicators, specifically for the data of labour market regulation, this study does not include the low-income countries.

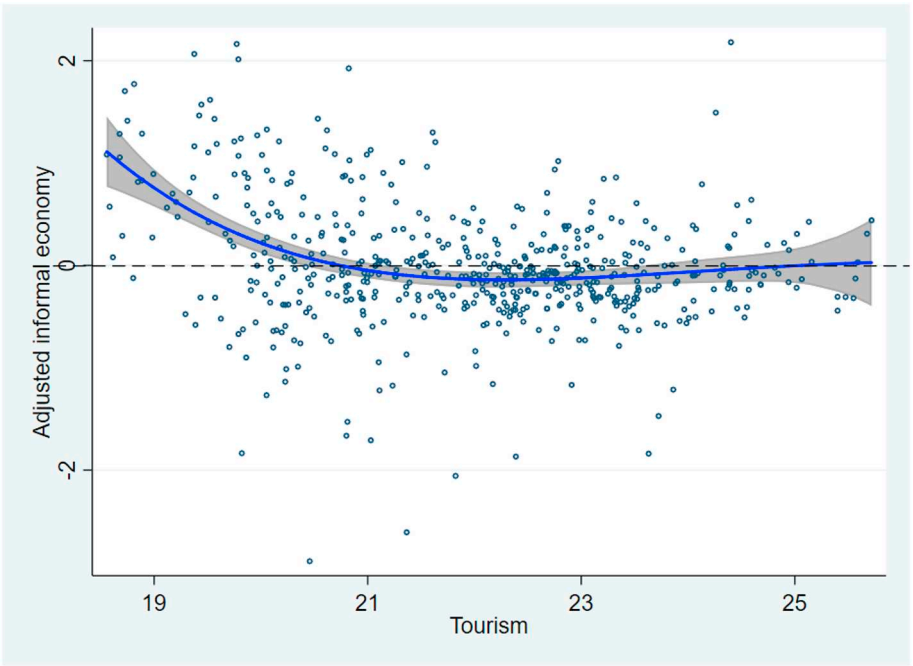

Fig. 1. Partial fits of the relationship between tourism and the informal economy.
Notes: the points in the graph are the estimated partial residuals for the informal economy in the semiparametric model. The blue curve represents the semi-parametric estimation of f(·). Shaded areas correspond to 95% confidence intervals. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

Table 7
Robustness tests: Dynamic panel estimation results.

	(1) Differences GMM	(2) System GMM
Informality (lagged)	0.752***	0.951***
	(0.049)	(0.007)
Tourism	−5.591***	−1.656**
	(1.770)	(0.630)
Tourism Sq.	0.075*	0.037**
	(0.040)	(0.014)
Log GDP per capita	6.229***	−0.247
	(1.307)	(0.203)
Government size	0.525***	0.397***
	(0.060)	(0.038)
Unemployment	0.083***	0.004
	(0.018)	(0.005)
Corruption	0.067	−0.209***
	(0.076)	(0.042)
Credit market regulation	−0.102*	0.020
	(0.054)	(0.042)
Labour market regulation	−0.060*	−0.186***
	(0.031)	(0.022)
Constant		20.691***
		(0.951)
# of countries	69	69
# of instruments	56	64
AR(1) test p-value	0.021	0.011
AR(2) test p-value	0.163	0.164
Hansen J test p-value	0.596	0.359

Notes: Standard errors are in parenthesis.
*** p < .01.
** p < .05.
* p < .1.

Table 8
Robustness tests: various sub-samples.

	High income countries	Upper-middle income countries	Lower-middle income countries	Asian countries		African countries		Europe countries	American countries
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Tourism	−9.089***	−6.860**	−10.388**	−0.630	−0.993***	17.894	−0.900***	7.237***	−13.138***
	(1.995)	(3.247)	(4.182)	(3.533)	(0.339)	(13.237)	(0.356)	(1.376)	(3.189)
Tourism Sq.	0.206***	0.137*	0.213**	−0.008		−0.418		−0.178***	0.272***
	(0.045)	(0.076)	(0.101)	(0.079)		(0.294)		(0.032)	(0.077)
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	296	152	104	112	112	32	32	224	176

Notes: A constant and all other control variables in Table 2 are included in the estimations but the results are not reported to conserve space. Standard errors are in parenthesis.

*** $p < .01$.

** $p < .05$.

* $p < .1$.

informal economy–tourism nexus is essentially monotonic. To confirm my prediction, I drop the quadratic term of tourism from Eq. (1), and the corresponding results are reported in columns (5) and (7). As expected, the coefficients on tourism are negative and statistically significant.

Conclusion and policy implications

Controlling the size of the informal economy is one of the main concerns for policy-makers, especially those in developing countries, which experience high levels of the informal economy. This paper empirically examines how tourism development affects the size of the informal economy during the development process. By using annual panel data from 2000 to 2007 of 96 countries, my estimation results indicate that an increase in tourism decreases the informal economy if the level of tourism development is low, and, in contrast, increases the informal economy if the tourism development level is too high. These results are robust, even if I use a different index of tourism and a different proxy for the informal economy. Furthermore, in dealing with possible misspecification of the parameter model and the presence of potential endogeneity issues, I conduct the semiparametric estimation and the GMM estimation, the results of which support my main findings in general.

Some policy recommendations could obtain from this study. First, since my results suggest that after reaching a threshold point the impact of tourism on the informal economy will significantly increase. Based on this evidence, I advise the policymakers of these countries to take some measures to regulate the tourism-related activities and facilities. Second, for some developing countries, such as Panama and Bolivia, as much as 65% of production occurs underground in 2000, but the level of tourism is only 20.07 and 18.68, respectively, and thus my study suggests that speeding up the development of tourism will be beneficial for decreasing the size of informal economy, and the governments of these countries should take some measure to promote the development of tourism.

Although my study has several strengths, it also has some insufficiencies, and needs further study and exploration. First, I use a cross-national panel approach to examine the association between tourism and the informal economy. Nevertheless, the cross-national study usually cannot describe in detail how tourism may influence the size of the informal economy in specific locations or regions. Hence, case study analysis of this topic at the subnational level is very appealing and valuable. Second, in this study, I mainly utilize the data of Schneider et al. (2010) to measure the informal economy, but this data aims to capture all kinds of unregistered economic activities, including the production of goods that do not have a lot to do with the type of informality present in the tourism industry.[7] Consequently, further studies should try to provide some additional evidence on these respects by using the data of the real informal activities in tourism, such as the number of self-employed workers in the tourism sector.

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[7] I thank an anonymous reviewer for pointing out this issue.

Appendix A

Table A1
Principal component analysis for tourism development index.

Panel A: Eigenvalues of the observed matrix

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.5315	2.1566	0.8438	0.8438
Comp2	0.3749	0.2813	0.1250	0.9688
Comp3	0.0936		0.0312	1.0000

Panel B: Eigenvectors (loadings)

Variable	Comp1	Comp2	Comp3
TE	0.5677	−0.6550	0.4987
TA	0.5536	0.7521	0.3576
TR	0.6092	−0.0731	−0.7896

Appendix B. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.annals.2019.102816.

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Zhike Lv, PhD, is an associate professor in the School of Business at Xiangtan University. His research interests include: Tourism economics, regional economic and human capital. His recent work has been published in journals such as *Tourism Management, Technological Forecasting & Social Change, Current Issues in Tourism, Economics Letters, Journal of Behavioral and Experimental Economics*, and *The Social Science Journal*.