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The Influence of Tourism on Deforestation and Biodiversity

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Sustainable use of space is often influenced by human activities causing adverse effects on biodiversity. Human impact on land and its natural reserves is very obvious in the case of forests. International tourism as an income-generating human activity also affects biodiversity and forests. Therefore, this paper analyses international tourism arrivals as a factor influencing deforestation in a global framework. The Mankiw, Romer and Weil (1992) growth model is applied to estimate the rate of deforestation, using the rate of change of tourism arrivals, economic growth rate, and population growth rate. Descriptive and inferential analysis was used to explain the various cross-national data used in this paper.

Keywords: deforestation, *convergence*, real GDP per capita

Introduction

In considering the benefits of tourism, it can be argued that tourism has the potential to become a strategic engine of long-run economic growth. It should also be added, however, that the uncontrolled growth of tourism may have a devastating impact on landscape quality and/or environmental conditions (Ridderstaat, Croes, & Nijkamp, 2014). The tourism industry uses large amounts of energy and water, creates more waste, emits more particulates and gases due to car and air traffic, and negatively impacts biodiversity via land use, climate change, and in other ways. The addition of billions of people to the medium and high income ranks, with its attendant high consumption patterns and travel preferences, increases the pressure enormously. Tourism in the world today is considered to be a highly relevant economic activity and social force impacting the allocation of scarce (often exhaustible and non-renewable) resources. If those resources are exhausted over time, then one way or another, material well-being and quality of life will suffer. A central premise is that tourism is underpinned by sets of assets, not just the conventional ones, such as hotel and camping infrastructure, but a broader set that includes multiple impacts on three dimensions of life: environmental, social and economic dimension. In this paper, the focus is on studying the relationship on a global scale between tourism and natural environment, i.e. deforestation.

The rate of deforestation is dramatically fuelling climate changes and the destruction of an invaluable resource. Globally, the trend of accelerated environmental degradation in recent times has primarily been driven by land use changes as a consequence of frontier expansion and population growth (Richards, 1990). Land use practices and land use significantly impact natural forests, the environment and the entire biosphere. Much of our growing awareness of sustainability has to do with the environment (Spence, 2011). The earth becomes warmer because of "the anthropogenic (or manmade) greenhouse effect"; the climate campaigner George Monbiot has urged the governments of the rich world "to keep growth rates as close to zero as possible". In the years preceding the recent crisis of 2008/09, economic growth had been particularly high but the financial crisis has interrupted this growth. Linked to that, sustainability adviser Tim Jackson argues that only the complete elimination of growth (despite the colossally damaging effect on employment levels and inherent to such a policy, the argument persists) can save us from planetary disaster, adding hopefully that it will also make us happier (Op.cit., Skidelsky, R.). However, without growth, there will not be tourism as such or traveling to abroad: in short not much happiness at all.

Among various socio-economic factors that contribute to alter or deplete the forest cover and affect forest structure and species composition (Schwartz & Caro, 2003), tourism growth, is undoubtedly, among them. In this paper, we have assumed that tourism, as a global economic activity, impacts deforestation rates.

Those rates vary massively; one reason is the inaccessibility of many of the forests and the way people classify deforestation. It is claimed that only about 5% of the earth's surface is currently covered in tropical rainforests, compared to nearly 15% fifty years ago. Many people believe that tropical rainforests could disappear this century. With people becoming ever more environmentally conscious and looking for increasing adventures, ecotourism to rainforests is increasing. This not only helps protect rainforests but also creates income for locals. Ecotourism is an important source of income to countries like Costa Rica and Belize, for example, but does not prevail on a broader scale worldwide and has remained very rare.

Nordhaus's respected study (1992) anticipates an increase in average temperatures in the 1990–2050 period of 3 degrees Celsius due to an accelerated increase in greenhouse gasses. The burning of fossil fuels is the main factor behind human-caused climate change, but about 20% of the problem comes from deforestation. Every year, nearly 200,000 square kilometres of forest is cut down, mostly in tropics (Climate Central).

Deforestation as a negative externality is functionally linked to economic and population growth, and part of it is fuelled by the global tourism activity. In the growth literature, economic convergence has widely been studied in economic research since the mid-1980s. In this paper, we will develop the concept of convergence and apply it in the envirometrics perspective. Barro and Sala-i-Martin (1992) find that per capita income and gross domestic product have converged across states from 1880 to 1988. This includes the convergence of per capita income levels and economic growth rates across economies. The decline of per capita income dispersion is referred to as σ (sigma) convergence; and the convergence of economic growth rates as β (beta) convergence (Sala-i-Martin, 1990; Barro & Sala-i-Martin, 1991). A potential shortcoming in these studies is that only one measure of well-being is considered, i.e. a measure of wealth linked to incomes or production. It concerns the GDP per worker or capita; the former measures productivity and the latter standard of living. Inherent in many theoretical models (e.g. Wilson 1987) is the possibility that regions may converge in incomes when specialization occurs, e.g. poorer countries specialize in the production of pollution-intensive goods and experience large increases in per capita income, whereas richer regions specialize in the production of clean goods, but also in production of services such as pollution-free industry and subsequently have a lower growth rate in per capita income. The example of China is striking in relation to this; see also J. M. Diamond's chapter 12 on the pollution of rivers and the environment in China (2005) as a result of a 10% annual growth rate over the last three decades. In this scenario, it is quite possible that countries are converging in monetary wealth but diverging in "green incomes", or income levels adjusted for environmental quality (List, 1999). The fundamental issue related to our paper is how to hinder problems in order to maintain the economic and environmental factors in a symbiotic balance; there are various direction of thoughts regarding this: there is the freedom to adopt varying "shades of green" in approaching sustainable tourism. From the light green approach that holds tourism development and tourist and operator satisfaction as the central aim to the darker green in which the precautionary principle and concept of carrying capacities feature highly (Hunter, 1997).

The study of these issues has an important environmental policy implication. It aids in understanding the current trend of global deforestation, its convergence and how it is impacted by tourism and other socio-economic forces, and thus provides useful information for global environmental policy makers for further development *strategy.*

The paper is organized as follows. Section 2 describes the data and their source. Section 3 presents an econometric specification of the model of deforestation rate convergence and introduces the *Ordinary Least Squares* Estimation methodology for its estimation. The results are also presented. Finally, further steps are discussed in conclusions.

About the Data

This paper studies the convergence of per capita forest, and tourism arrivals impact on it across 185 various countries in the world in 1995–2011 (see Table 5 in Appendix): ABW - Aruba, AGO - Angola, ALB - Albania, ARE - United Arab Emirates, ARG - Argentina, ARM - Armenia, ATG - Antigua and Barbuda, AUS - Australia, AUT - Austria, AZE - Azerbaijan, BDI - Burundi, BEN - Benin, BFA - Burkina Faso, BGD - Bangladesh, BGR - Bulgaria, BHR - Bahrain, BHS - Bahamas, BIH - Bosnia and Herzegovina, BLR - Belarus, BLZ - Belize, BMU - Bermuda, BOL - Bolivia, BRA - Brazil, BRB - Barbados, BRN - Brunei Darussalam, BTN - Bhutan, BWA - Botswana, CAF - Central African Republic, CAN - Canada, CHE - Switzerland, CHL - Chile, CHN - China, CIV - Côte d Ivoire, CMR - Cameroon, COG - Congo, COL - Colombia, COM - Comoros, CPV - Cape Verde, CRI - Costa Rica, CUB - Cuba, CYP - Cyprus, CZE - Czech Republic, DEU - Germany, DJI Djibouti, DMA - Dominica, DNK - Denmark, DOM - Dominican Republic, DZA - Algeria, ECU - Ecuador, EGY - Egypt, ERI - Eritrea, ESP Spain, EST - Estonia, ETH - Ethiopia, FIN - Finland, FJI - Fiji, FRA - France, FRO - Faroe Islands, FSM - Micronesia, Federated States, GAB - Gabon, GBR United Kingdom, GEO - Georgia, GHA - Ghana, GIN - Guinea, GMB - Gambia, GNB - Guinea-Bissau, GNQ - Equatorial Guinea, GRC Greece, GRD - Grenada, GTM - Guatemala, GUY - Guyana, HND Honduras, HRV - Croatia, HTI - Haiti, HUN - Hungary, IDN - Indonesia, IND - India, IRL - Ireland, IRN - Iran, Islamic Republic, ISL - Iceland, ISR Israel, ITA - Italy, JAM - Jamaica, JOR - Jordan, JPN - Japan, KAZ - Kazakhstan, KEN - Kenya, KGZ Kyrgyzstan, KHM - Cambodia, KIR Kiribati, KNA - Saint Kitts and Nevis, KOR - Republic of Korea, KWT - Kuwait, LAO - Lao People s Democratic Republic, LBN - Lebanon, LBR Liberia, LBY Libyan Arab Jamahiriya, LCA - Saint Lucia, LKA - Sri Lanka, LSO - Lesotho, LTU - Lithuania, LVA - Latvia, MAC - Macao, MAR - Morocco, MDA - Moldova, MDG - Madagascar, MDV - Maldives, MEX - Mexico, MHL - Marshall Islands, MKD - the former Yugoslav Republic of Macedonia, MLI - Mali, MLT - Malta, MNG - Mongolia, MOZ - Mozambique, MRT - Mauritania, MUS - Mauritius, MWI - Malawi, MYS - Malaysia, NAM - Namibia, NCL - New Caledonia, NER - Niger, NGA Nigeria, NIC - Nicaragua, NLD - Netherlands, NOR - Norway, NPL Nepal, NZL - New Zealand, OMN - Oman, PAK - Pakistan, PAN - Panama, PER - Peru, PHL - Philippines, PLW - Palau, PNG - Papua New Guinea, POL Poland, PRI - Puerto Rico, PRT - Portugal, PRY - Paraguay, PYF - French Polynesia, ROU - Romania, RUS - Russian Federation, RWA - Rwanda, SAU - Saudi Arabia, SDN - Sudan, SEN Senegal, SGP - Singapore, SLB - Solomon Islands, SLE - Sierra Leone, SLV - El Salvador, SMR - San Marino, SOM - Somalia, SPM - Saint Pierre and Miquelon, SRB - Serbia, TP Sao Tome and Principe, SUR - Suriname, SVK - Slovakia, SVN - Slovenia, SWE - Sweden, SWZ - Swaziland, SYC - Seychelles, TCD - Chad, TGO - Togo, THA - Thailand, TJK - Tajikistan, TKM - Turkmenistan, TON - Tonga, TTO - Trinidad and Tobago, TUN - Tunisia, TUR - Turkey, TUV Tuvalu, TZA - Tanzania, United Republic of, UGA - Uganda, UKR - Ukraine, URY - Uruguay, USA - United States, UZB - Uzbekistan, VCT - Saint Vincent and the Grenadines, VEN - Venezuela, VUT Vanuatu, PSE West Bank Gaza, WSM - Samoa, YEM - Yemen, ZAF - South Africa, COD - the Democratic Republic of Congo, ZMB - Zambia .

Data Source

The source of all data that used in this paper is from the Database of World Development Indicators (http://data.worldbank.org/data-catalog/world-development-indicators). In short, FOREST area (in sq. km) is land under natural or planted stands of trees of at least 5 metres in height *in situ*, whether productive or not, and excludes tree stands in agricultural production systems and trees in urban parks and gardens. GDP per capita is gross domestic product divided by midyear population. Total population (POP) is based on the *de facto* definition of population, which counts all residents regardless of legal status or citizenship (except for refugees), and the number of arrivals (ARRIV) refers to international inbound tourists of each country as a section unit.

Descriptive Statistics

From the descriptive statistics of Table 1, it is clear that the lowest growth of forest as land area per capita in 1995–2011 was realized in Comoros (about -0.104%) and the largest by the Iceland (4.1%), the disparity being 2.5 times greater in favour of Iceland. If deforestation per capita is defined as a negative forest growth rate from 1995 to 2011, Deforestation is defined as a negative change in forest area, the occurrence of which was found in many countries throughout the world: from 185 countries included as the observation, 122 countries have negative or zero growth rate of forest per capita in the time interval of our observation (see histogram as Figure 1).

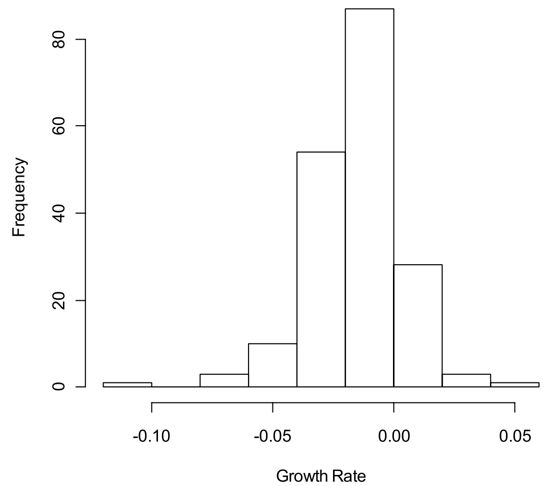

Figure 1 Histogram of Growth Dynamics of Forest per Capita
Source: Calculated by authors

In 1995, the forest per capita gap between the most endowed nation, i.e., Suriname and the least endowed nation in forest, Macedonia, FYR, was so extreme that the ratio of the level of forest per capita between these two countries equalled approximately 141250:1. Because our sample is created from almost the country units from around the world, high heterogeneity in forest density in each country is not surprising. Regarding population, it is interesting to note that Lithuania, as a country once part the former Soviet bloc now a member of the EU, shows the heaviest rate of depopulation; in contrast, the United Arab Emirates has the highest population growth rate, because of inflows of new labour from abroad. France is the most developed nation with regards to tourism, i.e. it has the most tourism arrivals; Tuvalu is the most under-developed country, in the sense of tourism. From the Table 1 of the descriptive statistics, it is clear that the lowest income per capita growth in 1995–2011 was realized by Gambia and the largest growth dynamic occurred in the post-Soviet state of Azerbaijan.

Table 1 Summary Descriptive Statistics

Variable	Mean	Min	Max
gFOREST_PC	-0.015	-0.104 (COM)	0.041 (ISL)
Fo_PC	0.0168	0.0000024 (MKD)	0.339 (SUR)
ARRIV	6793501	1218 (TUV)	74124000 (FRA)
gGDP_PC	0.064	-0.022(GMB)	0.198 (AZE)
gPOP	0.284	-0.170 (LTU)	2.8 (ARE)

Source: Calculated by authors

Modelling Deforestation per Capita Convergence: Hypothesis, Results and Evidence

In order to verify FOREST per capita convergence, we first start testing for β-convergence. This analyses whether countries with a lower (normalized) initial level of FOREST per capita have augmented their forest protection in relation to the deforestation at a higher rate, with a simultaneous augmentation of the speed of forest growth per capita than those countries with a higher initial level of forest under the land area per capita. In a very broad sense, in the long run, deforestation is function of pervasive or continuing economic growth, but in the shorter run (i.e. in terms of one generation, or less as in our case), there can be convergence. The latter hypothesis should be additionally clarified. It is known that deforestation historically resulted in excellent agricultural land which eventually supported the Industrial Revolution and remains productive in EU countries to this day. It is perhaps noteworthy that most of EU countries were heavily forested 1000 years ago; nowadays, those countries hinder the process of deforestation by various measures of forest policy protection; the increasing returns in agriculture can be achieved by applying the modern agro-technical measures that leave the remaining stocks of forests intact. The green revolution in agriculture, which greatly increased grain yields per hectare, staved off the threat of mass starvation, predicted in the 1972 bestseller *Limits to Growth*, despite the close-to-projected growth of world population by the end of the 20^{th} century.

The empirical test of absolute convergence involves estimating the following equation that relates the growth rate of the level of the i-th country's FOREST per capita to the log of its initial level, that is:

$$gFOREST\_PC,i=\alpha+\beta\log(FOREST\_PCi,o)+u,i$$

where gFOREST_PC, i is the average geometrical growth rate in the level of FOREST_PC in country i over the entire sample period, FOREST_PCi, o is the initial level of forest area in thousands squares km (per capita ratio) in country i, u, i is the random error component, and α and β are estimated parameters. β-convergence holds for $\beta < 0$.

The formula for calculating the average geometrical growth rate in the above regression is

$$g = (FOREST\_PC_{11} / FOREST\_PC_{95})^{(1/16)} - 1$$

We will also test the hypothesis of relative convergence in forest per capita (regression equation 2), which states that the countries with lower forest per capita over time accelerate the growth of forest per capita, while the countries with higher initial forest per capita decelerate the forest growth in the own country over time, due to additional variation of tourism arrivals, economic growth and unequal population growth among them.

$$gFOREST\_PC,i=\alpha+\beta\log(FOREST\_PCi,o)+\gamma\log(ARRAV) + \delta\log(gGDP\_PC) + \eta\log(gPOP)+ u,i$$

The second regression equation does not need to be particularly explained. Specifically, the expected decline of per capita forest growth rates gap is referred to as relative β (beta) convergence (Sala-i-Martin, 1990; Barro & Sala-i-Martin, 1991); that decline should be obtained by the help of additional variables. It is expected that the tourism arrivals and GDP growth rate should positively impact narrowing the gap in the forest per capita endowment among the nations. Furthermore, population growth as a variable is conditioned to widening the differences.

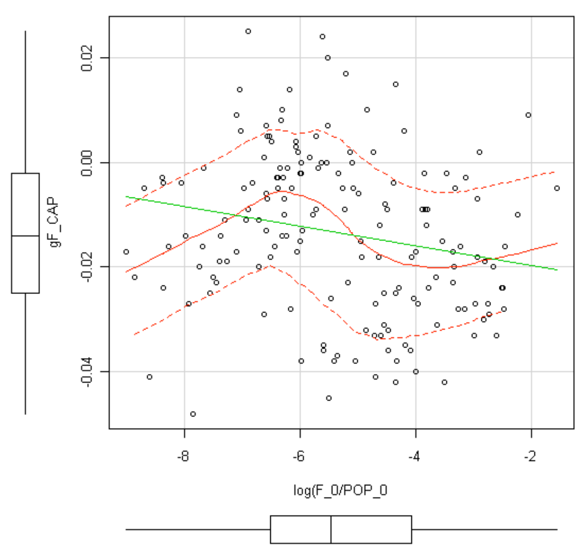

Figure 2 Convergence in Terms of Forest Area per Capita – Across Encompassed Countries, 1995–2011
Source: Calculated by authors
Note: Scatter plot based on influence measures criterion

Table 5 (in Appendix) reports the data of the selected countries in the initial year 1995 and the final year 2011. The choice of the initial year depends on those facts: previous periods, or years in falling in between are characterized by missing data.

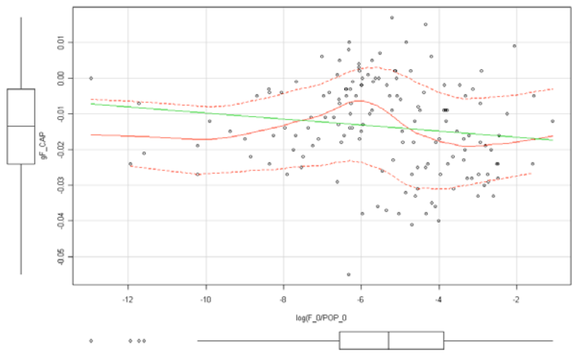

Figure 3 Convergence in Terms of Forest Area per Capita – Across Encompassed Countries, 1995–2011
Source: Calculated by authors
Note: Scatter plot based on so-called good observations

Table 2 Regression of gFOREST_PC on Log (FOREST_PCi,0), Absolute Convergence

Explanatory variable	OLS (a)	OLS based on delation diagnostics (b)	Resistant Regression (c)
A	-0.024 [-4.714]	-0.023*** [5.941]	-0.019*** [-5.588]
B	-0.0006 [-0.935]	-0.002** [-2.652]	-0.001 * [-1.927]
N. obs	185	164	182
Adjusted R-squared	-0.001	0.03	0.016
F-stat.	0.874 [0.351]	7.032 [0.008]	2.965 [0.086]
BP-test	2.266 [0.132]	0.046 [0.826]	0.477 [0.489]
RESET	0.525 [0.592]	9.077 [0.000]	0.883 [0.415]
λ = speed of convergence	1.187 (118% per year)	-1.332 (133% per year)	-1.182 (118% per year)
HL= *half life* of convergence	0.584	0.523	0.585

Source: Calculated by authors

Notes: *, ** and *** indicate that the coefficients are significant at the ten, five and one per cent levels respectively; in parentheses [] below coefficient indicates t-value, otherwise p-value

- Regression (a) is based on 1995–2011 average growth rates of forest land area per capita and for 187 countries. The t-values are given in parentheses.
- Regression (b) shows the results using all the available data during the 1995–2011 period but excluding the countries found to be outliers based the influence measures criterion. Excluded countries from data set, here, are: ABW, ARE, BHR, COM, DJI, GAB, ISL, KWT, MDW, MLT, MRT, NER, NGA, OMN, PYF, SGT, SUR, TGO, UGA, PSE.
- Resistant regression (c) shows the results using all the available data during the 1995–2011 period; deletion of countries as outliers based on a "bad observation" criterion. Excluded countries, are: ARE, COM, MLT.
- The speed of convergence is obtained according to equation: $(1-e^{(-\lambda t)})/T = -\beta$
- The formula for *half life* (HL) of convergence in years is HL = ln (2) / λ, where ln(2) is the *natural logarithm* of 2 (approximately 0.693).

Figures 1 & 2 plot the average annual growth rate of FOREST per capita against the log of the level of FOREST per capita at the start period (1995) for 166 and 184 various included countries, respectively; the number of observations refer to unique data set according to criterion in identifying outliners. The scatter plots show a negative correlation between the growth rate and the initial position. Table 2 displays the results of the regression test. The latter are consistent with the convergence hypothesis as β is less than zero and significant (t-value greater than value of 2). This implies that countries converged in terms of forest in squares kilometres of land per capita. For the 1990–2005 period, a convergence speed of forest per capita among the various countries is about 118–133 per cent per year and the half-life of convergence is 0.5–0.58 years.

The dangers of using OLS were expressed by Swartz and Welsch (1986, p. 171) in econometrics literature. Outliers can cause the estimate of the regression slope line to change drastically. In the least squares approach, we measure the response values in relation to the mean. However, the mean is highly sensitive to outliers; one outlier can change its value so it has a breakdown point of zero per cent. To address the concern of outliers influencing the results of simple OLS regression (column a in Table 2), we exclude the countries found to be outliers as well as the ones found to be outliers because of individual data points, with leverage higher than three times the mean leverage above or below the sample mean (Kleiber, Zeileis, 2008, p. 99); regression results with excluded countries based on influence measures are located in column b. Otherwise, we performer the least trimmed squares regression as "resistant" regression (in column c) that can withstand alternations of a small percentage of outlying observations (Ibidem, p. 111). By far the best response to outlier problem is to use a robust estimator, such as least trimmed squares. Qualitatively, the results do not change. Importantly, changes in statistically significant coefficients are major in some cases, and some coefficients become significant.

For cross-section regressions, the assumption of constant variance is typically in doubt. The most of the cross-section regressions are plagued by heteroskedasticity problem, and our example is not an exception. The studentized Breusch-Pagan test (Breusch and Pagan, 1979) detect heteroskedasticity in the data with respect to the regressors if its p-value < 0.05 (regressions a and b in Table 3). Therefore, we corrected the standard errors of the OLS regression by the White procedure; White (1980) proposed the heteroskedasticity-robust variance matrix estimator to adjust the standard errors of a regression in the presence of heteroskedasticity.

It should be added that the RESET test (Ramsey, 1969) as a general misspecification test, implies the rejection of the null hypothesis in the case of both models, based on the influence of the measuring criterion when we remove outliers from total observations as well as OLS regression, which tests the relative convergence hypothesis. Therefore, we find that those models with just a few independent and significant variables are incorrectly specified, but how the models are mis-specified is beyond the concern of this study.

Table 3 Regression of gFORESTPC on Log (FORESTPCi,0), Conditional Convergence

Explanatory variable	OLS (a)	OLS based on delation diagnostics (b)	Resistant Regression (c)
α	-0.028*** [-4.141] /-2.3256/	-0.009. [-1.988] / -1.946 /	-0.003 [-0.616]
β	-0.001* [-2.177] /-2.0105/	-0.001* [-2.503] /-2.435/	-0.001 [-1.247]
ARIVV	0.001*** [3.185] /2.045*/	0.001. [1.687] /1.835/	0.0003 [0.870]
gGDPpc	-0.001*** [-3.562] /-2.235*/	0.015 [0.835] /0.685/	0.014 [0.653]
gPOP	-0.042*** [-12.706] /-3.048/	-0.061*** [-20.902] /-13.284/	-0.068*** [-18.409]
N. obs	185	163	177
Adjusted R-squared	0.52	0.76	0.70
F-stat.	65.75 [0.000]	180.7 [0.000]	136.6 [0.000]
BP-test	22.287 [0.000]	16.369 [0.001]	3.350 [0.340]
RESET	20.672 [0.000]	10.324 [0.000]	0.841 [0.437]
λ = speed of convergence	1.187 (119% per year)	-1.165 (116% per year)	-1.179 (118% per year)
HL= *half life* of convergence	0.584	0.594	0.587

Source: Calculated by authors

Notes: the t-values between slashes (//) are based on heteroskedasticity-consistent estimates of the variance-covariance matrix

- Regression (b) shows the results using all the available data during the 1995–2011 period but excluding the countries found to be outliers based the influence measures criterion. Here, the excluded countries from data set, are: ARE, BHR, CYP, KNA, KWT, MKD, MLT, NGA, PYF, SGT, TGO, TUV, URY.
- Resistant regression (c) shows the results using all the available data during the 1995–2011 period; deletion of countries as outliers based on 'bad observation' criterion. Excluded countries are: ARG, ARM, BHR, COM, EGY, KWT, MDA, RWA.

A similar result was confirmed in the case of estimates of beta coefficients in the model of relative convergence; the positive impact of tourism on the convergence rates is observed in the case of the second regression with deleted outliners but unfortunately only at the 10% level of significance of the coefficient, and that only when taken into consideration HC estimate of standard deviation, as a remedy to problem of heteroskedasticity. In line with theoretical expectations, the growth in population dynamics discourages the reduction of the gap in the forest area per capita between countries; this is confirmed in all three regressions.

Conclusion

This paper uses cross-sectional tests for deforestation convergence, using data on deforestation per capita from 185 very heterogenic countries belonging to the developed, developing as well as emerging market countries over the 1995–2011 period. Our findings suggest that the extension of the augmented Solow model of Mankiw et al. (1992) applied to deforestation, if it includes tourism arrivals, performs remarkably well in explaining cross-country differences in deforestation rate per capita for the aforementioned time period. Including tourism arrivals, GDP per capita and population growth improves the explanatory power of the model, in contrast to model of absolute convergence, which comes without conditioned variables and only with an initial explanatory variable. For the OLS regression based on deletion diagnostics, which considers the highest levels of robustness, the coefficients on the tourist arrivals remain significant at the 10 per cent level for the forest growth. The positive link between tourist arrivals and subsequent forest growth does not appear to be driven by outliers or due to deletion. The growth of the global population has a strong negative impact on the renewal and growth of forest reserves, while the impact of economic growth per capita seems to be insignificant in regressions without outliners

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Appendix

Table 5 The Distribution of the Deforestation Rate, Forest per Capita, Tourism Arrivals, Population and the GDP per Capita in 1995 and 2011

Country	gFOREST	FOREST_0	FOREST_11	ARRAVER	gPOP	gFOREST_CAP	gGDPpc
ABW	0.003	4	4.2	717470.6	0.27	-0.012	0.027
AND	0	160	160	2530846.2	0.22	-0.012	NA
AFG	0	13500	13500	NA	0.66	-0.031	NA
AGO	-0.002	603520	584494.4	163176.5	0.67	-0.033	0.17
ALB	0	7790	7790	885000	-0.06	0.004	0.118
ARB	-0.014	926413.8	739325.4	56177779	0.42	-0.035	0.08
ARE	0.009	2775	3202.7	4220454.6	2.8	-0.072	0.021
ARG	-0.008	333270	293077.8	3586705.9	0.17	-0.018	0.027
ARM	-0.014	3255	2597.7	276882.4	-0.08	-0.009	0.134
ASM	-0.002	182.2	176.5	29807.1	0.05	-0.005	NA
ATG	-0.002	101.5	98.3	235941.2	0.29	-0.018	0.036
AUS	-0.003	1547100	1474486.9	5001705.9	0.24	-0.016	0.072
AUT	0.001	38070	38683.7	19309059	0.06	-0.002	0.032
AZE	0	9360	9360	933000	0.19	-0.011	0.198
BDI	-0.022	2435	1705.8	98062.5	0.54	-0.048	0.027
BEL	NA	NA	NA	6614705.9	0.09	NA	0.032
BEN	-0.011	54110	45333.4	152588.2	0.63	-0.041	0.046

Country	gFOREST	FOREST_0	FOREST_11	ARRAVER	gPOP	gFOREST_CAP	gGDPpc
BFA	-0.01	65475	55749.2	194705.9	0.59	-0.038	0.065
BGD	-0.002	14810	14343.1	232000	0.28	-0.017	0.054
BGR	0.011	33510	39920.2	4206000	-0.13	0.02	0.101
BHR	0.037	3	5.4	5546294.1	1.29	-0.015	0.049
BHS	0	5150	5150	1521352.9	0.31	-0.017	0.036
BIH	0	21975	21975	226933.3	0.09	-0.005	0.147
BLR	0.005	80265	86932.7	123764.7	-0.07	0.01	0.1
BLZ	-0.007	15375	13740.5	206764.7	0.53	-0.033	0.029
BMU	0	10	10	302823.5	0.08	-0.005	0.06
BOL	-0.005	614430	567076.6	482352.9	0.35	-0.024	0.062
BRA	-0.005	5603910	5172023	4475117.7	0.22	-0.017	0.063
BRB	0	83.6	83.6	523176.5	0.07	-0.004	0.038
BRN	-0.004	4050	3798.4	177625	0.38	-0.024	0.06
BTN	0.003	30880	32396.1	16058.8	0.43	-0.019	0.094
BWA	-0.01	131265	111766.6	1294875	0.25	-0.024	0.061
CAF	-0.001	230530	226869.1	18687.5	0.35	-0.02	0.024
CAN	0	3101340	3101340	18017235	0.17	-0.01	0.06
CHE	0.004	11725	12498.3	7583250	0.12	-0.003	0.038
CHI	0	8	8	NA	0.11	-0.007	NA
CHL	0.003	155485	163118.6	2029176.5	0.2	-0.008	0.07
CHN	0.014	1670705.5	2086926.6	39013529	0.12	0.007	0.147
CIV	0.001	102750	104406.4	228000	0.36	-0.018	0.03
CMR	-0.01	232160	197674.4	515000	0.52	-0.036	0.042
COG	-0.001	226413	222817.4	48235.3	0.55	-0.028	0.097
COL	-0.002	620140	600590.4	1200294.1	0.29	-0.018	0.067
COM	-0.081	100	25.9	21176.5	0.5	-0.104	0.036
CPV	0.012	699	846	173764.7	0.23	-0.001	0.074
CRI	0.004	24700	26329.1	1415529.4	0.36	-0.015	0.061
CSS	0	327795	327795	5205352.9	0.12	-0.007	0.065
CUB	0.016	22465	28960.5	1840470.6	0.03	0.014	0.05
CYM	0.001	124	126	315176.5	0.79	-0.035	NA
CYP	0.003	1663.6	1745.3	2332058.8	0.31	-0.014	0.046

Country	gFOREST	FOREST_0	FOREST_11	ARRAVER	gPOP	gFOREST_CAP	gGDPpc
CZE	0.001	26330	26754.5	9156444.4	0.02	0	0.085
DEU	0.001	109085	110843.5	20394588	0	0.001	0.023
DJI	0	56	56	27142.9	0.28	-0.015	0.043
DMA	-0.006	487	442.3	72882.4	0	-0.006	0.05
DNK	0.01	4655	5458.4	5349529.4	0.06	0.006	0.035
DOM	0	19720	19720	3194882.4	0.27	-0.015	0.063
DZA	-0.006	16230	14740.1	1253823.5	0.29	-0.022	0.085
ECU	-0.018	128290	95934.9	754235.3	0.35	-0.036	0.054
EGY	0.02	515	707	7113882.4	0.3	0.004	0.072
EMU	0.005	916152.6	992258.5	261382468	0.07	0.001	0.033
ERI	-0.003	15985	15234.7	142352.9	0.74	-0.037	0.061
ESP	0.011	154031	183496	49259824	0.19	0	0.046
EST	0.001	21665	22014.3	1514470.6	-0.07	0.006	0.114
ETH	-0.011	144095	120722.9	241058.8	0.57	-0.038	0.063
FIN	0	221740	221740	3132571.4	0.05	-0.003	0.041
FJI	0.003	9666.7	10141.3	461235.3	0.12	-0.004	0.034
FRA	0.004	149450	159307.2	74124000	0.1	-0.002	0.03
FSM	0	637.2	637.2	18538.5	-0.04	0.002	0.024
GAB	0	220000	220000	188818.2	0.48	-0.024	0.061
GBR	0.004	27020	28802.1	25611294	0.09	-0.001	0.041
GEO	-0.001	27736	27295.5	771941.2	-0.05	0.002	0.114
GHA	-0.021	67710	48214.3	501125	0.48	-0.045	0.093
GIN	-0.005	70840	65380.4	33583.3	0.42	-0.027	-0.002
GMB	0.004	4515	4812.8	97176.5	0.63	-0.026	-0.022
GNB	-0.005	21680	20009.1	13750	0.43	-0.027	0.063
GNQ	-0.007	18015	16099.9	NA	0.62	-0.037	0.302
GRC	0.008	34500	39191.1	13552059	0.05	0.005	0.048
GRD	0	169.9	169.9	120470.6	0.05	-0.003	0.064
GRL	0.006	2	2.2	NA	0.02	0.005	NA
GTM	-0.014	44780	35736.7	1138941.2	0.47	-0.038	0.051
GUM	0	258.8	258.8	1188647.1	0.11	-0.006	NA
GUY	0	152050	152050	111176.5	0.09	-0.005	0.087

Country	gFOREST	FOREST_0	FOREST_11	ARRAVER	gPOP	gFOREST_CAP	gGDPpc
HND	-0.022	72640	50885.9	587000	0.39	-0.042	0.077
HRV	0.002	18675	19281.6	6600470.6	-0.08	0.007	0.072
HTI	-0.007	1125	1005.4	190764.7	0.28	-0.022	0.05
HUN	0.006	18540	20402.2	9715000	-0.03	0.008	0.074
IDN	-0.009	1089770	943003.5	5382647.1	0.26	-0.023	0.078
IMN	0	34.6	34.6	NA	0.17	-0.01	NA
IND	0.004	646645	689295.3	3609647.1	0.28	-0.011	0.091
IRL	0.019	5500	7432.8	6764588.2	0.27	0.004	0.062
IRN	0	110750	110750	1704352.9	0.25	-0.014	0.101
IRQ	0.001	8110	8240.7	405100	0.56	-0.026	NA
ISL	0.053	135.5	309.6	352117.6	0.19	0.041	0.033
ISR	0.005	1425	1543.4	1996117.7	0.4	-0.016	0.042
ITA	0.009	79795	92094.6	39076294	0.07	0.005	0.039
JAM	-0.001	3427.5	3373.1	1466823.5	0.09	-0.006	0.053
JOR	0	975	975	2532058.8	0.47	-0.024	0.069
JPN	0	249130	249130	5790705.9	0.02	-0.001	0.005
KAZ	-0.002	33935	32865.2	2991916.7	0.05	-0.005	0.146
KEN	-0.003	36450	34739.2	1106437.5	0.53	-0.029	0.058
KGZ	0.009	8474	9780.2	613058.8	0.21	-0.003	0.073
KHM	-0.013	122450	99319.2	1163647.1	0.36	-0.032	0.065
KIR	0	121.5	121.5	4564.7	0.3	-0.016	0.053
KNA	0	110	110	98470.6	0.24	-0.013	0.06
KOR	-0.001	63290	62284.9	5798235.3	0.1	-0.007	0.043
KWT	0.027	42	64.3	143176.5	0.97	-0.016	0.071
LAO	-0.005	169230	156187.6	625470.6	0.34	-0.023	0.081
LBN	0.003	1310	1374.3	1046176.5	0.44	-0.02	0.055
LBR	-0.007	47790	42709.6	NA	0.96	-0.048	0.116
LBY	0	2170	2170	47600	0.29	-0.016	0.003
LCA	0.002	452.5	467.2	275235.3	0.22	-0.01	0.041
LIE	0.002	67	69.2	54823.5	0.18	-0.008	NA
LKA	-0.011	22160	18565.7	475529.4	0.15	-0.02	0.09
LSO	0.005	410	444.1	250545.5	0.16	-0.004	0.059

Country	gFOREST	FOREST_0	FOREST_11	ARRAVER	gPOP	gFOREST_CAP	gGDPpc
LTU	0.006	19825	21816.3	1429705.9	-0.17	0.017	0.124
LVA	0.003	32070	33644.5	1002000	-0.17	0.015	0.125
MAR	0.001	50330	51141.3	5487470.6	0.19	-0.01	0.059
MDA	0.012	3215	3891.1	17176.5	-0.03	0.014	0.093
MDG	-0.004	134070	125742.2	186470.6	0.61	-0.033	0.042
MDV	0	9	9	539705.9	0.36	-0.019	0.091
MEX	-0.004	685210	642647.9	20921588	0.25	-0.018	0.065
MHL	0	126.4	126.4	6094.1	0.03	-0.002	0.02
MKD	0.004	9350	9966.7	190764.7	0.07	0	0.05
MLI	-0.006	136765	124210.2	118411.8	0.6	-0.035	0.064
MLT	0	3	3	1191529.4	0.12	-0.007	0.052
MMR	-0.01	370430	315405.5	225705.9	0.15	-0.019	NA
MNA	0.001	207446.8	210791	31547271	0.33	-0.017	0.081
MNG	-0.007	121265	108373.6	267176.5	0.2	-0.018	0.106
MNP	-0.005	327.9	302.6	482941.2	-0.07	0	NA
MOZ	-0.005	422830	390243	914727.3	0.54	-0.031	0.084
MRT	-0.027	3660	2362	27000	0.59	-0.055	0.039
MUS	-0.006	387.5	351.9	715117.6	0.15	-0.014	0.057
MWI	-0.009	37315	32289.5	448000	0.55	-0.036	0.061
MYS	-0.005	219835	202892.6	14518177	0.39	-0.025	0.055
NAC	0.001	6084000	6182077.5	68526471	0.17	-0.009	0.037
NAM	-0.009	83970	72661.2	731764.7	0.34	-0.027	0.055
NCL	0	8390	8390	101235.3	0.32	-0.017	NA
NER	-0.02	16365	11844.9	56764.7	0.8	-0.055	0.041
NGA	-0.035	151855	85874.9	2902882.4	0.51	-0.06	0.152
NIC	-0.019	41640	30634.8	618823.5	0.27	-0.033	0.04
NLD	0.002	3525	3639.5	9533705.9	0.08	-0.003	0.039
NOC	0	8232017	8232017	101137320	0.09	-0.005	0.079
NOR	0.006	92155	101411.4	3628588.2	0.14	-0.002	0.069
NPL	-0.011	43585	36515.5	446647.1	0.32	-0.028	0.076
NZL	0.002	79930	82526.5	2146785.7	0.2	-0.009	0.049
OMN	0	20	20	791750	0.4	-0.021	0.084

Country	gFOREST	FOREST_0	FOREST_11	ARRAVER	gPOP	gFOREST_CAP	gGDPpc
OSS	-0.003	526713.5	501992.2	5690586.6	0.32	-0.02	0.069
PAK	-0.021	23215	16530.7	645235.3	0.39	-0.041	0.06
PAN	-0.006	35805	32518.1	743058.8	0.36	-0.025	0.073
PER	-0.002	696845	674877.3	1334470.6	0.24	-0.015	0.064
PHL	0.008	68435	77740.4	2495470.6	0.37	-0.011	0.051
PLW	0.002	389	401.6	72647.1	0.19	-0.009	0.041
PNG	-0.005	308280	284521.2	81529.4	0.49	-0.029	0.037
POL	0.003	89700	94103.8	15634118	0	0.003	0.085
PRI	0.025	3755	5574.3	3343764.7	0	0.025	0.054
PRK	-0.019	75670	55670.8	NA	0.13	-0.027	NA
PRT	0.002	33735	34830.9	5868823.5	0.05	-0.001	0.042
PRY	-0.009	202625	175336.2	369058.8	0.37	-0.028	0.045
PSS	0	39905.8	39905.8	774708.2	0.22	-0.012	0.033
PYF	0.044	800	1593.3	195941.2	0.26	0.029	-1.000
ROU	0.002	63685	65753.8	6128764.7	-0.11	0.009	0.116
RUS	0	8091092	8091092	20555941	-0.03	0.002	0.106
RWA	0.019	3310	4473.2	434750	0.97	-0.023	0.059
SAS	0.002	794804	820622.8	6091694.8	0.29	-0.014	0.085
SAU	0	9770	9770	9405307.7	0.5	-0.025	0.074
SDN	-0.018	734362	549153.8	195764.7	0.49	-0.042	0.082
SEN	-0.005	91232	84200.9	805555.6	0.53	-0.031	0.042
SGP	0	23	23	6777000	0.47	-0.024	0.048
SLB	-0.002	22960	22236.2	13000	0.5	-0.027	0.007
SLE	-0.007	30200	26989.5	28705.9	0.49	-0.032	0.052
SLV	-0.014	3545	2829.1	862294.1	0.09	-0.019	0.052
SOM	-0.011	78985	66173.7	NA	0.56	-0.038	NA
SST	-0.002	894414.3	866218.4	12234054	0.26	-0.016	0.064
STP	0	270	270	9588.2	0.4	-0.021	NA
SUR	0	147760	147760	109941.2	0.22	-0.012	0.108
SVK	0	19215	19215	6080888.9	0.01	0	0.086
SVN	0.002	12105	12498.2	1381941.2	0.03	0	0.054
SWE	0.002	273350	282229.6	3966117.7	0.07	-0.002	0.043

Country	gFOREST	FOREST_0	FOREST_11	ARRAVER	gPOP	gFOREST_CAP	gGDPpc
SWZ	0.009	4950	5713	553941.2	0.26	-0.005	0.042
SYC	0	407	407	140411.8	0.16	-0.009	0.037
SYR	0.013	4020	4942.8	3249235.3	0.53	-0.014	NA
TCA	0	344	344	195823.5	1.07	-0.044	NA
TCD	-0.007	127135	113619.6	65000	0.73	-0.04	0.104
TGO	-0.048	5855	2665.1	96941.2	0.51	-0.072	0.041
THA	-0.001	192765	189703.8	11420059	0.13	-0.009	0.038
TJK	0	4090	4090	218750	0.35	-0.019	0.089
TKM	0	41270	41270	88333.3	0.22	-0.012	0.152
TLS	-0.014	9100	7262.3	34500	0.36	-0.033	NA
TON	0	90	90	37705.9	0.09	-0.005	0.041
TTO	-0.003	2371.5	2260.2	387000	0.06	-0.007	0.094
TUN	0.02	7400	10158.6	5515764.7	0.19	0.009	0.049
TUR	0.009	99130	114409.9	17328000	0.25	-0.005	0.085
TUV	0	10	10	1217.6	0.07	-0.004	0.078
TZA	-0.011	394785	330751.1	560882.4	0.55	-0.038	0.07
UGA	-0.024	43100	29219.6	456411.8	0.69	-0.056	0.029
UKR	0.002	93920	96970.9	13434529	-0.11	0.01	0.087
URY	0.027	11660	17857.7	1972529.4	0.05	0.024	0.054
USA	0.001	2982650	3030732	50206412	0.17	-0.009	0.035
UZB	0.003	31285	32820.9	559937.5	0.29	-0.013	0.062
VCT	0.003	256.5	269.1	76117.6	0.01	0.002	0.059
VEN	-0.006	505885	459445.4	621117.6	0.34	-0.024	0.075
VIR	-0.008	227.5	200.1	519294.1	-0.02	-0.007	NA
VNM	0.018	105440	140271.6	2986294.1	0.22	0.005	0.111
VUT	0	4400	4400	65176.5	0.44	-0.022	0.055
PSE	0.001	90.8	92.3	227375	0.59	-0.027	0.041
WSM	0.008	1505	1709.6	96411.8	0.1	0.002	0.068
YEM	0	5490	5490	428647.1	0.55	-0.027	0.097
ZAF	0	92410	92410	6773294.1	0.32	-0.017	0.045
COD	-0.002	1588060	1537997.3	60294.1	0.52	-0.028	0.066
ZMB	-0.003	519670	495279.3	562117.6	0.54	-0.03	0.083

Country	gFOREST	FOREST_0	FOREST_11	ARRAVER	gPOP	gFOREST_ CAP	gGDPpc
ZWE	-0.018	205290	153515.3	2000647.1	0.15	-0.026	0.019

Source: http://data.worldbank.org/data-catalog/world-development-indicators)