Human Capital: "Travel Broadens the Mind"*

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Abstract

This paper adopts an economic framework to examine the impact of international travel on human capital development. Using a fixed-effects instrumental variable estimator as the primary analytical approach, the study investigates a panel dataset covering 64 countries from 1995 to 2019. The findings reveal that international travel, measured through tourism openness, has a significant positive effect on human capital. These results underscore the importance of global human mobility—encompassing migration, international educational exchange, and tourism—in fostering the development and dissemination of knowledge, culture, and technology.

Keywords: travel; human capital development; economic growth and development
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1 Introduction

Human capital, a foundational concept in labor economics, refers to the stock of skills, knowledge, experience, and attributes possessed by individuals. Unlike physical capital, which can be bought, sold, and separated from its owner, human capital is embodied within individuals, accumulated over a lifetime, and often sharpened through regular application. Among various forms of capital, including factories, machinery, and financial assets, human capital plays the most pivotal role in the modern economy. This prominence arises from its contribution to advancing scientific and technical knowledge, which in turn boosts the productivity of labor and other inputs in production processes. This significance is well-documented in growth theories (see e.g., Barro and Sala-i-Martin 1995; Galor 2011; Lucas 1988; and Romer 1990).

Given its importance, substantial research has focused on identifying factors that enhance human capital. Both early and contemporary scholars, such as Becker (2009), Goldin (2024), and Mincer (1958), emphasize the critical roles of education, on-the-job training, and health. Additionally, Acemoglu and Autor (2011) highlight factors such as innate ability, school quality, non-schooling investments, and pre-market conditions (e.g., peer group effects). Another strand of literature explores human capital at the micro-level, considering it as a multidimensional construct encompassing components like socio-emotional skills, cognition, and nutritional status. These components interact and begin to develop early in life, even before birth (Attanasio, 2020). For instance, Lu, Black, and Richter (2016) provide evidence linking child development to socioeconomic factors such as poverty and poor nutrition.[1]

This paper examines human capital[2] from a macroeconomic perspective, focusing on the role of cross-border mobility—international travel—in its development. We conceptualize international travel as a dual mechanism: outbound tourism directly facilitates learning through immersion in foreign cultures, while inbound tourism promotes learning by interaction. In outbound contexts, travelers absorb foreign knowledge and practices through first-hand experience, leading to gains in cognitive flexibility, creativity, and global employability (Hu and Wan, 2024; Oosterbeek and Webbink, 2011; Williams, 2009). These experiences mirror Schultz's (1961) notion of human capital investment via migration.

In contrast, inbound tourism affects the host country's human capital via more indi-

[1] See also Almond, Edlund, and Palme (2009) and Hamadani *et al.* (2014).

[2] To proxy human capital at a country level, we use three methods as reviewed by (Abraham and Mallatt, 2022) : the indicator method, the cost method, and the income method. More detailed discussion of this measurement was provided in Section 3.

rect yet significant channels. Domestic residents learn through observation and social interaction with international visitors, especially in service-intensive sectors such as hospitality, education, and transport. This aligns with Bandura's (1977) social learning theory and the idea of proximity-facilitated knowledge diffusion (Agrawal *et al.*, 2006). Inbound tourism can thus generate learning externalities and spur cultural openness and innovation, depending on the host's absorptive capacity (Munshi, 2011).

We acknowledge that outbound and inbound tourism may differ in their intensity and mode of influence. Outbound tourism tends to yield more direct human capital gains to the traveler; inbound tourism benefits the host population through spillovers. However, due to data constraints, we adopt an aggregate measure—"tourism openness"—which reflects the sum of inbound and outbound international travelers relative to population. We further emphasize the need for future studies to disaggregate these effects to identify possible asymmetries.

Beyond its effects on creativity and global exposure, tourism also facilitates productivity improvements through knowledge spillovers and efficiency gains. Tourists not only consume services but also act as carriers of ideas, skills, and cultural practices that can diffuse into host economies via interaction with local firms and communities. This knowledge transmission mechanism has been documented in several empirical studies. For example, Marrocu and Paci (2011) demonstrate that tourism flows contribute to regional production efficiency in Europe by introducing new information and innovative practices. Zhou, Xu and Lee (2019) provide evidence from southwestern China showing that tourism development enhances regional productivity, especially through improved labor allocation and service quality. Similarly, Harb, Bassil, and Al Daia (2024) revisit the tourism-led-efficiency hypothesis and find a robust link between tourism and productivity across Nomenclature of Territorial Units for Statistics (NUTS) regions. These findings align with our conceptual framework that views international travel not merely as a form of leisure consumption but also as an investment in human capital formation and economic dynamism. As such, tourists—both inbound and outbound—can be considered vectors of productivity-enhancing knowledge transfer, reinforcing the rationale for including tourism openness as a core explanatory variable in our analysis.

The age-old adage, "Travel broadens the mind," captures the essence of this relationship. When individuals travel to new countries, they bring their experiences, knowledge, and culture to share with host nations. Simultaneously, they acquire diverse ideas and perspectives from the host environment through observation,[3] a phe-

[3]Observational leaning in this cross-cultural environment can be influenced by individuals' level of competencies in languages and cultures. For example, people with good understanding of foreign languages and cultures are more likely to learn better because of good communication and more accurate

nomenon we refer to as "network effects". This exchange fosters creativity and innovation (Hu and Wan, 2024), which, in turn, promotes economic growth (Lee and Chang, 2008; Paramati, Alam, and Chen, 2017). Consequently, the positive correlation between international travel (inbound and outbound visitors)[4] and human capital development, as depicted in Figure 1, is unsurprising.

Since the onset of the new era of globalization in trade and migration following the fall of the Soviet Union in the 1980s, international travel has surged, contributing significantly to the global economy. In the early 1990s, only about 35% of the world population engaged in cross-border movement. By 2020, this figure had risen to 58%, as shown in Figure 1. Over the same period, human capital, as measured by indices such as the human capital index and school enrollment rates, nearly doubled.

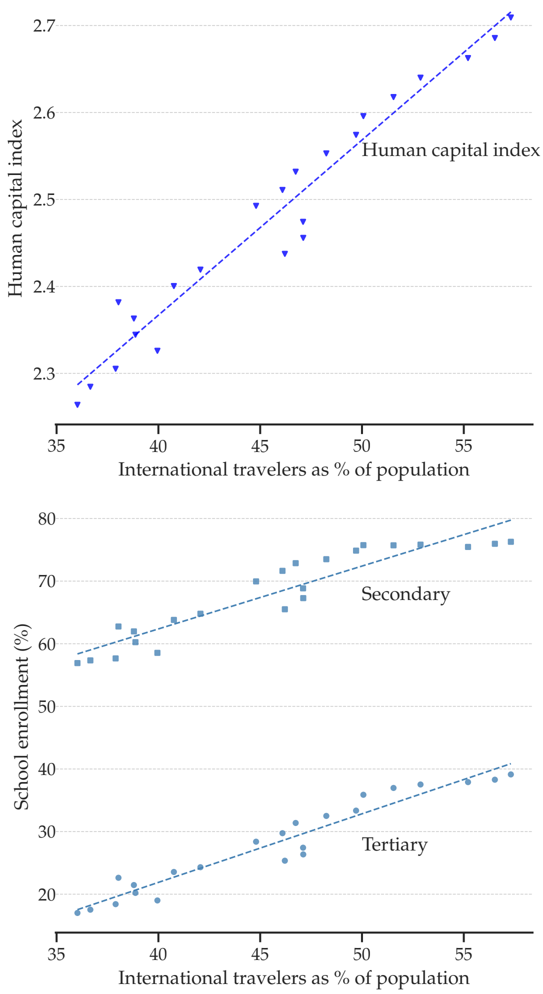
Numerous studies have explored the impact of international travel on various dimensions of economic and social development. These include its effects on economic growth (Adedoyin, Erum, and Bekun, 2022; Chou, 2013), trade openness (Fernandes, Pacheco, and Fernandes, 2019; Wong and Tang, 2010), environmental pollution (Zhang *et al.*, 2020), and creativity (Hu and Wan, 2024). While our work relates to some of these themes, it differs both theoretically and empirically by focusing on not just the effects of international travel on human capital development, but also the possibility of reverse causality: Highly educated individuals are more likely to have more overseas travels and holidays.

We develop a theoretical framework grounded in consumer theory, reconceptualizing overseas travel not merely as consumption—its conventional economic interpretation—but also as an investment in human capital. Traveling abroad incurs costs for individuals in terms of resources but yields benefits through new experiences and potential mental health improvements. This perspective aligns with Schultz (1961), who documented migration as a key investment in human capital that enhances individuals' capabilities. Our theoretical model posits a positive interaction between international travel and human capital formation.

interpretation of foreign behaviors. Note that travel widens people's horizon not just through observational learning. When facing unfamiliar situations, individuals are forced to think critically, adapt to new environments and thus develop resilience. Also travel forces people out of their comfort zone, which encourages self-discovery, independence and curiosity.

[4] Our key explanatory variable, which we refer to as "travel openness", is defined as the sum of inbound and outbound international visitors divided by population, following established practice in the literature (e.g., Chou, 2013; Fernandes *et al.*, 2019). While alternative measures such as international tourism receipts or expenditures are available, these are often more volatile, sensitive to exchange rate fluctuations, and reflect price and income effects rather than actual cross-border mobility. By contrast, international visitor flows more directly reflect the intensity of international exposure and potential knowledge spillovers, which form the basis of our theoretical mechanism. These definitions are central to the empirical design and are maintained consistently throughout the analysis.

Figure 1: Relationship between human capital and international travelers.



Note: The data in both panels are time series from 1995 to 2019. Human capital index is the average of 184 countries' human capital index each year, sourced from the Penn World Table version 10.01. International travelers as % of population is the world's sum of international inbound and outbound visitors divided by the world's population. School enrollment rates are the world's school enrollment rates. The source of these variables is the World Development Indicators (WDI).

To empirically test this relationship, we analyze a panel dataset covering 64 countries over the period 1995–2019. Our initial benchmark analysis employs pooled ordinary least squares (OLS) and fixed effects (FE) models. To address potential endogeneity, we utilize an instrumental variable (IV) approach as our main empirical strategy. Specifically, we use the average cost of international travel—an exogenous variable in our model—as an instrument to obtain consistent parameter estimates for the human capital production function.

The results reveal a significant positive association between international travel (both inbound and outbound) and human capital development. These findings are robust across various measures of human capital. Our analysis underscores the value of policies that foster international travel, such as student exchange programs and tourism, for enhancing human capital.

The paper proceeds as follows. Section 2 introduces a static model linking human capital to international travel. Section 3 outlines the econometric model specifications and describes the dataset used in the analysis. Section 4 presents the empirical results and robustness checks, and section 5 concludes.

2 An Economic Framework: The Relationship between Human Capital and Travel

In this section, we develop a simple, static theoretical model of human capital formation, which underpins the empirical analysis in the subsequent section. We explore the relationship between the two key variables of interest: human capital and international travel, and use an instrumental variable approach to address potential endogeneity concerns.

The study of human capital development has a long history in economics, starting with the seminal work of Gary Becker (Becker, 1964). More recently, several prominent researchers have advanced the theoretical framework for understanding human capital formation, such as Attanasio *et al.* (2020) and Cunha and Heckman (2008), contributing to the broader discourse on the subject.

In addition to macro-level network effects and knowledge spillovers, recent literature has highlighted a range of micro-level mechanisms through which international travel can enhance human capital (e.g., Bandura, 1977; Bahar *et al.*, 2024; Docquier and Rapoport, 2012). These include language acquisition, cross-cultural communication skills, global employability, and cognitive flexibility, all of which are cultivated through immersive exposure to foreign environment. Such competencies have become increasingly valued in the labour market, particularly in service and knowledge-intensive sectors where intercultural competence and global literacy complement traditional forms of formal education (e.g., Williams, 2009; Oosterbeek and Webbink, 2011). In this context, international travel functions not merely as a conduit for information exchange, but also as a skill formation experience that enhances both soft and transferable skills.

In our conceptual framework, international travel enhances human capital through two primary channels: direct exposure (as in outbound tourism) and indirect exposure (as in inbound tourism). The latter, in particular, operates through learning-by-interacting and learning-by-observing mechanisms. Drawing on Bandura's (1977) social learning theory, individuals acquire new knowledge and skills not only through formal education but also by observing and engaging with others in social contexts. In tourism, such interactions occur when local residents engage with foreign visitors in daily service exchanges, workplace encounters, or public events. These engagements allow residents to absorb new behaviors, languages, ideas, and problem-solving approaches that contribute to their skill base and cognitive development. This aligns with broader theories of informal human capital formation and observational learning. Additionally, Agrawal *et al.* (2006) show that physical and social proximity to diverse knowledge sources facilitates knowledge spillovers, and Munshi (2011) provides empirical evidence on peer networks as channels of occupational learning. Inbound tourism thus serves as a conduit for soft skill acquisition and cultural competence, which are increasingly valued in globalized labor markets.

Consider an economy with a large number of households. At time t, the representative household[5] produces output, denoted by Y_t, using a Cobb-Douglas production function:

$$Y_t = A_t K_t^{1-\alpha} \left[h_t L_t \right]^{\alpha}, \tag{1}$$

where $\alpha \in (0.5, 1)$ is the labor share of output,[6] A_t denotes productivity, K_t stands for physical capital, h_t represents human capital, and L_t is labor. Without loss of generality, we normalize A, K and L to 1, simplifying the production function to $Y_t = h_t^{\alpha}$.

The human capital develops according to a linear function:[7]

$$h_t = \beta T_t + \beta^{\boldsymbol{H}} \boldsymbol{H}_t + e_t, \tag{2}$$

where β and $\beta^{\boldsymbol{H}}$ are constant, and $\boldsymbol{H}_t$ is a multidimensional vector of factors that influence human capital, such as health, schooling, training, and environmental factors (e.g; peer group effects), which can be fixed or time-varying. e_t represents a random shock capturing unobserved factors. As discussed earlier, international travel enhances human capital by facilitating learning through observation and interaction.

[5]Although the theoretical framework is built upon consumer theory (at micro level), we can generalize and use it at macro level because we use the consumers' representative, whose consumption can be viewed as the average one. Thus, a country's indicator index, which is derived to show a general trend and growth, can be used to approximate the average data.

[6]Historically, although the labor share has been declining globally, it still exceeds 50% of output, as discussed in Karabarbounis and Neiman (2014) and Kheng, McKinley, and Pan (2024).

[7]We use this linear form for simplicity, enabling a closed-form solution to the consumer's maximization problem and facilitating the empirical analysis in section 3.

The representative household allocates its income, Y_t, between consumption of goods (C_t) and investment in international travel (T_t). The price of goods is normalized to 1, and the price of international travel is p_t. The household's budget constraint is:

$$C_t + p_t T_t = Y_t. \tag{3}$$

Note that international travel is assumed to not conflict with labor time used in production; people travel during holidays or leave. The household's utility is derived from both consumption and international travel, represented by the utility function:

$$U(C_t, T_t) = \ln C_t + \ln T_t, \tag{4}$$

where $C_t > 0$ and $T_t > 0$. The household chooses the levels of consumption and travel to maximize its utility in Equation (4), subject to the constraints in Equations (1)–(3). This maximization problem results in the following demand for international travel:

$$T_t = \frac{h_t^{\alpha}}{2p_t - \alpha\beta h_t^{\alpha-1}}. \tag{5}$$

Equation (5) shows that the demand for international travel increases with higher human capitalor income h_t,[8] and decreases with the real cost of travel p_t. We have the following proposition.

Equations (2) and (5) highlight the endogeneity in the model, as both human capital and international travel depend on each other. Therefore, the empirical analysis in the next section must account for this endogeneity issue.

Notably, contribution of travel to human capital arises not only from exposure to new ideas and institutions, but also through the development of individual-level capabilities shaped by mobility. These benefits may be reinforced by repeat travel, extended stays, or interaction with highly diverse cultural contexts. We also acknowledge that the intensity and nature of these gains may vary across countries depending on linguistic proximity, visa openness, diaspora density, and the adaptability of the domestic education system-all of which mediate the effectiveness of travel as a channel for human capital accumulation.

[8]The assumption $C > 0$ and $T > 0$, combined with $\alpha \in (0.5, 1)$, ensures that the first derivative of T_t with respect to h_t is positive in Equation (5). This is demonstrated in Appendix B.

3 Empirical Strategies and Data

We start with the baseline econometric model from Equation (2) that relates human capital to travel, as follows:

$$h_{it} = \beta_0 + \beta_1 \text{Travel}_{it} + \beta_2 \boldsymbol{X}_{it} + \beta_3 \boldsymbol{X}_i^* + e_{it}^h, \tag{6}$$

where the subscript t denotes time, indexed by $1, 2, \ldots, T$; $i = 1, 2, \ldots, N$ refers to countries; β_0, β_1, β_2 and β_3 are constant; h refer to human capital; $\boldsymbol{X}$ is a vector of control variables that vary across time and countries, including: i) schooling and training (both formal and informal), ii) health, and iii) financial development; $\boldsymbol{X}^*$ is a vector of unobserved time-invariant factors, such as innate ability, cultural openness or institutional quality[9]; and e_{it}^h refers to cross-country and time-variant factors that are unobserved in this specification.

To proxy human capital investment, we use three methods: the indicator method, the cost method, and the income method. The indicator method relies on school enrollment rates, average years of schooling, or literacy; the cost method is based on education spending; and the income approach is based on expected future earnings (Abraham and Mallatt, 2022).

To measure human capital (h), we use secondary and tertiary enrollment rates, similar to Barro (1991) and Kheng, Sun and Anwar (2017). Primary enrollment rates are not used because international travel typically requires a certain level of knowledge for people to navigate more confidently. Additionally, we use the human capital index constructed by Feenstra, Inklaar and Timmer (2015), which is based on the average years of schooling from Barro and Lee (2013), Cohen and Soto (2007), and Cohen and Leker (2014), along with the assumed return rate to education from Psacharopoulos (1994).

To measure investment in schooling and both formal and informal training, we use government expenditure on education per capita (PPP)[10] because education is largely publicly funded and provided in most countries (Goldin, 2024). We also include per-capita private credit (PPP) as a measure of financial development.[11] A more developed

[9] e.g., cultural openness can enhance human capital development through knowledge exchange (Dao and Khuc, 2023) and social cohesion (Florida, Mellander and Stolarick, 2008); institutional quality affects human capital formation through an environment it creates. For example, an institution that supports intellectual property and rights and research funding helps foster technological progress (Uberti and Knutsen, 2021)

[10] Purchasing Power Parity, 2021 real international price $.

[11] Domestic credit to private sector as a percentage of gross domestic product is commonly used to gauge financial development (Pan, Dwumfour, and Kheng, 2024). The proxy predominantly reflects

financial sector makes it easier and cheaper for people to access funds, which alleviates resource constraints for schooling or training. Following Banerjee, Mishra and Maruta (2021) and Goldin (2024), We use life expectancy at birth as a measure of overall health.

For the key regressor, "Travel," we measure it by tourism openness, defined as the sum of international inbound and outbound visitors as a proportion of the population[12]. As discussed earlier, we expect this key variable to positively influence human capital development, so we hypothesize that $\beta_1 > 0$.

As a benchmark analysis, We first estimate Equation (6) using both ordinary least square (OLS) and fixed effects (FE) models. We then employ the instrumental variable (IV) approach to address the endogeneity issue arising from the correlation between the "travel" variable with the error term e^h in Equation (6).[13] Since the variable p—the unit real cost of travel—appears only in Equation (5) and not in Equation (2), we use it as an instrumental variable. Moreover, there is no reasonable argument suggesting that the travel cost directly influences human capital development[14]. Therefore, we obtain the reduced form equation as below:

$$\text{Travel}_{it} = \lambda_0 + \lambda_1 p_{it} + \lambda_2 \boldsymbol{X}_{it} + \lambda_3 \boldsymbol{X}_i^* + e_{it}^T, \tag{7}$$

where e^T is the error term. The unit real cost of international travel p is measured by the average cost of international inbound and outbound expenditures (including airfares and overboard expenses) per a passenger, divided by the consumer price index (see Table A2 of Appendix A for the details of all the variables used in this study).

We use an unbalanced annual dataset for 64 countries from 1995 to 2019.[15] We then

bank-based intermediation, but also captures the broader capacity of the financial system to support economic activities relevant for travel and human capital investment.

[12]We employ this variable "tourism openness" rather than "the national's travel experience (domestic travel plus outbound travels)", which is a better indicator, for two main reasons. First, the data on the costs and visitors of domestic travels are not available. Second, although inbound visitors will return and contribute to their home country's human capital, a recipient country's residents can still learn by interacting with or observing foreign visitors—externality effects or knowledge spillover.

[13]Endogeneity issues can arise due to omitted explanatory variables, measurement errors, and simultaneity. In this case, reverse causality as outlined in the theoretical framework, is a concern.

[14]We think the travel cost might not significantly alters people's investment in education for two main reasons. Firstly, for most countries, education from primary to high school is publicly funded. Secondly, education is considered as a necessary good, whereas travel is luxury one.

[15]Our final sample comprises 64 countries over the period 1995-2019, selected primarily based on the availability and completeness of the key variables, "travel" and "human capital, that are jointly available only for this period. Moreover, the latest version of the Penn World Table has data available only up to 2019. In addition, we stop before 2020 to avoid confounding effects associated with the COVID-19 pandemic, which caused sudden the severe disruptions to internationally mobility, education system, and labor markets worldwide. Including post-2019 data would risk conflating the structural relationship between international travel and human capital with transitory crisis-driven shocks, thereby compromising the interpretability and stability of our estimates. We also did a sensitive analysis between high-income countries and low-income countries. However, the results are not as good as those from

select only countries with at least 10 years of data (see Table A1 of Appendix A for the list of countries). The data for the human capital index is sourced from the Penn World Table version 10.01, while data for the remaining variables is obtained from the World Development Indicators (WDI) of the World Bank. Table 1 presents the summary statistics of the variables.

Table 1: Summary statistics

	Mean	Std	Min	Max
Human capital index	2.817	0.563	1.364	3.892
School enrollment, secondary (% gross)	93.331	22.492	17.793	164.080
School enrollment, tertiary (% gross)	48.530	25.376	1.732	143.963
International travel (tourism openness)	1.630	1.600	0.007	8.948
Life expectancy	75.254	5.914	42.125	84.356
Average real cost of international travel	1.747	1.661	0.002	18.211
Gov't exp. on edu. per capita (PPP '0000)	15.756	14.153	0.168	69.167
Private credit per capita (PPP '0000)	282.772	328.381	0.745	1758.391

Note: The gross rates of school enrollment can exceed 100% if the number of students enrolled is greater than the number of students in the age group that corresponds to the educational level.

We observe that none of the variables are overly concentrated around their means. For instance, the human capital index ranges from 1.4 to 3.9, with a mean of 2.8 and a standard deviation of 0.6. International travel, as a proportion of the population, ranges from just 0.007 to almost nine times the population. This broad variation in the data provides a robust sample for the empirical analysis. We also report the correlation matrix of all variables in Table A3 of Appendix A.

the whole sample.

Table 2: Human capital and international travel, OLS estimates

	Human capital index				Secondary enrollment				Tertiary enrollment			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
International travel	0.153***	0.058***	0.069***	0.057***	5.204***	0.886**	0.679*	0.100	5.313***	1.547***	1.676***	1.07647**
	(0.009)	(0.010)	(0.010)	(0.009)	(0.390)	(0.398)	(0.399)	(0.341)	(0.447)	(0.488)	(0.492)	(0.444)
Gov't exp. on edu. per capita		0.020***	0.007***	0.0005		0.904***	1.152***	0.828***		0.789***	0.634***	0.298***
		(0.001)	(0.002)	(0.002)		(0.045)	(0.079)	(0.069)		(0.055)	(0.098)	(0.090)
Private credit per capita			0.0006***	0.0004***			-0.012***	-0.023***			0.007*	-0.004
			(0.00008)	(0.00007)			(0.003)	(0.003)			(0.004)	(0.004)
Life expectancy				0.043***				2.107***				2.185***
				(0.003)				(0.103)				(0.134)
Observations	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120
R-squared	0.19	0.37	0.40	0.52	0.14	0.37	0.37	0.55	0.11	0.25	0.25	0.40

Note: *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Table 3: Human capital and international travel, FE estimates

	Human capital index				Secondary enrollment				Tertiary enrollment			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
International travel	0.100***	0.079***	0.080***	0.033***	3.426***	2.198***	2.219***	-0.351	7.575***	5.221***	5.335***	3.061***
	(0.006)	(0.007)	(0.007)	(0.005)	(0.440)	(0.469)	(0.469)	(0.408)	(0.531)	(0.548)	(0.537)	(0.507)
Gov't exp. on edu. per capita		0.012***	0.009***	0.001		0.663***	0.619***	0.227**		1.271***	1.028***	0.682***
		(0.001)	(0.001)	(0.001)		(0.100)	(0.105)	(0.089)		(0.116)	(0.120)	(0.110)
Private credit per capita			0.0002***	0.00010***			0.004	-0.005**			0.021***	0.0133***
			(0.00004)	(0.00003)			(0.003)	(0.002)			(0.003)	(0.003)
Life expectancy				0.051***				2.774***				2.455***
				(0.001)				(0.128)				(0.159)
Observations	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120
R-squared	0.19	0.24	0.26	0.65	0.05	0.09	0.09	0.37	0.16	0.25	0.28	0.41
Number of countrycode1	64	64	64	64	64	64	64	64	64	64	64	64

Note: *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

4 Results and Discussion

4.1 Baseline results

We start with a simple pooled OLS estimation. The results in Table 2 indicate that the relationship between international travel and human capital development is positive and statistically significant at the 1% level across all model specifications. The significant positive effect remains robust across all three measurements of human capital: human capital index, secondary enrollment rates, and tertiary enrollment rates.

However, a limitation of the OLS estimation is its failure to account for time-invariant variables, such as innate ability. To address this, we further use a FE estimator to control for these time-invariant factors. The FE estimation results, shown in Table 3, confirm that the coefficients of our variables of interest remain positive and statistically significant at the 1% level. This suggests that an increase in international inbound and outbound travelers is significantly associated with an increase in human capital formation.

To examine the possibility that the impact of international travel on human capital may not be immediate but rather realised with a time lag, we conduct an additional robustness check using the lagged value of international travel as the key explanatory variable. This approach allows us to capture potential delays in the transmission of international exposure into human capital gains such as through learning, adaption, and institutional diffusion. The results, presented in Appendix C, show that lagged international travel remains positively and statistically significantly associated with human capital. The coefficient on the lagged variable is significant at the 1% level, reinforcing the view that international mobility contributes to human capital accumulation.

It is worth noting that the coefficient on private credit per capita exhibits sign variation across the OLS and fixed effects specifications. This inconsistency likely reflects heterogeneity in the structure and function of credit markets across countries. In some settings, higher private credit may ease liquidity constraints for households, thereby facilitating discretionary expenditures such as international travel. In others, private credit may be concentrated in corporate or investment lending, or reflect financial vulnerabilities that deter consumption. Additionally, macroeconomic factors such as credit cycles, financial repression, or inequality in access to finance may further influence this relationship. Given these limitations, we emphasize that the IV estimates—where endogeneity is explicitly addressed through instrumentation—provide a more reliable basis for causal inference.

4.2 Main IV results

One may argue that the direction of causality could run in the opposite direction—that is, individuals with higher levels of human capital may be more likely to travel internationally, rather than international travel fostering human capital development. This concern is particularly relevant at the micro level, where education, income, and cognitive skills influence an individual's capacity and confidence to engage in cross-border mobility. To address this potential reverse causality, we implement an FE-IV estimator as our main estimation strategies. Specifically, we use the average real cost of international travel as an instrument for actual international travel flows. This cost-based instrument is plausibly exogenous, as it is determined by global transportation pricing and infrastructure rather than domestic education policies or latent ability. By isolating exogenous variation in travel exposure, we aim to identify the causal effect of international mobility on human capital accumulation.

A key identifying assumption underlying our IV strategy is that international travel cost affects human capital only through its influence on international travel intensity, not through other direct or indirect channel. This assumption, known as the exclusion restriction, is justified on both theoretical and empirical grounds. Travel costs are primarily driven by exogenous global factors such as international airfare trends, oil prices, airline route density, and geopolitical shocks that affect transportation infrastructure. These factors vary over time but are not systematically correlated with country-specific determinants of human capital accumulation, such as national education policy, social capital, or innate cognitive ability. As we have only the real cost as an instrument, all our model specifications are exactly identified: each model having as many instruments as regressors.

Table 4 reports the results from the two-stage least square (2SLS) estimation. The coefficients for the key regressor, whether proxied by the human capital index, secondary enrollment rates, or tertiary enrollment rates, are positive and statistically significant across almost all model specifications. Similarly, life expectancy and per-capita private credit also show statistically significant positive associations with human capital development. However, government expenditure on education shows a statistically insignificant association with the dependent variables in most models, except for two specifications where it is negative and statistically significant. One possible explnation is that, although government expenditure on education positively affects human capital through investment in schooling, the taxes required to finance this expenditure could reduce households' disposable income, thereby lowering their ability to invest in travel. This reduction in travel investment could, in turn, limit human capital development.

Table 4: Human capital and international travel, IV estimation

Second stage	Human capital index				Secondary enrollment				Tertiary enrollment			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
International travel	0.276***	0.316***	0.296***	0.032	13.302***	15.485***	15.026***	1.711	25.208***	28.493***	26.661***	23.715***
	(0.032)	(0.056)	(0.052)	(0.046)	(2.022)	(3.522)	(3.409)	(3.959)	(2.871)	(5.104)	(4.721)	(7.812)
Gov't exp. on edu. per capita		-0.008	-0.010**	0.002		-0.445	-0.476	0.092		-0.669	-0.795*	-0.669
		(0.005)	(0.005)	(0.003)		(0.318)	(0.318)	(0.273)		(0.461)	(0.440)	(0.538)
Private credit per capita			0.0003***	0.0001***			0.006*	-0.004			0.025***	0.0224***
			(0.00005)	(0.00003)			(0.004)	(0.003)			(0.005)	(0.006)
Life expectancy				0.051***				2.586***				0.572
				(0.004)				(0.382)				(0.753)
Observations	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120
R-squared												
Number of countries	64	64	64	64	64	64	64	64	64	64	64	64
First stage	International travel											
	(1)	(2)	(3)	(4)								
Average cost of international travel	-0.148***	-0.094***	-0.096***	-0.056***								
	(0.017)	(0.016)	(0.016)	(0.016)								
Anderson-Rubin Wald-test: F-stat	117.85***	64.86***	59.87***	0.46	64.13***	34.45***	33.52***	0.19	151***	84.04***	78.24***	23.47***
Observations	1,120	1,120	1,120	1,120								
R-squared	0.07	0.18	0.18	0.24								
Number of countries	64	64	64	64								

Note: *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Additionally, the first-stage regression results, also presented in Table 4, support our theoretical expectation: demand for international travel is negatively correlated with its cost, and this relationship is statistically significant at the 1% level across all specifications.

Beyond the educational contexts referenced earlier, our findings have broader policy and managerial implications that extend to general forms of international travel, including inbound tourism for leisure, business, and social purposes. While school exchange programs and outbound educational excursions illustrate the direct channels of learning-by-exposure, inbound tourism can also foster local human capital development through more informal and decentralized mechanisms. For instance, sustained contact with international visitors may increase residents' exposure to foreign languages, cultural practices, entrepreneurial behaviors, and aspirational norms. Local firms engaged in tourism-related services often adapt by investing in service quality, digital platforms, and workforce training, thereby facilitating tacit knowledge transfer. These interactions—though diffuse—can shape local human capital accumulation over time, particularly in communities with high tourism penetration. As such, tourism policy should be viewed not only as an economic stimulus tool but also as a soft infrastructure for knowledge diffusion and capability upgrading. Governments may consider community-based cultural exchange initiatives and local tourism workforce development programs to maximize these spillover benefits. For managers, embedding skill-building opportunities within the tourism value chain—through staff exchanges, multilingual training, or international certifications—can help convert visitor flows into long-term human capital assets.

In summary, our findings suggest that an increase in international inbound and outbound visitors contribute to human capital development through learning by observing. In turn, higher levels of human capital enable individuals to travel more, creating a positive feedback loop between travel and human capital formation.

4.3 Robustness checks

4.3.1 Lewbel (2012) heteroscedasticity-based identification

To assess the robustness of our results, we augment our external instruments with heteroskedasticity-based instruments, following the approach outlined by Lewbel (2012).

As Lewbel (2012) argues, heteroskedasticity-based instruments can be useful when external instruments are unavailable or to test the validity of existing external instruments. We briefly explain Lewbel's approach below. Consider the model:

$$Y_1 = X'\beta + Y_2\gamma + \varepsilon_1, \quad Y_2 = X'\alpha + \varepsilon_2$$

where ε_1 and ε_2 are the error terms which may be correlated, Y_1 is the dependent variable (the human capital index in our case), Y_2 is the endogenous variable (international travel), and X is the vector of control variables. One key challenge is the possibility that no element of X is excluded from the Y_1 equation, or that any element of β is zero. To address this, Lewbel (2012) develops an identification strategy based on 2SLS estimator in the absence of external instruments for the endogenous variable Y_2. This strategy constructs valid instruments by exploiting the heteroskedasticity in ε_2.

The model assumes the standard conditions of non-singularity for the matrix $E(XX')$, and that $E(X\varepsilon_1) = E(X\varepsilon_2) = 0$. Furthermore, β and γ are assumed to be constants. There are also several critical assumptions for the Lewbel (2012) estimator, including $Cov(Z, \varepsilon_1\varepsilon_2) = 0$ and $Cov(Z, \varepsilon_2^2) \neq 0$, where Z equals X or is a subset of the elements in X. After estimating α and obtaining the residuals from the OLS regression of Y_2 on X, β and γ are estimated using the 2SLS regression with instruments X and $(Z - \bar{Z})\hat{\varepsilon}_2$, where $\bar{Z}$ is the mean of Z.

Table 5 reports the results of the Lewbel (2012) IV estimates, with the human capital index as the proxy for human capital. Columns (1) to (4) present the results based on the standard instrumental variable, columns (5) to (8) report the IV estimates using the constructed instruments, and columns (9) to (12) show the results using external instruments augmented by the constructed instruments. The results clearly indicate that the coefficient for international travel is positive and statistically significant in almost all regressions, confirming the positive causal effect of international travel on human capital development.

Our results also show that the estimates from the standard IV approach are quantitatively larger than those from the augmented model. However, as documented in Lewbel (2012), the estimates from the augmented model are more efficient. Overall, we find that international travel has a positive effect on human capital development, and our results are robust across alternative specifications.

4.4 Bounding values and omitted variable bias

Given that the timeframe of our data includes several major shocks, such as the Global Financial Crisis (GFC) and the European debt crisis, one might argue that these events could cause unobserved country heterogeneity, potentially generating coefficient in-

Table 5: Lewbell (2012) IV estimates using heteroskedasticity-based instruments

VARIABLES	Standard IV				Generated IV				Generated and External IV			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
International travel	0.276***	0.317***	0.296***	0.032	0.108***	0.085***	0.081***	0.032***	0.109***	0.081***	0.078***	0.034***
	(0.062)	(0.078)	(0.076)	(0.066)	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)
Gov't exp. on edu. per capita		-0.008	-0.010*	0.002		0.011***	0.009***	0.002***		0.012***	0.010***	0.002***
		(0.005)	(0.005)	(0.005)		(0.001)	(0.001)	(0.001)		(0.001)	(0.001)	(0.001)
Private credit per capita			0.0003***	0.0001*			0.0003***	0.0001***			0.0002***	0.00005**
			(0.000)	(0.000)			(0.000)	(0.000)			(0.000)	(0.000)
Life expectancy				0.051***				0.053***				0.053***
				(0.007)				(0.001)				(0.001)
Observations	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120
Hansen J stat	-	-	-	-	229.89	204.59	185.44	229.86	233.80	231.56	233.13	227.54
Hansen J p-value	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

stability. For instance, Nguyen, Castro and Wood (2024) find that banking crises have a more significant effect on human development and its components in developed countries, while debt and currency crises tend to have more harmful effects in developing countries. To address this, we examine the robustness of our results to omitted variable bias that could arise from unobserved country heterogeneity, such as these heterogeneous effects of financial crises.

To assess potential estimation bias from unobservable factors, we adopt the approach developed by Oster (2019), which is designed to estimate the degree of selection on unobservables and establish a lower bound that would confound the treatment effect. Oster's method uses information on coefficient and R-squared movements to calculate bounding values for the treatment effect. The underlying assumption is that observable covariates are a random subset of all relevant covariates, implying that the selection of observable and unobservable covariates is similar. Based on this, a lower bound estimate of the treatment effect can be derived from the movement in coefficients after the inclusion of additional observable covariates.

The method proposed by Oster (2019) is outlined as follows:

$$\Delta h = \beta \Delta \text{Travel} + \gamma \omega^o + W_2 + \varepsilon$$

where h denotes human capital, $Travel$ is the treatment variable, ω^o is a vector of observed covariates, and W_2 is a vector of unobserved covariates. Denoting $W_1 = \gamma\omega^o$, where all elements of ω^o are assumed to be orthogonal to W_1, we can infer that W_1 and W_2 are also orthogonal. The proportional selection relationship is given by:

$$\delta \frac{\delta_1 \text{Travel}}{\delta_1^2} = \frac{\delta_2 \text{Travel}}{\delta_1^2}, \tag{8}$$

where $\delta_i\text{Travel} = Cov(W_i, \text{Travel})$ and $\delta_i^2 = Var(W_i)$, for $i \in \{1, 2\}$. The parameter δ is the coefficient of proportionality that captures the relative importance of observables vs unobservables. For instance, $\delta = 1$ indicates that observed and unobserved factors have equal importance.

The estimated coefficient and the R-squared from the unconditional regression of h on Travel are denoted by $\dot{\beta}$ and $\dot{R}$, respectively. The corresponding estimates from the controlled regression of h on $Travel$ and ω^o are $\tilde{\beta}$ and $\tilde{R}$. We define R_{max} as the R-squared from a hypothetical regression of h on all observable and unobservable covariates, including Travel. For the OLS estimates of $\dot{\beta}$ and $\tilde{\beta}$, the omitted variable bias is determined by auxiliary regressions of each element of ω^o on Travel, W_2 on Travel, and W_2 on Travel and ω^o. Based on the proportional selection relationship in equation

(8), the bias-adjusted treatment effect can be calculated as:

$$\beta^* \approx \tilde{\beta} - \delta[\dot{\beta} - \tilde{\beta}]\frac{R_{\max} - \tilde{R}}{\tilde{R} - \dot{R}}$$

Following Oster (2019), we use $\delta = 1$ since it is unlikely that unobservables have a larger impact than the observables included in the model. Additionally, Oster (2019) suggests a bound for $R_{\max}$, which we set as $R_{\max} = \min\{1.3\tilde{R}, 1\}$.

Table 6: Oster (2019) bound estimates

	(1) Controlled effect	(2) Identified set
	$\tilde{\beta}$(S.E.)	$[\tilde{\beta}, \beta^*(min\{1.3\tilde{R}, 1\}, 1)]$
Panel A: OLS estimation		
International travel	0.05717***(0.00882)	[0.05717, 0.15341]
Obs.	1,120	
$\tilde{R}^2$	0.51554	
Panel B: FE estimation		
International travel	0.03254***(0.00475)	[0.03254,0.09992]
Obs.	1,120	
$\tilde{R}^2$	0.65	

Note: *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Table 6 presents the bounding values for β from both the OLS and FE models with full controls. For ease of comparison, column (1) reproduces the controlled-effect estimates for the human capital index used as the proxy for human capital, as shown in Tables 2 and 3. The bounds in column (1) clearly do not include zero, suggesting that our OLS and FE estimates are robust to potential omitted variable bias.

We also examine the width of the bound estimates. The OLS estimate of a 0.06% increase in human capital development for a 1% rise in international travel is robust, but the bound is slightly larger at 0.15%. Similarly, the FE estimate of a 0.03% increase in human capital development from international travel is robust, with the bound widening to 0.10%. Thus, Oster's (2019) bounding analysis suggests that the causal effect of international travel on human capital development is likely to be somewhat larger than the estimates presented in Tables 2 and 3, after accounting for potential omitted variable bias.

5 Conclusions

In this paper, we present a simple, static theoretical model that explores the relationship between human capital, international travel, and other key variables. We argue that overseas travel is not merely consumption, but also an investment in human capital, as it broadens one's perspective. Using a panel dataset of 64 countries from 1995 to 2019, we estimate the model employing instrumental variables as our primary empirical strategy. Our results indicate that a higher number of international inbound and outbound visitors is significantly associated with greater human capital development. These findings suggest that policies promoting human mobility, such as school exchange programs and educational excursions, are beneficial. This is because individuals learn not only through formal schooling and training but also by observing others, a phenomenon we refer to as "network effects."

While our study treats international travel as a combined indicator of inbound and outbound mobility, we acknowledge a potential asymmetry in their respective effects on human capital development. Outbound travel, particularly when undertaken by a country's own citizens, may have a more direct impact on national human capital through exposure to foreign knowledge, cultural learning, and subsequent reintegration of acquired skills upon return. In contrast, the influence of inbound travel is likely more indirect, occurring via social interaction, knowledge spillovers, or imitation learning within host communities. However, due to data limitations, we are unable to disaggregate inbound and outbound effects across our full sample. We therefore propose that future research can explore this asymmetry using more granular data, such as passport ownership rates, visa issuance records, or survey-based measures of travel experience and cross-cultural exposure. Such data would enable a more nuanced understanding of how different forms of mobility contribute to the accumulation and diffusion of human capital.

In addition, although our study establishes a robust average effect of international travel on human capital across a global sample, future research may further explore the heterogeneous effects of travel-driven learning mechanisms. Specifically, the impact of travel on human capital may differ across countries depending on contextual factors such as language barriers, immigration regime, diaspora networks, and institutional receptiveness to foreign knowledge. Moreover, disaggregating the relative importance of pathways-such as language learning, intercultural adaptation, or global employability gains-could offer valuable policy insights for tailoring mobility-related educational investments. Future theoretical and empirical models could incorporate such heterogeneity to refine our understanding of how international exposure contributes to human capital formation in diverse national settings.

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Appendix A

Table A1: Country list

Australia	Ireland	Albania	Kuwait	El Salvador
Austria	Iceland	Armenia	Sri Lanka	Eswatini
Belgium	Israel	Bangladesh	Morocco	Thailand
Canada	Italy	Bulgaria	Malta	Tajikistan
Switzerland	Japan	Brazil	Mauritius	Tunisia
Chile	Lithuania	Cyprus	Malaysia	Ukraine
Colombia	Luxembourg	Algeria	Nepal	Uruguay
Costa Rica	Latvia	Ecuador	Panama	Zimbabwe
Germany	Mexico	Fiji	Peru	.
Estonia	Netherlands	Guatemala	Philippines	.
Finland	Norway	Indonesia	Paraguay	.
France	Poland	India	Romania	.
Greece	Slovenia	Jordan	Russian Federation	.
Hungary	United States	Cambodia	Saudi Arabia	.

Table A2: Variable list

Variable Names	Notations
(1) Human capital index	hc
(2) population, total	SP.POP.TOTL
(3) Consumer price index (cpi) (2010 = 100)	FP.CPI.TOTL
(4) Life expectancy at birth, total (years)	SP.DYN.LE00.IN
(5) Domestic credit to private sector (% of GDP)	FS.AST.PRVT.GD.ZS
(6) Government expenditure on education, total (% of GDP)	SE.XPD.TOTL.GD.ZS
(7) Int. tourism, number of arrivals	ST.INT.ARVL
(8) Int. tourism, number of departures	ST.INT.DPRT
(9) GDP per capita, PPP (constant 2021)	NY.GDP.PCAP.PP.KD
(10) Int. Tourism, expenditures for passenger transport items	INT.TRNX.CD
(11) Int. Tourism, receipts for passenger transport items	INT.TRNR.CD
(12) School enrollment, Secondary (% gross)	SE.SEC.ENRR
(13) School enrollment, Tertiary (% gross)	SE.TER.ENRR

Note: We derive the following variables used in the models:

- Travel (tourism openness) = $(No.\ of\ arrivals + No.\ of\ departures)/population$
- Average real cost of travel = $\left(\frac{No.\ of\ arrivals}{receipts...items} + \frac{No.\ of\ departures}{expenditures...items}\right)/2cpi$
- Per-capita gov. exp. on edu. = $Gov.\ exp.\ on\ edu. \times GDP\ per\ capita$
- Per capita private credit = $Domestic\ credit... \times GDP\ per\ capita$

Table A3: Correlation matrix of all the variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Human capital index	1.00							
(2) Secondary enrollment	0.70	1.00						
(3) Tertiary enrollment	0.75	0.73	1.00					
(4) International travel	0.44	0.37	0.34	1.00				
(5) Average cost of int. travel	0.12	0.16	0.03	-0.25	1.00			
(6) Gov't exp. on edu. per capita	0.59	0.60	0.49	0.54	0.13	1.00		
(7) Private credit per capita	0.59	0.46	0.44	0.40	0.24	0.85	1.00	
(8) Life expectancy	0.67	0.69	0.61	0.39	0.15	0.65	0.62	1.00

Appendix B

We solve the consumer maximization problem. Setting up Lagrangian equation (dropping the subscript)

$$L(C, T, \lambda) = \ln C + \ln T + \lambda(Y - C - pT) \tag{B.1}$$

Taking the first derivative of the Lagrangian equation with respect to C and T (note that $Y = h^\alpha$ and $h = \beta T + \beta^{\boldsymbol{H}}\boldsymbol{H} + e$), we obtain:

$$\frac{1}{C} = \lambda, \tag{B.2}$$

$$\frac{1}{T} = \lambda(p - \beta Y'). \tag{B.3}$$

From Equations (B.2) and (B.3)[16], we get

$$C = T(p - \beta Y'). \tag{B.4}$$

With the assumption that C and T are positive and using the fact that $Y' = \alpha Y/h$, we obtain:

$$p > \alpha\beta Y/h. \tag{B.5}$$

Substituting Equation (B.4) into Equation (3) and $Y_t = h_t^\alpha$, we get:

$$T = \frac{h^\alpha}{2p - \alpha\beta h^{\alpha-1}}.$$

[16] Y' denotes the first order derivative of Y respect to h.

Taking the first derivative of T with respect to h (and note that $Y_t = h_t^{\alpha}$), we obtain:

$$T' = \frac{Y'(2p - \alpha\beta Y/h) + \alpha\beta Y(Y'/h - Y/h^2)}{(2p - \alpha\beta Y/h)^2},$$

where $x'(x = T, Y)$ is the first derivative of x with respect its argument (h). We need to show that the numerator is positive. Using the fact that $Y' = \alpha Y/h$, the numerator becomes:

$$Y'(2p - \beta Y/h).$$

From (B.5), we have:

$$p > \alpha\beta Y/h.$$

Because the labor share α exceeds 50%, we get

$$2p > 2\alpha\beta Y/h > \beta Y/h.$$

This proves that $T' > 0$.

Appendix C

Table A4: Human capital and lagged international travel, FE estimates

	Human capital index				Secondary enrollment				Tertiary enrollment			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Lagged international travel	0.100***	0.080***	0.081***	0.031***	3.449***	2.355***	2.372***	-0.239	7.389***	5.234***	5.334***	2.947***
	(0.007)	(0.007)	(0.007)	(0.005)	(0.469)	(0.499)	(0.500)	(0.437)	(0.570)	(0.590)	(0.580)	(0.547)
Gov't exp. on edu. per capita		0.011***	0.009***	0.002		0.594***	0.561***	0.191**		1.170***	0.978***	0.639***
		(0.001)	(0.002)	(0.001)		(0.103)	(0.107)	(0.091)		(0.122)	(0.124)	(0.114)
Private credit per capita			0.0002****	0.00008***			0.003	-0.004*			0.019***	0.012***
			(0.000)	(0.000)			(0.003)	(0.002)			(0.003)	(0.003)
Life expectancy				0.053***				2.784***				2.545***
				(0.002)				(0.135)				(0.169)
Observations	1,056	1,056	1,056	1,056	1,056	1,056	1,056	1,056	1,056	1,056	1,056	1,056
R-squared	0.19	0.35	0.39	0.49	0.13	0.35	0.34	0.50	0.11	0.24	0.25	0.37
Number of countrycode1	64	64	64	64	64	64	64	64	64	64	64	64

Note: *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.