Environmental Science and Pollution Research
https://doi.org/10.1007/s11356-022-19819-2

RESEARCH ARTICLE

Is there a trade-off between financing current account deficits and environmental deterioration in developing countries? An empirical investigation for the validity of the pollution haven hypothesis

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Received: 10 December 2021 / Accepted: 16 March 2022

Abstract
The impact of foreign direct investment (FDI) on environmental quality has been discussed in the environmental economics literature over the last decades. Within this scope, the pollution haven hypothesis (PHH) postulates that FDI inflows can cause environmental degradation in developing countries. Using data over the period 1993–2018 for 10 developing countries with current account deficits, this paper aims to test the validity of the PHH. Therefore, the paper examines whether or not developing countries face off a trade-off between financing current account deficits and environmental deterioration. The paper employs panel data methods that consider cross-sectional dependence. The empirical findings show that foreign direct investment inflows have no impact on environment, meaning the PHH does not dominate for these countries. Hence, the findings indicate that there is no trade-off between financing current account deficits and environmental deterioration.

Keywords Current account deficit · Foreign direct investment · Environmental deterioration · Pollution haven hypothesis · Panel data analysis

Introduction

The balance of payments is a record of all economic transactions between residents of a country and residents of the rest of the world (Pilbeam 2006). The current account balance is the first subaccount of the balance of payments and indicates the monetary value of international flows related to transactions in goods, services, income flows, and unilateral transfers (Carbaugh 2009). A current account deficit for a country means that it spends abroad more than it earns from abroad, while a current account surplus implies that it earns from abroad more than it spends abroad (Pilbeam 2006). Put differently, a current account deficit means that the expenditures of the country for foreign goods and services are higher than the income obtained from international sales of its own goods and services (Carbaugh 2009). In addition, from a macroeconomic perspective, the current account balance is equal to the difference between national savings and national investments (International Monetary Fund (IMF) 2010). Therefore, the current account balance is also a reflection of the investment-savings balance of a country.

In the economics literature, it is widely accepted that the balance of payments and the current account balance are closely related to economic crises (Krugman 1979; Ferretti and Razin 1998; Kang and Shambaug 2016). For instance, a gradual decrease in foreign exchange reserves stemming from the problems in the balance of payments led to a speculative attack for national currencies in many countries,

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Published online: 24 March 2022

which in turn resulted in severe economic crises (Krugman 1979; Flood and Garber 1984). Within this scope, Kaminsky (2006) revealed that 13% of economic crises in developed economies and 17% of economic crises in developing economies were directly associated with the deteriorations in the balance of payments.

A current account deficit is financed by the capital and financial account which consists of foreign direct investment (FDI), portfolio investment, and foreign debts. As was stressed by Agarwal (1997), a great share of foreign portfolio investments in the capital and financial account may lead to considerable problems. Accordingly, foreign investors can suddenly decide to leave the country in which they are investing easily. Hence, the reversal of foreign capital flows can lead to depreciation of the national currency. Additionally, if the current account deficit is financed by mainly foreign debts, the net international investment position (NIIP) of the country is negatively affected. NIIP indicates the value of the difference between external assets and external liabilities. Therefore, financing current account deficit through FDI inflows is more reasonable compared to portfolio investment and foreign debts for a country as (i) it is more difficult for foreign investors who make FDI to leave the host country in the presence of a possible economic downturn (Gopalan et al. 2018) and (ii) the economic, political, and geopolitical risk is shared between the FDI investors and the host country (Fry et al. 1995). Besides financing the current account deficit, FDI inflows are likely to create employment opportunities, export revenues, enhance productivity, lead to positive externalities, result in infrastructure investments, and improve the technology level in the host country (World Bank 1993; Anyanwu 2006; Acharyya 2009; Shahbaz et al. 2015).

Despite these desirable impacts of FDI inflows in the context of the contributions to the economy, an extending theoretical and empirical literature in the environmental economics has examined the possible negative effects of inward FDI on environmental quality in the host country. In other words, the negative environmental impacts of FDI inflows have comprised a considerable part of the research agenda in the environmental economics literature in recent years. These studies stress that FDI may also result in some problems that can threaten environmental sustainability. The view in these studies is denominated as the pollution haven hypothesis (PHH) in the environmental economics literature. The PHH postulates that higher capital mobility along with relatively weaker regulations for environment in developing economies may attract multinational companies in polluting and dirty industries, leading to the migration of dirty and polluting industries from developed countries to developing countries (Akbostanci et al. 2007; Mert and Boluk 2016). Accordingly, multinational firms tend to move their operations to less developed countries to take advantage of less compelling environmental regulations. Additionally, a country may undervalue environmental quality to attract new investments. In either case, this results in extreme (non-optimal) pollution levels and environmental degradation. Therefore, developing countries may face off environmental deterioration as a result of FDI inflows including the migration of the dirty and polluting firms (Baek 2016; Zhang and Zhou 2016). Herewith, the resource- and pollution-intensive industries have a significant impact on creating a local preference for areas with low environmental standards in developing countries (OECD, 1999).

One can observe through World Bank (2021) data that a considerable part of middle-income/developing countries has a current account problem, meaning they have great current account deficits. As is clearly expressed above, the most reasonable way to finance the current account deficit is financing this deficit through FDI inflows. Hence, these countries may face with a possible trade-off between financing the current account deficit and environmental destruction. Put differently, on one hand, FDI inflows towards developing countries can finance the current account deficit in the most desired way. On the other hand, these FDI inflows can negatively influence environmental quality and increase environmental destruction in these countries. Put differently, considering the emphasis of environmental economics theory and research sources reporting less stringent environmental regulations, the PHH may prevail for developing countries. This paper focuses on this question and examines whether the PHH dominates for the developing countries with current account deficits. More clearly, the paper investigates the possible presence of the PHH for 10 developing countries (Argentina, Brazil, Chile, Colombia, Czechia, Mexico, Peru, Poland, South Africa, and Turkey) within a panel data framework over the period 1993–2018. Hence, the paper searches for whether developing economies finance the current account deficit through FDI inflows at the expense of environmental destruction.

The present paper contributes to the environmental economics literature in some ways. Firstly, the previous papers using a panel data analysis in the extant ecological economics literature mostly ignore the possible presence of cross-sectional dependence (CD). Within this frame, only Destek and Okumus (2019) perform panel data methods that take CD into account. Hence, the previous papers may have presented inefficient and unbiased empirical findings about the validity of the PHH for developing countries. The paper considers the possible presence of CD to present efficient and unbiased empirical output. Secondly, the paper neither randomly selects the countries in the data set nor focuses on investigating the PHH for a region. Accordingly, the paper examines whether the PHH dominates in developing countries with current account deficits. Therefore, the paper examines the validity of the PHH with a special focus

Table 1 FDI, CAB, and FDI/CAB

Countries	2000			2010			2015			2018		
	FDI	CAB	FDI/CAB	FDI	CAB	FDI/CAB	FDI	CAB	FDI/CAB	FDI	CAB	FDI/CAB
Turkey	0.98	−9.92	−9.89	9.09	−44.62	−20.39	19.26	−27.31	−70.52	12.82	−21.74	−58.96
Argentina	10.42	−8.98	−116.01	11.33	−1.623	−698.25	11.75	−17.62	−66.72	11.71	−27.08	−43.26
Brazil	32.99	−24.96	−132.19	82.39	−79.24	−103.97	64.73	−54.79	−118.15	78.16	−51.45	−151.9
Chile	4.86	−0.89	−541.49	16.02	3.06	522.02	20.87	−5.735	−364.04	7.75	−11.64	−66.66
Colombia	2.43	0.84	288.20	6.43	−8.58	−74.91	11.62	−18.7	−62.13	11.29	−14.04	−80.46
Czechia	4.98	−2.69	−185.41	10.16	−7.35	−138.31	1.69	0.84	201.11	8.32	1.259	660.84
Mexico	18.38	−18.75	−98.02	30.52	−4.83	−632.07	35.81	−31.08	−115.25	37.70	−25.12	−150.05
Peru	0.81	−1.546	−52.37	8.45	−3.56	−237.19	8.31	−9.52	−87.278	6.19	−3.91	−158.19
Poland	9.33	−10.34	−90.25	18.39	−26.66	−68.99	15.06	−4.34	−346.56	17.62	−7.53	−233.83
South Africa	0.96	−0.19	−508.42	3.69	−5.42	−68.12	1.52	−14.94	−10.17	5.56	−12.28	−45.32

CAB, current account balance in billion USD, *FDI*, foreign direct investment inflows in billion *USD*, *FDI/CAB*, The ratio of FDI inflows to CAB (%). Source: World Bank (2021)

on current account balance by differing from the previous papers in the literature. Within this scope, it should also be noted the FDI inflows towards the countries in the data set have considerably increased over the last decades. Accordingly, as per World Bank (2021) data, the share of the countries in the data set in global FDI inflows was 5.5% in 2000 and was 10% in 2010. This ratio increased to about 18.5% in 2018. Table 1 reports FDI inflows, current account balance, and the ratio of FDI inflows to the current account balance for the countries in the data set. As is seen in the table, FDI inflows have a considerable role in financing the current account deficits of these countries. This table indicates there may be a trade-off between financing the current account deficits and environmental destruction stemming from FDI inflows for these countries.

The rest of the paper is organized as follows: the following section presents the empirical literature about the PHH for developing countries. Model and data set are presented in "Model and data set" section while "Empirical strategy" section introduces the estimation methods. Findings are exhibited in "Results" section. "Conclusion" section concludes the paper.

Literature review

One can see from the extant literature that lots of studies have investigated the prevail of the PHH for developing countries. He/she can also notice that a great part of these studies has been published in the last years.

This paper distinguishes the previous papers in the extant environmental economics literature into two parts. The first part of the papers finds evidence in favor of the PHH hypothesis, meaning FDI inflows increase environmental deterioration. For instance, Lau et al. (2014) test the PHH for Malaysia for the period 1970–2008 via the autoregressive distributed lag (ARDL) approach and the Granger causality test based on the vector error correction model (VECM). They find strong evidence for the validity of the PHH. Sapkota and Bastola (2017), utilizing data for the period 1980–2010 and running the fixed effects and random effects estimators, give evidence in favor of the PHH for Latin American countries. Bakirtas and Cetin (2017) analyze the validity of the PHH for MIKTA (Mexico, Indonesia, South Korea, Turkey, and Australia) countries over the period 1982–2011 by performing the panel vector autoregressive (PVAR) model and the panel Granger causality test. They find the PHH is valid for these countries. Solarin et al. (2017) examine the PHH for Ghana using data over the period 1980–2012 via the ARDL approach to cointegration. They present evidence that the PHH prevails for Ghana. Kocak and Sarkgunesi (2018) employ a cointegration test with structural breaks and use data for the period 1974–2013 to test whether the PHH dominates in Turkey. Their findings indicate the PHH dominates for Turkey. Ur Rahman et al. (2019), who test the PHH for Pakistan, employ data for the period 1975–2016 and the nonlinear ARDL approach. The findings of this paper imply the PHH is valid in Pakistan. Shao et al. (2019) perform the panel cointegration and causality analyses to examine the validity of the PHH over the period 1982–2014 in MINT (Mexico, Indonesia, Nigeria, and Turkey) and BRICS (Brazil, Russia, India, China, and South Africa) countries. They find that the PHH prevails for both country groups. Balsalobre-Lorente et al. (2019), utilizing data for the period 1990–2013 and carrying out panel cointegration and causality analyses, examine whether the PHH is valid in MINT countries. Their findings imply the PHH dominates in these countries. Mert and Caglar (2020), using data for the period 1974–2018 and performing a causality test, find that the PHH dominates for the Turkish

economy. Terzi and Pata (2020) investigate the validity of the PHH for Turkey by using data for the period 1974–2011 and a causality test. They obtain findings in favor of the PHH. Bulut et al. (2021) test the validity of the PHH for Turkey by using data over the period 1970–2016 and employing nonlinear smooth transition models. They yield that the PHH dominates for Turkey.

The second part of the papers finds that the PHH is not valid, implying environmental destruction is not related to FDI inflows. For instance, Al-Mulali and Tang (2013) examine the validity of the PHH for The Gulf Cooperation Council (GCC) countries over the period 1980–2009 through panel cointegration and causality methods. They find no evidence in favor of the PHH. Rafindadi et al. (2018), using data over the period 1990–2014, investigate whether the PHH dominates for the GCC countries via panel cointegration tests. Their findings yield the PHH does not dominate for these countries. Destek and Okumus (2019) utilize data covering the period 1982–2013 and perform the panel cointegration methodology to test whether the PHH prevails for newly industrialized countries (Brazil, China, India, Indonesia, Malaysia, Mexico, Philippines, South Africa, Thailand, and Turkey). Their findings indicate the PHH is not valid for these countries. Nadeem et al. (2020) peruse the validity of the PHH for Pakistan using data for the period 1971–2014 via the ARDL bounds test approach to cointegration. Their findings indicate no evidence in favor of the PHH. Finally, Bulut (2021) tests the validity of the PHH for Turkey over the period 1970–2016 by employing the ARDL approach the dynamic ordinary least squares method. The findings of this paper imply the PHH is not valid for Turkey.

As is seen from the extant empirical literature, the previous papers do not exhibit clear-cut evidence for the validity of the PHH in developing countries. Accordingly, some of them find that the PHH prevails, whereas some others do not find any evidence in favor of the validity of the PHH.

Model and data set

In this paper, a panel data analysis is followed to examine whether or not the PHH prevails in developing countries with current account deficits. Accordingly, environmental deterioration is proxied by CO_2 emissions in the paper. In addition to FDI inflows, GDP, renewable energy, and urbanization are included in the empirical model. If the coefficient of FDI is found to be statistically significant and positive, then the PHH prevails. The model incorporates GDP as greenhouse gas emissions are emitted as a result of economic activities.[1] The expected coefficient of GDP is positive and significant. The exploitation of renewable energy sources can reduce environmental destruction and improve environmental quality because far fewer wastes emerge when renewables are used compared to the utilization of fossil energy sources, namely natural gas, coal, and oil (Panwar et al. 2011). Hence, renewable energy sources are considered to be environmentally friendly and energy sources (Bilgili et al. 2016; Bulut and Inglesi-Lotz 2019). Due to these reasons, renewable energy consumption is contained in the model, and the coefficient of renewable energy consumption is expected to be statistically significant and negative. The empirical model also includes urbanization as urbanization can lead to an increase in environmental destruction as the urbanization process increases population and boosts the use of considerable resource utilization in both economic and transportation activities, which in turn can lead to an increase in pollutant emissions (Grazi et al. 2008; Wang et al. 2016; Ozatac et al. 2017; Danish et al. 2020). For this reason, the expected coefficient of urbanization is statistically significant and positive. Based on these explanations, the paper considers the following panel data model:

$$\ln CO_{2it} = \gamma_0 + \gamma_1 \ln GDP_{it} + \gamma_2 \ln FDI_{it} + \gamma_3 \ln REC_{it} + \gamma_4 \ln URB_{it} + \varepsilon_{it} \quad (1)$$

where CO_2, GDP, FDI, REC, URB, and ε are respectively CO_2 emissions (kt), GDP per capita (constant 2015 USD), foreign direct investment (net inflows, current USD), the share of renewables consumption in total final energy consumption, urban population (% of the total population), and the error term. As seen, all variables are used in natural logarithm forms described by ln. The panel data set consists of 10 developing countries (Argentina, Brazil, Chile, Colombia, Czechia, Mexico, Peru, Poland, South Africa, and Turkey) for the period 1993–2018. Data for all variables are obtained from the World Bank (2021).

Empirical strategy

The paper presents the estimation methods in this section. Accordingly, the paper first carries out a CD test to examine whether a positive or negative event in one country affects other countries through trade and capital flows. To test CD, the paper employs the CD test of by Pesaran (2004).

[1] One of the most tested hypotheses in the environmental economics literature is the environmental Kuznets curve (EKC) hypothesis of Grossman and Krueger (1991, 1995). This hypothesis posits that there may be an inverted U-shaped relationship between environmental deterioration and output, implying economic growth first increases environmental problems and then decreases them after output reaches a threshold. As none of the countries in the data set is a developed country, the paper does not examine whether the EKC hypothesis prevails for these countries.

The null hypothesis for this test is that there exists no CD across countries in the panel. Then, the paper utilizes the cross-sectionally augmented Dickey-Fuller panel unit root test (hereafter CADF) of Pesaran (2007) to determine the order of integration of the variables in the model. The null hypothesis for this panel unit root test is that there exists a unit root, meaning the series is not stationary. Additionally, this test is capable of taking possible CD into account. Then, the paper performs the Westerlund (2007) panel cointegration test to check the possible existence of cointegration in the model. Finally, the paper employs the common correlated effects mean group (CCEMG) estimator suggested by Pesaran (2006) to estimate the long-run parameters of the regressors in the model.

Westerlund (2007) panel cointegration test

Westerlund (2007) suggests a panel cointegration test that relies on the error correction model and considers CD. Westerlund (2007) produces four test statistics, namely P_τ, P_α, G_τ, and G_α, to examine whether there exists cointegration in the panel data model. While P_τ and P_α statistics rely on pooling information about the error correction model, this information is not utilized by G_τ and G_α statistics. The null hypothesis of the absence of cointegration is tested for this panel cointegration test. Westerlund (2007) first utilizes the data model described as follows:

$$\Delta y_{it} = \delta_i d_t + a_i y_{it-1} + \lambda_i x_{it-1} + \sum_{j=1}^{p_i} a_{ij}\Delta y_{it-j} + \sum_{j=0}^{p_i} \gamma_{ij}\Delta x_{it-j} \quad (2)$$

In Eq. (2), d_t and λ_i respectively stand for deterministic components and long-run coefficients. Besides, α_{ij} and γ_{ij} show short-run parameters. For P_α and P_τ tests, the null hypothesis of the absence of cointegration that is defined as H0: $p_i = 0$ for all i is tested against the alternative of cointegration that is described as H1: $p_i < 0$ for all i. These test statistics are calculated as below:

$$P_\alpha = T\hat{\alpha} \quad (3)$$

$$P_\tau = \frac{\hat{\alpha}}{SE(\hat{\alpha})} \quad (4)$$

Additionally, the null hypothesis of the absence of cointegration is stated as H0: $p_i = 0$ for all i while the alternative hypothesis of cointegration is defined as H1: $p_i < 0$ for at least some i for G_α and G_τ tests. G_α and G_τ tests statistics are computed as follows:

$$G_\alpha = \frac{1}{N}\sum_{i=1}^{N} \frac{T\hat{\alpha}_i}{\hat{\alpha}_i(1)} \quad (5)$$

Table 2 CD test

Variable	Statistic	Prob. value
$lnCO_2$	9.970*	0.000
lnGDP	31.470*	0.000
lnFDI	20.490*	0.000
lnREC	0.680	0.494
lnURB	11.000*	0.000

*1% significance level.

$$G_\tau = \frac{1}{N}\sum_{i=1}^{N} \frac{\hat{\alpha}_i}{SE(\hat{\alpha}_i)} \quad (6)$$

CCEMG estimator

If cointegration is found in a panel data model including CD, the long-run coefficients can be estimated through the CCEMG estimator developed by Pesaran (2006). Pesaran (2006) uses the following panel data model:

$$y_{it} = \alpha_i d_t + \beta_i x_{it} + e_{it} \quad (7)$$

In Eq. (7), d_t is an $n \times 1$ vector of common effects that are observed while x_{it} denotes a $k \times 1$ vector of independent variables. The errors are described as follows:

$$e_{it} = \gamma_i f_t + \varepsilon_{it} \quad (8)$$

In Eq. (8), f_t indicates the $m \times 1$ vector of common effects that are not observed while ε_{it} stands for the errors. For this test, f_t is defined as $f_t = \bar{\lambda}^{-1}\left(\bar{y}_t - \bar{a} - b\bar{x}_t\right)$, and extends Eq. (7) as the following:

$$y_{it} = \alpha_i + \beta_i x_{it} + d_{1i}\bar{y}_t + d_{2i}\bar{x}_t + e_{it} \rightarrow \hat{b}_{CCEMG} = N^{-1}\sum_{i=1}^{N}\hat{b}_i \quad (9)$$

where $\hat{b}_{CCEMG}$ stands for the long-run parameters of the regressors.

Results

The findings obtained from the CD_{NT} test are reported in Table 2. As seen, the null hypothesis of no CD is rejected at 1% level for all variables except lnREC by the test, implying the existence of CD in the empirical model. Hence, the analysis yields that there is evidence in favor of the existence of CD in the empirical model.

After determining the existence of CD in the model, this paper employs the CADF panel unit root test to examine the order of integration of the variables. Table 3 reports the results for this test. As is seen, the null hypothesis of the presence of a unit root is not rejected at level, but it is

Table 3 CADF panel unit root test

Variable	Test statistic	
	Level	1st difference
$lnCO_2$	−1.711	−2.631*
lnGDP	−1.920	−2.413**
lnFDI	−1.981	−3.126*
lnREC	−1.111	−2.872*
lnURB	−2.153	−2.406**

* and ** respectively illustrate 1% and 5% significance levels.

Table 4 Westerlund (2007) panel cointegration test

Statistic	Value	*p* value
G_τ	−3.173*	0.000
G_α	−3.629	0.997
P_τ	−8.704*	0.002
P_α	−5.891	0.523

*1% significance level.

Table 5 CCEMG estimator

Variable	Coefficient	Std. error	Prob. value
lnGDP	0.744*	0.156	0.000
lnFDI	−0.005	0.005	0.247
lnREC	−0.320**	0.132	0.016
lnURB	7.441	7.089	0.294
Constant	4.692	16.155	0.771

* and ** respectively indicates 1% and 5% significance levels.

rejected at first differences for the variables. Thus, the output of the test presents evidence the variables become stationary at the first difference forms, implying possible cointegration in the panel data model can be investigated.

The next step in the empirical analysis is to investigate whether there occurs a cointegration relationship in the model. The results obtained from the Westerlund (2007) panel cointegration test are demonstrated in Table 4. As is seen, the null hypothesis of no cointegration is rejected by G_τ and P_τ test statistics, while it cannot be rejected by G_α and P_α test statistics. Hence, two out of four statistics present evidence in favor of the existence of cointegration, meaning the presence of cointegration in the empirical model and that the long-run coefficients could be estimated through the CCEMG estimator.

Finally, Table 5 exhibits the empirical outputs of the CCEMG estimator. One can observe from Table 4 that lnGDP, lnFDI, lnREC, and lnURB respectively appear to have the estimations of 0.744, − 0.005, − 0.320, and 7.441. He/she can also observe that the parameters of lnGDP and lnREC are statistically significant, while the parameters of lnFDI and lnURB are insignificant. Therefore, the paper explores that $lnCO_2$ is positively related to lnGDP and is negatively related to lnREC. The paper explores that $lnCO_2$ is not related to lnFDI and lnURB as well.

The empirical findings indicated by the CCMEG estimator show that an increase (decrease) in output results in an increase (decrease) in environmental deterioration and that an increase (decrease) in the utilization of renewables results in a decrease (increase) in environmental destruction in developing economies. Both results are compatible with the expectations as CO_2 emissions emerge due to economic activities, and renewable energy sources are cleaner compared to fossil energy sources. The findings also indicate urbanization has no influence on environmental destruction in developing economies. Even though a large body of the extant literature is interested in the negative impacts of urbanization on environmental quality, Sadorsky (2014) explains why urbanization may have no impact on environmental destruction. Accordingly, on one hand, higher urbanization results in greater economic activities, which in turn increase CO_2 emissions. On the other hand, increasing urbanization may also lead to economies of scale for public infrastructure, and economies of scale may reduce environmental damage. These two opposing impacts of urbanization on CO_2 emissions can offset each other, and the net impact of urbanization on CO_2 emissions may be equal to zero. Last but not least, the paper presents evidence that the PHH does not prevail in developing countries in the data set as the coefficient of FDI is statistically insignificant. Accordingly, FDI inflows appear to finance the current account deficits of developing countries while they do not accelerate environmental damage in these countries. Hence, the analysis reveals that the developing countries do not face a trade-off between financing the current account deficits and environmental deterioration.

Conclusion

It is widely accepted in the international economics literature that the most reasonable way to finance the current account deficit is to attract FDI inflows as FDI inflows can contribute to increase employment, export revenues, productivity, and the technology level in the host country. Yet, the negative impact of FDI inflows on environmental quality has been assessed in the ecological economics over the last decades as FDI inflows stemming from the transfer of dirty and polluting industries from developed economies to developing economies may lead to environmental destruction in developing economies. This view refers to the PHH in the existing environmental economics literature.

This paper examines whether the PHH prevails for 10 developing countries with current account deficits over the

period 1993–2018 within a panel data framework. After employing a recently produced CD test and detecting the existence of CD, the paper utilizes a panel unit root test and detects all variables are integrated of order one. Afterwards, the paper carries out a panel cointegration test and yields that there occurs cointegration in the model. Finally, the paper runs a panel data estimator to estimate the long-run coefficients of the independent variables in the model. The empirical results indicate that FDI inflows have no influence on environmental quality, meaning the PHH does not dominate for these countries, and there is no trade-off between financing current account deficits and environmental destruction.

The findings that imply the non-existence of the PHH provide considerable implications. First, the FDI inflows towards the developing countries do not have negative effects on environmental quality in these countries. The distribution of global inward FDI stock implies that the services sector accounts for almost two-thirds of global FDI stock. As per UNCTAD (2021) data, in 2014, services were calculated for 64% of global FDI stock, followed by manufacturing (27%) and the primary sector (7%). Besides, the overall sectoral patterns of inward investment are similar in developed and developing economies. These data confirm the findings of the present paper as the services sector needs less energy and produces fewer pollutant gas emissions compared to the manufacturing sector. Moreover, these FDI inflows can contribute to the sustainable development goals (SDGs) of these countries indicated by the United Nations. Accordingly, the expected benefits of FDI inflows appear to be directly related to SDG-8 (decent work and economic growth) and SDG-9 (industry, innovation, and infrastructure). Second, these countries with current account deficits should improve their current account balances not to face off an economic crisis triggered by the current account deficits. Within this frame, the present paper presents some policy proposals for the policy makers in these countries. First, as was stressed in the first part of the paper, the current account balance is equal to the difference between national savings and national investments, implying there exists a current account deficit when national savings cannot finance national investments. Hence, not to decrease national investments and sacrifice economic growth, saving rates in these countries should be increased. Second, these countries should re-allocate their sources for producing high-technology and high value-added products to increase their export revenues. Although the share of high technology exports in total manufactured goods exports was around 20% for Mexico and the Czechia in the last years, high-technology exports are quite insufficient for other countries in our sample (World Bank, 2021). Increasing high technology exports can improve the current account of these countries and reduce the probability of an economic crisis stemming from the current account deficits. Besides, these countries should substitute imported goods and services with domestic goods and services by supporting domestic production through incentives and subsidies. Otherwise, a speculative attack towards the national currencies of these countries can lead to a financial crisis, which in turn negatively influences output and employment, just like many developing countries have experienced throughout the last decades. Finally, the empirical findings imply that environmental quality is positively related to renewable energy. In 2018, the share of renewable energy consumption in total energy consumption was respectively 47% and 30% for Brazil and Colombia. However, data for renewable energy indicates that the use of renewable energy is not sufficient in other countries. As a clean energy source, renewable energy can support economic growth without increasing CO_2 emissions. Hence, the countries in the data set should adopt energy policies to change the energy mix in favor of renewable energy and also support FDI in possible renewable energy projects.

Author contribution Umit Bulut: conceptualization, formal analysis, methodology, project administration, writing—original draft, writing—review and editing. Hande Aksoz-Yilmaz: conceptualization, data curation, investigation, writing—original draft, writing—review and editing. Gulbahar Ucler: supervision, validation, writing—original draft. Dila Nur Basaran: data curation, validation, writing—original draft.

Data availability The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate Not applicable.

Consent for publication Not applicable.

Competing interests The authors declare no competing interests.

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