Understanding the impact of economic complexity on balance of payments across countries

Yusuf Ünsal
Anadolu University,
Faculty of Economics,
Anadolu Univeritesi Iktisat
Fakultesi Yunus Emre kampusu,
Eskişehir, Turkiye
Email: y_unsal@anadolu.edu.tr

Ibrahim Tuğrul Çinar
Anadolu University,
Faculty of Economics,
Anadolu Univeritesi Iktisat
Fakultesi Yunus Emre kampusu,
Eskişehir, Turkiye
Email: itcinar@anadolu.edu.tr

Bülent Günsoy
Anadolu University,
Faculty of Economics,
Anadolu Univeritesi Iktisat
Fakultesi Yunus Emre kampusu,
Eskişehir, Turkiye
Email: bgunsoy@anadolu.edu.tr

This study examines the long-term effects of the economic complexity index (ECI) on the current account balance in 66 countries from 1995 to 2021. Economic complexity, reflecting a country's knowledge, technological capabilities, and skill sets in production and exports, influences the current account balance differently based on its economic structure and development stage. The empirical approach includes tests for homogeneity, cross-sectional dependence, unit roots, and cointegration, with long-term coefficients estimated using the augmented mean group (AMG) estimator. The findings reveal that while higher economic complexity generally exerts a negative effect on the current account balance, this relationship varies significantly across economies. In advanced economies like the United States and the United Kingdom, increased economic complexity positively influences the current account balance, likely due to their advanced industrial structures and robust technological infrastructures. In contrast, in middle-income economies such as Turkey, Poland, and Sweden, the relationship is negative, highlighting challenges related to competitiveness in sophisticated product markets. These divergent outcomes emphasize the need for country-specific policies that account for economic structures and development levels when leveraging economic complexity for external balance improvements. The study contributes to the existing literature by addressing a relatively underexplored relationship between economic complexity and the current account balance, offering both theoretical insights and actionable policy recommendations.

Keywords:
trade balance,
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Introduction

In recent years, the economic complexity index (ECI) has attracted increasing attention for its ability to explain the complex dynamics driving a country's economic growth. Unlike conventional metrics of export diversification, the economic complexity index assesses the depth of knowledge, technological advancements, and skills embedded in a nation's production and export activities (Hidalgo–Hausmann 2009, Doğan et al. 2023). This index is a crucial indicator of advanced economic structures, showcasing a country's capability to produce and export high-value-added goods (Hidalgo–Hausmann 2009).

Countries with high levels of economic sophistication have transitioned from traditional production and export structures to specializing in sectors that are driven by advanced technology and knowledge-intensive processes (Hausmann et al. 2014). This sophistication not only stabilizes export revenues but also enhances economic resilience and sustainability by strengthening competitive advantages in the global market (Hidalgo–Hausmann 2009). Additionally, nations that focus on complex products can experience positive spillover effects, such as the development of a skilled workforce and the attraction of foreign direct investment (Hausmann et al. 2014). These factors can contribute to a more favourable current account balance by mitigating the risks associated with external economic vulnerabilities.

The balance of payments serves as a comprehensive overview of a country's international economic transactions and is divided into two primary components: the current account and the capital-financial account (Krugman et al. 2018). The current account balance reflects a nation's net export income, representing the difference between exports and imports (IMF 2020). Given that economic complexity is derived from export data, it is closely tied to a country's trade profile. Consequently, economic sophistication can have a direct impact on the trade balance of goods and services, thereby influencing the current account balance.

Understanding the relationship between economic complexity and current account balance is crucial because the current account is a key indicator of a country's external economic health. In the case of persistent imbalances, the balance of payments can signal structural weaknesses, vulnerabilities to external shocks or unsustainable consumption and investment patterns. The relationship between economic complexity and the balance of payments may differ depending on a country's income level. High-income countries with advanced industrial and technological infrastructure may exhibit different dynamics compared to middle- and low-income countries. Countries with high economic complexity often exhibit stable trade surpluses thanks to their ability to export technologically advanced and high value-added products. These trade surpluses can support sustainable current account balances. In contrast, countries with low economic complexity are more vulnerable to global price fluctuations and external shocks, as they depend on exports of raw materials or low value-added products. In contrast, middle-income countries, depending on their level of industrialization and integration into global value chains, may have a more uncertain structure where economic complexity can lead to both current account surpluses and deficits. Low-income countries, on the other hand, generally have lower levels of economic complexity and limited capacity to produce and export sophisticated products (Hidalgo–Hausmann 2009). However, as these countries increase their economic complexity, they may temporarily lose their global competitive advantage in less sophisticated products, which may have negative effects on export revenues and the current account balance (Çinar et al. 2022, Korkmaz et al. 2024). Therefore, this study aims to explore the relationship between economic complexity and the balance of payments in 66 countries from 1995 to 2021, with a particular emphasis on the current account balance, a crucial aspect of a country's external economic structure.

The remainder of the paper is structured as follows: the authors review the theoretical and empirical literature on the relationship between economic complexity and the current account balance. Then, a detailed explanation of the methodology employed in the study is provided, followed by the main empirical findings. After discussing the results, the conclusions of the study are presented.

Literature review

The economic complexity index serves not only as a measure of a country's export capability but also as an indicator of its overall level of productive knowledge (Hausmann et al. 2014). This knowledge encompasses advanced skills, higher education, and specialized qualifications (Adam et al. 2023). In this context, economic complexity also mirrors a nation's human capital. The skilled labour theory, developed by Keesing (1965, 1966) and Kenen (1965), aligns with the economic complexity approach by emphasizing the role of human capital. This theory highlights the ability of a workforce with a certain level of education, knowledge, and skills to engage in complex, high-value-added jobs. It underscores the importance of the education and skill levels of the labour force on productivity, asserting that a skilled workforce is crucial for economic growth and development. Skilled labour is closely tied to innovation, the application of technology, and competitive advantage in modern economies (Keesing 1965, 1966). The production of complex and sophisticated products requires advanced technical knowledge, skills, and innovative thinking, which can only be achieved with a highly skilled workforce. By enhancing its capacity to train a qualified labour force, a country can increase its ability to produce more complex products.

Beyond skilled labour and human capital, economic complexity has been studied in relation to economic growth (Hidalgo–Hausmann 2009, Hausmann et al. 2014, Chavez et al. 2017, Stojkoski–Kocarev 2017, Hidalgo 2021, Çinar 2023), income inequality (Hartmann et al. 2017, Fawaz–Rahnama-Moghadamm 2019, Lee–Vu 2020, Zhu et al. 2020), and globalization (Can 2016, Kurt 2018, Yu–Qayyum 2022, Azimi–Azimi 2022). The hypothesis that economic complexity is a significant driver of a country's economic growth (Hidalgo–Hausmann 2009, Hausmann et al. 2014) has been validated by numerous empirical studies (Chavez et al. 2017, Stojkoski–Kocarev 2017, Britto et al. 2019, Lee–Lee 2020, Hidalgo 2021, Inoua 2023). Furthermore, studies have also explored the link between economic complexity and exports (Erkan–Yildirimci 2015, Şeker–Şimdi 2019, Dar et al. 2020, Vu 2022, Canh–Thanh 2022, Abdi et al. 2023), trade openness (Leite–Cardoso 2023, Ispiroğlu 2021, Shahabadi–Pouran 2023), FDI attraction (Sadeghi et al. 2020, Antonietti–Franco 2021), international financial inflows (Ogbuabor et al. 2023) and foreign trade (Daude et al. 2016, Akin–Güneş 2018, Khan et al. 2020, Yalta–Yalta 2021, Gnangnon 2022). As the effect of trade freedom on economic complexity increases, so does the capacity to produce a wider variety of goods (Sepehrdoust et al. 2019). Furthermore, Sepehrdoust et al. (2019) demonstrated that a trade freedom shock positively impacts economic complexity.

Guo et al. (2023) identified that higher economic complexity is linked to reduced trade-adjusted resource consumption, highlighting the potential environmental benefits of complex economic structures. Studies by Erkan–Yildirimci (2015) and Khan et al. (2020) found that economic complexity enhances export competitiveness, suggesting that foreign trade can drive the production and export of more sophisticated goods. Canh–Thanh (2022) further demonstrated a positive, bidirectional relationship between economic complexity and export diversification, indicating that not only does the production of complex goods boost exports, but increased exports also contribute to further economic complexity.

Economic complexity affects exports, which in turn influences the degree of trade openness of an economy. Empirical evidence supports the idea that countries with high economic complexity tend to benefit more from trade. At the same time, countries that are more likely to gain from trade are also more likely to have higher trade openness (Doğan et al. 2020). Research on trade openness and economic complexity by Leite–Cardoso (2023) and Shahabadi–Pouran (2023) suggests that trade openness facilitates the transfer of knowledge and technology, thereby enhancing economic complexity. In contrast, Ispiroğlu (2021) contends that while trade openness positively affects complexity, the reverse is not necessarily true, indicating a unidirectional relationship. Can (2016) and Kurt (2018) also found that globalization – both economic and financial – plays a crucial role in advancing economic complexity by integrating nations into more sophisticated global production networks. Conversely, DiPietro–Anoruo (2006) argue that exports, alongside technology transfer, are vital in expanding a country's capability to produce complex goods.

Economic complexity arises when a country can produce a diverse range of products, and its exported goods involve intricate production processes (Shahzad et al. 2022). Exploring the relationship between economic complexity and international trade dynamics, Dar et al. (2020) highlighted a significant correlation between South Korea's trade activities and the economic complexity index, underscoring the interdependence between trade flows and economic sophistication. The mixed findings on the relationship between terms of trade and economic complexity, such as those by Akin–Güneş (2018) and Yalta–Yalta (2021), reveal that this relationship may vary based on specific country contexts. Additionally, Rodríguez-Crespo–Martínez-Zarzoso (2019) found that countries with similar levels of information and communication technologies (ICT) adoption and product complexity tend to engage more in trade, indicating that technological alignment can enhance trade interactions between nations. Studies providing evidence that countries with higher economic complexity are more resilient to external shocks and financial crises (Gomez-Gonzales et al. 2023) emphasize raising a country's level of economic complexity as a tool for maintaining financial stability. Despite the extensive research on the relationship between economic complexity and various economic factors, the connection between economic complexity and the balance of payments, particularly through the current account balance, has been largely overlooked.

Methodology

Data and model

This study examines the effect of the economic complexity index on the current account balance across 66 countries from 1995 to 2021. The time frame of our sample is constrained by the availability of economic complexity data, which spans from 1995 to 2021. Countries lacking sufficient data during this period were excluded from the analysis, resulting in a final sample of 66 countries for the study.

Current account balance (CA), which reflects the difference between a country's economic transactions with the rest of the world over a given period and acts as a crucial measure of external economic relations, is chosen as the dependent variable. Drawing from the literature, the model incorporates five independent variables: imports, the consumer price index (CPI), foreign direct investment (FDI), gross domestic product (GDP), and the economic complexity index (ECI). The balance of imports and exports of goods and services significantly influences the current account balance, making imports an important explanatory variable in the model. The economic complexity index, which captures the embedded knowledge in a country's exported products, also serves as an indicator of high value-added production and exports. Additionally, FDI can indirectly impact the current account balance through exports, imports, and profit transfers (Göçer–Peker 2014), justifying its inclusion as an explanatory variable. GDP and CPI are also incorporated to enhance the model's robustness. The GDP and import variables are log-transformed to smooth the data. However, since the current account balance and FDI are expressed as percentages of GDP, the economic complexity index and consumer price index are not log-transformed. Data for the current account balance, GDP, imports, FDI, and the consumer price index are sourced from the World Bank database, while the economic complexity data are derived from the Harvard Growth Lab database. The model based on these variables is presented in equation 1, and a summary of the variables used in the study is provided in Table 1.

Table 1

Definitions of variables

Variable	Description	Source
CA	current account balance (percentage of GDP)	World Bank (2024)
LNGDP	the logarithm of GDP per capita (constant 2015 USD)	World Bank (2024)
LNM	the logarithm of imports (constant 2015 USD)	World Bank (2024)
FDI	foreign direct investment, net inflows (percentage of GDP)	World Bank (2024)
ECI	economic complexity index	Harvard Growth Lab (2019)
CPI	consumer price index	World Bank (2024)

In equation 1, ε_{it}, is the error term. In addition, *i* denotes the cross-sectional level and *t* denotes the time dimension.

$$CA_{it} = \alpha_0 + \alpha_1 LNGDP_{it} + \alpha_2 LNM_{it} + \alpha_3 ECI_{it} + \alpha_4 CPI_{it} + \alpha_5 FDI_{it} + \varepsilon_{it} \quad (1)$$

Estimation methodology

This study employs a four-step empirical research approach. In the first step, we test the slope coefficients of the variables and the model for homogeneity, along with cross-sectional dependence, to determine whether the data exhibit interdependencies across cross-sectional units. The second step involves assessing the unit root and stationarity properties of the data series to ensure the statistical appropriateness of subsequent analysis. Unit root tests help confirm whether the data are non-stationary and integrated. In the third step, the presence of a long-term relationship is investigated using cointegration analysis. Cointegration tests are critical for determining whether a stable, long-term equilibrium relationship exists among the variables, even if they are non-stationary individually. This step ensures that the relationships explored in the model are not spurious but reflect meaningful economic linkages. Finally, if a cointegration relationship is identified, the long-term coefficient estimates are determined using the augmented mean group (AMG) estimator, as proposed by Bond–Eberhardt (2009) and Eberhardt–Teal (2010). The AMG estimator is particularly well-suited for this study because it accounts for cross-sectional dependence and heterogeneity among panel units. Unlike alternatives such as ordinary least squares (OLS), which assume homogeneity and independence across units, the AMG estimator allows for country-specific dynamics and heterogeneity in both the short-term and long-term parameters. Moreover, compared to the generalized method of moments (GMM), which is better suited for dynamic panels with small T (time periods) and large N (cross-sectional units), the AMG estimator is more appropriate for panels with larger T, as is the case in this study. It also avoids the potential bias introduced by GMM's reliance on lagged variables as instruments, especially when dealing with cross-sectionally dependent data.

Cross-section dependence and slope homogeneity tests

Identifying cross-sectional dependence is crucial in econometric analysis, especially due to the challenges posed by the common factor problem (Tiwari et al. 2023). Therefore, the initial step in panel data analysis involves examining the relationships among cross-sectional units. The selection of tests for identifying cross-sectional dependence depends on whether the time dimension exceeds the cross-sectional dimension (T > N) or the reverse (N > T). The Pesaran (2004, 2021) cross-sectional dependence (CD) test is suitable in both cases, regardless of whether the time dimension is smaller (T < N) or larger (T > N) (Tiwari et al. 2023). In this study, we employ the Pesaran (2004) CD test to examine the presence of cross-sectional dependence in the model. This test is effective in detecting weak cross-sectional dependence and can manage data with non-normally distributed errors (Perone 2024). The Pesaran CD test statistic is detailed below.

$$CD(N,T)=\sqrt{\frac{2T}{N(N-1)}}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{p}_{ij}\right) \tag{2}$$

In equation 2, N represents the cross-sectional units, T denotes the time series dimension and $\hat{p}_{ij}$ is the sample estimate of the pairwise correlation of the error terms. Additionally, in the Pesaran CD test, the probability value is assessed under the null hypothesis of cross-sectional independence.

The homogeneity test examines whether a change in one country impacts other countries at the same level. For models involving countries with different economic structures, cointegration coefficients are expected to be heterogeneous, whereas for models involving countries with similar economic structures, these coefficients are anticipated to be homogeneous (Tiwari et al. 2023). This study employs the slope homogeneity test developed by Blomquist–Westerlund (2013) to assess the slope homogeneity coefficient. The Blomquist–Westerlund (2013) test builds on the method proposed by Pesaran–Yamagata (2008) and generates a normally distributed test statistic under the null hypothesis of homogeneous slope coefficients. It compares the distance between the coefficients derived from pooled fixed effects regression and those obtained from cross-sectional unit-specific regression (Bersvendsen–Ditzen 2021). A key advantage of the Blomquist–Westerlund (2013) test is its effective handling of variance and autocorrelation issues (Lin et al. 2024). The test utilizes the heteroskedasticity and autocorrelation (HAC) consistent test statistic, which is illustrated in equation 3 (Bersvendsen–Ditzen 2021).

$$\tilde{\Delta}_{HAC} = \sqrt{N}\left(\frac{N^{-1}S_{HAC} - k_2}{\sqrt{2k_2}}\right) \quad (3)$$

Unit root test

Testing the stationarity of the time series for both independent and dependent variables is crucial for selecting the appropriate panel estimation technique. In this study, the stationarity of the series is evaluated using the Pesaran (2007) CIPS test, which is especially useful as it accounts for cross-sectional dependence among units (Perone 2024). Furthermore, the test offers a robust and reliable analysis of non-stationarity by addressing the challenges posed by heterogeneity (Dahmani–Ben Youssef 2024). The CIPS test can produce consistent results even when the cross-sectional (*N*) and time (*T*) dimensions are small and are applicable whether $T>N$ or $N>T$ (Pesaran 2007). Pesaran (2007) CIPS test statistic is presented in equation 4.

$$CIPS = \frac{1}{N}\sum_{i=1}^{N} CADF_i \quad (4)$$

CIPS statistics are based on the individual cross-sectional augmented Dickey–Fuller (CADF) statistics for each unit in the panel. The CADF regression is calculated by extending the standard Dickey–Fuller regression to include the cross-sectional averages of both the lagged levels and the first differences of each series. The null hypothesis of the CIPS test suggests the presence of a unit root in the series, while the alternative hypothesis indicates that the series is stationary.

Co-integration analysis

After determining the stationarity levels of the variables, verifying the presence of a long-term relationship through cointegration analysis is essential. Similar to unit root tests, accounting for cross-sectional dependence in cointegration analyses is crucial to avoid biased results (Tiwari et al. 2023). Westerlund (2008) developed the Durbin–Hausman cointegration method, which specifically addresses cross-sectional dependence in this context.

Durbin–Hausman (DH) test is chosen for several reasons: first, it accounts for cross-sectional dependence in the cointegration process; second, it permits the use of explanatory variables with varying levels of integration (I(0) or I(1)) (Westerlund 2008). Moreover, the Durbin–Hausman test can handle both homogeneous and heterogeneous panel parameters across units. The DH panel cointegration test employs the Durbin–Hausman statistic. When panel parameters are consistent across units, the DH panel test statistic is utilized, while the DH group test statistic is applied if the parameters vary between units. The DH cointegration test statistics are detailed in equation 5 and equation 6 (Westerlund 2008).

$$DH_g = \sum_{i=1}^{n} \hat{S}_i(\tilde{\varphi}_i - \hat{\varphi}_i)^2 \sum_{t=2}^{T} \hat{e}_{it-1}^2 \quad (5)$$

$$DH_p = \hat{S}_n(\tilde{\varphi} - \hat{\varphi})^2 \sum_{i=1}^{n} \sum_{t=2}^{T} \hat{e}_{it-1}^2 \quad (6)$$

In equation 5 and equation 6, DH_g and DH_p represent group and panel statistics, respectively. Both test statistics test the null hypothesis of no cointegration against the alternative hypothesis of cointegration.

Method for estimating long-term coefficients

After identifying a cointegration relationship among the series, the next step is to estimate the long-term cointegration coefficients. This study employs the augmented mean group (AMG) estimator, introduced by Bond–Eberhardt (2009) and Eberhardt–Teal (2010), which enables the calculation of both overall panel and country-specific coefficients. The AMG method is especially advantageous because it yields unbiased estimates even when heterogeneity, cross-sectional dependence, and endogeneity are present (Guo et al. 2023). Moreover, the AMG estimator is designed to account for common dynamic effects as well as common factors within the series.

The panel AMG method can be estimated using a two-step technique, as outlined in equation 7 and equation 8 (Mngumi et al. 2024).

$$\Delta y_{it} = \alpha_i + \beta_i \Delta x_{it} + \lambda_i f_i + \sum_{i=2}^{T} \delta_i \Delta D_i + \varepsilon_{it} \quad (7)$$

$$\hat{\beta}_{AMG} = N^{-1} \sum_{i=1}^{N} \hat{B}_i \quad (8)$$

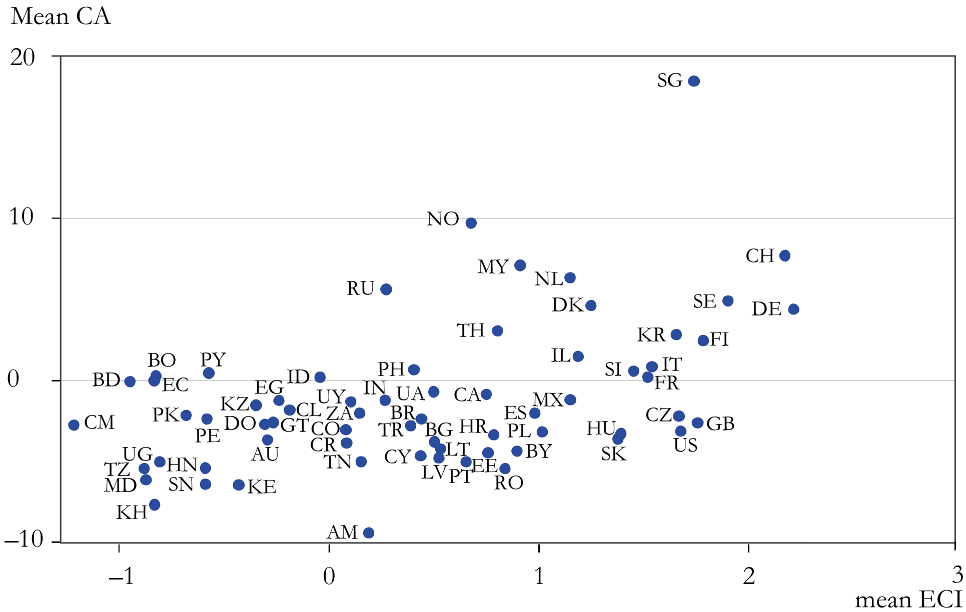
In equation 7, Δ represents the first difference operator and Δx_{it} and Δy_{it} represent observable variables. In addition, β_i, f_i, and δ_i represents the coefficient of country-specific estimators, common factor that ignores heterogeneity, and time dummies, respectively. Finally, ε_{it} represents the error term. In equation 8, $\hat{\beta}_{AMG}$ represents the mean group (MG) estimator for AMG.

Findings

Before presenting the statistical analysis results, Figure 1 displays the scatter plot illustrating the relationship between economic complexity and the current account balance for our sample. Figure 1 shows that Singapore has the highest economic complexity paired with a positive current account balance. Other countries with high economic complexity and positive current account balances include Switzerland, Sweden, and Germany. In contrast, countries like Cambodia, Madagascar, Tanzania, Kenya, Honduras, and Senegal exhibit low economic complexity alongside a negative current account balance. Furthermore, the figure highlights Norway, which, despite having a notably high current account balance, maintains an average level of economic complexity.

Figure 1

Average current account balance (CA) and economic complexity index (ECI)



Notes: AM: Armenia, AU: Australia, BD: Bangladesh, BG: Bulgaria, BO: Bolivia, BR: Brazil, BY: Belarus, CA: Canada CH: Switzerland, CL: Chile, CM: Cameroon, CO: Colombia, CR: Costa Rica, CY: Cyprus, CZ: Czech Republic, DE: Germany, DK: Denmark, DO: Dominican Republic, EC: Ecuador, EE: Estonia, EG: Egypt, ES: Spain, FI: Finland, FR: France, GB: United Kingdom, GT: Guatemala, HN: Honduras, HR: Croatia, HU: Hungary, ID: Indonesia, IL: Israel, IN: India, IT: Italy, KE: Kenya, KH: Cambodia, KR: South Korea, KZ: Kazakhstan, LT: Lithuania, LV: Latvia, MD: Madagascar, MX: Mexico, MY: Malaysia, NL: Netherlands, NO: Norway, PE: Peru, PH: Philippines, PK: Pakistan, PL: Poland, PT: Portugal, PY: Paraguay, RO: Romania, RU: Russia, SE: Sweden, SG: Singapore, SI: Slovenia, SK: Slovakia, SN: Senegal, TZ: Tanzania, TH: Thailand, TN: Tunisia, TR: Turkey, UA: Ukraine, UG: Uganda, US: United States, UY: Uruguay, ZA: South Africa.

Additionally, Table 2 provides the descriptive statistics of the variables used in our analysis, and Figure 2 depicts the annual values of each variable over the sample period.

Table 2

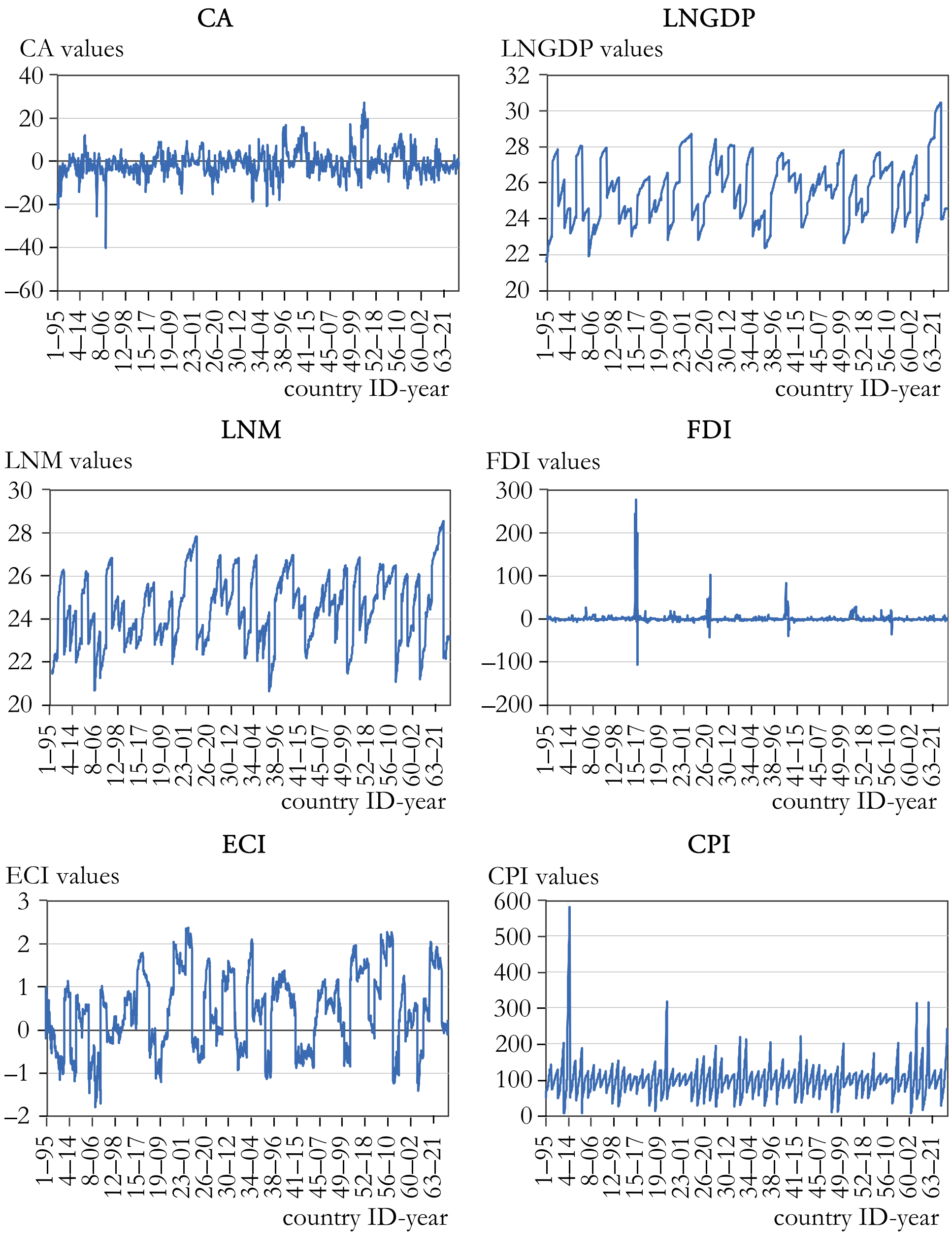
Descriptive statistics

Variable	Mean	Standard deviation	Minimum	Maximum
CA	–1.153192	5.791872	–40.40243	27.14333
LNGDP	8.967438	1.334785	5.937331	11.39099
LNM	24.64581	1.608749	20.7943	28.8115
ECI	0.4587501	0.9087486	–1.808811	2.44531
CPI	95.70203	45.74653	0.3507038	587.3011
FDI	4.622445	14.50723	–103.1567	279.361

Figure 2 offers an initial visual inspection of the variables to identify potential unit roots and helps detect whether the variables exhibit trends, constants, or other characteristics. The visual analysis reveals that the variables display both trends and constants, which will inform the choice of suitable models for the unit root analysis.

Figure 2

Graphs of the variables



The empirical analysis begins by testing for cross-sectional dependence and slope homogeneity. The Pesaran (2004) CD test is used to identify potential cross-sectional dependence, and the results are shown in Table 3. The null hypothesis of no cross-sectional dependence among the panel members is rejected at the 1% significance level, indicating the presence of cross-sectional dependence in the model used in this study.

Table 3

Cross-sectional dependence and slope homogeneity results

Pesaran (2004) CD test results				
CD test statistic value	p-value	correlation coefficient	average correlation coefficient	conclusion
7.21***	0.000	0.030	0.183	cross-sectional dependence exists
Blomquist–Westerlund (2013) test results				
test	test statistic value		p-value	conclusion
Delta test	26.945 ***		0.000	heterogeneous
Adjusted delta test	31.307 ***		0.000	heterogeneous

*** Indicates significance at the 1% level. The Pesaran CD test was conducted with the error term calculated as heterogeneously parameterized using the mean group estimator. Blomquist–Westerlund (2013) test null hypothesis: the slope coefficients are homogeneous.

Notes: Pesaran CD test null hypothesis: there is no cross-sectional dependence.

Table 3 also presents the results of the Blomquist–Westerlund (2013) tests, which evaluate the homogeneity of slope coefficients. The p-values from both the delta test and the adjusted delta test reject the null hypothesis of slope homogeneity at the 1% significance level, indicating heterogeneity among the coefficients. After confirming the presence of cross-sectional dependence and heterogeneity in the model, a unit root analysis appropriate for these conditions was conducted to assess the stationarity levels of the variables. The results of the unit root tests are outlined in Table 4.

Table 4

CIPS panel unit root test results

Variable	CIPS value at level	CIPS value at first difference	Conclusion
CA	–2.494	–4.538***	I(1)
LNGDP	–1.844	–3.503***	I(1)
LNM	–2.544	–4.156***	I(1)
ECI	–3.230***	–	I(0)
CPI	–2.343	–3.145***	I(1)
FDI	–3.552***	–	I(0)

*** Indicates significance at the 1% level. The critical values at the 10%, 5%, and 1% significance levels are –2.58, –2.66, and –2.81, respectively.

Notes: in the unit root analysis, a model with a constant and trend was used.

The CIPS test results in Table 4 indicate that CA, LNGDP, LNM, and CPI are stationary at their first differences, whereas ECI and FDI are stationary at their levels. Given the differing integration orders of the series, the Westerlund (2008) DH panel cointegration test, which accommodates mixed integration orders, was utilized. The outcomes of the Westerlund (2008) DH test are presented in Table 5.

Table 5

Westerlund (2008) DH panel cointegration test results

Test	Test statistic value	P-value
DH group	12.158***	0.000
DH panel	11.096***	0.000

Notes: DH test null hypothesis: there is no cointegration. *** indicates significance at the 1% level.

Both test statistics in Table 5 reject the null hypothesis at the 1% significance level. However, due to the heterogeneity of the model in this study, the DH group test results are prioritized. The DH group test findings confirm the presence of a valid cointegration relationship, indicating that the CA, LNGDP, LNM, ECI, FDI, and CPI series exhibit long-term co-movement. Consequently, it is necessary to estimate the long-term impacts of the independent variables LNGDP, LNM, ECI, FDI, and CPI on the dependent variable, CA. The long-term coefficients were therefore estimated using the AMG estimator, with the results for the entire panel displayed in Table 6.

Table 6

AMG long-term coefficient estimation results

Dependent variable: CA			
variable	coefficient	standard error	p-value
LNGDP	–1.287978	4.076584	0.752
LNM	–10.72138***	1.554108	0.000
ECI	–1.942524**	0.7986233	0.015
CPI	–0.0187624	0.0239784	0.434
FDI	–0.0726093	0.0650827	0.265
Constant	259.8187***	33.20528	0.000
Number of observations	1752	RMSE	1.8993
Wald chi2	55.47	prob > chi2	0.0000

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.
Notes: RMSE stands for root mean square error.

The AMG estimation results shown in Table 6 reveal that LNM has a negative and statistically significant impact on the dependent variable CA at the 1% level in the long run. Similarly, ECI's p-value is statistically significant at the 5% level, also exerting a negative effect on CA. In other words, both imports and the economic complexity index contribute to a reduction in the current account balance. Conversely, the LNGDP, FDI, and CPI variables are not statistically significant, indicating that, in the long term, GDP, foreign direct investment, and the consumer price index do not have a statistically significant relationship with the current account balance in the 66 selected countries. After analysing the overall panel results, the focus shifts to evaluating the results for each country using the AMG estimator. These country-specific results are presented in Appendix, Table A1. Table A1 reveals that the effect of economic complexity (ECI) on the current account balance (CA) varies across countries. In the United States, the United Kingdom, Uganda, Thailand, Slovakia, Romania, and Bulgaria, ECI positively and significantly influences the current account balance, suggesting these countries benefit from exporting high-value-added and complex products. In contrast, ECI negatively impacts the current account balance in South Africa, Cyprus, Guatemala, Croatia, Spain, Sweden, Kazakhstan, Poland, Portugal, Senegal, and Turkey, indicating that the level of economic complexity in these countries may not yet be sufficient to improve the current account balance or that challenges in producing sophisticated products are harming their trade balances. Meanwhile, in countries such as Germany, Australia, Bangladesh, Belarus, Bolivia, Brazil, the Czech Republic, Denmark, the Dominican Republic, Ecuador, Indonesia, Armenia, Estonia, the Philippines, Finland, France, South Korea, India, the Netherlands, Honduras, Israel, Switzerland, Italy, Cambodia, Cameroon, Canada, Kenya, Colombia, Costa Rica, Latvia, Lithuania, Hungary, Madagascar, Malaysia, Mexico, Egypt, Norway, Pakistan, Paraguay, Peru, Russia, Singapore, Slovenia, Chile, Tanzania, Tunisia, Ukraine, and Uruguay, no statistically significant relationship between economic complexity and the current account balance was detected.

Discussion

The findings of the study indicate that the economic complexity index negatively and significantly affects the current account balance in the long term. This result partially aligns with the existing literature, which often highlights the positive role of economic complexity in enhancing export competitiveness and influencing trade dynamics. For instance, studies by Erkan–Yildirimci (2015) and Khan et al. (2020) emphasize that economic complexity improves export competitiveness, thereby supporting trade balances. However, the negative relationship found in this study suggests that, in some countries, the benefits of increased economic complexity in advancing export sophistication have not yet translated into improvements in the current account. Alternatively, the difficulties associated with producing and exporting more complex products might be adversely affecting the current account balance.

Although few studies directly explore the link between economic complexity and the balance of payments, our findings contribute to the broader understanding of this relationship. Insights from existing literature on economic complexity's connections with exports, trade openness, and foreign trade provide valuable context.

For example, Sepehrdoust et al. (2019) found that trade liberalization positively influences economic complexity, while Guo et al. (2023) noted that economic complexity reduces trade-adjusted resource consumption. Additionally, research by Canh–Thanh (2022) identifies a positive feedback loop between economic complexity and export diversification, indicating that higher economic complexity can boost export potential. However, as demonstrated in our study, the impact of this relationship on the current account varies by country, highlighting the intricate and diverse nature of the connection between economic complexity and trade dynamics. In this framework, studies showing that countries with higher economic complexity have more stable and low-volatility growth processes (Güneri−Yalta 2021, Chu et al. 2023) provide clues that countries' structural characteristics may determine the relationship between economic complexity and balance of payments.

Conclusion

This study investigated the long-term effects of the economic complexity index on the current account balance across 66 countries from 1995 to 2021. The analysis involved testing for homogeneity and cross-sectional dependence, assessing unit root and stationarity properties, and conducting a cointegration analysis. Long-term coefficients were estimated using the AMG estimator. The panel results indicate that the economic complexity index has a significant negative impact on the current account balance, implying that higher economic complexity may be associated with larger current account deficits, potentially exerting a negative influence on trade balances. Conversely, other variables such as GDP (LNGDP), foreign direct investment (FDI), and the consumer price index (CPI) did not show significant long-term effects on the current account balance.

The findings underscore that the impact of economic complexity on the current account balance varies widely among countries, influenced by each nation's economic structure, level of development, and trade positioning. The country-specific analysis using the AMG estimator showed that while economic complexity positively and significantly affects the current account balance in some countries, the relationship is negative or statistically insignificant in others. In nations such as Germany, Australia, Norway, Switzerland, the Czech Republic, Italy, and Chile, no significant relationship between economic complexity and the current account balance was observed, suggesting that economic complexity does not exert a clear and consistent impact on the current account in these contexts, or that its effect is not detectable within the model used. This could imply that other macroeconomic factors – such as monetary policy, trade strategies, or external shocks – might have a more prominent influence on the current account balance. Additionally, elements like robust industrial infrastructure or high levels of financial integration could overshadow or neutralize the effects of economic complexity. In this context, the most important element that must be considered but which is very difficult to include in the analysis, is that economic complexity is a multidimensional concept that includes not only a country's production structure but also the skills of its labour force, the quality of its human capital, knowledge intensity, institutional quality and the socio-economic dynamics of the country.

These results highlight the unique economic landscapes and trade positions of each country, demonstrating that the influence of economic complexity on the current account balance is context dependent. The absence of a statistically significant relationship in some cases suggests that more nuanced analysis and further investigation are needed when shaping policies or implementing structural reforms. For policymakers in these countries, it is essential to recognize that enhancing economic complexity may not directly affect the current account balance, although this relationship could change under varying macroeconomic conditions.

In countries like the United States and the United Kingdom, the economic complexity index positively and significantly impacts the current account balance. This finding suggests that these nations can improve their current account balance by producing and exporting high-value-added, sophisticated products, which command higher prices in international markets and maintain consistent demand, thereby boosting export revenues. Policymakers can use insights from this relationship to design industrial and trade policies that promote sectors contributing to higher economic complexity, thereby improving external balances. Strategies such as increasing R&D investments, accelerating technology transfer, and developing a highly skilled workforce could further enhance economic complexity and positively influence the current account balance. In contrast, countries like Turkey, Poland, and Sweden experience a negative and significant impact of ECI on the current account balance, indicating that their economic complexity might be linked to challenges in producing or marketing advanced products. To address this, policies should focus on optimizing production processes, deepening integration into global value chains, and strengthening technological infrastructure. Diversifying exports and expanding access to new markets could also help mitigate the negative impact of economic complexity on the current account balance.

Investigating the relationship between economic complexity and the current account balance is not just an academic endeavour – it has significant policy and economic implications. It sheds light on how nations can leverage their productive capabilities to achieve external balance while being mindful of the potential transitional challenges and structural barriers. This study aims to fill this knowledge gap and offer actionable insights for sustainable economic policy design.

The overarching takeaway from this study is that the effects of economic complexity on the current account balance are highly context-dependent, reflecting the diverse economic structures, development levels, and trade positions of countries. This variability underscores the need for country-specific approaches when designing policies to leverage economic complexity for improving external balances. While some countries, such as the United States and the United Kingdom, benefit from positive and significant impacts of economic complexity, others, like Turkey and Poland, face challenges that may be tied to structural or policy deficiencies. Policymakers should recognize that enhancing economic complexity is not a one-size-fits-all solution and must be tailored to the unique economic dynamics and institutional capacities of each country.

One key limitation of this study is the selection of control variables. While GDP, FDI, and CPI were included in the analysis, numerous other potentially influential factors were omitted. Variables such as institutional quality, governance indicators, trade openness, financial development, technological infrastructure, research and development expenditures, exchange rate volatility, terms of trade, demographic factors, and energy consumption could provide additional insights into the relationship between economic complexity and the current account balance. While it might seem logical to include as many control variables as possible in a statistical analysis to account for all potential sources of variation, doing so introduces several statistical issues. Data limitations often restrict the number of variables that can be included in cross-country or long-term panel studies, among many those limitations. Furthermore, economic complexity is inherently multidimensional, encompassing aspects like workforce skills, human capital quality, and socio-economic dynamics, yet our analysis primarily relies on export-based measures. Data constraints, including inconsistent availability and reliability across countries and over time, pose additional challenges.

Future research can address these limitations by incorporating different control variables, including institutional quality, innovation capacity, research and development intensity, exchange rate dynamics, demographic trends, and environmental sustainability indicators. Additionally, sector-specific analyses could offer deeper insights into how different industries contribute to the current account balance within the context of economic complexity. In addition, comparative regional studies focusing on economic blocs (e.g., EU, ASEAN, MERCOSUR) might reveal how regional integration and trade agreements mediate the relationship between economic complexity and current account balances. Finally, expanding the dataset to include more recent years and additional countries could provide a more nuanced understanding of the institutional and structural factors driving this relationship.

Appendix

Table A1

AMG estimation results for countries

Dependent variable: CA					
country	LNGDP	LNM	ECI	CPI	FDI
Armenia	2.4581 (0.839)	–17.3127** (0.034)	–2.5286 (0.305)	–0.5088*** (0.000)	–0.5702* (0.054)
Australia	26.1135 (0.198)	–9.2385** (0.029)	–1.3407 (0.734)	0.4816*** (0.000)	–0.1248 (0.374)
Bangladesh	44.1998** (0.012)	–1.9450 (0.385)	0.6423 (0.812)	–0.2595*** (0.003)	1.1942 (0.132)
Belarus	–34.6571*** (0.007)	7.2575 (0.371)	2.4073 (0.678)	0.0083 (0.289)	–0.0609 (0.914)
Bolivia	–123.5450*** (0.009)	23.4573* (0.062)	1.6485 (0.813)	0.1677 (0.428)	–0.3573 (0.292)
Brazil	4.3119 (0.704)	–6.8259** (0.022)	2.2360 (0.239)	–0.0159 (0.461)	–0.9361*** (0.000)
Bulgaria	–16.2207 (0.200)	–0.8592 (0.919)	17.0922* (0.054)	–0.1449** (0.014)	–0.9291*** (0.000)
Cambodia	–25.0800 (0.635)	12.7971 (0.630)	–3.9047 (0.728)	–0.3302 (0.178)	0.4434 (0.488)
Cameroon	–8.1358 (0.673)	–5.2703* (0.070)	0.4982 (0.571)	–0.0451 (0.576)	–0.6882** (0.023)
Canada	75.8743*** (0.000)	–17.6279** (0.018)	5.2545 (0.121)	0.2252** (0.013)	0.1226 (0.393)
Chile	–38.8515** (0.033)	–2.3277 (0.685)	–8.4443 (0.196)	–0.2982*** (0.000)	0.0357 (0.834)
Colombia	1.2051 (0.922)	–8.3732* (0.051)	1.2802 (0.551)	–0.0119 (0.719)	–0.0733 (0.695)
Costa Rica	6.4288 (0.680)	–5.8933 (0.190)	–4.7796 (0.197)	–0.0248 (0.626)	–0.9211*** (0.000)
Croatia	9.3874 (0.658)	–24.7958** (0.018)	–13.5571** (0.015)	–0.2395 (0.195)	–0.2571 (0.350)
Cyprus	–11.1571 (0.277)	–8.4034* (0.073)	–6.0773* (0.078)	–0.1559 (0.537)	0.0065 (0.411)
Czech Republic	5.0775 (0.754)	–9.8171 (0.289)	–4.1158 (0.768)	–0.0060 (0.949)	–0.0609 (0.720)
Denmark	20.6078* (0.095)	–19.4786** (0.000)	2.0188 (0.687)	0.5256*** (0.000)	0.0212 (0.610)
Dominican Republic	15.1562 (0.501)	–13.5332 (0.364)	–4.1810 (0.457)	–0.1087 (0.276)	–0.7754 (0.253)
Ecuador	–3.6700 (0.769)	–13.2531** (0.019)	2.5106 (0.445)	–0.1172* (0.075)	–1.7476*** (0.003)
Egypt	–17.0582 (0.245)	–2.5420 (0.579)	–4.8449 (0.650)	–0.0092 (0.344)	0.2022 (0.416)
Estonia	–45.9893*** (0.000)	–10.7153* (0.064)	8.7106 (0.157)	0.3642*** (0.000)	0.0889 (0.305)

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Dependent variable: CA					
country	LNGDP	LNM	ECI	CPI	FDI
Finland	74.6194*** (0.003)	–38.2730** (0.021)	–3.2287 (0.617)	0.0979 (0.683)	0.1459 (0.105)
France	–9.8457 (0.580)	6.0365 (0.399)	–1.1549 (0.713)	0.0228 (0.842)	0.3265 (0.208)
Germany	6.9780 (0.555)	–4.7488 (0.436)	–2.1321 (0.133)	–0.1487* (0.054)	–0.3009*** (0.000)
Guatemala	12.2315 (0.517)	–13.0922*** (0.000)	–8.8124*** (0.000)	0.1682*** (0.006)	0.1061 (0.256)
Honduras	–19.9370 (0.296)	–3.5776 (0.690)	1.8323 (0.737)	–0.0862 (0.203)	–1.5466*** (0.000)
Hungary	–26.4322*** (0.006)	–20.5729*** (0.000)	4.7554 (0.182)	0.2177*** (0.003)	0.0114 (0.378)
India	–10.6567** (0.039)	–8.5776*** (0.000)	0.6396 (0.642)	0.0539*** (0.012)	1.0143*** (0.000)
Indonesia	–25.0632*** (0.000)	–0.0107 (0.996)	–4.1391 (0.267)	0.1175* (0.063)	–0.7462** (0.017)
Israel	–2.0271 (0.833)	–8.7772* (0.088)	0.6155 (0.760)	–0.0021 (0.976)	0.1931 (0.203)
Italy	–74.5117*** (0.001)	16.2047 (0.126)	–5.9560 (0.488)	–0.1642 (0.498)	0.7054 (0.207)
Kazakhstan	7.1867 (0.508)	–3.9655 (0.474)	–8.8737*** (0.001)	–0.0245 (0.354)	–0.2629* (0.081)
Kenya	–50.2214 (0.138)	–10.1562 (0.319)	–9.8167 (0.339)	0.0499 (0.600)	–0.0160 (0.988)
South Korea	–45.5966*** (0.001)	–13.5858*** (0.002)	0.1604 (0.958)	0.6799*** (0.000)	0.7882 (0.280)
Latvia	–4.0895 (0.759)	–37.9359*** (0.000)	0.1188 (0.984)	0.4370*** (0.000)	–0.2394 (0.457)
Lithuania	–2.4290 (0.899)	–20.4262*** (0.031)	–1.1488 (0.842)	0.3809*** (0.000)	–0.1806 (0.535)
Madagascar	46.1934** (0.040)	–10.7610 (0.139)	–5.2688 (0.297)	0.0853 **(0.040)	–0.6361 (0.101)
Malaysia	–126.4658*** (0.000)	2.1271 (0.910)	4.4650 (0.553)	0.6116 (0.197)	0.2445 (0.748)
Mexico	–34.0249*** (0.001)	4.6732 (0.255)	2.0345 (0.257)	–0.0016 (0.959)	–0.4684 (0.120)
Netherlands	–10.7292 (0.642)	–16.9609 (0.213)	–7.5820 (0.293)	0.2148 (0.343)	–0.0015 (0.945)
Norway	70.7533** (0.015)	–25.9393** (0.046)	–10.0707 (0.102)	–0.4037** (0.021)	0.2537 (0.455)
Pakistan	–75.3159*** (0.000)	6.4633 (0.145)	–5.3212 (0.218)	0.0531* (0.068)	–0.9545 (0.326)
Paraguay	3.1323 (0.853)	–10.4544 (0.128)	5.7013 (0.397)	–0.0052 (0.969)	0.0918 (0.899)
Peru	–26.8357*** (0.006)	–0.7969 (0.866)	–4.0831 (0.163)	0.0119 (0.832)	0.4090* (0.072)

(Table continues on the next page.)

(Continued,)

Dependent variable: CA					
country	LNGDP	LNM	ECI	CPI	FDI
Philippines	6.3683 (0.574)	–15.4274*** (0.000)	–1.2085 (0.691)	–0.0096 (0.900)	0.4838 (0.338)
Poland	30.5446*** (0.001)	–14.7324*** (0.007)	–10.3013** (0.028)	–0.1036 (0.156)	–0.3909 (0.111)
Portugal	–125.4978*** (0.000)	33.4609** (0.040)	–25.0001** (0.022)	–0.1859 (0.624)	0.1865 (0.471)
Romania	–5.2485 (0.568)	–13.7368*** (0.007)	15.2687*** (0.006)	0.0018 (0.977)	–0.7193 (0.001)
Russia	77.4984*** (0.000)	–24.2104*** (0.000)	7.0915 (0.127)	–0.1025** (0.012)	–0.7861 (0.310)
Senegal	2.4095 (0.911)	–1.8181 (0.794)	–5.9299** (0.032)	–0.1535 (0.253)	–0.5539 (0.114)
Singapore	24.4842 (0.490)	–10.6646 (0.502)	–5.7493 (0.396)	–0.5809*** (0.003)	0.0326 (0.853)
Slovakia	–3.2409 (0.818)	–15.9813** (0.024)	25.8382*** (0.001)	0.0189 (0.873)	–0.4427*** (0.006)
Slovenia	–47.1688* (0.097)	7.8913 (0.626)	–3.7605 (0.597)	–0.2164 (0.158)	0.3734 (0.135)
South Africa	–2.2513 (0.834)	–14.5227*** (0.000)	–7.8004*** (0.004)	0.0227 (0.304)	0.2346** (0.016)
Spain	27.8914* (0.076)	–38.9231*** (0.000)	–11.8573** (0.012)	–0.2380* (0.078)	0.5439** (0.010)
Sweden	92.4601*** (0.000)	–23.5995*** (0.001)	–7.2293* (0.054)	0.1651 (0.161)	0.0240 (0.726)
Switzerland	–77.7979 (0.104)	–0.2887 (0.986)	–9.9651 (0.325)	–0.2185 (0.739)	0.0906* (0.068)
Tanzania	–3.3327 (0.834)	–17.0892*** (0.000)	–1.5108 (0.350)	–0.0013 (0.970)	–0.0887 (0.777)
Thailand	–3.2743 (0.822)	–35.5161*** (0.000)	26.9796*** (0.001)	–0.1097 (0.593)	0.4250 (0.354)
Tunisia	12.9248 (0.181)	–18.1021*** (0.000)	1.6257 (0.629)	–0.0611** (0.032)	–0.0500 (0.804
Turkey	13.2791** (0.032)	–16.2967*** (0.000)	–7.8892* (0.052)	–0.0014 (0.918)	–0.2156 (0.634
Uganda	–7.0008 (0.760)	–11.0708* (0.098)	5.3576* (0.081)	–0.0378* (0.097)	–0.7581** (0.024)
Ukraine	36.7386 (0.104)	–35.8107*** (0.006)	15.6407 (0.103)	0.0101 (0.705)	0.2929 (0.595)
United Kingdom	26.6633* (0.072)	–22.2650 (0.026)	4.3366* (0.070)	0.0995 (0.105)	–0.0693 (0.287)
United States	–10.5712 (0.331)	–15.0583*** (0.001)	4.9411*** (0.000)	0.2177*** (0.000)	0.5018** (0.014)
Uruguay	26.4470*** (0.000)	–19.0412*** (0.000)	–2.8892 (0.255)	–0.0097 (0.314)	–0.0256 (0.817)

Notes: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The values in parentheses represent the p-values of the coefficients.

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