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Panama Canal expansion impact on Latin
America and the Caribbean region

メタデータ	言語: eng 出版者: 公開日: 2022-06-13 キーワード (Ja): キーワード (En): 作成者: Kahuina, Hassan Miller メールアドレス: 所属:
URL	https://oacis.repo.nii.ac.jp/records/2461

博士学位論文内容要旨
Abstract

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論文題目 Title	Panama Canal expansion impact on Latin America and the Caribbean region: Advent Mega-Ships		

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The expanded Panama Canal opened on June 26, 2016. This expansion is the third set of locks that enabled the canal to double its capacity by adding new traffic lanes, which allowed neo-Panamax and some post-Panamax vessels to transit across the canal. The widening of the canal has increased maritime traffic within Latin America and the Caribbean (LAC). As a result, major ports in the regions have made huge investments in port expansion and infrastructural development to accommodate neo-Panamax vessels. Port activity and seaborne trade are often associated with positive socio-economic effects, such as GDP, HDI, and employment growth (Nogue-Alguero, 2019; Notteboom et al., 2021; Munim et al., 2018; Rodrigue et al., 2020; Talley, 2006; Talley, 2017). In addition, ports are the drivers of urban and regional economic growth, which is a function of port productivity (Lonza and Marolda, 2016; Munim and Schramm, 2018; Tally, 2017; Shetty and Dwarakish, 2018). Logistics plays an essential role in a nation's growth and economic development. This role fosters more productivity in the export sector which is one keen component of international trade vital to modern economies. The Panama Canal expansion (PCE) has changed the dynamics of maritime trade within Latin America and the Caribbean (LAC). Therefore, four (4) impact evaluation methods will be used to investigate (1) the impact of the PCE on the LAC ports using the Difference in Difference. Method. This impact was evaluated for 100 major and regular ports within the three sub-regions of LAC. (2) Examining port performance is important to ascertain the PCE impact on port efficiency within the LAC region. Scholastic Frontier Analysis (SFA) was used to determine the technical efficiency of the 19 major ports within the LAC from 2010 to 2018. (3) examines the relationship between exports and the six (6) LPI components among LAC countries regarding income classification and its influence on exports during the pre-and post- PCE era. The Hierarchical Linear Model (HLM) assessed this relation among 20 Latin American countries for 2010, 2012, 2014, 2016, and 2018. (4) to analyse this PCE impact on economic growth using two covariates of HDI and the rate of unemployment among 19 LAC countries using the Bayesian Structural time-series (BSTS) model

The findings from the DID model for the 100 ports revealed that the average container port throughput (TEUs) for the treated ports (DTrp) was more than that of the controlled ports (CONTP) with transshipment hub, Central America, and South America has 20%, 12%, and 34% growth, respectively, since the PCE (the treatment) except for the Caribbean ports (DTrp), which experienced losses of 8% within the LAC region from 2010 to 2019.

The result of the SFA for the 19 major ports indicates that, among the four (4) port performance indicators (berth length, port area, the number of cranes (STS gantry and mobile), and the number of berths), the number of STS gantry cranes and berth length had the largest and most significant impact. In addition, some ports with

high technical efficiency experienced TEU losses despite port infrastructural development and privatization. The findings also revealed that the increased competition among regional and US East and Gulf Coast ports has negatively impacted some LAC ports' TEU volumes due to port proximity.

The HLM results for the 20 LAC countries revealed that for 2016 and 2018, the LP-Customs model had accounted for 10% and 7.0% of the variance in exports. The findings also revealed that LP-Customs had a significant and negative relationship to Higher-income exports accounting for 1.2% of the variance to exports and was statistically insignificant for both Upper-middle and Lower-income countries. For Pre-PCE and Post-PCE era, LP-Customs were 1.3% and 8.3% of the variance to exports. Logistics performance is important for improving trade and economic growth, which has benefited several developed countries.

The BSTS results for the 20 countries revealed that PCE had positive and statistically significant relative effects for Central American countries such as El Salvador, Honduras, Guatemala, and Belize had 18%, 11%, 11%, and 9.6%, respectively. For South America, Brazil had a relative effect of 27%. For the Caribbean region, Cuba, Dominican Republic, Bahamas, and Jamaica, have 38%, 10%, 5.7%, and 9.8%, respectively. However, findings also revealed that countries that were statistically insignificant but had a relatively positive effect by various factors such as Fiscal imbalance, GFCE, trade route, market segment, port proximity, and trade agreement during the pre- and post-era; therefore, the PCE would have little to no effect on economic performance for these countries.

The conclusions from this study contribute to academic research in assessing the PCE impact on Latin America and the Caribbean region. In general, the maritime sector is volatile and sensitive to the dynamic changes within global trade. Therefore ports that are proactive in assessing the effectiveness of a policy or intervention will have a competitive edge in adjusting or improving endogenous factors (e.g., policies, infrastructure, and trade) to remain sustainable in the maritime industry. Therefore, the dynamism of the maritime sector, especially containerization, requires ports to implement value-added services and logistics centres in tandem with port performance indicators to remain sustainable and competitive in the maritime industry. Policymakers within the region must address these issues, such as corruption and inefficient customs procedures. In addition, regardless of income classification, countries within this region must improve logistics performance to increase international and regional export volumes. An intervention like the PCE has a different regional impact; therefore, countries must constantly assess policies and programs to develop policies that will foster economic growth. The PCE's overall impact on the LAC region depends on countries, trade, geographical location, port infrastructure, economic and trade policies, logistics performance, added-value service, and the type PPIs used to measure port performance. Interestingly, not all regions benefit from the PCE, especially South America and some Central American. However, impact evaluation methods are essential for determining the causal effect of a program or intervention.

日本語要約：

2016 年 6 月にパナマ運河が拡張 (Panama Canal expansion: PCE) されたことにより、カリブ海や中南米の貿易に構造的な変化がもたらされた。本研究は、その効果を各種の経済統計を用いて明らかにすることを目的としている。具体的には以下の 4 つの分析手法を適用した。(1) PCE の影響をラテンアメリカおよびカリブ海の港湾について、「差の差の分析」(Difference in Difference: DID) を適用した。100 の港湾について精査したところ、20% を越える TEU 増加効果を認めることができた。しかし、カリブ海の港湾では効果は発現していない。これは PCE による船の大型化が、これら港湾の transship の減少を引き起こしたためと考えられる。(2) 世界銀行が発行する LPI (Logistics Performance Index) を用いて、PCE 前後のカリブ海、中南米の 19 の港について、その効率性を Scholastic Frontier Analysis (SFA) で分析した。分析期間は 2010 年から 2018 年である。結果から、ガントリークレーンの数やバース長などが効率性に大きく影響することが判明した。さらに、アメリカや湾岸地域との貿易量と港湾の効率性にも一定の関係を見出すことができた。(3) 20 の中南米国を取り上げ、2010、2012、2014、2016、2018 年の統計から、輸出量と LPI の 6 指標、それに国民所得を用いた、PCE 前後の比較を、階層線形モデル (Hierarchical Linear Model: HLM) により分析した。結果から、所得階層による PCE 効果の差異 (中層および下層国で効果が薄いなど) を明らかにし、LPI との因果関係から、ロジスティクスに関わるインフラ投資が経済成長に大きな影響を与えることも明らかにできた。(4) PCE の効果を、19 カ国の経済統計を、柔軟性の高い時系列モデルである、Bayesian Structural time-series (BSTS) モデルで分析した。PCE の正の効果、負の効果の発現が国により異なることを確認し、今後の港湾インフラ投資戦略について示唆を得ることができた。

これらの分析を通して、PCE の効果を、港湾・国別に補足し、また港湾インフラ整備水準が与える影響も明らかにすることができた。最終的には、各国の、PCE 後の国家戦略について有益な知見を得ることができた。