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Labor Productivity and Economic Growth in Selected Latin American Countries

Seçilmiş Latin Amerika Ülkelerinde İşgücü Verimliliği ve Ekonomik Büyüme

ABSTRACT

Despite the fact that labor productivity, beyond being an indispensable gauge of labor's efficiency, encompasses a wider economic spectrum that integrates technological growth, skill advancement, and infrastructural enhancements; limited studies delve into exploring the nexus between labor productivity and economic growth. The main motivation of this work is to investigate the relationship between labor productivity and economic growth in Latin American countries namely, Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Mexico, and Peru during the period from 1990 to 2018. The cross-sectional dependency of the panel is examined employing the Breusch and Pagan (1980) CDLM2 and the LMadj test. The homogeneity of the variable coefficient is investigated with the Swamy Homogeneity Test. Furthermore, the presence of a unit root is examined by employing the CIPS test. Moreover, the cointegration nexus between the variables had been analyzed employing the Durbin-Hausmann test. Finally, the Dumitrescu and Hurlin (2012) causality test has been applied to determine the causal nexus between the variables. The results affirm the presence of a cointegration nexus between the variables. Furthermore, there is a bidirectional nexus between labor productivity and economic growth during the studied interval, emphasizing the significance of investing in productivity-enhancing measures.
Keywords: Labor Productivity, Economic Growth, Latin American Countries.

ÖZET

İşgücü verimliliği, sadece işgücünün etkinliğinin vazgeçilmez bir ölçüsü olmanın ötesinde, teknolojik büyümeyi, beceri gelişimini ve altyapı iyileştirmelerini kapsayan daha geniş bir ekonomik spektrumu kapsamaktadır; sınırlı çalışmalar, işgücü verimliliği ile ekonomik büyüme arasındaki ilişkiyi keşfetmeye dalmaktadır. Bu çalışmanın ana motivasyonu, 1990-2018 döneminde Arjantin, Bolivya, Brezilya, Şili, Kolombiya, Kosta Rika, Meksika ve Peru gibi Latin Amerika ülkeleri arasındaki işgücü verimliliği ve ekonomik büyüme arasındaki ilişkiyi araştırmaktır. Panelin yatay kesit bağımlılığı, Breusch ve Pagan (1980) CDLM2 ve LMadj testi kullanılarak incelenmiştir. Değişken katsayısının homojenliği Swamy Homojenlik Testi ile araştırılmıştır. Ayrıca, bir birim kök varlığı CIPS testi kullanılarak incelenmiştir. Dahası, değişkenler arasındaki eşbütünleşme ilişkisi Durbin-Hausmann testi kullanılarak analiz edilmiştir. Son olarak, Dumitrescu ve Hurlin (2012) nedensellik testi uygulanmıştır. Sonuçlar, değişkenler arasında bir eşbütünleşme ilişkisinin var olduğunu doğrulamaktadır. Ayrıca, incelenen dönemde işgücü verimliliği ve ekonomik büyüme arasında çift yönlü bir ilişki vardır, bu da verimlilik artırıcı önlemlere yatırım yapmanın önemini vurgular.
Anahtar Kelimeler: İşgücü Verimliliği, Ekonomik Büyüme, Latin Amerika Ülkeleri.

1. INTRODUCTION

Economic growth and Labor productivity are fundamental aspects that affect any economy's performance (Auzina-Emsina, 2014). Labor productivity hinges on the accessibility and superiority of labor resources and utilized technologies. Thus, labor productivity exerts a crucial mien on both production process and production costs which, in turn, can affect the nation's competitive advantage in the international market. Typically, Productivity is the metric for evaluating how effectively resources are being utilized to generate income and output. Dolman, Parham, and Zheng (2007) claimed that in spite of the fact that improvements in the productivity frontier were being propelled by productivity growth in Norway, the inefficient usage of labor resources diminished the prosperity level in the economy. According to the Australian Government Productivity Commission, labor productivity contribution has outstripped by a significant margin population contribution since 1977-78 in Australia. Furthermore, they claimed that during the period between 1960 and 2004, the real income gains had been fundamentally attributed to productivity enhancements with capital stock and labor force also playing a role. Theoretical models elucidate the nexus between the growth of output and resource productivity gains. Solow (1957) put forth a model for analyzing sources of economic growth, featuring a neoclassical production function that included labor, capital and technology. Labor and capital accumulation had been described in the neoclassical growth theory as the principal catalysts of the long-run growth. Nonetheless, this approach neglected the possibility of maintained growth in the absence of ongoing productivity improvements due to the fact that capital's impact is confined by diminishing returns. After a certain threshold, the marginal return gained

from investing in new capital becomes less significant. As per “New” growth theory, the principal catalyst of growth is technological progress which can mitigate the impact of diminishing returns by boosting productivity and accordingly stimulating long-run economic growth. This approach has been dubbed as "endogenous growth theory" owing to its prioritization of internal factors driving growth.

There are several empirical studies that affirm the significance of productivity in achieving economic growth. Jalava (2002) claimed that there was a transition in the Finnish growth pattern towards intensive growth observed after the 1990s recession, with multi-factor productivity (MFP) being the principal catalyst of growth between 1975 and 1999. Jorgenson and Vu (2005) investigated the nexus between GDP and total factor productivity (TFP) growth during the period from 1989 to 1995 and from 1995 to 2003. Their investigation centers on how investment in information technology impacts global economic evolution. The results revealed a substantial impact recorded for investment in IT equipment and software, thus its involvement in world GDP growth doubling from 0.27% to 0.53% per year, while GDP growth increased by 38%. While productivity growth was responsible for 20% of the total growth in the earlier period, it accounted for less than 30% in the later period, with input growth being more prominent. Developing Asia experienced declines in GDP growth (from 7.35% to 5.8%) and TFP growth (from 3.86% to 1.72%) from 1989-1995 to 1995-2003. This finding suggests a significant connection between TFP growth and output growth. In the case of Pakistan, both GDP growth (from 4.10% to 3.47%) and TFP growth (from 0.76% to 0.52%) declined during the later period compared to the earlier one. Compared to 1989-1995, developing Asia underwent a decrease in GDP growth (from 7.35% to 5.8%) and TFP growth (from 3.86% to 1.72%) during the period from 1995 to 2003, pointing to a robust nexus between TFP growth and output evolution. In a similar fashion, in Pakistan, both GDP growth (from 4.10% to 3.47%) and TFP growth (from 0.76% to 0.52%) experienced a decline in the subsequent period as opposed to the earlier one.

Mahmood and Siddiqui (2000) utilized Solow methodology to estimate TFP from 1972 to 1997 in Pakistan. The results revealed that the sluggish growth in Pakistan's manufacturing sector since the late 1980s can be attributed to the decline in TFP growth. Hark and Gökdemir (2023) explored the nexus between economic evolution and total factor productivity (TFP) in the Turkish economy over the period of 1971 to 2019. The conclusions revealed the existence of a long-run nexus between the series, with a 1% surge in TFP resulting in about a 3% surge in economic growth. Furthermore, the results of the causality test demonstrate the existence of a unidirectional nexus running from TFP to economic growth. Hark and Gökdemir confirmed the positive mien of TFP on the evolution of the Turkish economy. Their study contributes to the economic literature by considering structural breaks that arose from economic and political crises during the period under investigation. In their study, Nehru, Dhareshwar, and Dec (1994) delivered new approximations of TFP growth for 83 industrial and developing countries during the period from 1960 to 1987. The results revealed that the accumulation of human capital is the vital catalyst in accounting for growth, outpacing the indications of previous research. Going against the results of other studies, the results revealed that the accumulation of human capital is a vital catalyst in explaining growth. Furthermore, the study revealed that the growth of TFP in high-income countries is akin to that in faster-growing low and middle-income countries. The developing economies which achieve the greatest growth rates give precedence to the accumulation of physical and human capital, rather than prioritizing high TFP growth. The study suggested that political stability and initial conditions are the predominant catalysts that explain cross-country changes in TFP growth, rather than readily available structural and policy differences.

Hacker and Hatemi-J (2003) revealed that Swedish real exports are proven to Granger cause foreign real GDP, but there was no significant casual nexus was revealed between foreign real GDP and domestic GDP or total factor productivity. Furthermore, the results revealed that fluctuations in Swedish exports appear to facilitate the nexus between changes in foreign real GDP and Swedish output and productivity. Kurt and Terzi (2010) inspect the nexus between export and import of the manufacturing industry, economic growth, and productivity growth per hour of labor in the manufacturing industry. Their conclusions revealed the presence of unidirectional causality running from export to import and economic growth, as well as from import to productivity growth. Moreover, they revealed two-way causality between import and economic growth, economic growth and productivity growth, and export and productivity growth. Adak (2009) revealed a noteworthy positive association between TFP and Economic Growth in Turkey during the period from 1987 and 2007. Similar results had been revealed by (Işık 2016) for the period from 1990-2014. Gündüz, Alakbarov, and Erkan (2018) revealed that the most significant catalyst of the Turkish evolution is the surge in the amount of capital, with a positive mien of TFP on economic evolution.

Khadimee (2016) estimates the mien of Total Factor Productivity Growth (TFPG), labor accumulation, and capital stock accumulation in Iran's economy from 1981 to 2013. The results revealed that the average TFP annual growth rate is roughly 0.5% over the interval studied. Furthermore, the results revealed that Iran's economy demonstrates weaker long-run productivity growth in contrast to other developed and developing countries, with a comparatively lower involvement of TFPG in its economic evolution. Alancioğlu and Şit (2019) investigate the nexus between economic evolution and TFP in BRICS economies during the period from 2000 to 2016. Their results revealed the presence of long-run nexus between the variables, with TFP accounted as a vital sign of economic growth in the BRICS economies. Kamacı, Ceyhan, and Peçe (2019) claimed that countries exhibiting low TFP tend to be relatively impoverished, whereas those with high TFP tend to be richer and more developed. Their results revealed the existence of a unidirectional causal nexus running from TFP to economic growth in 15 OECD economies during the period from 1995 to 2016. Doğan (2022) show that total factor productivity, innovation, and financial development have a statistically important and positive mien on economic evolution in 12 emerging economies during the period from 1996 to 2017, with a positive contribution of TFP to economic growth found to be larger than that of the innovation and financial development. Furthermore, they claimed that the mien of TFP on economic evolution is contingent on the degree of innovation.

Overall, we can conclude that the literature underscores the crucial role of productivity, especially TFP, in shaping economic outcomes. Furthermore, the literature reinforces the necessity of giving priority to policies and strategies that stimulate productivity evolution to enhance a nation's competitiveness in the international market and promote maintainable economic development. Limited studies in the literature probe into the relationship between labor productivity and economic growth. The main motivation of this paper is to investigate the relationship between labor productivity and economic growth in Latin American countries namely, Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Mexico and Peru during the period from 1990 to 2018. This work is made up of three sections: the first section includes the introductory part and a summarized theoretical and literature review. The second section entails the methodology. The third section includes the empirical implementation. The fourth section is about evaluating the results and conclusions.

2. METHODOLOGY

In this study, utilizing the variables of labor productivity and GDP, the cross-sectional dependency of the panel is first examined by employing the Breusch and Pagan (1980) CDLM2 and the LMadj test. The homogeneity of the variable coefficient is examined with the Swamy Homogeneity Test. Furthermore, the presence of a unit root in the series of lnGDP and lnPRODUCT is analyzed employing the CIPS test, one of the second-generation unit root tests that considers cross-sectional dependency. Moreover, the cointegration nexus between the variables had been analyzed employing the Durbin-Hausmann test crafted by Westerlund (2008). Finally, the Dumitrescu and Hurlin (2012) causality test has been applied to determine the causal nexus between the variables.

3. EMPIRICAL IMPLEMENTATION

3.1. Data

In this study, we tried to examine the relationship between labor productivity and economic growth among nine Latin American countries namely, Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Mexico and Peru during the period from 1990 to 2018. The model is as follows:

$$\ln GDP_t = a_0 + a_1 \ln PRODUCT_t + \varepsilon_t$$

The labor productivity was calculated by dividing gross value added at constant 2015 prices (millions, local currency) on employment. The labor productivity data is available at the labor productivity data is available at Groningen Growth and Development Centre University of Groningen. GDP data is available in the World Bank's electronic database. All variables incorporated in the model are specified in natural logarithmic units.

3.2. Cross-Sectional Dependency Test Results

In this section, the consequences of the cross-sectional dependency and homogeneity tests are put into practice. Considering that in the series T (time dimension) exceeds N (cross-section), the Breusch and Pagan 1980 (LM) test becomes a suitable selection. The results derived are showcased in Table (1).

Table-1: Cross-Sectional Dependency and Homogeneity Test Results

	Tests	Statistics	Prob.
Cross-Sectional Dependency	CDLM	16.317*	(0.000)
	LMadj	13.875*	(0.000)
Homogeneity	Swamy Homogeneity Test $H_0 = \beta_1 = ... = \beta_7 = \bar{\beta}$ Hypothesis $\chi^2_{12} = 22122$ (0.000)		

Under these circumstances, the null hypothesis stating "H0: there's an absence of cross-sectional dependency" is dismissed at the 1% significance threshold, suggesting the existence of cross-sectional dependency. Given this result, a sudden change in one country might have repercussions in other countries. As per the insights from Table-1 and considering the 0.05 significance level of the Swamy Homogeneity test's probability value, the null hypothesis is overturned, signifying heterogeneity among the units rather than homogeneity. The slope parameters of the variables utilized in the model display heterogeneity. This underscores that the ramifications of a productivity modification on the economy's growth differ among countries.

3.3. CIPS Unit Root Test Results

Table-2 displays the CIPS test results related to the variables. Considering the t-bar (CIPS) statistic for the lnGDP series has a lesser absolute value than the critical values, it achieves stationarity when the first difference is applied. The t-bar (CIPS) statistic for the LnPRODUCT series surpasses the critical values in absolute value at the 5% significance level, indicating the series is stationary.

Table-2: Unit Root Test Results

Variables	I(0)	I(1)	Sonuç
lnGDP	(t-bar: -1.902)	(t-bar: -3.383)*	I(1)
lnPRODUCT	(t-bar: -2.412)**	-	I(0)

Note: *, ** represent the 1% and 5% significance levels, respectively.
-2.330 (5%) and -2.570 (1%) are the CIPS critical values

3.4. Cointegration Test Results

After examining the stationarity of the variables, the long-term relationships of the analyses were tested with the Durbin-Hausman cointegration test. The results are shown in Table-3.

Table:3 Cointegration Test Results

Tests	Statistics	p-value
dh_p	187.753 ***	0.000
dh_g	54.177 ***	0.000

Based on the statistical and probability values of the panel and group test, the findings in Table-3 demonstrate the rejection of the H0 hypothesis at a 1% significance level, pointing to a cointegration link between the variables.

3.5. Causality Test Results

According to the causality analysis findings presented in Table 4, the H0 hypothesis between the lnPRODUCT and lnGDP series has been mutually rejected at the 1% significance level. This finding indicates that there is a bidirectional nexus between the series

Table-4: Dumitrescu ve Hurlin (2012) Panel Causality Test Results

	W-bar	Z-bar	Z-bar tilde	Sonuç
lnproduct does not Granger-cause lngdp.	2.6104	3.0128 (0.0026)*	2.4527 (0.0142)	There is a mutual causality relationship between the series
lngdp does not Granger-cause lnproduct.	6.7953	10.8421 (0.0000)*	9.1905 (0.0000)*	

4. CONCLUSION

In this study, we tried to investigate the nexus between labor productivity and economic growth in Latin American countries namely, Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Mexico and Peru during the period from 1990 to 2018. The results affirm the presence of a cointegration nexus between the variables. Furthermore, there is a bidirectional nexus between labor productivity and economic growth during the studied interval, emphasizing the significance of investing in productivity-enhancing measures. Policymakers should craft strategies that are attuned to the unique economic conditions and obstacles of each nation. Putting emphasis on education, tech innovation, and infrastructural progress, labor productivity can be fortified. Furthermore, discerning the mutual influence between productivity and economic growth can guide towards integrated economic approaches focusing on both facets.

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