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Sheshi "Skënderbej", nr. 1, Tiranë, Shqipëri
Tel.: + 355 4 2419301/2/3; + 355 4 2419409/10/11
Fax: + 355 4 2419408
E-mail: public@bankofalbania.org
www.bankofalbania.org

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C O N T E N T

FACTORIAL AND SECTORAL PROFILE OF LABOR PRODUCTIVITY AND UNIT LABOR COST DYNAMICS IN ALBANIA

Evelina Çeliku, Monetary Policy Department, Bank of Albania
Enian Çela, Monetary Policy Department, Bank of Albania

ABSTRACT

The study attempts to analyze annual dynamics in labor productivity (LP) and unit labor costs (ULC) in the horizon 2013-2022 based on the decomposition approach suggested by Tang & Wang (2004). It must be emphasized that LP and ULC figures are not insulated from various structural changes in labor statistics reflecting formalization processes in the labor market since 2014, wage review policies and Covid-19 effects. Due to these impacts, LP has increased over the years, but unevenly. Based on the factor decomposition approach, the pure effect has generated negative contributions on a broad base. The static reallocation effect has provided a positive impact on LP growth given sector base differentials in the indicator. Positive contributions were generated from "Trade, transport, accommodation etc", "Construction" and "Industry". Lastly, the dynamic reallocation effect associated with sector based LP growth, is shown to be marginally negative with shrinking magnitude in the final years of the sample. As for ULC, the figure has increased on average due to higher wage growth as compared to LP growth. On a sectoral level, the interconnection between wage and productivity growth is more pronounced in the case of "Industry", "Construction" and "Trade, transport, accommodation etc". The relationship is weaker for the other sectors. Estimations of the relationship between LP and ULC are subject to limitations arising from short time series and frequent shocks throughout time.

Keywords: Generelized Exactly Additive Decomposition (GEAD) Method, Labor Productivity, Unit Labor Cost, Sectoral Contributions.

JEL Classification: C43, E24, J31, J24, J21.

1. INTRODUCTION

Labor productivity (LP) represents an important economic indicator closely associated with economic growth, competitiveness and living standards. LP is measured as the ratio of total output over the total number of employed, and is interpreted as output per unit of labor in a given period. It reflects the efficiency of labor factor for the generation of output. On a macro-economic level, LP dynamic analysis shows whether economic growth is due to: (i) increased employment which by default would generate more output, services and income; (ii) higher efficiency of the labor factor, therefore higher LP.

The role of productivity is particularly important for long-term economic growth (Krugman, 1994)[1]. Recent studies on business cycle turning points associated with crisis, indicate that although sources of growth have diminished, productivity has been the main determinant for economic and social development (Baily et. al., 2020). Authors show that even in the case of developed economies, where labor force growth has slowed down due to weakened demographic trends in the last two decades, productivity has become the main driver of economic growth although at a lower "intensity" than previously.

Productivity represents and important indicator for assessing inflationary pressures from labor costs. In the post-covid period when most restrictions were lifted, advanced and developing economies experienced a highly accelerated economic activity. This rebound was expected to increase supply and lower inflationary pressures. However, inflation must be viewed in close connection to unit labor costs (ULC), which in turn are determined from average wage of LP. In the longer term, when productivity growth is mostly stable, wage dynamics would be a close proxy for ULC. Turning back to the pandemic, wage growth was highly affected by administrative decisions, countries' specifics, online procceses replacing onsite work and ultimately, the reduction and removing of "non essential" jobs. Howver, once the measures were lifted and jobs re-opened, firms offered higher wages to fill the re-conceptualized jobs and the new spots. Wage growth in the post pandemic was joined by higher LP due to the economic rebound. As a result of this combination, ULC was contained and so were inflation rates. Statistics indicated that in the cases of the USA, Euro-area and the UK, LP growth almost doubled in 2021 following a mere growth of nearly 1% on average in the years 2013-2018. Such good performance of LP in 2021 enabled falling ULC rates. This development tamed wage related inflation confirming the role of LP in discouraging the wage-price spiral.

The study analyzes the annual dynamics of LP. The indicator is calculated based on national account and labor statistics for the Albanian economy in the years 2013-2022. Annual growth rates for LP are decomposed by factors and sectoral LP contributions based on the Generalised Exactly Additive Decomposition (GEAD) (Tang & Wang, 2004). It is an approach

[1] *Quoting from Krugman, P.' "The Age of Diminished Expectations" (1994): "Productivity isn't everything but in the long run it is almost everything. A country's ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker."*

that enables pinpoint accuracy in terms of addition of components and overall LP growthm using chain-linked gross value added data[2]. GEAD decomposes the aggregate and sectoral LP growth into three components where each of them measures: the pure effect; the static reallocation effect and; the dynamic reallocation effect. Each component will be further explained in the paper. The effects bears contributions from value added, employment and relative prices both in level and changes. Calculations are also conducted for ULC for the period 2015-2022, applying overall and sector based average wage as an input.

Results indicated falling trends in overall LP until 2020, followed by a positive tendency in 2021 and 2022. An important factor playing out were structural changes in the labor market. As the number of employees is included in the ratio calculation on the denominator, sharp increases or decreases affect the overall LP figure should the nominator remain mostly constant. Labor market formalization has produced an increasing figure for the number of employees throughout time, both for the economy as a whole and by sector. This process has impacted employment data in particular since 2014. As a result, growth rates for LP in 2015-2016 were predominantly negative, reflecting rapidly higher employment (also due to formalization) versus more moderate growth in the value added. In more granular terms, the pure sectoral effect has contributed negatively until 2020, turning to positive territory in 2021-2022. The static reallocation effect has generated positive effects for LP growth. The dynamic effect has been mostly negative, but marginal and with a shrinking magnitude in the final years.

In regard to ULC, wage growth effect appears as dominating the LP growth effect. Sector based analysis indicates a non-negligible connection between LP and ULC annual growth rates in the case of "Industry", "Construction" and "Trade, transport, accommodation etc.". In overall terms, the relationship seems weak due to the effects associated with "Agriculture" and "Public administration". The weak relationship is also due to various administrative decisions for increases in minimum wage and public sector wages for certain categories. These decisions have impacted wages in the private sector and the economy as a whole. At the same time, formalization and wage declaration initiatives, which were more pronounced since 2015, have impacted the fluctuation of both LP and ULC estimations. Calculations and analysis are conducted based on not so long - time series for labor market and wages by sector. As a result, present estimations for the relationship between wages and productivity must be further validating with longer time series in the future.

The study has the following structure: chapter 2 is dedicated to the literature review. The literature on LP and its role on macroeconomic performance is substantially large. However, in this study, we have placed more emphasis on certain fields of literature: LP behavior during turning points in the economy

[2] *In the case of Albania, since the 2015 first quarter publication of GDP, INSTAT has published nominal GDP data starting from the first quarter of 2008 adopting the Eurostat methodology. Quarterly GDP data in volume are published in constant previous year prices and chain-linked (2010=100) prices.*

and its impact on labor costs and inflation. More particularly, the role of factoral and sectoral contributions on aggregated LP dynamics was reviewed. A particular emphasis was placed on studies dealing with Albania at different moments in time. Chapter 3 explains on the data applied in the analysis. Chapter 4 explains the decomposition approach with special emphasis on the economic meaning of each component. Chapter 5 incorporating 4 sub-sections, is dedicated to the results. It analyzes the factor effects for the economy as a whole and by sector in terms of both LP and ULC dynamics. The last chapters touches upon the main conclusion and recommendations.

2. LITERATURE REVIEW

LP growth is conditioned on several factors including country specific patterns, sector based policies and long-term strategies contemplated and applied by the governments. Factors include innovation, process automatization, education and training progress, infrastructure and institutional improvements, human resource incentivizing policies etc.

LP performance analysis assists in the definition and monitoring of education and labor market policies. High productivity in certain sectors is associated with their particular nature, the ratio of capital over labor and the continued qualification of employees. In most cases, higher LP would suggest the presence of employees with above average professional skills. In terms of education policies, higher LP would point to the need for more focus on the part of education and training programs, their further specialization and continuity, and also the need for them to show higher intensity and profilization. The success in the implementation of such programs is mostly visible in such industries like automotives, information technology and financial services where the application of knowledge and innovation were reflected in higher LP growth. On the other hand, in the case of industries where the interest in implementing innovation and automatization of work processes has been lower and more delayed, the LP has also grown slowly. That is mostly the case of agriculture, fishery, forestry, tourism (bars and restaurants) and other sectors which are more labor intensive.

Growth in LP is viewed as an important indicator of higher living standards as it represents a must have for higher income (Anderson, 2007). Higher LP would positively affect wages and compensation, which in turn would stimulate higher aggregate demand, in particular consumption and investment. On both economy and sectoral level, wage growth must be supported by productivity growth in order to obtain more controllable inflationary pressures helping the monetary policy decision-making at the central banks. That is because the inflation caused by LP related growth in aggregate demand, would correct for the controlled nominal wage growth. Therefore, LP growth would enable real wage growth coupled with higher working and living standards. Literature also explores the other side of the coin, showing how wage growth can stimulate further productivity growth (Feldstein, 2008).

LP is considered a foundamental factor to assure for sustainable and long-term economic growth. In such regard, economic policies aim for the structuring and implementation of incentivizing programs for sectors of the economy which have a larger impact on LP growth. Such sectors have the potential to drive the whole economic growth through the inter-sectoral competitiveness mechanism. According to Denison (1962), high productivity growth in certain sectors is able to attract workers from sectors that have lower productivity and wages.

More productive sectors are able to transmit the need for reform and progress to other sectors that are somehow related to them. In order to narrow inter-sectoral productivity gaps, the less productive sectors are fostered to increase it through the implementation of novelty and new technologies, continuous educational programs etc. All these processes improves the labor market and the wage-setting process.

Swiecki (2017) analyzes 45 countries in the years 1970-2005 and emphasizes, among others, the differentiated productivity as the main factor behind structural transformations in economic systems. Roson (2019) argues that LP disbalances bear certain economic implications. One such implication is the so called "Baumol effect" (1966)[3]. Sectors that have experienced little to no LP growth, experience higher cost as they rise wages in an attempt to respond to wage increases in sectors with considerable acceleration in their productivity rates. In the second group, growth in labor costs from wages is lower compared to growth in ouput per worker. In such cases, productivity differentials generated inflationary pressures that are unjustified from LP developments. Baumol (1986), Triplett & Bosworth (2003), Tang & Wang (2004), Young (2014) witness the economic cost from this phenomenon in their inter-sectoral comparative analysis in different economies. McMillan & Rodrik (2011) and Rodrik (2016) show that the main driver of economic and social development is the movement of workers from less productive to more productive sectors in the economy. They further evidence that in countries with major natural resource exporting industries (enclaves) featuring high LP but low wages, structural policies have not helped in generating a broader based economic growth. These sectors have not been able to attract workers from less productive sectors (e.g. agriculture) as they were non-competitive in terms of wages. Specialization and international trade are considered as barriers in the development of African and Latin American countries as their structural policies focused on closed sectors of their economies. In other countries, "*premature de-industrialization*" has been a barrier to the processing of natural resources. They were therefore exported as raw material with lower value added. In this examples, development and investment in labor force have been minimal, labor costs were low and producitivity was weak (Rodrik, 2016).

[3] *The phenomenon was first explained by William J. Baumol in "Performing Arts: The Economic Dilemma" (1966). While economic theory denotes that wage growth occurs with higher productivity, Baumol counters that for certain activities, wages increase also when productivity doesn't. This is known as the 'Baumol's Cost Disease' or the Baumol effect.*

Additional studies have focused on sectoral and economy LP dynamics, variations in sectoral behavior and the impact of LP differences on overall productivity and labor costs. Applying sectoral data, Konte et. al (2022) analyze how structural reforms have fostered differences in LP growth between developing economies in the years 1975-2005. The study shows how inter and intra-sectoral components have impacted the overall LP growth. Empirical evidence suggests that the most effective way for productivity growth through structural reforms is via the labor efficiency reallocation within sectors as opposed to reallocation between sectors. Results indicate that productivity growth was a result of reforms in trade tariffs for commodities, current account sub-components, electricity grids and telecommunication. At the same time, financial reforms touching upon internal finances, banking system and bond markets have had positive and statistically significant effects on LP growth. However, in more granular terms, the study indicates that structural reforms affect LP through the inter-sectoral component with a contribution ranging between 76% and 96% on overall productivity growth. While the impact from the other component – the inter-sectoral one – contributes for 4%-24% on LP growth.

Perhaps the only exception is associated with agriculture, where inter-sectoral and intra-sectoral contributions are evenly distributed. However, the impact of the sector on overall LP growth is statistically insignificant. On several occasions, the inter-sectoral component bears a negative effect on LP growth. These results suggest that structural reforms in developing economies have stimulated LP growth via the intra-sectoral reallocation and not via the inter-sectoral reallocation. Additional estimates suggest that the regulatory framework in the labor market is crucial for the materialization of effects associated with structural reforms on LP growth. Results confirm that structural reforms in agriculture and current account, generate a positive inter-sectoral effect for flexible regulatory frameworks in the labor market. On the contrary, the effects are negative when such frameworks are more rigid. In such cases, intra-sectoral effects dominate.

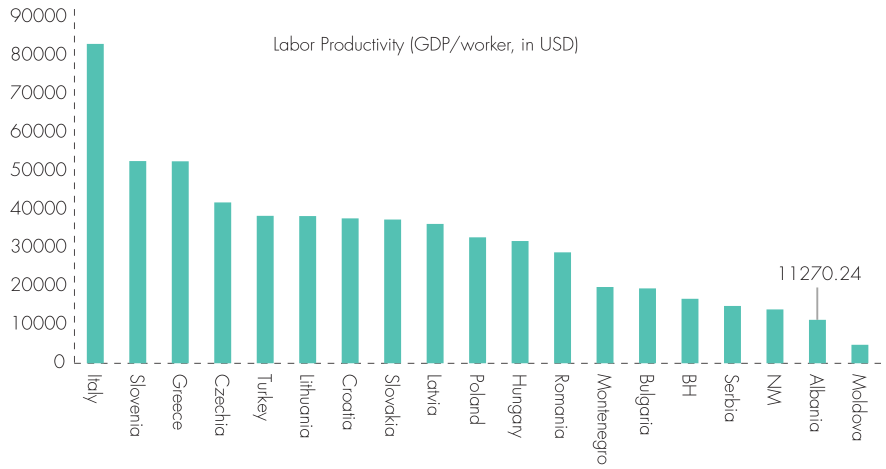
Research contributions concerning the estimation and performance of LP and ULC in the case of Albania cover a various array of periods and sectors in the economy[4]. Results converge on the statement that services and generally non-tradable sector have spearheaded LP performance in the economy. Çeliku & Metani (2011) show that wage index dynamics were closely related with LP developments in the tradable sector. That was not the case for the non-tradable sector which fueled most of the economic growth. The study shows that in the years 2009-2010, the country was lagging in terms of competitiveness as LP levels vis-à-vis neighbouring pears and beyond were lower. Simultaneously, the study finds certain advantages in terms of lower labor cost in the country in comparison to the other economies, but they have been ultimately non-stable throughout time[5].

[4] *Çeliku & Metani (2011); Çeliku, Çela & Metani (2018); Çela, Metani & Çeliku (2019).*

[5] *Proxy indicators for LP and ULC continue to be generated with the same methodologies and reflect improvement in the time series involved. Their dynamics are an integral part of monetary policy analysis in the determination of domestic inflationary pressures and their association with LP developments.*

LP associated competitive disadvantages have also been observed beyond the period included in the given study. Estimations and projections by the International Labor Organization (ILO, 2023) show that Albania is amongst the least competitive countries based on LP figures (Graph 1)[6]. Measured as a ratio of GDP (in USD) over the number of employees, the LP figure is estimated at 11270.24 usd/employee or about 1.28 million ALL/employee in 2022, increasing by 1.3% compared to the previous year. According to ILO data, the average annual LP growth stood at around 0.66% in the years 2014-2022 and was generally non-stable[7].

Graph 1 LP for Albania and some other countries in 2022



Source: ILO Modelled Estimates and Projections (ILOEST) Database, Nov. 2023 edition, ILOSTAT.
Note: 19 countries were selected from the database for comparison purposes.
NM: North Macedonia; BH: Bosnia and Herzegovina.

Other studies applying different methods have pointed out the role of total factor productivity (TFP) (not only that of LP). Potential output re-estimations (Çeliku et. al. 2018) incorporating Cobb-Douglas production function, reveal that TFP contributions to real growth have dimished since 2009 in the aftermath of the global financial crisis. Estimations suggest a TFP contribution of 2.2 percentage points to the average real growth rate of GDP in the years 2002-2008. In the years 2009-2015, it has fallen to 0.4 percentage points. The study concludes that aside for the crisis impact, falling TFP is also related to diminishing LP during the same period. A similar conclusion is presented by Çela et. al. (2019), who apply Social Accounting Matrixes to generate input productivity as an alternative to TFP in the years 2009-2013. Under such concept, TFP would be interpreted as the efficiency in the use of inputs to generate a given output in each sector of the economy. Results evidence that non-tradables have been leading developments for overall productivity

[6] *ILO figures for GDP are provided in terms of 2015 USD with purchasing power parities (PPP) to allow for comparison between countries. This includes GDP data in constant 2015 USD from World Development Indicators. For LP defined as GDP per worker, ILO estimations apply total employment. For more details, consult https://ilostat.ilo.org/topics/labour-productivity/; https://ilostat.ilo.org/resources/concepts-and-definitions/description-competitiveness-indicators/; https://www.ilo.org/ilostat-files/Documents/TEM.pdf*

[7] *Converted using the average USD-ALL exchange rate at 113.14 ALL/usd (Bank of Albania). ILO estimations are very similar to ours. Refer to section 5.1 for more insight.*

both in level and growth rates, confirming conclusions from previous studies. Furthermore, results indicate that the overall productivity in the economy and for the tradables remains below 2010 levels.

To summarize, research contributions concerning total and sector based productivity in the case of Albania, indicate the need for revitalization of LP in the post crisis. Therefore, the acceleration of structural reforms coupled with a more flexible labor market, would enable for improved productivity within the most dynamic sectors of the economy generating LP related competitiveness advantages and improving living standards. In terms of productivity expansion, a flexible labor is insufficient if not coupled with wage reforms, education refoms and broadbased inclusion of innovation and information technology.

3. DATA

Sectoral studies are subject to limitations associated with times series availability, method re-contemplation and the level of detail available for sectors and various indicators. LP and ULC estimations are therefore subject to data availability. In the case of Albania, estimations are conducted on data from value added, employment, average wage, inflation and output deflators for the economy as a whole and by sector in the period 2013-2022. Data is available on a quarterly basis, but annual figures were applied to correct for quarterly fluctuations. The analysis horizon stretches for the years 2013-2022 for LP and 2015-2022 for ULC. Although GDP and deflator are available, shorter time series for sectoral employment and wages dictate the shorter time horizons for LP and ULC.

LP is calculated as the ratio of value added over the number of employees. ULC is estimated as the ratio of real average wage over LP. Although the ratios are similar to previous studies[8], the data core includes nominal and real chain-linked GDP series. Gross value added deflators, by sector, are included as well. Employment and wage indicators are obtained from INSTAT statistics including the Quarterly Labor Market Survey and quarterly measures for wages.

4. METHODOLOGY

Series availability for the indicators mentioned above allow for the application of the approach proposed by Tang & Wang (2004). According to this method, each sectoral contribution to LP growth can be decomposed into three additive effects. The approach also known as the The Generalised Exactly Additive Decomposition (GEAD)[9], decomposes contributions on LP and ULC growth according effects and sectors in exact way. It is refered as one of the methods available from the literature on the matter. The main advantage compared to

[8] *Based on the study by Çeliku & Metani (2011) also applying value added, employment and wages for LP and ULC calculations at different sectoral level. Value added figures were at the time available through a different methodology. The same applies for employment wage data. For more details on the decomposition's steps according GEAD, see Montebell & Darmanin, 2021 (Appendix I & II, pages 30-32).*

other methods is the ability to add up the sectoral contributions according to the effects, giving exactly the total LP growth rate, when the GDP and value added figures are calculated according to chain-linked technique, as the case of Albania.

Each sector contribution on overall LP growth can be decomposed into three effects: (i) the pure LP effect; (ii) the reallocation effect (on LP as a level); and (iii) the dynamic reallocation effect (on LP as growth rates).

(i) The pure LP effect measures the sectoral contribution to overall LP growth in the economy due to within-sector factors, weighted by the sector's share in aggregate nominal output in the previous period. This effect captures the gains in sectoral efficiency from technological progress, automation and increased skills of workers within the sector (Montebello & Darmanin, 2021). It is named 'pure' as it isolates the influence of the factors related to changes in the relative size of a sector.

The approach can also determine the (ii) static and (iii) dynamic reallocation effects. The reallocation effect captures the impact a sector has on overall LP growth as a result of changes in its relative size. These changes can occur due to: changes in the sector's employment relative to the rest of the economy; changes in the value added deflator (the price effect); the combination of both labor the price effects. As an example, even when sectoral LP levels remain unchanged, the overall LP can increase if: - labor shifts from below average LP sectors to above average LP sectors; the sector augmentation factor changes due to changes in relative deflators. If the deflator of a given sector increases relative to the rest of the economy, its contribution to overall LP growth will also increase even if its respective labor remains unchanged.

(ii) The static reallocation effect captures the impact from absolute changes in labor and/or relative prices weighted by the sectoral LP share over the overall LP in the economy.

(iii) The dynamic reallocation effect takes into account if such changes are occurring when the sectoral productivity is either increasing or decreasing. Therefore, if a sector (A) with LP above average increases in relative and, at the same time, a sector (B) with LP below average decreases its relative size, a positive reallocation contribution will emerge from sector (A) and a negative contribution will come from sector (B). As the reallocation effect is weighted for the relative productivity of the sector vis-à-vis the rest of the economy, the positive contribution from sector (A) will most probably dominate the negative contribution from sector (B), generating a net positive effect on the overall LP.

The GEAD formula is defined as follows:

$$G_t = \sum_i [\frac{Y_{t-1}^i}{Y_{t-1}} G_t^i + \frac{z_{t-1}^i}{z_{t-1}} (p_t^i l_t^i - p_{t-1}^i l_{t-1}^i) + \frac{z_{t-1}^i}{z_{t-1}} (p_t^i l_t^i - p_{t-1}^i l_{t-1}^i) G_t^i]$$

where:
G_t overall LP growth in period compared with a previous period;
G_t^i LP growth of sector i in period t as compared to a previous period;
z_t overall LP in the economy in period t;
z_t^i sector i LP in period t;
Y_t nominal value added of the whole economy in period t;
p_t^i relative price of sector i in period t ;
l_t^i share of employment in sector i over aggregate employment in the economy in period t.

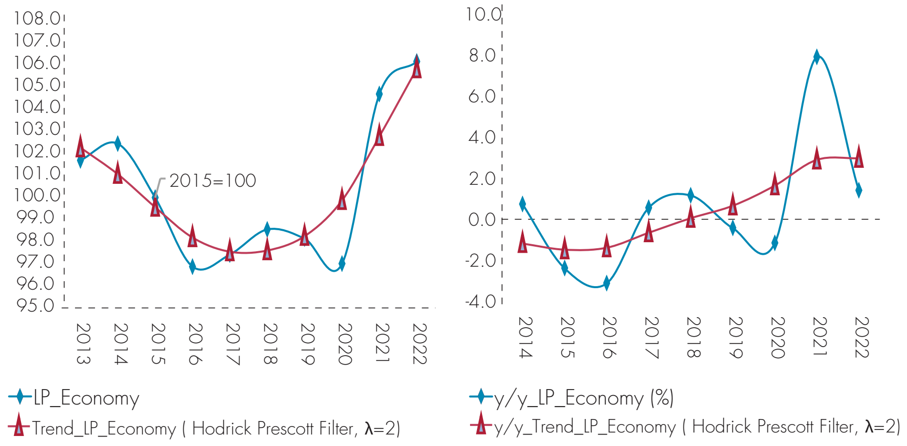
5. RESULTS AND ANALYSIS

5.1. GENERAL TENDENCY IN LABOR PRODUCTIVITY LEVEL

Results indicate a general increasing trend for the overall LP in the years 2013-2022 (2015=100) (Graph 2, left), however uneven. LP level has improved substantially in 2014 as compared with 2013. The years 2015-2019, witness a general decrease in LP compared with 2014 also reflecting for formalization effects in the labor market. In the following years, LP decreased again as the effects from the 2019 earthquake were further exacerbated by the negative contributions from the Covid-19 pandemic. The falling LP reflects decreasing value added at a higher pace compared with employment. The sharp rise in LP in 2021 reflects the low base effect from the previous year and also the economy's attempt to rebound. Improvements were more pronounced in the case of output as compared to the more gradual labor growth. The later reflected the business tendency not to permanentely decrease labor during the pandemic under the belief that the economic activity would rebound quickly in the aftermath. LP improvements continued throughout 2022 as the level reached 1.2 million lek/worker, surpassing the pre-pandemic level (1.07 million lek/worker). It was also above the 2014 level which marked the maximum value of the 2013-2019 period. LP level in 2022 would also remained above the average trend.

In terms of annual growth, LP average figure for the whole 2014-2022 time horizon stands at a mere 0.5% (graph 2, right). Growth has not been uniform due to different changes affecting various sub-components of LP calculation. These results make it very difficult to draw conclusions about the sustainable LP growth during the analysis horizon. Following the frequent fluctuations in LP growth rates, the annual rate marked around 1.4% in 2022, resulting even higher than in 2018 (1.2%).

Graph 2 LP level including trend (left) and annual growth rates in the years 2013-2022 (right) (%)



Source: INSTAT; authors' calculations and estimations.

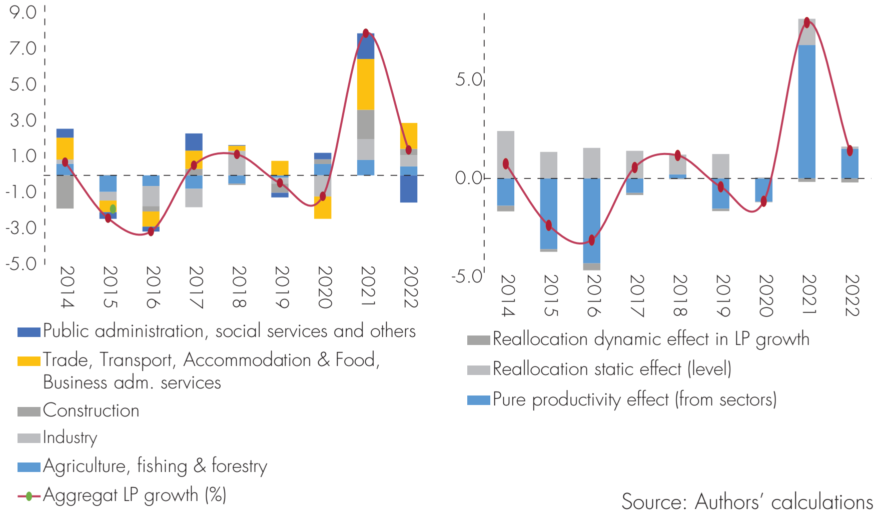
5.2. LP GROWTH AND SECTOR BASED CONTRIBUTIONS

In terms of sectoral decomposition, LP dynamics have been defined by certain sectors in given years (Graph 3, left). Positive contributions have primarily emerged from services which are generally considered as non-tradable. Positive contributions have risen from "Trade, transport, accommodation, food services and professional services" in the years 2017-2022, with the exception of 2020, the year of the pandemic peak. Formalization efforts and statistic improvements in the years 2015-2016, were reflected in higher employment growth as compared to value added growth. As a result, sector based contributions have dragged the overall LP in the economy. On average, "Trade, transport, accommodation, food services and professional services" have contributed by 0.5 percentage points to LP growth in the years 2014-2022. An additional 0.1 percentage point contribution has emerged from the public sector and other services, again considered as non-tradable.

Production sectors, which also include export oriented industrial sub-sectors as well as construction, have generally produced negative contributions with large variations. Fluctuations are mostly associated with variations in value added as employment remains generally stable. Industrial fluctuations are due to output changes due to export shifts, as export flows are closely related to international movements in raw material and mineral prices. Another factor affecting sharp changes was the "electricity" sector which is closely linked to weather conditions. Statistical effects from data are also a factor.

Negative contributions coming from construction until 2019 are associated with the subsequent barriers steaming from the global financial and debt crisis (2008), domestic restrictions for new housing and other factors which are specific to this particular sector. Construction has generated positive contributions on LP growth in the years 2020-2022. These contributions were particularly high in 2021 as value added increased much faster compared to employment.

Graph 3 Overall LP growth Sectoral decomposition (left) and factor decomposition (right) (in pp)



Source: Authors' calculations.

5.3. LP GROWTH: FACTOR EFFECTS FROM GEAD DECOMPOSITION

The GEAD decomposition tool rearranges factors behind LP growth based on a macro-economic concept (Graph 3, left). In the years 2014-2020, the *pure effect* related solely with sectoral LP growth augmented for their respective share on nominal output, has generated a negative contribution of 1.8 percentage points on total LP growth. The pure effect has turned positive in the years 2021 and 2022 with contributions at 6.8 percentage points and 1.5 percentage points respectively. These late developments underscore that the sectors have improved their internal labor usage efficiency as their output has increased at a faster pace compared with employment.

Positive contributions have emerged from the *static reallocation effect* in the years 2014-2022. The average contributions stands at 1.2 percentage points for the whole LP growth. This denotes that the effects sourcing from changes in labor shares and/or relative prices weighted for sectoral LP level, have positively affected LP growth in the economy. That is most probably associated with labor shifts towards sectors with higher productivity growth without neglecting for the relative price effect. The positive contributions coming from this effect have somewhat buffered the negative outcomes form the *pure effect* in the years 2014-2019.

Contributions from the dynamic reallocation effect were negative in all years, but have been marginal. This suggests that the economic structure has not favored sectors with higher LP level. That has been due both to lower shares from above average sectors and higher shares from below average sectors. The combined contribution on overall LP growth for the whole 2014-2022 horizon stands at -0.16 percentage points. The magnitude has decreased approaching the zero bound since 2017. The rationale behind this development is for the above average sectors to have increased their relative share in the economy without being able to fully dominate the below average sectors.

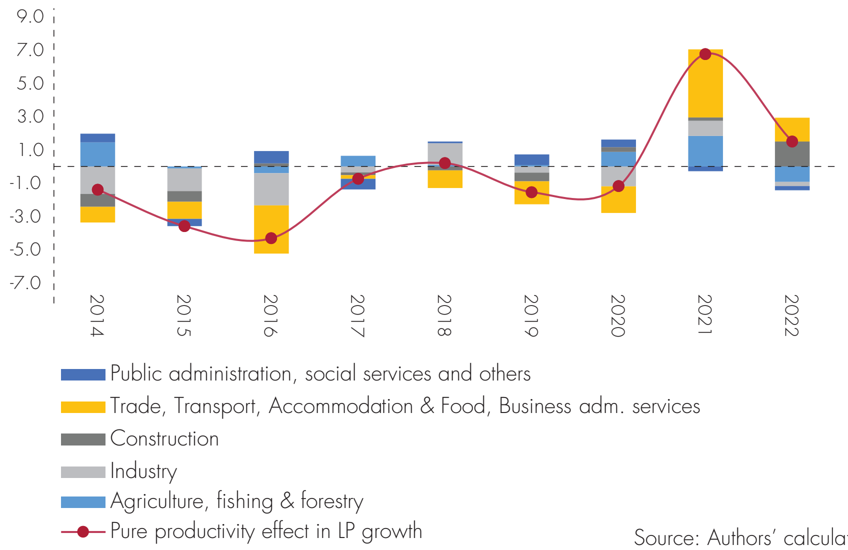
5.4. THE ROLE OF SECTORS IN THE EFFECTS' FORMATION ACCORDING TO GEAD

The following analysis will show how the economic sectors have contributed to each effect under the GEAD approach further exploring their role on total LP.

- *Sector based pure effects*

The sector based decomposition for the *pure effect* provides a detailed profiling for LP dynamics (graph 4). Throughout the whole 2014-2020 time horizon, the pure effect stands as negative mainly due to falling contributions from "Trade, transport, accommodation, food services and administrative services", with supplementary negative contributions from "Industry" and "Construction". Negative effects are more pronounced after 2017, when employment growth has been fueled by formalization processes. A positive contributions is denoted for "Industry" in 2018, probally associated with the positive impact from electricity production. That was however short lived, as contributions have turned negative in 2019 and also in 2020 - the starting of the pandemic. The positive contributions in 2021-2022 are mostly related to "Trade, transport, accommodation, food services and administrative services" and "Construction". The later has been particularly active in 2022.

Graph 4 Sector based pure effect decomposition (in pp)



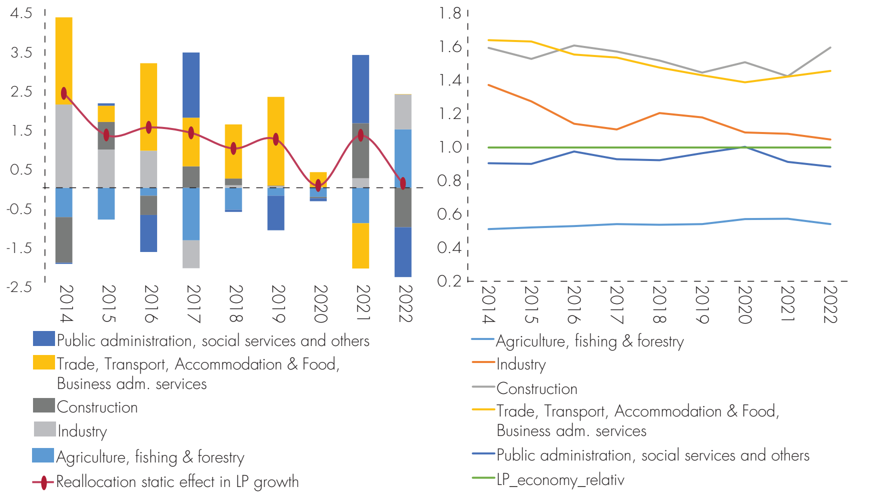
Source: Authors' calculations.

- *The static reallocation effect*

The main positive contributions to LP growth in the economy has been generated from the *static reallocation effect*. That is associated with relative productivity by sector and differences in prices and employment vis-à-vis the rest of the economy. Graph 5 (left) shows this particular effect decomposed by sector and also the performance of the relative productivity of each sector[10] (Graph 5, right). Positive contributions from this effect are related to LP level differences between sectors.

[10] *The relative productivity is determined as a ratio of sectoral LP over the overall LP in the economy.*

Graph 5 Sector based static reallocation effect decomposition (in pp, left); Sector based relative productivity to the economy (left)

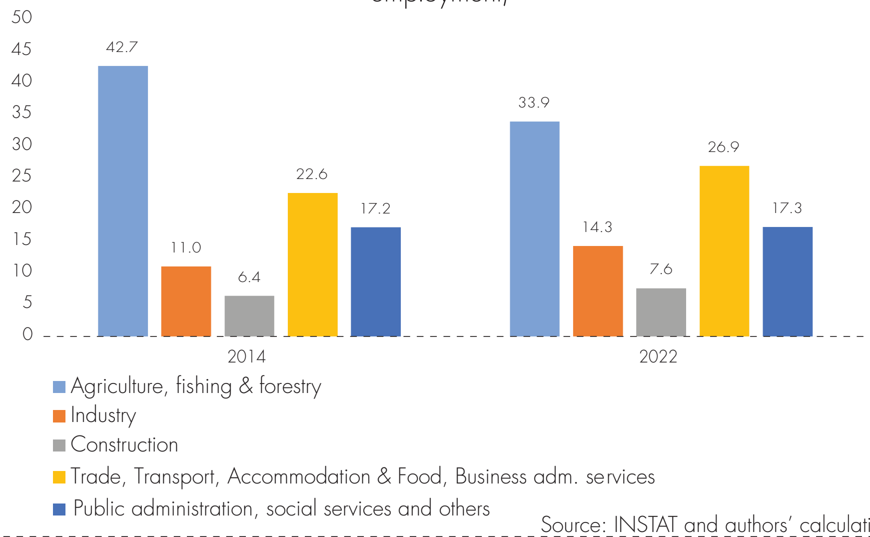


Source: Authors' calculations.

The positive contributions from these effecs rise from sectors with productivity above average. Positive effects are closely related with "Trade, transport, accommodation, food services and administrative services" with "Construction" and "Industry" also affecting in certain years. The positive effects from "Trade, transport, accommodation, food services and administrative services" are due to the sector's higher relative productivity and its increasing share across the years (graph 6). Although "Construction" and "Industry" have higher relative productivity compared tothe economy, their contributions are lower, volatile and, at times negative. That is due to two reasons: althrough the sectors have increased their respective shares on total employment, they are still lower compared with "Trade, transport, accommodation, food services and administrative services". Secondly, relative prices (proxied by value added deflators) are not just lower for these two sectors, but also decreasing. As the weighting is applied using nominal value added, falling prices denote falling shares in the economy.

On the other hand, the static reallocation contributions are negative in the case of "Agriculture, fishery and forestry" with the exception of 2022. Agriculture has the lowest relative LP in the economy (Graph 5, right). Employment structure in the economy denotes the falling relative share of labor in agriculture by nearly 9.0 percentage points in 2022 as compared with 2014 (Graph 6).

Graph 6 Employment structure by sector in 2014 and 2022 (% on total employment)



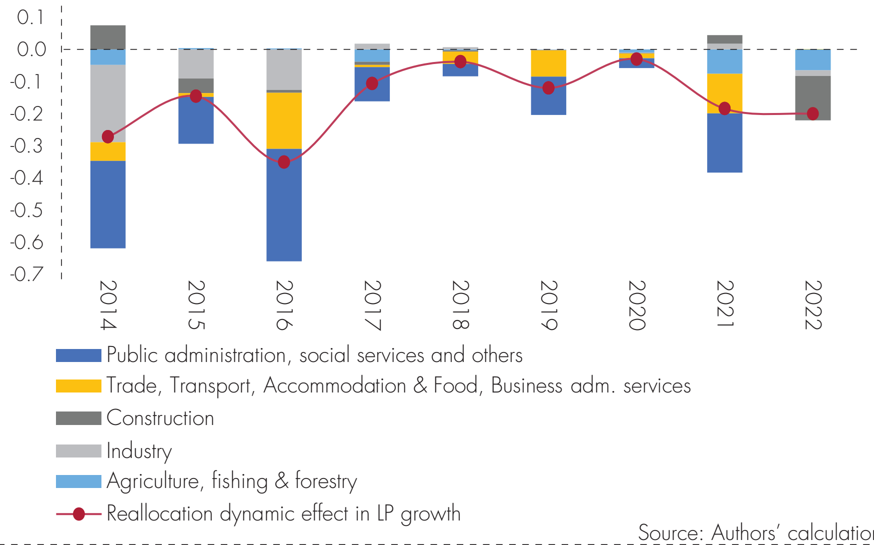
Source: INSTAT and authors' calculations.

The general conclusion is that more productive sectors in the economy have attrackted labor from the less productive sectors. This represents an important positive development in terms of competitiveness related to relative LP, generating positive contributions from static reallocation effect to the aggregate growth of LP. These positive contributions have somewhat acted as a counterweight for the negative pure effect contributions.

- *The dynamic reallocation effect*

The *dynamic reallocation effect* is calculated in a similar manner to the static effect with the difference being the presence of productivity growth (aside for the level productivity). It is interpreted as complementary to the static effect. In other words, it explores weather the movement of labor towards the more productive sectors occurs at the times productivity in these sectors is also increasing. Results indicate generally negative effects suggesting that labor movements have not occurred at times of growing productivity. However, the effect is marginal with a falling magnitude. Sector based decomposition reveal negative contributions coming from almost all the sectors of the economy (graph 7). The main effects are associated with the "Public administration, social services etc.", as a sector with below average productivity but which has retained its relative share on employment.

Graph 7 Sector based decomposition of dynamic reallocation effect (in pp)



Source: Authors' calculations.

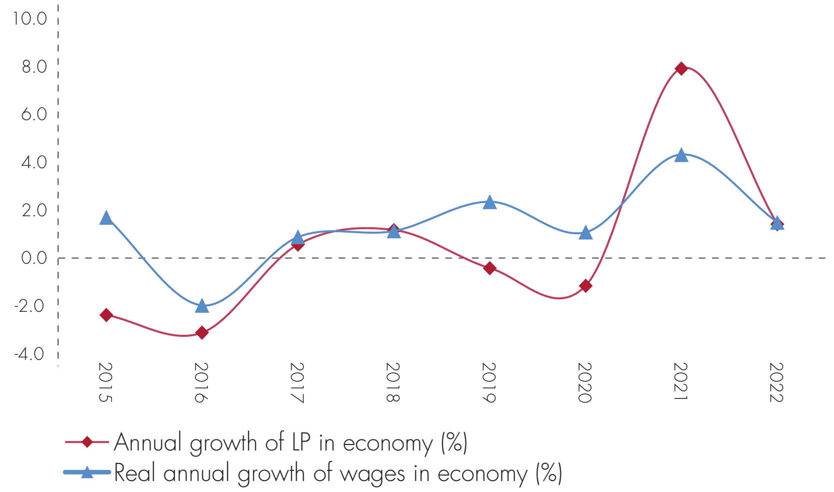
In conclusion, it is shown that the pure effect (by factor and by sector) has been dominant with negative contribution on LP growth throughout the period. This negative impact has been partly mitigated from positive static reallocation effects. Above average productivity sectors have been able to retrieve labor from below average productivity sectors. This is denoted in the movement of labor away from Agriculture towards the other sectors with the exception of "Public administration, social services etc." which has retained a relatively stable share of employment between 2014 and 2022. The highest increase in labor share is recorded for "Trade, transport, accommodation, food services and administrative services" (4.3 percentage points). As for the tradable sectors, "Industry" has gained 3.2 percentage points followed by "Constrution" at 1.2 percentage points.

4.5 OVERALL AND SECTOR BASED TRENDS FOR ULC

Productivity differences between sectors have caused labor shiftings as demonstrated by the positive effect from the static reallocation effect. On the other hand, important correlations have been established between LP and wage developments since 2015 (correlation coefficient at 0.8) (Graph 8). Short time series seriously inhibit more in depth empirical analysis on the causality's direction over time[11]. Real wage dynamics are certainly less volatile compared to LP dynamics in the years 2016-2022. Across the years, various regulations have increased the minimum wages with upward effects on the overall wage in the economy. Furthermore, formalization has also affected statistics with improved measures of both the number of employees and the wage they receive.

[11] *Nominal wage growth deflated by inflation.*

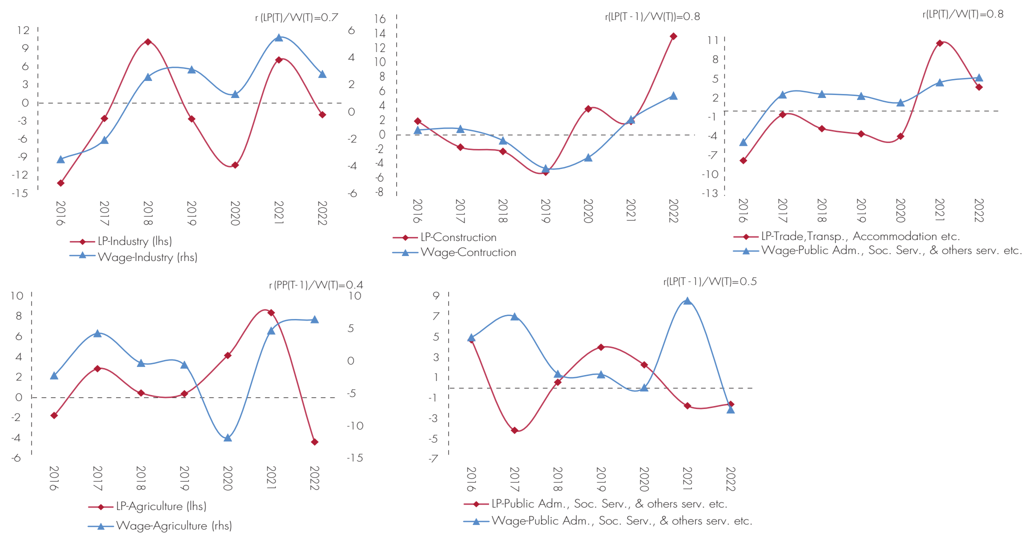
Graph 8 Annual changes in LP and average real wage for the economy (2015-2022)



Source: Authors' calculations.

On a sector level, high correlations between annual growth rates of LP and real wage are observed in the case of "Industry", "Construction" and "Trade, transport, accommodation, food services and administrative services" (graph 9, upper row). "Agriculture" and of "Public administration, social services etc." show weak correlations denoting the lower productivity level vis-à-vis the rest of the economy and also different specifics in terms of employment and wage setting (graph 9, lower row).

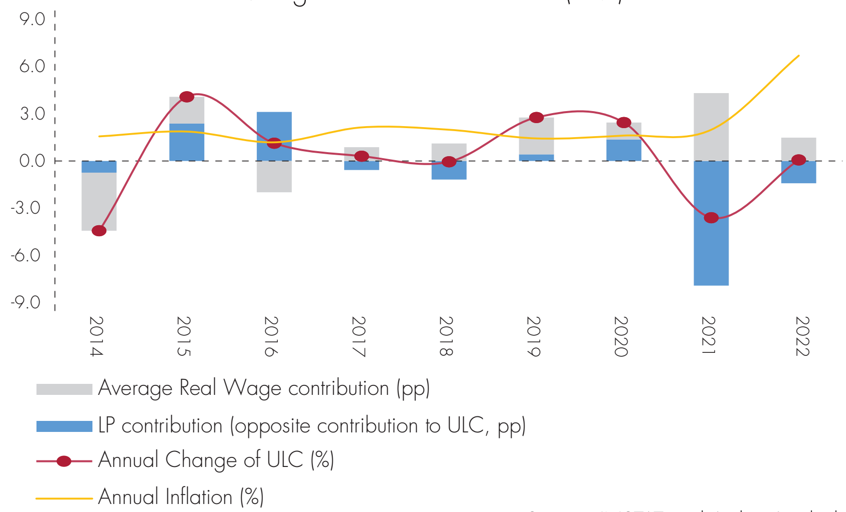
Graph 9 Annual growth rates of LP and real wage by sector



Source: Authors' calculations.
Note: Estimations were conducted for simoultaneous movements and also for 1-year lags.
The later denotes that increases/decreases in real wage in a given year, were also affected by the increase/decrease of LP a year before.

Developments in wages and productivity affect the ULC indicators which are calculated as a ratio of real wage over LP. Changes in ULC are a result of changes in the subcomponents (real wage and LP). In the years 2010-2019[12], average LP growth stands at 1.7% with a lower real wage growth at 1.4%. As a result, ULC has decreased on average by 0.3% denoting weak wage related inflationary pressures. They have certainly been a factor behind low inflation rates (2.1% during this period) which fell below the target of Bank of Albania. In 2020, as the pandemic evolved, real wage contributions were positive while those from LP were negative on overall ULC (graph 10). As a result, ULC increased annually by 2.5%. Growth rates were volatile in 2021 and 2022. Higher LP growth compared to wage growth, decreased ULC in 2021. On the other hand, higher ULC in 2022 further contributed to domestic inflationary pressures which coincided with tight conditions in the labor market and above objective inflation expectations.

Graph 10 Annual growth rates of ULC decomposed by factors (in pp) and average annual inflation rates (in %)

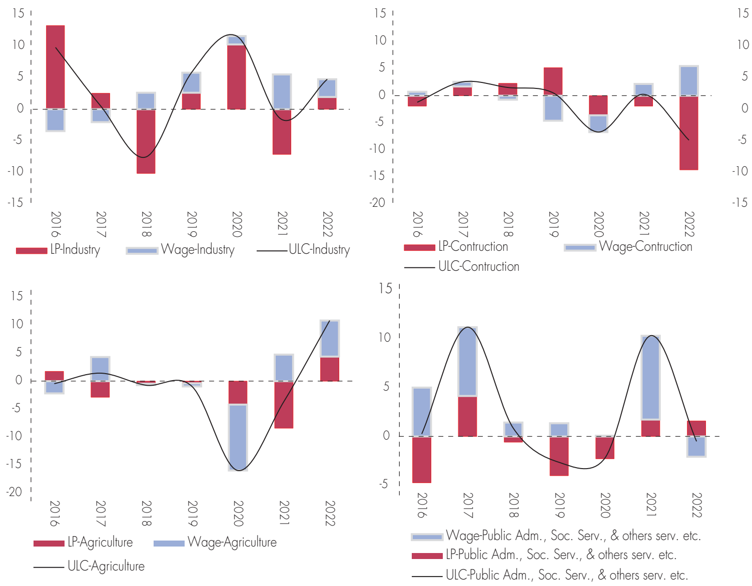


Source: INSTAT and Authors' calculations.

On a sector level, stronger inflationary pressures from labor costs are associated with "Industry" and "Trade, transport, accommodation, food services and administrative services" (graph 11). "Agriculture" and "Industry" have increased their respective ULCs in 2022 as wage growth outpaced LP growth. This phenomenon is more pronounced in "Agriculture" activity which also features the lowest efficiency of the labor factor in the economy. "Construction" has reflected high productivity growth which has eclipsed the substantial increase in real wage enabling lower inflationary pressures from labor costs.

[12] *Estimations for LP and ULC before 2015 are based on short-term statistics indicators (INSTAT).*

Graph 11 ULC annual growth rates according factors for each sector



Source: Authors' calculations and estimations.

6. CONCLUSIONS

The study analyzes the level and dynamics of LP and ULC indicators on overall and sectoral terms for Albania in the years 2013-2022. A three factor effect decomposition is applied in the case of LP growth: pure effect, static reallocation effect and dynamic re-distribution effect. Each effect is further decomposed into sectoral contributions.

In the case LP, a volatile low-magnitude positive dynamic is observed in the years 2014-2022. This dynamic has been affected by important developments in the LP calculation sub-components. Structural changes in the employment data due to formalization in the years 2015-2016 and the economic shocks associated with the earthquake and the pandemic in 2019 and 2020, are amongst the examples for the relatively unstable LP figures. In 2021 and 2022, strong LP growth rates were observed. In the first case, they were associated with the economic rebound in the post-pandemic from the low base 2020. In 2022, in spite of the conflict breakout in the Ukraine, the value added increased at a higher pace compared with employment, driving LP upwards. LP in level and growth rates terms in 2022 were above the respective figures of 2018.

The method applied in the study (GEAD), decomposes the overall LP growth on sector based effects. Factor decomposition denotes that the pure effect has generally driven the falling LP dynamic in the economy. Almost all sectors have contributed likewise. However, figures indicated that the negative magnitude has decreased since 2016 suggesting for improved intra-sectoral developments in the LP.

The static reallocation effect has positively affected productivity growth. That is associated with sectoral relative productivity vis-à-vis the rest of the economy. Continous positive contributions were associated with "Trade, transport, accommodation, food services and administrative service etc.', "Construction" and "Industry", all sectors featuring higher productivity compared to the average of the economy. Higher contributions could have been a result of higher prices, higher employment or both. Focusing on employment, data indicate that labor has shifted from "Agriculture" towards sectors with higher productivity in the years 2014-2022. It is difficult to denote the impact associated with prices in this case. Higher prices might have affected relative LP contributions in the case of industry, where the raw material and mineral base is related to international export price developments.

Dynamic reallocation effects are related to LP growth and not just levels as in the case of the static effect. These contributions are primarily negative, however they are marginal and ever decreasing. This denotes attempts in the economy to move labor also when the productivity is growing.

As for ULC, the indicator is also volatile, particularly in the years 2021 and 2022. In 2021, LP increased quickly in the post-pandemic recovery. The growth rate was higher compared with the growth in real wages. As a result, ULC decreased compared to the previous year. In 2022, ULC has turned to positive growth rates. That is associated with tight conditions in the labor market, wage upward re-setting, high inflation and expectations on inflation above the target, all adding up to inflationary pressures from labor costs.

On a sector level, LP and ULC growth rates are high-correlated in the cases of "Industry", "Construction: and "Trade, transport, accommodation, food services and administrative service etc". These correlations become increasingly weaker in other sectors (Agriculture and Public Administration).

The presence of short and structural break bearing time series is a serious limitation in the analysis of correlation and causality tests between the indicators included in this study. In the future, research will benefit from longer and enriched time series. Continuous improvements in labor and wage statistics including the availability of data for "compensation of employees" (income side GDP), would certainly enhance the quality of analysis.

In conclusion, GEAD is a valid alternative for LP growth decomposition into factor and sector based sub-components. In spite of its validity, the interpretation of the sub-components is no easy task. Reallocation effects bear the combined contributions from both relative employment and prices. The availability of more detailed price, output and labor data would enable the application of easier and more transparent methods. The later would enable the detachment of reallocation effects associated with prices from those associated with labor reallocation between sectors.

BIBLIOGRAPHY

Anderson, Richard G. "How well Do Wages Follow Productivity Growth?". Federal Reserve Bank of St. Louis, (2007).

Baily, M. Neil; Bosworth, B; Doshi, S. "Productivity comparisons: Lessons from Japan, the United States, and Germany", Economic Studies at Brookings (January, 2020).

Baumol, J. William. "Productivity Growth, Convergence, and Welfare: What the Long-Run Data Show". The American Economic Review, Vol. 76, No. 5, pp. 1072-1085, (December, 1986).

Çela, E.; Metani, I.; Çeliku, E. "Analiza dhe zhvillimet strukturore të ekonomisë shqiptare: përqasja sipas matricave të kontabilitetit social" Banka e Shqipërisë. Material Diskutimi, No. 39(78)2019 (in Albanian only).

Çeliku, E.; Metani, I. "Competitive Position of the Albanian Economy in terms of Productivity and Labour Cost" Bank of Albania, Working Paper, No. 01(24)2011.

Çeliku, E.; Çela, E.; Metani, I. "Potential output and growth, output and unemployment gap in Albania – Comparative analysis of recent estimations - 2015". Bank of Albania, Working Paper, No. 30(69)2018.

Denison, E. "The sources of economic growth in the United States and the alternatives before us", New York: Committee for Economic Development (1962).

Feldstein, S. Martin. "Did wages reflect growth in productivity?". NBER. Working Paper 13953. (April, 2008).

Herrendorf, B; Rogerson, R; Valentinyi, Á. "New Edvidence on Sectoral Labor Productivity: Implications for Industrialization and Development", NBER, Working Paper 29834, (March, 2022).

Konte, M; Kouame, A. W; Mensah, B. E. "Structural Reforms and Labor Productivity Growth in Developing Countries: Intra or Inter-Reallocation Channel?". World Bank Economic Review. Vol. 36, No.3. (August, 2022).

McMillan, S. M. & Rodrik, D. "Globalization, structural Change and Productivity Growth". NBER. Working Paper 17143, (June, 2011).

Montebello, R & Darmanin J. "Labour Productivity growth in Malta: A Sectoral Decompostion Analysis", Central Bank of Malta, Working Paper, No. WP/04/2021 (April, 2021).

International Labor Organisation: "ILO Modelled Estimates" Methodological Overview, Department of Statistics, January, 2024, https://www.ilo.org/ilostat-files/Documents/TEM.pdf; "ILO Modelled Estimates and Projections (ILOEST) Database, Nov. 2023 edition, ILOSTAT ".

Roson, R. "Sectoral Differences in Labor Productivity Growth Estimation and Modeling". Research in Applied Economics, Macrothink Institute, vol.11(1), (March. 2019).

Rodrik, D. "Premature Deindustrialization". Journal of Economic Growth. Vol. 21, Issue 1, No. 1 (2016).

Tang, J; Wang, W. "Sources of Aggregate Labour Productivity Groëth in Canada and United States". The Canadian Journal of Economics, 37, 421-444, (2004).

Triplett, E. Jack; Boswrth, B. "Productivity Measurement Issues in Services Industries: Baumol's Disease Has Been Cured", Economic Policy Review, Vol. 9, No.3 (September 2003)

Young, A. "Structural Transformation, the Mismeasurement of Productivity Growth and Cost Disease of Services" The American Economic Review, Vol. 104, No. 11, pp. 3635-3667, (2014).

"A SYNTHETIC METRIC APPROACH TO ASSESS SUSTAINABLE DEVELOPMENT IN THE CASE OF ALBANIA."

Gerti Shijaku[1], Bank of Albania Research Department
Monnin[2], Council on Economic Policies

This paper introduces an adequate, continuous and accepted alternative metric approach to evaluate a composite synthetic indicator on sustainable developments. It is expected to play a key role helping policy-making to monitor better and formulate more appropriate policies in the case of a small open economy, Albania. The metric approach relies upon two crucial components. One element refers to the need to coordinate economic, social and environmental developments. The other element accepts the need to balance between intra-generational well-being and maximize overall inter-generational well-being. For these reasons, the information used to estimate this metric includes a dataset of 12 pre-selected indicators, with information for the period that is independently related to these dimensions. The estimation technique follows a three-step process. First, each of the indicators are standardized to ensure that the data are consistent, comparable and meaningful. Second, the weights of each of the standardized indicator, which would be used then in the aggregation process, are calculated using the entropy weighting method. Finally, these weights are used to aggregate the standardized indicators into a single indicator with a range from 0 to 1. The higher the value of this synthetic indicator is, the better will be the performance in sustainable developments, and vice versa.

JEL Classification: Sustainable development, entropy methods, environmental assessment, index.

Keywords: Sustainable development, entropy methods, environmental assessment, index.

[1] *PhD in Banking and Finance, Bank of Albania Research Department (gshijaku@bankofalbania.org) . The views expressed in this paper are those of the author only and do not reflect that of the Bank of Albania. The author is grateful to his colleagues at Department of Research for their valuable comments and suggestions on the early drafts of this paper..*

[2] *Council on Economic Policies (pm@cepweb.org).*

1. INTRODUCTION

The prompt development of the global economy and society has triggered several problems related to sensitive environmental and social issues, among which the excessive consumption of natural resources, the deterioration of the ecological environment and the imbalance of social development around the world [Jin, et al (2020)]. This theoretical idea on the matter has been latent in the rhetoric of sustainable development policies following the Brundtland Commission[3]. It is developed further through subsequent meetings and publications since the adoption of Agenda 21[4] in Rio de Janeiro. This theoretical concept is, however, being only recently intensively promoted as a popular and important concept by many leading multilateral organisations and is incorporated and adopted in national and international policy, including the Sustainable Development Goals [Ness, et al (2007)]. On the one hand, this is seen as a dominant policy response to growing climate change risks and ecological breakdown [Hickel and Kallis (2019)]. On the other hand, as Kwatra, et al (2020) advocate, it rests upon the assumption that economic development and expansion should be compatible with our planet's ecology, upon which technological changes and substitutions, should allow us to absolutely coordinate economic growth, environmental, and social progress and cohision. Similarly, sustainability policies should be seen through the need to balanceoverall intra-generational welfare and maximize inter-generational overall welfare. That is why sustainable development and its assessment have increasingly played a key background role in policymaking across the world. For this reason, the main actors, e.g. governments, regulators, investors and researchers, require reliable estimates of sustainable development risks and opportunities that would serve properly the decision making process within a country, including policies, plans programs and projects. At this point, it is also crucial that for the best outcome such assessment should be understood as a systematic and comprehensive approach aiming to evaluate and monitor progress as a combination of environmental, social and economic manners within a country and beyond.

In this sense, the United Nations Conference on Environment and Development held in 1992 recognized the important role that indicators can play in helping countries to make informed decisions concerning sustainable development. This conceptual approach clearly means, as quoted by Dasgupta (2001), that it is necessary to have a tight, comprehensive and sound analytical framework that is based on a systematic set of different indicators. This dataset should provide information on sustainable development assessments with regards to environmental, social, and economic dimensions. This is necessary for policymaking as it makes it easier to proceed to practical decisions [UN (2008)]. In parallel to this, while assessing these risks is challenging, several commercial data providers and academics have started to develop some related risk scores or indicator metric approach, which most importantly as it

[3] *Formally known as the World Commission on Environment and Development (1987).*
[4] *Agenda 21, Programme of Action for Sustainable Development, adopted at the UN Conference on Environment and Development, Rio de Janeiro, Brazil 1992.*

is accepted[5] can provide crucial guidance for decision-making in a variety of ways. Firstly, the information provided by these means, can translate physical and social science knowledge into manageable units of information. This is expected to facilitate the decision-making process in such as to be able to take better decisions and more effective actions by simplifying, clarifying and making aggregated information available to policy makers. Secondly, they can help to measure and calibrate progress towards sustainable development goals. Thirdly, they can provide an early warning metric approach, sounding the alarm in time to prevent economic, social and environmental setbacks and damages. They are also important tools to communicate ideas, thoughts and values. At this point, however, two prominent questions remain still challenges, at least regarding concerns with sustainable development. The first questions is related to the way on how one should arrive at a more substantive definition on the concept of sustainable development. The other question refers to the need understanding the importance of conceptual differences between weak and strong sustainability upon which we then move to outline what we consider to be currently the best practice in measurement and quantification approach for consideration on such developments.

At present, there is a large number of metric approach gauging sustainability from different perspectives, with most of them being synthetic composite indices. Each of them is related, however, to different metric approaches. Similarly, they intent to assess the degree of sustainability either for a given single country (region) or for a set of countries. Authors like Hui, et al (2022), however, distinguish their restrains in three aspects. Firstly, some of them contain too many indicators, which creates some limitations for countries with data shortages. Secondly, some other metric provide scoring indicators that have simple structures and low data requirements. This might be relatively positive and provide sustainability metric for most countries, but their configuration does not represent sustainable development effectively. Thirdly, their aggregation approach is based on a common weighing method reported in the literature, namely “equal weights”, “expert weights”, and “factor analysis”, but each of these techniques comes with its own limitations. The first two methods are criticized for their lack of objectivity. The third method can only estimate weights if correlation exists between indicators. For these reasons, the main input of this paper is to build a concise and acceptable composite synthetic metric for sustainability assessment in the case of a small open economy, namely Albania that reflects two fundamental principles. One of them, as suggested by Guillen-Royo (2016), involves the need to integrate and coordinate the dynamic balance among economic, social, and environmental developments. The other element, as Kwatra, et al (2020) imply, involves the need to ensure and balance inter-generational and intra-generational equity and then maximize total inter-generational welfare. In this view, this paper builds upon the work of Hui, et al (2022). These authors adopt and modify an alternative metric for sustainability assessment, called the National Sustainable Development Index, which has been presented previously by Jin, et al (2020). This approach relies upon a composite synthetic metric that includes a battery of 12 relevant pre-selected indicators (variables). Every single indicator

[5] *See among others Shah (2004); and United Nations (2007).*

contains information independently related to individual dimensions bore on sustainable development. The estimation technique follows a three-step process. Firstly, each of the indicators is standardised to ensure that the data are consistent, comparable and meaningful. Secondly, the weight of each of the standardised indicators, which would be used then in the aggregation process, is calculated using the entropy weighting approach. Finally, the estimated weights are used then to aggregate the standardised indicators into a single indicator, which takes a value ranging from 0 to 1. The higher the value of this synthetic indicator, the better will be the performance in sustainable developments, and vice versa.

The advantages of this paper is threefold. Firstly, as a data-driven metric, this carefully constructed and methodologically rigorous sustainable index is estimated for the first time in the case of Albania. On the one hand, this index provides a synthetic metric approach to assess sustainable development at the national level in the case of Albania. On the other hand, it makes up for gaps of existing indices and may help authorities in this case to monitor better the status of sustainability on continues basis and make better decisions and plans upon such developments. In return, this would allow us to track trends, identify emerging sustainable problems and ensure that policy decision-making offer the greatest return possible, which even more helps strengthen the public and academic understanding of sustainable development. Secondly, this approach is comprehensive and recognizes the core sustainable developments, while most of the existing metric fail to understand properly the essence of sustainability. This includes the need to coordinate economic, social and environmental development and the need to balance intra-generational well-being and maximize overall inter-generational well-being. On the one hand, this will be helpful to strengthen the planning and understanding of sustainable developments. On the other hand, it promises to improve decision making related to sustainable developments and steer the country towards a more sustainable future, but only if policymakers embrace fact-based analysis and act on the insights that emerge from the data. Finally, this paper builds the NSDI using the entropy method to make the calculation of weights more scientific and objective.

The remaining part of this paper is organised as follows. Section 2 describes the NSDI and the methodology to build a synthetic index for measuring sustainable development in Albania. Section 3 presents the results. Main conclusions are drawn in section 4.

2. THE METHODOLOGY AND DATA FRAMEWORK

2.1. THE ESTIMATION APPROACH

The concept of sustainable development has sparked a heated debate around the world and gained momentum in academia once an updated version of this notion was introduced. Acknowledged to have originated in ecology, this concept is increasingly justified as a comprehensive and multidimensional concept that should be approached according to two fundamental principles [Hui, et al (2022)]. One of them involves the need to integrate and coordinate the dynamic balance among economic, social, and environmental developments [Guillen-Royo (2016)]. The other one involves the need to ensure and balance inter-generational and intra-generational equity and then maximize total inter-generational welfare [Kwatra, et al (2020)]. At present, a large number of researchers are devoted to studying the assessment of sustainable developments from different perspectives. However, only a few of them have been delving into building a suitable composite synthetic metric that base their work on such considerations. Among them, this paper builds upon the work of Jin, et al (2020). These authors propose a relatively systematic and complete index of sustainable assessment metric, that is, the National Sustainable Development Index (NSDI). The NSDI, which was seen as a way to amend the Human Development Index, is a synthetic composite index. This one includes information from a set of 12 relevant indicators (see Table 1 in Appendix), upon which Hui, et al (2022) adopt and propose a modified version to make up for some demerits of the original approach and enhance its acceptability, continuity, and reliability. The idea, according to them, is that two of the sub-indicators in the original NSDI, e.g. "drinking water" and "sanitation", which are respectively measured by "population using improved drinking water source (%)" and "population using improved sanitation facilities (%)" can only be measured once every 5 years, making it impossible to measure sustainability annually. This set of information loss, as these authors claim, would make NSDI unable to monitor national sustainable development on a regular base, e.g. annually. This limits its used for annual panel data analysis. Data shortage, as Khalid, et al (2020) reveal, is among the main reasons why many sustainable development indices cannot be effectively measured and compared. Therefore, Hui, et al (2022) address such data issue by using instead "drinking water" and "sanitation" respectively, measured by "population using at least basic drinking water sources (%)" and "population using at least basic sanitation facilities (%)". The advantages as they declare are twofold. Firstly, these set of data are accounted for once a year, hence, guaranteeing an annual measurement of NSDI. Secondly, both of them, meaning "basic drinking water sources and sanitation facilities" can better reflect the basic needs of humans for public health and the environment.

The estimation technique of the NSDI is based similarly in the entropy weight method. This is an important information weighting approach, which is commonly used to calculate the weight or the value dispersion in decision-making of each indicator in a composite indicators system. This technique is based on the idea of the entropy weights from basic information theory. This information is needed to relate the different variables in different units with a dimensionless scale from 0 to 1[6]. Specifically, the valuable information is a measure of the degree of order in a system and entropy is a measure of the degree of disorder in a system. This means that the greater the degree of dispersion, the greater the degree of differentiation, and more information can be derived. Therefore, the smaller the indicator information entropy, the greater the information provided by the indicator, the greater its effect in the

[6] *See among other Erkhembaatar and Bataa; and Zhu, et al (2020).*

comprehensive evaluation, and the higher the weight. As such, higher weight should be given to the index, and vice versa. Compared with various subjective weighting models, the biggest advantage of this approach is related to the fact that it avoidances the interference of human factors on the weight of indicators, which enhances the objectivity of the estimated results and analysis. According to the principle of the entropy method m indicators and n sample are set in the evaluation, and the measured value of the i indicator in the j sample is recorded as X_{ij}, which in our case with a country will be identify by X_i. The first step in this method is related to the need to standardise each of the measured value or indicators, which is a necessary step before the 12 indicators are aggregated into a single composite index. Among the many kinds of normalisation methods we adopted the min-max approach. This approach, as Khalid, et al (2020) reveal, is simple, mature and widely used. According to this approach, we divide each indicator into those, whose increasing values are positively related to sustainability, and those that are negatively related. This means that the first group of indicators includes those whose increasing values represent better performance in sustainable development, such as income level and forest area. This set of indicators are standardised using Equation (1). The second group refers to the ones whose value represents better the performance of sustainable development, such as CO2 emissions per capita, which needs to be treated using Equation (2), below:

$$\tilde{x}_i = \frac{X_i - min\ (X_i)}{max\ (X_i) - min(X_i)} \tag{1}$$

$$\tilde{x}_i = 1 - \frac{X_i - min\ (X_i)}{max\ (X_i) - min\ (X_i)} \tag{2}$$

Where, X_i is the raw data value; $minX_i$ is the minimum observed value of the indicator X_i; and $maxX_i$ is the maximum observed value of the indicator; and $\tilde{x}_i$ is the result of dimensionless treatment being standardised (normalised). In the second step, the entropy value (e_i) of indicator i is calculated as follows through Equation (3) and (4), below:

$$k = 1/\ln(n) \tag{3}$$

$$e_i = -k \sum_{j=1}^{m} \tilde{x}_i^j \ln \tilde{x}_i^j \tag{4}$$

Where, n is the number of observations of each of indicators included in the given sample and the constant k depends on n and the range of the entropy value e_i is [0, 1]. The larger is, the greater the differentiation degree if index i is, and more information can be derived. Hence, higher weight should be given to the index. In the third step, the information utility value of indicator i, namely g_i, is calculated, as follows: **(5)**

$$g_i = 1 - e_i$$

Finally, the weight of each indicator i is obtained, namely ω_i, as shown in Equation (6) below:

(6)

$$\omega_i = g_i / \sum_{j=1}^{p} g_j$$

Where, $\sum_{j=1}^{p} g_j$ is a constant for i= 1, …, p. Then, the estimated weights, ω_i, and the standardised value of indicator i are used to aggregate this set of information into a single benchmark, which is transformed into a comprehensive sustainable barometer, as follows: **(7)**

$$SDI = \sum_{i=1}^{p} \tilde{x}_i * \omega_i$$

And it is only after this transformation that estimated new indicator, then, is transformed into a single synthetic index using the formula as follows, **(8)**

$$SDI_t^* = \frac{SDI_t}{SDI_{average}} * 100$$

The advantages of this approach as these authors proclaim are fourfold. Firstly, each of the indicators reflect properly each sustainable development aspects including economic, resource, environmental, and social dimensions making it a concise and acceptable composite synthetic index. Secondly, the estimation approach is based on existing indicators that are representative and their quantity is not too many, making the SDI concise and acceptable. Thirdly, each indicator represents time series data making them continuous and comparable. This would provide us with an index that can be used to compare results on country (regional) and time basis. Finally, the selected indicators are quantifiable and strongly operable. Similarly, for each of them there is a high data availability and the reliability of their source of data make them best set of information for such analysis.

2.2. THE DATASET

The data dashboard, used to estimate the SDI in the case of Albania, contains 12 indicators that cover sustainability developments and threats with information on annual basis. This set of information is divided into three sub-categories, namely economic, resource and environmental and lastly

social dimension. Each of them provides comparative information related to sustainability developments with regards to Albania.
Firstly, the three indicators on economic dimension are GDP growth (GDP); Income Index (II); and Employment in Services (EMP). GDP is measured as the real annual growth rate of Albania economy. The income index reflects the fairness and equality in the case of unequal distribution factors, based on the disposable income or consumption of per capita family. The higher the income index is, the better the economic situation of the country is, and the more equal and fairer the income distribution of the country is. The Employment in Services expresses the proportion of employment of the tertiary industry (encompassing medical providers, educators, financial services, haircuts, and personal trainers, among many others) in total employments, which is used to measure the economic structure.

Secondly, the five indicators of resource and environmental dimensio provide information on climate, air quality, forest coverage, arable land, and energy patterns. Climate is factorised by the use of Per capita CO2 emissions generated by the combustion of energy such as coal, oil, natural gas, and so on (unit: ton per person). Air quality is measured by the indicator of PM2.5, which show the concentration in the atmosphere of fine suspended particles with a diameter less than 2.5 microns, which can penetrate into the respiratory tract and cause serious health damage, measured as PM2.5 air pollution, mean annual exposure ((unit: microgram/m3)). The forest coverage rate measures the proportion of forest area in the total land area, while the forest area refers to the land covered by upright trees (at least 5 m) which grow naturally or are planted artificially. The indicator of arable land per person includes temporary crop land, temporary grassland for mowing or pasture, market or kitchen garden land, and temporary fallow land, but excludes land abandoned due to rotation. The last indicator, renewable energy consumption show the proportion of renewable energy consumption in total energy consumption. The higher the proportion is, the more conducive to the sustainable development in resources and environmental dimension.

Finally, the four indicators of social dimension are education (ED); health; drinking water, and sanitation facility. The quality of knowledge and education, as measured the adult literacy rate, is captured by an indicator showing information on mean years of education for adults over 25 years old. It is calculated as the average number of years of education received by people ages 25 and older, in their lifetime based on education attainment levels of the population converted into years of schooling based on theoretical duration of each level of education attended. Life expectancy at birth, (years) is considered as an index of population health and longevity. It is calculated as the number of years a new-born infant (male or female) could expect to live if prevailing patterns of age-specific mortality rates at the time of birth stay the same throughout the infant's life. The last two are proxy through the use of the proportion of population using basic drinking-water services and the proportion of population using basic safely managed sanitation services. The former is a drinking water source that is free from external pollution, especially from excreta pollution, due to its own structure or through active intervention. The latter, is the proportion of the population with basic excreta treatment facilities, which can effectively prevent human, livestock, mosquitoes, and flies from contacting with excreta. Improved sanitation facilities include simple but protected latrines, and direct flush latrines connected to sewer lines, of which normal function can be guaranteed.

3. RESULTS ASSESSMENT

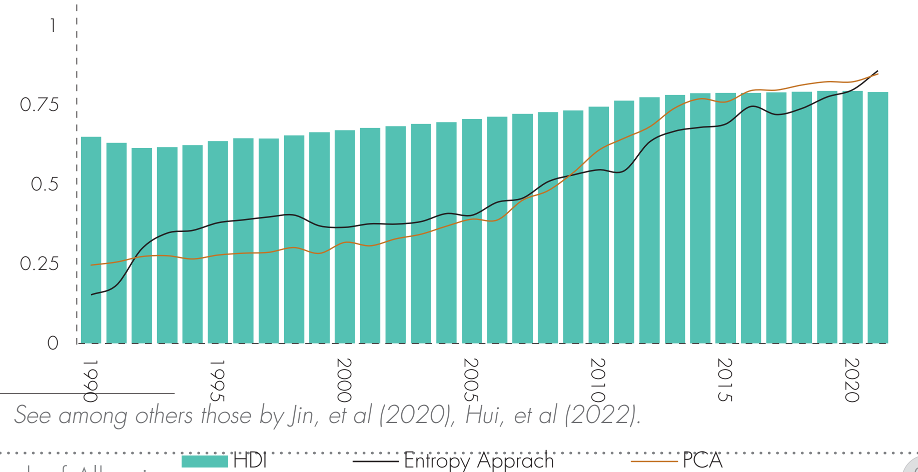
This study measures the weight of 12 indicators using the entropy method. The dataset is based on annual information for the period 1990 to 2022. It is important to note that due to the missing data during this time horizon for some indicators, this study adopts an interpolation (estimation) method of constructing (finding) new data points based on the range of a discrete set of known data points. Hence we employ available data to estimate unknown (missing) data values, which is known as an imputation method to fill in the missing data, rather than missing out information. This notion is also in tune with works by Campagnolo, et al (2018), whose approach adopted also by similarly by Hui, et al (2022). This study adopts two different imputation methods according to the actual situation. Firstly, it uses a linear interpolation approach, which as it is known requires knowledge of two points of x- and y-values directly and the constant rate of change between them. This means that we used the mean value interpolation method in which if data for two different periods, e.g. 2000 and 2005, are available, but those in between those periods are missing, we used the average of 2000 and 2005 to replace the value of 2001, then we used the average of 2001 and 2005 to replace the value of 2002, and so on until all the missing values are filled in. This method applies an imputation process regarding the set of missing data for employment in Service (% of total employment) and PM2.5 air pollution. Secondly, we use a linear interpolation (extrapolation) in backward direction, which is known a process of filling (computing) the missing value of the function outside the given range of the actual (known) data. This method is used to deal with missing data for the variables that are very stable over time, like the population using basic sanitation facilities (%) and population using basic drinking water (%), which are assume to change gradually making them autoregressive in their behaviour. The imputations approach in instances, as Khalid, et al (2020) suggest, can distort the results, but as Hui, et al (2022) admit losing out data might prove costlier and limit the horizon of our analyses. At the same time, this imputation approach is expected not to distort the results given that it is used to deal with missing data for the non-financial variables that are usually very stable over time.

Table 2 below presents the weights estimated based on this dataset. As the weights in table show, the economic dimension, social dimension, and resource–environmental dimension, respectively, accounted for nearly 22.6%, 46.1% dhe 31.3%. This means that factors related to resource-environmental dimension have the greatest contribution, compared to a lower share that offers economic growth and social progress dimension. According to the concept of sustainable development, as Jin, et al (2020) suggest, Albania is at a stage in which it should pay a greater intention to the other dimension by pursue social progress to ensure the welfare of present generations, while protecting the ecological environment and rationally utilizing natural resources to ensure the welfare of future generations. Results of weight calculation show that the sum of the weights of the economic and social dimensions is almost twice to the weights of the resource–environmental dimensions. This represents, as these authors would suggest, the concept and essence of sustainable development that the welfare of the present and future generations is equally important, and that we should not "care for this and lose that". Similarly, if we were to protect the environment and make the economy stagnate, this would also not be a sustainable development mode. Additionally, as in the case of Jin, et al (2020) and Hui, et al (2022), results show that in the case of Albania resource and environment are also important factors of economic development and contribute to quality of life, which justifies this high weight.

Other results show the average arithmetical (or geometric) mean weights of each of the indicators, related to these dimensions, and especially those related to the economic and social dimension, are found to be nearly 7.5 (7.23) and 7.8 (7.79) compared to the mean value of nearly 9.2 (9.02) for resource–environmental dimension. This means that mean weights are slightly lower for economic and social dimension than that of the environmental dimension. However, the standard deviation on the score of each the indicators belonging to these dimensions is relatively higher for economic and resource–environmental dimensions and lower for the social dimension, respectively, accounting for nearly 2.45 versus 1.98 and 0.82. If this set of results are to follow a normal distribution, it suggests that the value of each indicator belonging to economic and resource–environmental dimension are generally far away from the mean that those of the social dimension. Thus there is a higher deviation within the resource–environmental dimension dataset. This is because the weights deviation within the economic and resource–environmental dimension dataset exhibits a wider spread from the mean, and therefore the intuition toward this dimension is less homogenous. At this point, the most weighted factors are the income, energy, water and sanitation facilities, respectively, in each dimension. This means that these factors are the most important factors for sustainable national development. On the other hand, the least weighted factors are economic growth, arable land, education and health, respectively, in each dimension. As a developing country, according to Jin and Qian, (2020) Albania's poor performance of sustainability in these areas in light of two reasons. Firstly, the level of the economy and residents' income is relatively low compared to that of developed countries. Secondly, the supply of public goods and services is insufficient and inefficient, like education and public health, due to poor governments or inadequate fiscal revenue. This means that Albania is at a stage in which it should intensify and pursue better policies that would promote economic growth, use of arable land, education and health progress to ensure the welfare of present generations, while protecting the ecological environment and rationally utilizing natural resources to ensure the welfare of future generations.

In addition, the estimated final score of the SDI represents a summary measure for assessing long-term progress in three basic dimensions of sustainability development that is a decent standard of living in terms of income, environmental and social cohesion, including a long and healthy life and access to knowledge. Results, after weighting and aggregation, show the performance of sustainability developments in Albania during the period 1990 – 2021 as presented in Figure 1 below with a range from 0 to 1, with high values indicating a better performance of sustainable development. Firstly, the performance of the SDI in the case of Albania, as presented in Figure 1, is ranked from low to high. The higher the SDI value, the better will be the performance in sustainability development. Secondly following the work of Jin, et al (2020), according to the score value of SDI in Albania, we split the time horizon of the period 1990 to 2021 in three sub-periods. The first period is that during which the performance of SDI in Albania is at the lower part. This is called low-SDI period. This period is characterised by value of the SDI ranging from 0 – 0.5. The second period is that during which the performance of SDI in Albania is at the medium range. This includes values ranging from 0.5 to 0.6. The final period is that with score values of the SDI higher than 0.6. Results of such analysis show that the aggregated SDI value of Albania for 2021 is 0.82. This put Albania among the countries in the high sustainable development category as compared to previous estimation by others authors[7]. Accordingly, Albania's SDI value, between 1990 and 2021, increased from 0.24 to 0.82. This increase is nearly two and a half time bigger or 241 percent. This means that the progress of sustainable development in the case of Albania was gradual and improving continuously ranging from a low level in the early 90' to reach at the highest level in 2021. At the value of 2021, the performance of Albania, is relatively better compared to the SDI of other emerging market countries, which as estimated by Jin, et al (2020) have overall a lower performance. Results show that Albania has been at the first stage of a low-SDI period country in its early year of transitions lasting up to year 2007. The performance of the SDI during 2008 to 2011 places Albania in a medium-SDI period sustainable development. This phase seems to have lasted for a few years, being replaced by the third period in each such development have encompassed the country as a high-SDI country. The performance after this period, and especially after 2011, moves Albania from countries with medium sustainable development to one with relatively high development. Results reveal that Albania has experienced also some episodes of downgrade in sustainable development, characterised by a decrease of the score especially during 1998-1999 and in 2006.

Figure 1. Sustainable Development Index in the case of Albania, during 1990 - 2021.



Source: World Bank, and Authors' Calculations.

7 See among others those by Jin, et al (2020), Hui, et al (2022).

Furthermore, in order to assess whether the SDI could help policymakers and government officials in their decision-making toward achieving an all-round sustainable development goal, we compared it with HDI that has been published annually for Albania at national level. Figure 1 shows a comparison between our estimated measure of SDI and the HDI constructed by UN in the case of Albania. Results of a simple correlation test show that there is a high degree of correlation between them, with a coefficient reaching nearly 0.937 and t-stat (Prob) being 13.5 (0.000). From other measurement results, however, there are two main differences between each of the indices. First, the indicator of HDI shows a gradual trend upward improving of scoring values, whereas the SDI retains a more dynamic behaviour. Second, there is a big difference between the values of the two indicators in the first years of the evaluation. On the one hand, the value of the HDI indicator means that Albania retained a relatively high level of the average achievements in key dimensions of human development, meaning a long and healthy life, access to knowledge and a decent standard of living. This progress has been improving through years. On the other hand, the inclusion of indicators related to the ecological efficiency of the country in the provision of human development, without violating the parameters of ecological sustainability and well-being between generations, highlights that Albania's performance in this aspect for the same period is rated to a much lower level, starting from the lowest value that the SDI indicator shows for this period. This means that during this period Albania had a high human development, but with a high ecological impact, hence, violating the parameters of ecological sustainability, and recognizing that development must be achieved within planetary boundaries. Despite, the gap between them closes up in the following years, and the score value of SDI even exceeds that of HDI. This means that Albania has addressed progressively and significantly its social and environmental outcomes, offering a revealing picture of the levels of developments on the ecological efficiency of the country in delivering human development without violating the parameters of ecological sustainability and well-being between generations. These results are reflected symmetrically and independently from the indicator data calculated according to the Principal Component Analysis (PCA) approach, which confirms their robustness. Although, Albania is developing rapidly, its sustainable development level does not mean that the governments should pay more attention to GDP than to people's livelihoods, natural resources, or the environment.

4. CONCLUSIONS

This paper introduces an adequate, continuous and accepted alternative synthetic metric approach that can be adopted for sustainable development assessment in the case of a small open economy, Albania. This approach relies upon the need to coordinate economic, social and environmental developments in order to balance intra-generational well-being and maximize overall inter-generational well-being. This is expected to play a key role in helping policymakers to monitor better and formulate more appropriate policies for promote sustainable developments. Accordingly, the information used to estimate this metric includes a set of 12 pre-selected indicators. Each of them, is independently related to sustainability issues. The method for evaluating these indicators and transforming them into a single sunthetic index relies on a three-step process. Firstly, each of them is standardised to ensure that the data are consistent, comparable and meaningful. Secondly, the weights of each of the standardised indicator, which would be used then in the aggregation process, are calculated using the entropy approach. Finally, these weights are used to aggregate the standardized indicators into a single indicator with a range from 0 to 1. The higher the value of this synthetic indicator, the better will be the performance in sustainable developments, and vice versa.

Results related to the dynamic trends, as presented by value of the estimated aggregated SDI score, show that Albania has experienced improving level of sustainable development. This patterns have been gradual and continuously, ranging from a low level in the early 90' to reach at the highest level in 2022. The score value for 2022 with such regards puts Albania among the countries with a relatively high level of sustainable development. The results show that the economic dimension, the social dimension and the resource-environmental dimension all contributed to it. In particular, a significant role in this progressive development, however, belongs to the dimension related to the improvement of the resource-environmental aspects. This category of sustainability is found to have the greatest contribution, compared to a lower share that offers economic growth and social progress dimension. Additionally, results show that in the case of Albania, resource and environment are also important factors of economic development and contribute to quality of life, which justifies this high weight. This implies that the concept and essence of sustainability as with regards to boosting welfare of the present and future generations is equally important. In other words we should not "care for this and lose the other". Other findgs display that there is a high degree of correlation between the performance of the HDIs and our estimated SDI. This means that Albania retains a relatively high level of the average achievements in key dimensions of human development, while addressing also progressively and significantly its social and environmental outcomes. This offers also a revealing picture of the levels of developments on the ecological efficiency of the country in delivering human development policies without violating the parameters of ecological sustainability and well-being between generations. However, as Albania is developing rapidly, its sustainable development level does not mean that the government should pay more attention to GDP than to people's livelihoods, natural resources, or the environment.

LITERATURE

Campagnolo, Lorenza, Fabio Eboli, Luca Farnia, and Carlo Carraro. (2018). "Supporting the UN SDGs Transition: Methodology for Sustainability Assessment and Current Worldwide Ranking." Economics 12, 1–31.

Dasgupta, Partha (2001) "Human well-being and the natural environment." Oxford University Press, Oxford.

Erkhembaatar, Naranuya, and Otgonbayar Bataa. (2020) "Entropy weight method for evaluating indicators of ICT development index." International Journal of Current Advanced Research, Vol. 9(12), 23500-23504.

Guillén-Royo, Mònica. (2016) "Sustainability and Wellbeing: Human-Scale Development in Practice." London, UK: Routledge.

Hickel, Jason and Giorgos Kallis (2019) "Is green growth possible?" New Political Economy, Vol. 25(4), 17 Apr 2019, 469-486.

Hui, Jin, and Mihajlo Jakovljevic (2022) "A global assessment of sustainable development: integrating socioeconomic, resource and environmental dimensions."

Khalid, Ahmad, Seema Sharma, and Amlendu Dubey (2020) "Data gap analysis, indicator selection and index development: a case for developing economies." Social Indicators Research, Vol. 148, 893–960.

Ness, Barry, Evelin Urbel-Piirsalu, Stefan Anderberg, and Lennart Olssona (2007) "Categorising tools for sustainability assessment." Ecological Economics, Vol. 60(3), 498-508.

Shah, Reena (2004) "Assessment of Sustainability Indicators (ASI)." ASI Workshop 10-14 May 2004, Prague, Czech Republic. Retrieved from World Wide Web https://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=109&menu=1515

Jie, Sun, Hui Jin, Fu-Sheng Tsai, and Mihajlo Jakovljevic (2022) "A global assessment of sustainable development: integrating socioeconomic, resource and environmental dimensions." Frontiers in Energy Research, February (2022).

United Nations (2008) "Measuring sustainable development." Report on the Joint UNECE/OECD/Eurostat working Group on Statistics for Sustainable Development, (2008).

Zhu, Yuxin, Dazuo Tian,and Feng Yan (2020) "Effectiveness of entropy weight method in decision-making." Mathematical Problems in Engineering, Vol. 2020, No 3564835.

APPENDIX

Table 1 Framework of Sustainable Development Index for Albania.

Index	Dimension	Factor	Indictor	Premise
SDI	Economic	Economic growth	Real GDP	+
		Income level	Income Index	+
		Economic structure	Employment in service	+
	Environment	Climate	CO_2 emissions	-
		Air quality	PM2.5	-
		Forest	Forest coverage rate (in %)	+
		Arable land	Arable land per person	+
		Energy	Renewable energy consumption	+
	Social	Education	Mean years of schooling	+
		Health	Life expectancy at birth, (years)	+
		Drinking water	Population using basic drinking water	+
		Sanitation facility	Population using basic sanitation facilities	+

Source: UNDP, World Bank, INSTAT.

Table 2 Indicators and their weights used to calculate a sustainable development index for Alba

Index	Dimension	Factor	Indictor	Weight (%)
SDI	Economic	Economic growth	Real GDP	4.72
		Income level	Income Index	9.01
		Economic structure	Employment in service	8.90
	Environment	Climate	CO_2 emissions	8.62
		Air quality	PM2.5	9.22
		Forest	Forest coverage rate (in %)	8.07
		Arable land	Arable land per person	7.58
		Energy	Renewable energy consumption	12.58
	Social	Education	Mean years of schooling	7.18
		Health	Life expectancy Index	7.14
		Drinking water	Population using basic drinking water	8.83
		Sanitation facility	Population using basic sanitation facilities	8.15

Source: Authors' calculations.