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CONTENTS

Articles

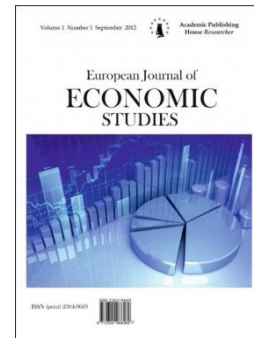
Analyses of the Impact of COVID-19 on the Hotel Industry in Italy. Future Perspectives and Recommendations in the Post-Pandemic Period M. Firuzi, N. Rahimov, G. Mammadova, G. Gadimov, U. Mahmarza, U. Salehzada	3
Absenteeism as Predictor of Voluntary Turnover A. Karamehmedović, N. Čelebić, E. Cero	14
The Role of the Human Factor in Development of Innovative Economy G. Sanadze	23
GDP Modelling and Forecasting Using ARIMA. An Empirical Assessment for Innovative Economy Formation D. Vintu	29

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Articles

Analyses of the Impact of COVID-19 on the Hotel Industry in Italy. Future Perspectives and Recommendations in the Post-Pandemic Period

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Abstract

Since Great Depression, the world economy has been in its worst condition. A bumpy year ahead is anticipated by many economists. Their 2020 prediction assumes that global retail trade volumes will decline by 13 % and 32 % in comparison with 2019. The severity of the fall will be related to two major factors: First, how much time is required to maintain the virus under control; and the second, economic policies countries will use at the national and international level to minimize its economic impacts. This highlights why it is more essential for countries than ever to collaborate together to enable people to have easier access to goods and services. Protecting public health and boosting economic activity can be achieved by collaborative action that we can react quickly to the pandemic. Therefore, policymakers and international organizations would better act together. This paper assesses the short-term effects of the coronavirus outbreak in Italy. Obviously, the consequences of infectious diseases are significant and have directly impacted the major economic and non-economic sectors around the globe. Our results indicate that the hotel industry as well as the whole tourism sector has declined rapidly since the virus outbreak in the different areas of the world. STEEPLE analysis is conducted to determine the significance of the major factors that impact the future activities of the hotel industry as a result of the pandemic. We will address this research for determining the current situation and the effect of the pandemic on the hospitality industry in Italy.

Keywords: the world economy, collaborative action, COVID-19, hotel industry, tourism sector, STEEPLE analysis.

1. Introduction

The COVID-19 pandemic, also known as the coronavirus pandemic which has been continuing in recent days, caused by the extreme acute respiratory syndrome of SARS-CoV-2. It was first detected in Wuhan, China, in December 2019. The World Health Organisation declared the epidemic a Global Health Emergency of International Significance in January 2020 and a "Pandemic" in March 2020. As of 22 January 2021, more than 97.5 million cases have been confirmed, with more than 2.09 million deaths attributed to COVID-19 in 190 countries worldwide.

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The signs of COVID-19 were extremely complex, varying from the absence of any symptoms to extreme cases that led to the fatal end.

The virus may be transmitted across the air from person to person or it can also spread across infected surfaces. This situation almost continues for up to two weeks and will transmit the virus to people readily even though they do not exhibit symptoms.

Authorities nationwide have responded by applying travel bans, lock-downs, occupational hazard controls, and building closures.

Since delivering safer vaccinations in different countries in recent days, a great vaccination race is underway across the globe. "As the COVID-19 epidemic now becomes a pandemic, we need to think of not only ways to avoid future public health problems but also financial issues as well" was said in the article of International Journal of Environmental Research and Public Health. Several drug makers are working to deliver what they hope will be medicines that will save lives. "This infection is not going to disappear.... without science leading us to vaccines, we will get second and third waves of this unless we do produce drugs and vaccines we are not going to have an exit strategy," said J. Farrar on the long-term destructive damage the coronavirus could wreak on the globe.

"The pandemic is expected to plunge most countries into recession in 2020, with per capita income contracting in the largest fraction of countries globally since 1870." was emphasized in one of the articles of The World Bank. The COVID-19 pandemic has simultaneously inflicted significant blows on hoteliers worldwide as events across the globe continue to be cancelled or postponed and hotel occupancy rates plunge.

The extraordinary circumstance created by COVID-19 offers us an opportunity to analyze and evaluate the effects of the pandemic on the hotel industry in Italy, which has been majorly suffered among other sectors of the country.

In the following pages, the remainder of the paper is organized: Section 2 includes the related theoretical and empirical literature, followed by Section 3, the factors of STEEPLE analysis such as social, technological, economic, and legal are discussed accordingly, and Section 4 includes a recommendation and conclusion.

2. Materials and methods

When we look back, we can see that there were several breakdowns in the world as well as COVID-19. For example, the Spanish flu, also known as the 1918 flu pandemic, was an unusually deadly flu pandemic caused by the H1N1 influenza A virus. Between February 1918 and April 1920, 500 million people – around a third of the world's population at the time – were hit by four consecutive waves. The death toll is popularly assumed to be between 17 million and 50 million, perhaps as high as 100 million, making it one of the deadliest pandemics in world history.

We are well informed that the COVID-19 pandemic is much more than a health crisis: it impacts society and economies at their heart. Although the effects of the pandemic will differ from nation to country, hunger and inequality are more likely to rise worldwide, rendering SDGs (Sustainable Development Goals) much more urgent. The evaluation of the impacts of the COVID-19 crisis on populations, economies, and disadvantaged communities is important to advise and tailor the responses of governments and stakeholders to rebound from the crisis and to ensure that no one is left behind in this endeavor. Until immediate socio-economic solutions, global misery will escalate, putting lives and livelihoods at risk for years to come. Immediate planning solutions to this situation need to be pursued with a view to the future. Long-term growth trajectories would be influenced by the decisions taken by the Governments and the funding they get.

Big activities, from soccer to golf, skiing, and basketball, have been disrupted. Important revenue sources, from sponsorship, processing, and sale of media rights, to ticketing and corporate hospitality, have unexpectedly slowed down (Ferrari, Macchi, 2020).

Despite government support through short-term job schedules and a limitation on lay-offs, jobs contracted heavily in April and May. This exceeds the monthly rate at which jobs were decreased in the worst month of the Eurozone debt crisis. It is not shocking that self-employed employees and civilians on a temporary contract bear the brunt. In May, jobs for the latter group decreased by 19 % compared to May last year. The sharp drop in jobs was followed by a sharp contraction of the workforce (Wijffelaars, 2020).

On the analysis stage, the article investigates the impact of COVID-19 on the hotel industry by using the steeple analysis method.

- Social – the impact of COVID-19 on the wealth, unemployment, and income of people. How to afflicted the hotel industry in pandemic period.

- Technological – some industries as well as the hotel industry used modern technology in the breakdown. The consequences of new technology offered safety and a confident situation for customers.

- Economical – in this stage describes that the GDP of Italy decreased dramatically and the major reason for this trend.

- Legal – The Italian Government decided regulation on the fighting with COVID-19. We identified two steps and analyzed them.

3. Results

Theoretical and empirical literature

The economy of Italy is the third-largest national economy in the European Union, the eighth-largest by nominal GDP in the world, and the 12th-largest by GDP (PPP). Apart from being a member of the EU, Italy is also a member of the OECD, the G7, and the G20. It is considered the tenth-largest exporter in the global economy, with \$ 632 billion in export products in 2019. The proportion of trade between Italy and the countries of the European Union accounts for 59 %, while other big trade partners in terms of market share are Germany (12.5 %), France (10.3 %), the United States (9 %), Spain (5.2 %), the United Kingdom (5.2 %) and Switzerland (4.6 %).

Although the country possesses a good place in the global economy, structural and non-structural problems are one of the main barriers to the development of the economy. Italy has had lower annual growth rates compared with other EU countries since its economy suffered from the 2007–2008 Global Financial Crisis. Living standards in different parts of the country, namely in the North and South division are different, meaning that the average GDP per capita in this north and central parts of Italy is higher than that of the European Union, whereas it is significantly low in other parts of Italy.

After recovery, the economy of Italy is undergoing slow development. In recent years, expansionary monetary policy, structural reforms, and fiscal policy played an important role in the recovery of Italy's economy. The main drivers of the economic growth are exports, private consumption, and investment, supported by higher value-added products in the export industries. The level of employment has risen by 3 % since 2015 and the banking system has been developed. Nevertheless, recovery has slowed. Although GDP was projected to contract by 0.2 % in 2019, the GDP growth rate in that year became 0.3 %. Real GDP per capita is more or less the same as in 2000. Despite an increase in employment level, this level is still the lowest one among OECD countries (OECD, 2019).

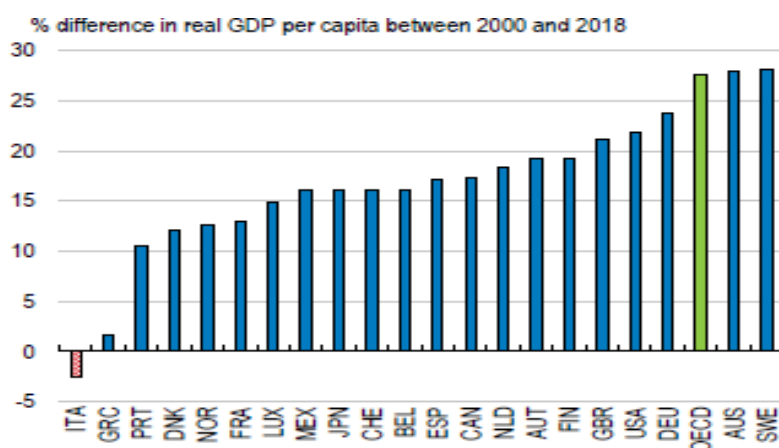


Fig. 1. Difference in real GDP per capita between 2000 and 2018

Source: OECD Economic Outlook 104 database

Global pandemic hit the economy of Italy more severely than Global Financial Crisis did

The global pandemic made European countries close the main parts of the economies to keep the virus under control. These lockdown policies affect the economy of Italy negatively, with having

a decrease in GDP by 5.4 % in the first quarter and by 12.4 % in the second quarter of 2020. The main reasons behind GDP contraction were a decline in household consumption and investment. The national industrial output index declined by 17.5 %, with production undergoing its lowest level in history. According to data, in April tourist accommodations arrivals, car sales, retail sales, industrial output, and building production decreased by 99 %, 98 %, 29 %, 47 %, and 68 %, respectively. The economy of Italy is likely to recover this year with the support of vaccine rollouts.

Lockdowns will harm investment and employment until immunization across the world has been achieved. It is expected to have a high level of unemployment during 2021 and will last in 2022. The growth in consumption level is expected to bounce back, savings are projected to be high, while investment is expected to rebound in 2022, and companies continue to conduct replacement investments in more sustainable industries, such as manufacturing. Conversely, the revival in the service sector will be more slowly since domestic demand and tourism are weak until an effective vaccine is widely implemented. This will intensify inequalities across regions of Italy. Additionally, like in other nations, bankruptcies and non-performing loans will increase.

Fiscal support increased net borrowing in 2020. However, it will decline in 2022 since growth and income rebound and EU programs for recovery become more relevant. It is expected that interest rates will stay low. There are considerable downside risks to the forecasts. The rate of growth in 2022 will be limited by delays in public investment budgets and a slower recovery in private sector investment (Wijffelaars, 2020).

Challenging time for one of the essential sectors of Italy

As one of the most damaged sectors of the economy of Italy in our analyses we took is the tourism sector. Tourism is one of Italy's leading sectors. The annual number of international visitor arrivals in Italy rose from 81.6 million to 96.2 million visitors between 2015 and 2019. Italy is the fifth largest country in the world and the third-largest in Europe in terms of foreign tourist arrivals. People mainly visit this country for its rich culture, renowned cuisine, past of natural scenery, fashion and architecture, its stunning coastline and beaches, its mountains and precious ancient monuments (Statista, 2019).

The tourism industry plays a vital role in Italy's economy. In this report, we include essential information related to the different sectors in the tourism industry. This sector accounted for nearly 13.3 % of the Italian gross domestic product. The overall contribution of tourism to the Italian economy has been gradually rising and is projected to cross some EUR 268 billion or 14.3 % of GDP in 2028. By 2019, the tourism sector had added more than 1.5 million workers to employment in Italy, and this number is projected to increase gradually until 2029 (Statista, 2019).

As in other areas, the effect of the COVID-19 on tourism has been negative. Tourism sales in Italy fell from EUR 44.3 billion in 2019 to EUR 21.08 billion in 2020 (January-November). Main tourism industries have undergone decline, such as the sports industry, the cultural sector, the aviation industry, and the hotel industry (Trading Economics, 2020).

We know that a significant number of tourists visit Italy for sport events taking place in a region. Big activities, from cricket to golf, skiing, and basketball, have been disrupted. Important revenue sources, from advertising, processing, and sale of media rights, to ticketing and corporate hospitality, have abruptly dried up. For example, the final races of the Audi FIS Alpine Ski World Cup, as well as the ATP and WTA tennis teams, confirmed the suspension. As a result, this year's ATP Masters 1000 BNL Internazionali d'Italia, scheduled to take place in Rome from 10 to 17 May, will also not proceed as expected. In view of the fact that last year's Internazionali d'Italia produced more than EUR 13.2 million in ticket sales alone, the related stakeholders would incur tremendous losses if the tournament is canceled. UEFA has delayed the UEFA European Football Championship 2020 (Euro 2020) until the summer of 2021. The city of Rome was to host the Euro 2020 opening game. The Italian Series A deficit is projected at EUR 720 million due to reduced profits from non-delivery of live matches to broadcasters. Taken as a whole, Italian football – which creates up to 98,000 jobs – is projected to be worth EUR 3.5 billion per year. These estimates, based on sales announced for the 2017-2018 season alone, will include Series A, Series B, and Series C. It is also worth noting that the 90th edition of the Formula 1 Italian Grand Prix recorded the best ever weekend attendance with 200,000 spectators in 2019, which is 9.29 % more than the 2018 Formula 1 Italian GP, but by 2020 the number of fans was reduced due to lockout (Ferrari, Macchi, 2020).

The latest order of the Italian Government to shut down all galleries, libraries, cinemas, and concert halls due to the coronavirus pandemic caused shock waves through the nation's already ravaged cultural industry and festivals, tournaments, exhibitions, trade shows, and international fairs, all faced with the reality of cancelation or postponement ([Agostino et al., 2020](#)).

The museums, which were unable to open their doors to tourists, had to take the only chance to spread culture and information by online means. Social networking sites, particularly Facebook, Twitter, and Instagram, have become museums' favored means of spreading culture during the COVID-19 lockdown. The museums, physically closed to the public, were instead opened because of their multimedia technologies. And not only were they available, but they also saw a major uptick in their online activity. Today, approximately 86 % of the museum's sales come from the selling of tickets on-site ([Agostino et al., 2020](#)).

Winter tourism is one of the main industries of tourism for Italy. The economic weight of the business is between EUR 10 billion and EUR 212 billion. Besides, it hires about 120 thousand employees. Overall, the Italian winter tourism market will see a decline of approximately 33.1 % in tourism presence, with a decrease of 72.8 % in international inflows ([Froyd, 2020](#)).

Providing the only rapid worldwide transportation network

The aviation industry in Italy has seen promising trends in both air freight and passenger air travel in recent years. 714,000 workers funded by the air transport industry. A total contribution of USD 51 billion to GDP. 2.7 % of GDP assisted by air travel and international visitors arriving by air. According to the Italian Civil Aviation Authority, the number of passengers arriving and leaving rose from 185 million in 2017 to 191 million in 2019. Italy has missed more than 700,000 flights relative to 2019 and over a hundred and ten million passengers. Flights to/from Italy are reportedly 70 % lower than last year and the number of passengers is 83 % lower. Domestic flights were less impacted (46 % lower) than European flows (-68 %) ([Statista, 2020](#)).

The hospitality industry in Italy has reported rising revenues. This rise was due to the increasing tourism sector, which grew by EUR 100 billion and accepted more than 63 million visitors in 2018. Demand from domestic companies and various countries of the European Union has been a main force for the tourism industry, accounting for about 60 % of the tourism industry in Italy. This pattern reflected the rise of domestic and foreign branded hotels and their chains, with a double gap in their presence, throughout the world. The number of foreign tourists was very small to Milan and Rome, followed by Florence and Venice. Rome has become home to high-end luxury brands, with more than 45, 5-star hotels that are foreign brands. The hospitality industry in Italy is the largest sector and ranks fourth in the world in terms of the number of rooms available, with a total of about 1 million rooms, followed by the United States, China, and Japan ([Mordor Intelligence, 2020](#)).

Italy also registers more overnight stays. Many international labels serve as management contracts in the region.

A catastrophic € 36.7 billion is predicted to be lost to the Italian economy due to the decline of foreign travel during 2020, according to the new study undertaken by the World Travel & Tourism Council (WTTC). WTTC, which represents the global private travel & tourism industry, claims that the massive decrease in the number of foreign visitors and visitors visiting Italy due to the COVID-19 pandemic could lead to an astounding 82 % reduction in international visitor spending. This devastating deficit to the Italian economy is equal to a deficit of €100 million per day, or € 700 million a week, in the country's economy. According to the WTTC 2020 Economic Impact Survey, Travel & Tourism was responsible for about 3.5 million jobs in Italy in 2019, or 14.9 % of the country's overall workforce. It also produced € 232.9 billion of GDP or 13 % of GDP for the Italian economy. Gloria Guevara, President & CEO of WTTC, said: "The economic pain and misery caused by millions of households across Italy, who are dependent on good travel & tourism for their livelihoods, is evident from our current shocking statistics." WTTC's review of international travel spending in Italy in 2019 showed that it hit almost € 45 billion, accounting for 24 % of the country's overall tourism spending. Domestic travel costs last year accounted for another 76 %. A further breakdown shows how important the Italian economy was to the spending of foreign travelers during 2019. Per month, it amounted to € 3.74 billion or € 861 million a week – and € 123 million per day ([WTTC, 2020](#)).

Almost immediately after COVID-19 had been announced in Italy, demand for hotel rooms – particularly for international visitors – had been affected. After the first confirmed case on

21 February, the average number of rooms available online showed an upward trend until 24 February. As visitors canceled their booking, they immediately made those rooms available on all OTAs and hotel websites. The influence of the COVID-19 also influences the average price of online rooms. Of necessity, one of the first steps taken by hoteliers at the onset of the recession was to support demand by lowering prices. By tracking the original and final rates (prices for the same bid before and after the crisis) in the months of March and April for the major Italian tourist cities, it has been reported that the gap in rates often results in a negative and double-digit number. Rome and Milan have both recorded -17 % shift in values, while Venice, Turin, and Florence have recorded -21 %, -25 % and -28 % respectively ([The Data Appeal Company, 2020](#)).

Analysis on afflicted hotel business

Methodology

We used a steeple analysis to investigate the impact of COVID-19 on the hotel industry. Other businesses as well as the hotel industry depend for their survival on understanding and responding to external factors that are beyond their control. We undertake STEEPLE analysis to assess the importance of the major external influences in which the consequence of pandemic period on the hotel industry's future activities. We will approach analysis with stakeholder concept. The idea or philosophy of the stakeholder is that many other parties are active and interested in business activity and that business decision-makers should address the needs of these groups – local people, the public, government, and pressure groups such as ecological lobbyists. In hotel industries like in other businesses have two types of stakeholders – internal and external stakeholders. The internal stakeholders have their own set of interests in the business's activities in which employees, managers, and shareholders are involved. The external stakeholders include customers, suppliers, government, banks, special groups, and competitors. In this method, we will use the factors of steeple analysis which are social, technological, economic, and legal.

Social

From a social point of view, the main points to consider will be income, unemployment, and wealth. During the pandemic, people lost their jobs, which significantly affected their interest in traveling. Because they need capital to travel, and it doesn't matter if they lose their job or go bankrupt. As can be seen from this graph, the significant increase in the unemployment rate is associated with the loss of jobs in the hotel business. From the last period to nowadays, tourism industry and employment have a strong correlation between them, because of a dependent of some countries economy from the service sector. Another important nuance was that, mainly because the virus was more solitary in the elderly, almost 99 % of the adults did not travel at all, and they did not rank among those who traveled in the age groups.

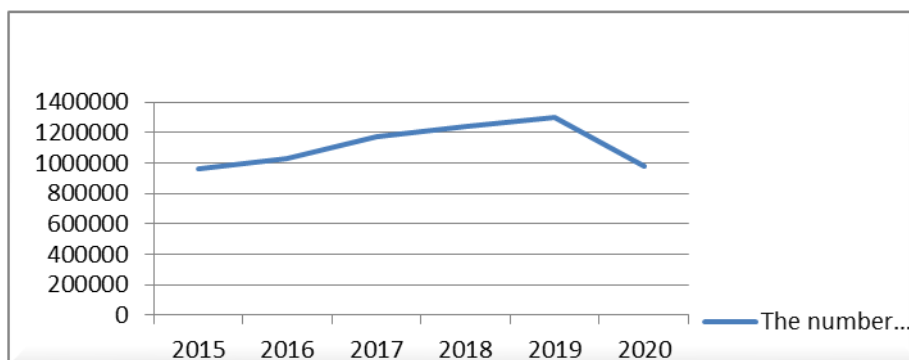


Fig. 2. The number of employees in tourism industry (2015–2020)

Source: www.statista.com

Technological

In the second half of January, COVID-19 reached Italy. However, the real crisis started between February and March, with a dramatic increase in the number of infections. So, the impact of COVID-19 on the economy as well as the hotel industry had started. During the pandemic period, the number of customer circulation decreased. COVID-19 spread out sharply from February

2020. Therefore, Italy has completely closed its land and air borders, so the hotel business faced a crisis it has never faced before.

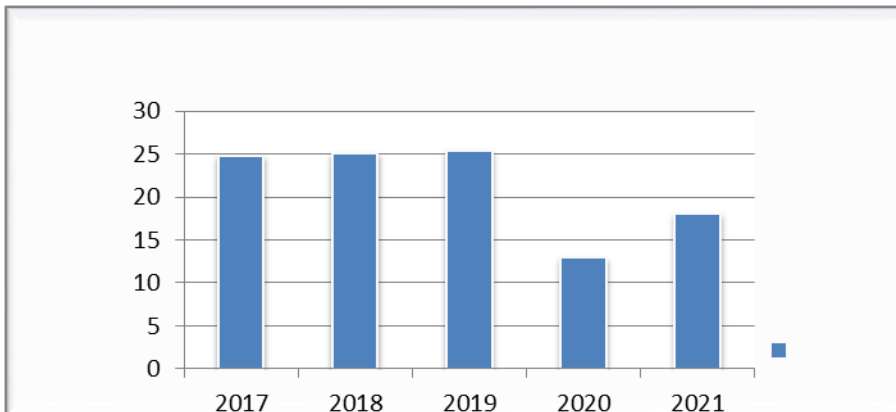


Fig. 3. The number of users in hotels in millions (2017–2021)

Source: www.statista.com

Due to the promotion of customer safety, the hotel industry is applying technological advancement to its business. Most hotel businesses use "contactless communication" to serve their clients during the pandemic period. Now it is important to limit face-to-face interactions as much as possible, quick and contactless operations are much more appropriate. This means that a self-service approach should be taken rather than a face-to-face check-in. The hotel industry, therefore, set up a self-service kiosk at the hotel entrance or lobby. With this kiosk, guests can check-in, answer any necessary questionnaires and screening prompts and make any special requests without ever having to see an employee.

Many businesses are mitigating the chance of spreading COVID-19 with a mandatory temperature check for anyone arriving at the premises, but hotels are unique on that guests stay in the premises for an extended period. As a result, the guest could arrive at the hotel at a normal temperature, but they could start running a fever later in their stay and possibly get infected. One way to monitor this – without having to perform disruptive and manual temperature checks – is through thermal imaging. Thermal imaging is a non-invasive way that hotels can help detect when an individual, whether a guest or an employee, has an elevated temperature. An automated alerting platform has also been implemented to improve the efficiency of thermal imaging. With a combination of thermal imaging and an automated alerting platform, staff members can receive detailed alerts as to the situation at hand.

The communication portal, most often available via a tablet, gives guests access to important information and services. This means that all necessary or additional safety information can be provided to guests, as well as a way to easily request a variety of services without having to interact directly with the staff member.

Economical

The world economy, as well as the Italian economy, had been affected by the period of the COVID-19 pandemic. Breakdown affected economic factors, so the hotel industry faced with serious problems. The important point for Italy's economy is that the tourism industry accounts for more than 50 % of GDP. Thus, the level of GDP and the hotel industry have a strong correlation. Based on the 1 to 1 relationship between demand for hotel rooms and GDP levels in the USA in the 1920s, as is evident in Italy. This graph shows that the rate of economic growth decreased to – 10.9 % during the pandemic period.

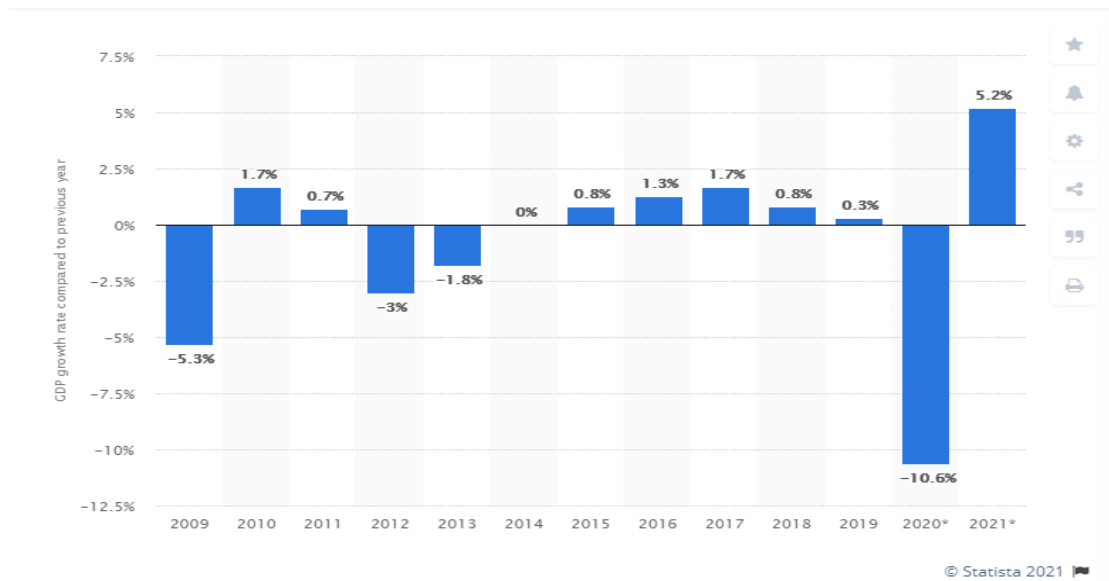


Fig. 4. The rate of Economic Growth in Italy

Source: www.statista.com

During the period of the pandemic (2020) inflation rate was -0.1%, which shows the deflation in the Italian economy. In this situation, economic growth was slow and linked to the demand for the hotel industry. Moreover, interest rates have fallen, and this has been reflected in the exchange rate. The flow of tourists has decreased, and thus these factors have also been affected.

Legal

Following the official positions of the Italian Government, we can identify two different phases. In the first phase, the government issued a large number of measures, decrees, and administrative orders to limit the spread of the virus.

Strict restrictions have been introduced, including not only the lockdown but also restrictions on commercial and industrial activities.

In this context, economic measures (such as the Salva Italia Decree) were also central. The aim was to help families and companies that had been forced to suspend their work during this time. In phase two (fase due), which was officially announced by the Government on 26 April, the Italian authorities began a gradual relaxation of the restrictive measures.

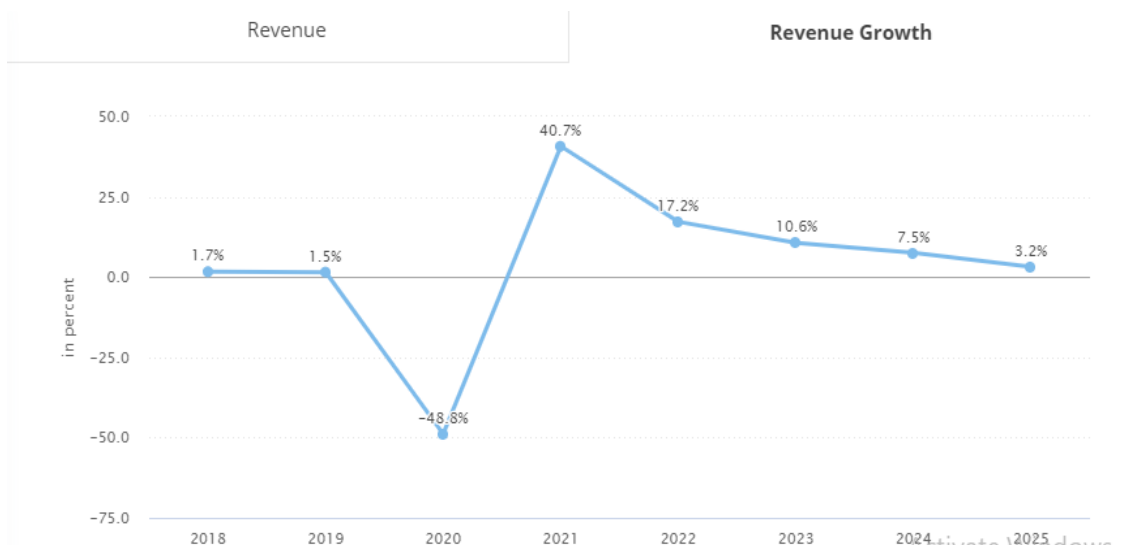




Fig. 5, 6. Revenue Growth
Source: www.statista.com

These restrictions have had an impact on the hotel industry. Based on the graphs, it is clear that the revenue and revenue growth of the hotel industry decreased dramatically during the pandemic period. As a result, these interventions have substantially or drastically reduced the flow of tourists to Italy. Because nobody wants to stay at home in the country where they're going to travel.

The first research issue was that how the COVID-19 outbreak intensified social problems in Italy and led to a significant decrease in employment, income, and wealth level.

The following outcome has been achieved:

As the tourism industry makes up an essential part of the Italian economy, people working in the hotel industry have suffered more from the pandemic caused a surge in the unemployment level. It has contributed to an increase in the poverty rate across the country.

The second issue was the technological methods the hotel industry is implementing to achieve customer safety and the ways which are used to make the hotel industry sustainable from the perspective of technology at a time of economic crisis. Addressing the importance of technology is more critical today with the background of the crisis.

The following results have been obtained: Hotel businesses should apply advanced technologies such as automated alerting platforms and thermal imaging which might be useful for having distant communication with customers and checking their health problems without face-to-face check-in.

The third research issue was the macroeconomic importance of the hotel industry in the economy of Italy. There is a strong correlation between GDP growth and the hotel industry. The results of the research indicated that activities in the hotel industry have a significant impact on the GDP growth of Italy, meaning that negative demand shock in this sector resulted in deflation has led to contraction of GDP growth by 10.9 %.

The last one focused on how legal measures taken by the Italian government had influenced the hotel industry and how the government was good at demonstrating support to the population. The results have shown that tough restrictions and lockdowns hit the hotel industry severely and caused the sector to have a substantial drop in the number of tourists, thereby leading to a decrease in the number of tourists coming to Italy, while the government-assisted people with entering Salva Italian law into force.

6. Conclusion

The results of the studies show the impact of economic factors on the Italy hotel industry through the use of STEEPLE analysis. We applied this method for the researching and investigating on hotel industry of Italy. Based on table 1, the pandemic impacted negatively on the employment rate of the hotel industry. The government should regulate it with fiscal policies by increasing spending and speeding up the economic development. Another notable point is that the

size of customers decreased sharply. People who are in charge of the hotel companies should decrease prices and use safety strategies for attracting customers. For the economical side, the tourism industry occupies more than 50 % of Italy's GDP. Therefore, the economy of Italy was afflicted sharply by the COVID-19. The government should support the hotel industry, by assisting them with subsidies, grants, and other financial aids.

To sum up, The government should take some measures to ease the impacts of a pandemic on the hotel industry and support recovery:

- Stand ready to provide more assistance if the recovery is slow.
- Cut fiscal support steadily once the recovery is well underway.
- Follow purposed fiscal reform while resolving long-term challenges.
- Reduce taxes on labor income while at the same time raising taxes on environmental, property, and capital income.

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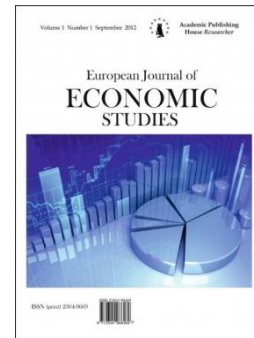
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Absenteeism as Predictor of Voluntary Turnover

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Abstract

This study examines the relationship of prior absenteeism and demographic variables on absenteeism and turnover intentions in a commercial bank in Bosnia and Herzegovina. Although there can be found a lot of research related to turnover in the literature, relatively little exists on the relationship of turnover to other behavioral outcomes, most notably absenteeism.

The article describes the results of the research done at the Faculty of Economics and Social Sciences of the International Burch University. There were two research objectives. The first objective was to find out whether absenteeism rates of employees who leave voluntarily show tendency to be higher than of those who stay with the company. The second objective was to find out will absenteeism explain statistically significant amount of variation in voluntary turnover beyond that explained by demographics, such as age and gender.

Data is collected from Human Resources Department in a commercial bank in B&H. Descriptive statistics is conducted to show detailed information about the sample. The findings show that absenteeism levels of employees who voluntarily leave is not higher than that of those who remain with the organization and that demographic variables explain voluntary turnover more than does the absenteeism.

This research identifies and systematize the main satisfaction factors that affect the work of banking employees.

In today's conditions of recession, for bank managers in Bosnia and Herzegovina and wider this research can be a guideline for better and more successful management of human resources.

Keywords: absenteeism, turnover, employees, organizational commitment components, bank.

1. Introduction

Commercial Banks have a major role in any country's economic activity and as such they control it. Although commercial banks generate employment opportunities for B&H citizens their approach also creates something known as "Employee Turnover Phenomena" Retention of key employees is a strategic issue for any organization and especially for the banks due to competitive pressures and often shortages of employees. Departure of employees means not only a human capital loss but also loss of accumulated knowledge. High priority of every organization, in order to create a competitive advantage is not only to "buy in" talented professionals with cross-functional skills but also to retain talents. Turnover is a major contributor to the shortage of employees in banking sector. Among the main reasons for turnover cited by the employees are: unproductive relationship with their supervisors and poor supervision, low salaries, no perspective for career growth, and heavy workload.

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The battle for talents in the work environment today and global changes in business world means that companies must offer more than rise of compensation packages.

In the banking industry, clients expect highly professional service. Overall image of the bank is highly dependent on its' employees and their professional and welcoming attitude and approach to clients. On the other side, banking sector has been facing high turnover and shortage of employees recently.

Speaking of absenteeism, it can be minimized through planning, supervision and application of best practice management principles. The cost of absenteeism for every company ranges from loss of productivity and wages to poor quality of goods/services demanding excess management time. Another negative effect of absenteeism is that employees who do show up at work are additionally "punished" by extra duties and responsibilities as they must fill in for their absent colleagues, feeling frustrated and unappreciated. Occasional absences from work are something that is inevitable as people get to have health problems/suffer injuries or have to take care of their family members or simply need to handle personal business during office hours. However, the most challenging absences for employers are "habitual absences" as they are considered to create the most negative impact on coworkers.

Absenteeism and turnover have important implications for companies and their performance in general. Both of these phenomena have direct impact on productivity and costs. In cases of turnover, the impact is reflected in the gap between departure of employee and recruitment of the replacement during which no one performs the job. Additionally, recruitment process of new employee generates cost. New employees with similar if not better skills and qualifications are usually more expensive in terms of salary and other benefits packages. In the case of absenteeism, the employee is still in service but valuable work-hours are lost which presents a cost for organization and increases administrative overheads ([Halilbegovic et al, 2020](#)). As a developing country, B&H has been facing both of these issues in banking business lately. Statistical reports presented by the Banking Agency of the Federation and Bosnia and Herzegovina, which is regulatory institution that conducts banking supervision, which shows that the banks have been facing reduction of overall number of employees of 0,04 % in the previous 3 years ([Banking Agency of FB&H, 2016](#)). The main reasons of this reduction are low salaries which range between 450 and 475 USD (Foreign Investment Promotion Agency of B&H, 2015) and migration to EU Countries ([Dinc et al., 2017](#)). This study examines the relationship between variables representing several explanatory models of turnover intentions and absenteeism among employees working in banking sector. The variety of the variables examined represent the complexity of the outcomes examined here, particularly absenteeism. The literature has justifiably noted that absences clearly do arise from a mix of causes; no one has discovered an absenteeism magic bullet. This research also aims to identify and systematize the main factors that affect absenteeism among employees working in banking sector. In today's conditions of recession, for bank managers in B&H and wider this research can be a guideline for better and more successful management of human resources.

2. Literature Review

Absenteeism is defined as not coming to work when scheduled. The common measure of absenteeism reported was "absence frequency", which was defined as the number of days absent over a given period of time. Other measures used were total days, duration and percentage. Causes can be from a personal lack of work ethics to a job avoidance strategy due to other work commitments ([Blau, Boal, 1987: 288](#)). Empirical research warns of a negative correlation between absenteeism and level wages and salaries. Generally, with well-paid jobs there is less absenteeism, and any increase in wages also diminishes the frequency of this phenomenon. On the other hand, absenteeism is positively correlated with the safety of the workplace ([Smith et al., 1969](#)). The number and duration of absences in people of different ages, gender, family responsibilities and qualifications are studied the most. It is characteristic, for example, that young people are missing more often than the elderly, but older ones are absent for longer periods ([Newman, 1974: 610](#)). Additionally, lower wages of employees working in banks contribute to a high turnover rate and shortage of employees in developing countries. Absence has a number of negative consequences ([Bycio, 1992: 193](#)). It reduces the productivity due to the absence of employees and insufficient utilization of work capacity. Workers who are not absent from work are exposed to additional effort and stress, causing a decline in morale and motivation as they have to compensate for work missions for missing

colleagues (Meglino, 2007: 493). It carries a significant financial loss to employers because it is necessary to pay for overtime or replacement for a person who is not at work.

Apart from the payment of sick leave at the expense of the employer, consideration should also be given to the possible costs of temporary workers who are replacements, additional engagement of managers dealing with the problem of substitution rather than more constructive work, and one should not forget a missed opportunity, such as lost sales, a drop in quality of services, and all-in turn, it reduces revenue. So, it can be concluded that the consequences of high absence fall in the satisfaction and morale of employees and their productivity (Caseio, 1991). Before deciding what to do to reduce absenteeism, it is necessary to assume or investigate what are the most frequent reasons for employees to be absent from work in a particular company. Namely, useful information is whether it is extremely challenging and stressful, do mothers with small children or women who care about elderly family members predominate among employees? Or maybe they are very young employees, without family responsibilities, who in turn make their extended weekends that they use for traveling and having fun (Wolpin, 2008: 57). Or it's about a company in which the mentality of overstated rights prevails, according to which employees look to how much they take from the company and do not see how they will contribute to company's success. In such companies, employees believe that the company exists for them to have a job and receive a salary. Monitoring absenteeism costs allows organizations to identify possible savings that could be achieved by investing in appropriate programs to reduce absenteeism (Stumpf, 1981: 148). False sickness is the most common choice when people are stressed, traveling, wanting to deal with some kind of private obligations, going to an interview for another job, or in conflict with an employer. Also, there are responsibilities at college, family problems or simply saturation. All this in addition to financial losses, results in a decline in morale and productivity (Mobley, 1982: 111). What can an employer do? Frequent absenteeism is a sign of upcoming fluctuations, and fluctuation points to negative tendencies and problems in the organization. It is considered that the rate of absenteeism is inversely proportional to the competitiveness of employees, and the competitiveness of employees is obtained by researching the human capital value.

Human capital value is measured by different indicators such as knowledge and skills of employees, professional internships, age, absenteeism, fluctuations, investments in education and the like (Cohen, Golan, 2007: 416). The employee turnover is defined as the number of permanent employees leaving the company within the reported period versus the number of actual active permanent employees on the last day of the previous reported period.

Two main kinds of turnover are voluntary and involuntary turnover (Williams, Livingstone, 1994: 269). It is very important to distinguish between these two basic forms of fluctuation: a deliberate and inevitable fluctuation. Inevitable fluctuations are those departures from an organization that cannot be influenced by either individuals or organizations (for example, due to retirement, death). Intentional fluctuation involves leaving the organization based on a personal decision and the desire of the one who leaves (voluntary) or based on organizational needs. This fluctuation can be controlled, and therefore can be avoided (Cotton, Tuttle, 1986). It is certainly quite important because it points to some negative trends and problems in the organization. It is a regular cause of dissatisfaction and an indicator of an unsatisfactory situation in the organization. It can disrupt the reputation of the organization as an employer and reduce the chances of successfully recruiting new employees, as well as further development of the organization (Johnston, Futrell, 1997: 141).

There are few theories about the correlation between turnover and absenteeism. According to Blau and Boal (Blau, Boal, 1987) the correlation between absenteeism and turnover depends on the employee type. Some employees would use absences for medical reasons only and in their case, decision to leave the company is not in correlation in any way with absenteeism. On the other hand, there are employees who exercise a different form of withdrawal in which absenteeism and turnover are directly correlated. In such cases, the withdrawal starts with absenteeism which further leads towards the decision to resign from the company (Halilbegovic, Ertem, 2020: 469). One of the explanations by Blau and Boal (Blau, Boal, 1987) is that in such cases absenteeism is used for different purposes which have a goal in career advancement such as trainings and education which then continue with unexcused absences for job seeking purposes which as a final consequence have resigning from the company after a new job is secured. According to Bycio (Bycio, 1992), there is an alternate explanation that supervisors tend to label employees who are frequently absent as trouble makers, attributing them

with deviant behavior and laziness. They give them low performance evaluation marks which pushes employees to even higher levels of absenteeism.

What can be concluded in majority of literature, although not all, through theoretical and empirical research favor the theory of close correlation between absenteeism and turnover.

3. Methodology

The study targeted employees working in targeted commercial bank in B&H (hereinafter the Bank) in two years' period (2017–2018), as well as voluntary leavers in same period of time. The Bank is liquid, solvent and profitable with positive growth tendencies in all segments of business. The capital adequacy is above legally prescribed minimum. All mentioned indicates higher profitability in comparison to other banks operating in B&H market. A large number of activities have been launched in order to define and strengthen corporate identity as well as social responsibility management. Implementation of corporate governance standards is ongoing.

Data was collected from Human Resources Department, and was analyzed by using Excel software package conducting descriptive statistics. It is important to note that collected data is unique to this research and, until it is published, no one else had access to it. Both primary and secondary data collection procedures were used, with primary data collected directly through field interviews, while secondary data was collected by accessing and reading research material and staff records within HR department of the Bank.

Two methods of data analysis were used: qualitative and quantitative. Main method used was questionnaire i.e., exit interviews. Besides being used to collect a large amount of data from the participants, questionnaire was also used for descriptive and explanatory research. Exit interviews were completed by respondents. The interview method has been used in order to obtain information and to increase the quality of gathered information.

Documentary review is a technique to obtain various information from various literature including books, journals, research papers and other documentary source relating to a certain field of study. Normally, it helps to gather both quantitative and qualitative data, and measure the consistency of information obtained through other techniques (Kothari, 2004). Various documents were used such as termination letters, HR files and different department reports

Targeted population of this study are employees of the Bank who voluntary left and those who were on the sick leave in the targeted period. Final sample consisted of 213 (number) employees.

Ethical conduct implies ethical values, confidentiality and anonymity of an individual, group or an organization. In this research the participants were notified about the nature of the research as well as the reasons for which it had been carried out, while informed about the confidentiality of their responses and were guaranteed anonymity.

All the ethical codes are followed while completing the research. The answers given by the respondents were kept confidential during the process of analysis and they were not required to give their name.

4. Discussion

This part of the study discusses the absenteeism level within the Bank and demographics of variables influencing turnover. It presents the profiles of the employees who left the Bank during 2017 and 2018. The findings are presented in form of graphs. Out of total average number of employees within the Bank during 2017, 27 % were absent in that year, while in 2018 that ratio slightly increased to 34 %.

Figure 1 shows the distribution of absenteeism of employees per those who stayed in the Bank and those who voluntary left. The results clearly show that the level of absenteeism is higher for employees who stayed in the Bank compared to the level of absenteeism of those who voluntary left the Bank. Based on this, it can be concluded that there is no positive correlation between absenteeism and voluntary turnover, considering that we see higher amount of absenteeism in the case of stayers. This finding differs from Cohen and Golan's findings, discussed in literature part, where frequent absenteeism is a sign of upcoming fluctuations, and fluctuation points to negative tendencies and problems in the organization, as well as findings of Wolpin and Burke (Wolpin, Burke, 1985: 57), Newman (Newman, 1974: 610) and Stumpf and Dawley (Stumpf, Dawley, 1981: 148), which indicate higher use of sick leave period prior to termination.

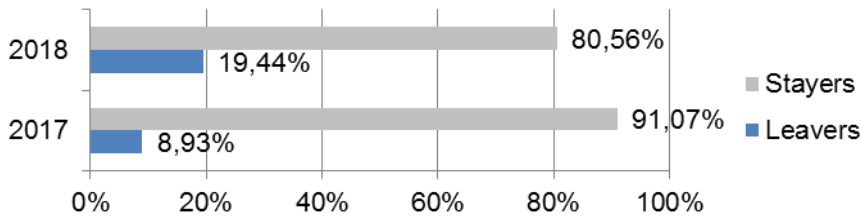


Fig. 1. Distribution of absenteeism per employees that stayed and those who left the Bank

The rise of turnover in banking sector calls for better understanding of critical issues. [Table 1](#) shows trend of employee turnover in 2017 and 2018, as well as the reasons for leaving from the Bank, by the gender. The most significant reason for employee turnover is Mutual termination agreement which takes 66 % of total employee turnover during two years 2017-2018 in targeted bank. In one year, the employee turnover based on Mutual agreement increased by 44 %, from 16 to 23, and is almost equally distributed between male and female.

Table 1. Trend of Employee Turnover

Gender \ Year		2017	2018	Total
Retirement	Male	1	5	6
	Female	1	3	4
Termination of the contract	Male	0	1	1
	Female	0	0	0
Mutual agreement	Male	6	12	18
	Female	10	11	21
End of contract	Male	1	3	4
	Female	1	4	5
Total		20	39	59

Age is one of the most studied demographic factors for both absenteeism and turnover. In general, older employees have lower rates of avoidable absence than do younger employees. On the other hand, older employees have higher rates of unavoidable absence, probably due to poorer health associated with aging and longer recovery when injured. Older employees have more investment in the organization (e.g., pension plans) and more to lose from voluntary turnover. Therefore, they are expected to remain in their employing organization ([Becker, 1960: 32](#)). 49, 15 % male and 50, 85 % female left the bank during two years' period, and their age group is shown in [Figure 2](#).

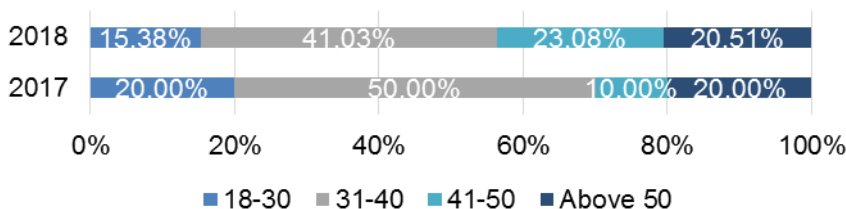


Fig. 2. Distribution of Leavers by Age

The next factor of the research is gender where 46,92 % respondents were male and 53,08 % were female respondents, in average for 2017 and 2018, which does not indicate significant difference of employee turnover per male and female.

The results of gender analysis are shown in [Figure 3](#) below.

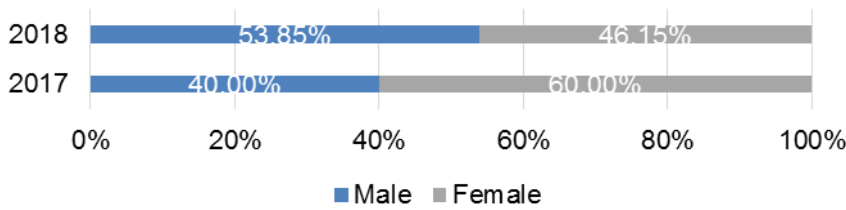


Fig. 3. Distribution of Leavers by Gender

Indications are that married employees have fewer absences, undergo fewer turnovers, and are more satisfied with their jobs than are their unmarried co-workers (Robbins, 2003). According to this, it is considered that due to increased responsibilities that marriage brings, employees would opt for a steady job perspective and thus there would be a positive correlation between marital status and employee's length of service within the company.

The results of employee marital status are shown in Figure 4 below.

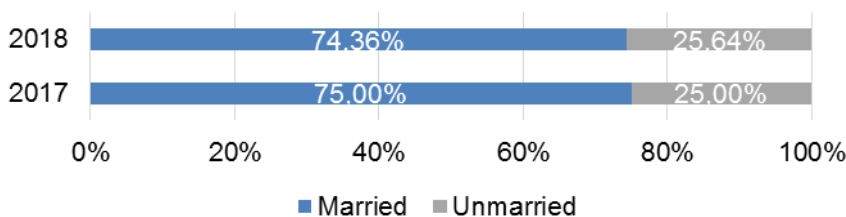


Fig. 4. Distribution of Leavers by Marital Status

Marital status shows an influence on absenteeism. The results show that in average 74, 68 % respondents are married and 25, 32 % are not married. Considering that targeted population reflect voluntary leavers the results show considerable difference between married and unmarried employees.

The relationship between age and absenteeism is considered in terms of whether absence is avoidable or not. Generally, older employees tend to have a lower avoidable absenteeism rate than the younger ones as oppose to unavoidable absenteeism that shows a higher tendency when it comes to elderly employees which can be explained by the fact that older people have more health problems and need longer recovery periods. This seems to be the case at Johnson and Johnson and Mercedes Benz, where age and health were highlighted as the main reasons for absenteeism among older workers (Robbins, 2003). However, the above is not supported by this study, where the results of age group of absent employees are shown in Figure 5.

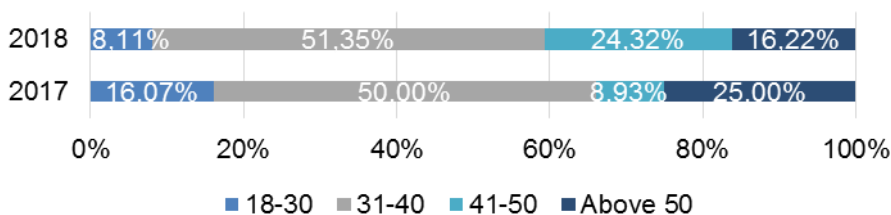


Fig. 5. Distribution of Absenteeism by Age

The next factor that has impact on absenteeism is gender. (Robbins, 2003) reported that research on absence consistently indicates that women have higher rates of absenteeism than men. This can be explained by the fact that in traditional cultures women are the ones who bear the burden of family responsibilities, for example, but not only, tending to sick children when it is traditionally expected from woman to take time off. Markussen (Markussen, 2009: 959) and Laaksonen (Laaksonen, 2008: 325) made a conclusion that regardless of marital status and whether they have children or not women tend to have higher rate of absenteeism.

The results of gender absenteeism of employees are shown in Figure 6.

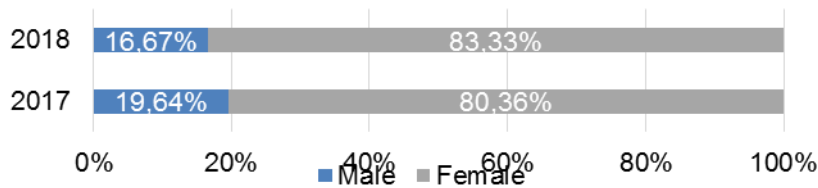


Fig. 6. Distribution of Absenteeism by Gender

Due to family obligations, women between 30-41 years of age tend to have a higher absenteeism rate.

As marriage brings a higher level of responsibility it leads to conclusion that job security is an important and valuable factor. It is related to studies of Westhuizen (2006) and Adebayo (2008) where they have shown a significant effect of marital status and the number of dependents on the frequency of absenteeism.

The results are shown in Figure 7.

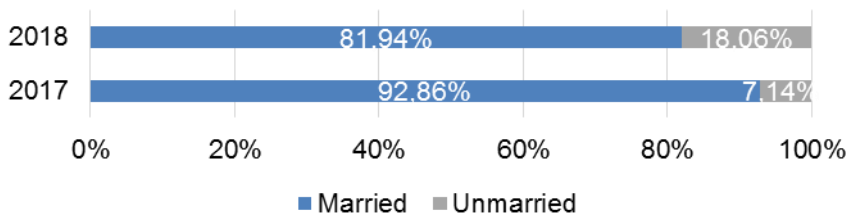


Fig. 7. Distribution of Absenteeism by Marital Status

Findings point to the conclusion that a certain critical group in terms of turnover can be identified. This group contains of married female employees between 31-40 years. This clearly indicates that gender, marital status and age of employees have significantly important implication both on turnover and absenteeism.

Figure 8 shows the distribution of voluntary turnover per employees who were absent and those who were not absent prior to leaving the Bank. For observed period the results show that the not absent ratio is higher in both years which indicate that absenteeism is not statistically significant variable for determining the voluntary turnover.

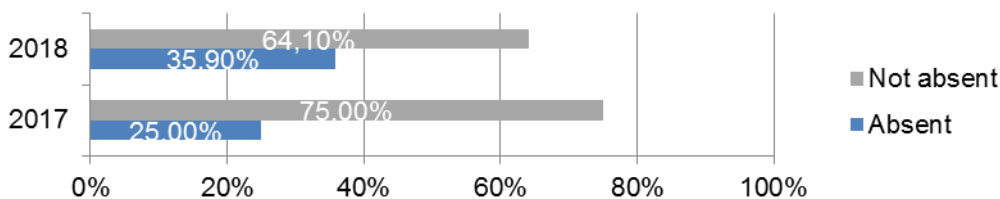


Fig. 8. Voluntary Turnover Explained by Absenteeism

5. Conclusion

From the findings and results of the study given above, it is possible to formulate conclusions:

–Absenteeism levels of employees who voluntarily leave is not higher than that of those who remain with the organization.

–Demographic variables, such as age and gender, explain voluntary turnover more than does the absenteeism.

There were 50,00 % in 2017 and 41.03 % in 2018 of age group 31-41 voluntary leavers that were absent, and it clearly shows that the age has higher effect on voluntary leavers compared to absenteeism. There were 60.00 % in 2017 and 46.15 % in 2018 of female voluntary leavers, and it clearly shows that the gender has higher effect on voluntary leavers compared to the absenteeism. Results also show that marital status has effect on the absenteeism of voluntary leavers as well.

There were 75.00 % in 2017 and 74.36 % in 2018 of married voluntary leavers that were absent, and it clearly shows that the marital status has higher effect voluntary leavers compared to absenteeism.

Managers need to better understand the importance and nature of turnover rate by better understanding a voluntary turnover as this type of turnover is at discretion of the employee. This study brings practical and theoretical benefit by offering suggestions to banking sector in order for them to be able to retain good employees and decrease the turnover rate by pointing to variables that most significantly impact the turnover rate in B&H. There is a constant interest both of managers and researchers if there is a connection between absenteeism and turnover which in the case of this research (sample) proved to have less importance compared to the demographic variables.

One of the goals of this study was to provide help to bank managers and especially HR managers to have a better understanding what causes turnover in the banks and to help them create strategies which will reduce the employee turnover. Additionally, it should also help to understand which are the factors that increase employee turnover trends in order to mitigate their effects by endorsing policies and regulations which will enable more effective retention process in banking sector.

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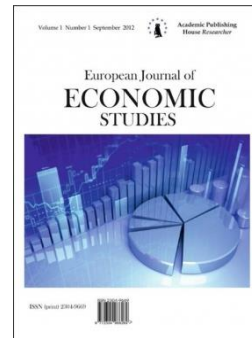
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The Role of the Human Factor in Development of Innovative Economy

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Abstract

The capacity of the innovative economy is becoming significantly important in the modern civilized world. Consequently, the development of a country's economy is influenced by the innovativeness of its constituent structure. Taking into consideration that the human is the main actor within the economy, the economic development from an innovative angle can be described as unimaginable without certain human factors. Based on the above-mentioned, a completely new and previously non-existent human factor might be defined as the main producer of an innovative economy. We call this new factor "Homo Hi Techicus". In our opinion, "Homo Hi Techicus" should supply society with high-tech-based products and services. The role of the "High-Technological Man" human factor in the development of the innovative economy is growing fast, especially nowadays when the development of block chain technologies is getting more and more important. A number of relevant technical skills are characterized for "Homo Hi Techicus" in order to develop or use various modern high-tech-based facilities. Therefore, "Homo Hi Techicus" can be defined as a mostly sufficient and adapted model for the successful production of an innovative economy. The development of a high technology-based innovative economy needs some preparatory measures, including the better promotion of R&D and scientific research-related activities in a country.

Keywords: human factors, Homo Hi Techicus, Homo Innovaticus, Homo Economicus, innovation economy, economic development.

1. Introduction

The economy – it is a system derived from the entrails of society while society itself could be defined as the unity of people based on a certain structure. Therefore, an innovative economy might be characterized as a system based on relevant demands of society.

In the XXI century, society's demand for high tech-based production and services is growing fast. This, in turn, increases the share of innovative facilities in the economy. Until the 1990s, the issues in line with innovation were relatively less popular among economists. Despite this, the situation has changed radically since the 1990s. The internet and its widespread development can be considered as the main reason for this (Lemanowicz, 2015: 62-64).

The innovative economy – this is a theoretical approach that focuses on the active use of high-tech tools and knowledge in order to achieve economic growth and, therefore, produce relevant products and/or services which is unlike the traditional model of economics (Lemanowicz, 2015: 61). Based on the above-mentioned, the main goal of this paper is to discuss those important human factors that are necessary for the production of an innovative economy.

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The entire level of the economic development of a country is highly dependent on the relevant technological facilities which are used for the production of services. It should be taken into account that more modern technological facilities provide a more positive effect on economic progress. Technological development can lead to fundamental changes in the norms, values and traditions which exist within a society. Additionally, we can highlight that society's existing demands vis-à-vis technological development are undergoing fundamental changes and it is necessary to develop completely different and innovative technologies based on high technology in order to face them. Those national businesses which are focused on modern technologies and innovations are considered as the main and driving force of the national competitiveness strategy in the modern global world (Beardsley et al., 2010: 61).

2. Methodology

Desk research has been used for this article which includes the collection and analysis of materials from foreign open internet sources as well as the study of research conducted by relevant authors. The main theoretical finding of this article on "Homo Hi Techicus" ("High-Technological Man") has been elaborated by the author based on his research and analysis.

3. Results and discussion

When speaking about the importance of the human factors in the economy, it is also necessary to consider the theoretical concept introduced by Adam Smith which is called "Homo Economicus" ("Economic Man"). This concept refers to the human theoretical approach (model) whose purpose is to obtain maximal economic benefit and/or profit. In order to achieve this goal, it is necessary to expand one's own production as well as relevant investments as Smith clearly mentioned (Heilbroner, Milberg, 2012: 48). Therefore, the "Homo Economicus" theoretical approach is a model focused on any kind of economic profitability.

Special attention needs to be made to Frank Knight's point of view that the theoretical construct of "Homo Economicus" refers to groups and categories of factors that are related to both human goals and the relevant knowledge that must be used in order to achieve the set goals. Therefore, it can be considered that the process of economic activity is a direct duty of "Homo Economicus" (Knight, 1947: 84).

Some scientists (for example, Drucker, 2009) have criticized the "Homo Economicus" theoretical approach for different reasons. According to Peter Drucker, the theory of "Economic Man" no longer corresponds to the existing reality. Drucker argues that it is difficult to say that an "Economic Man" is a worker who is willing to do a colossal volume of work for a small reimbursement which, in turn, causes income imbalances. Based on Drucker's theory, the unequal distribution of income is a prerequisite for a potential wave of protests in society. Drucker argues that the "Economic Man" has lost his function and has mostly become a tool for more political battles (Drucker, 2009: 38). In accordance with Peter Drucker's opinion, society is characterized by a number of mercantile features that are more focused on the consumption of industrialized products. He pays more attention to the theoretical approach of "Industrial Man." It should be noted this approach clearly defines human roles. In turn, it implies that all actors in industrialization perform their duties meticulously. For example, a manager formulates the development plan of an enterprise, a banker issues a loan to expand production and a hired worker tries to perform his work in a relevant quality manner in order to further receive the appropriate remuneration. However, the final goal of all of the above-mentioned is to satisfy society's demands.

According to Drucker's opinion, society is characterized by mercantilism while the development of economic activity for a mercantile society carries a peculiar social prestige feature. In other words, level of stability in society is strongly correlated with a better quality of the satisfaction of the existing demands (Drucker, 1995: 48-50). The theoretical matters of the innovative development of a country's economy cover a wide range of economic activities. They could be in line with the creation of a completely new sector of the economy as well as a significant improvement of the existing economic sector.

The innovation process in an economy is distinguished by its own dynamics and its specific nature. First of all, it ensures a significant increase in the role of the information and communication (ICT) and R&D sector in the economy of a country (Kelly, 1998: 2).

Before proceeding further with the “Innovative Man” model, it is interesting to see how the concept of innovation itself is defined in the field of social sciences. In his work, *Social Theory and Social Structure*, the well-known American sociologist, Robert Merton, defines innovation as a model of deviation from the prevailing standards in a society where the practical realization of social and cultural values accentuated and dominating in society takes place through the use of technically effective facilities (Merton, 1968: 230).

Referring to the opinion of Joseph Schumpeter, certain innovative actions are vital for the further development of the economy (Clemence, ed., 2009: 234).

Thus, in order to better implement innovative activities, a number of scientists (for example, Shelton, 2018) define the promotion of the transformation process of “Homo Sapiens” into “Homo Innovaticus” as a necessary precondition for this process.

Despite all of the above-mentioned, it should be noted that emphasis is on the ability to create and use innovative high-tech based products and services in the modern world (Lemanowicz, 2015: 61). Therefore, “Homo Innovaticus” by his nature can be characterized as a future innovation oriented on the human factor (Giddens, 2011: 22). Orientation to the future is somehow closely related to so-called economic optimism which might be ensured only in the case of a stable political, legal and, more importantly, macroeconomic environment. However, the sense of instability somehow contributes to the growth of future risks (Papava, 2019: 135-138).

Referring to R. Blum, various fields of social science (such as, for example, sociology, psychology, political science and etc.) have their own respective human theoretical concept called “Homo Logicus.” Therefore, different models appear on the stage such as “Sociological Man,” “Psychological Man,” “Political Man” and etc. (Blum, 1991: 111). The skills characterized by “Homo Innovaticus” are becoming increasingly irrelevant to the existing reality as the demand for high-tech-related products and services grows gradually. Therefore, the need for a completely new type of theoretical model vis-à-vis the human factor, which we have already called “Homo Hi Techicus” (or “High-Technological Man”), is getting more and more important.

The theoretical model of the “High-Technological Man” implies a number of relevant technical skills that are necessary in order to develop or use modern high-tech-based facilities (including different applications, software and etc.). Consequently, when talking about an innovative economy and its development, we do not forget the importance and the role of those specific skills that characterize the theoretical model of “Homo Hi Techicus.” Nevertheless, in our opinion, “Homo Hi Techicus” combines the best features of the already above-mentioned “Homo Innovaticus.”

For the development of a high technology-based innovative economy, providing certain preparatory measures are required in which the main scope of view will be directed on the training of professionals in order to better fulfill the activities related to R&D and scientific research (Papava, 2020).

The enterprises which are focused on creating or using high-tech-related facilities impose specific conditions on their own employees that cannot be met without proper knowledge. Here, it should be mentioned that employees of such enterprises are already free to work from home or even from another continent owing to remote labor options. Working outside the physical office does not negatively affect performance (Coyle, 2020).

In most cases, the innovation economy is carried out by companies that prioritize staff with a higher technical education. In fact, the creation of an innovative economy is driven by R&D-oriented companies with close cooperation to leading scientific research centers. Typically, the creation of an innovative economy is driven by research and development-oriented companies with close ties to leading scientific research centers. The innovation economy itself is achieved not only by high-tech capabilities but it also implies the creation of new or significantly improved products and, consequently, including the development of relevant processes for this production (Fagerberg et al., 2009: 4-8). Creating or using high-tech facilities, as has been mentioned above, can be a prerogative for a completely different human factor which we have named “Homo Hi Techicus.” Nevertheless, there is an opinion on another human factor that might be exerting some influence on the development of the future economy. This factor was called “Homo Complexicus” or in other words – “Machina-Economicus” (for example, Daneke, 2020: 18-39). At first glance, we might detect a great deal of similarities between “Homo Hi Techicus” and “Homo Complexicus.” Moreover, both of them might be considered as the same model. Although, if we analyze the

features of these models in depth, we can see more differences between them than similarities. Based on Daneke's opinion, "Homo Complexicus" would be considered not so much a human factor but artificial intelligence which is mostly oriented on establishing complex control over society and not on the development of the economy. In order to achieve this goal, "Homo Complexicus" relies on several high-tech-based facilities. Therefore, we are not able to correctly characterize "Homo Complexicus" as a human factor focusing on the development of the innovative economy. This issue can be defined as a main distinguishing factor between "Homo Complexicus" and "Homo Hi Techicus." Despite this, referring to Daneke's "Homo Complexicus" model is mostly routine work-oriented and it is not flexible. As for "Homo Hi Techicus," his aim is to define the prevailing wide demands of society with high-tech-based products and services.

Finally, what are the basic features of "Homo Hi Techicus?" In our opinion, these features could be the following:

- Creative thinking skills;
- Ability to create use or create different kinds software and applications;
- Analytical skills;
- Ability for data processing;
- Ability to think logically;
- Skills in line with problem identification and problem solving in the system;
- Innovation and professional development skills.

Thus, the producer of a modern and innovative economy should be considered "High-Technological Man." "Homo Hi Techicus" should provide society with high-tech based wealth which will be a precondition for the sustainable development of the innovative economy. Despite this, nowadays when the development of block chain technologies is getting more and more important, the "High-Technological Man" human factor is growing immeasurably. Based on this point of view, "Homo Hi Techicus" can be named as the most perfect model for this stage in order to produce an innovative economy.

The innovative economy itself should necessarily be based on the following main aspects (Chen, Dahlman, 2006: 4):

1. Investments in the education sector;
2. Development and implementation of relevant innovative opportunities in the education sector;
3. Ensuring an ICT based infrastructure and economic environment.

In accordance with all of the aforementioned, the following issues need to be carried out for the development of the innovative economy (Chen, Dahlman, 2006: 4):

- Encouraging the economics of the education sector and the development of an appropriate institutional approach which should ultimately ensure the efficient allocation of resources in order to facilitate the acquisition and use of knowledge;
- Increasing the number of educated and experienced specialists who can use their knowledge in an effective manner;
- Promoting companies, research and consulting centers, universities and other organizations in order to ensure the accumulation and realization of knowledge in accordance with the existing needs in society;
- Developing a modern and adequate information infrastructure.

High technologies lead to the further development of the economy which is accompanied by large investments as well as the development of a system of financing high-tech-based entrepreneurship and a relatively high share of employment in terms of scientific research and development. In recent times, also noteworthy is the gradually growing funding of the R&D-related sector, including personnel costs (Papava, 2019: 135). In addition, based on the aforementioned, it is also important to increase the quality of the educational level in a country's universities in order to elaborate a relevant knowledge-based economic model as well as to enlarge research and development-related activities. Nevertheless, it could be noted here that the development of an innovative economy should not eliminate or neglect the so-called "traditional" industries whose existence contributes to the accumulation of capital and the economic stability in a country (Papava, 2019: 139).

4. Conclusion

Based on all of the above-mentioned, several key directions emerge in the theories related to the innovative development of the economy. A country's economy should meet several conditions before it can be considered as innovative. First of all, it has to be knowledge-based and rely on the latest advances of R&D or, in other words, high technology. The development of an innovative economy requires the relevant political will in order to better promote innovative business in a modern competitive global market. The political will should ensure the development of information technology and a knowledge-based economy in a country to further strengthen the internal economic potential. To achieve sustainable economic development, the main proposition for this issue is to create a knowledge-based economy. Therefore, it is necessary to implement appropriate economic policies in order to promote the development of this type of economy in a country. A knowledge-based economy should ensure the creation of competitive innovative products and/or services. Based on the discussions mentioned above, we can conclude that:

- In modern society, special attention is paid to the products and services that are developed using high-tech facilities.
- Establishing an innovative economy is impossible without the relevant environmental conditions which include the willingness and the desire of society to produce and/or consume innovative high-tech products and services.
- Human factors in economics are the theoretical concepts ensuring the establishing of economic activities. Thus, the theoretical concept of the "Innovative Man" can be considered as the creator of the innovative economy.
- Innovative economics is increasingly relying on high-tech facilities. The relevant technical skills of the "Innovative Man" are no longer sufficient vis-à-vis the existing reality. Consequently, a completely new theoretical concept emerges which can be called the "High-Technological Man."
- "A high-tech individual is the supreme creator of an innovative economy based on high technology.
- Due to the increasing demand on high-tech products and services, the "High-Technological Man" can be considered as the most complete theoretical model for this stage.
- High technologies lead to the further development of the economy and at the same time ensure large investments regarding high-tech-based entrepreneurship.
- The innovative economy is not oriented on eliminating or neglecting the so-called "traditional" industries whose existence contribute to the accumulation of capital and the economic stability in a country.

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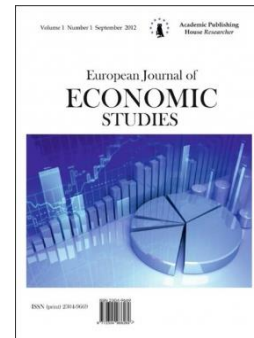
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GDP Modelling and Forecasting Using ARIMA. An Empirical Assessment for Innovative Economy Formation

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Abstract

This article reconsiders the developing of a new forecast model using the interrupted timeseries of the gross domestic product for the Republic of Moldova. The theme arises from a first need to redefine, economic growth in the context of increasing globalization but also the complexity of commercial transactions. The forecasting method used is based on ARIMA each model partly emphasizing the urgent need to redefine, the economic growth in the context of the Association Agreement (AA) with the EU, which includes a Comprehensive Free Trade Agreement (2014) but also future prospects of integration among the countries with an average degree of development. The technique used comes to bring novelty in the field of forecasting, as an alternative to the one which should be —, a simultaneous equations method and traditional VAR. The policy and practical implications of the results are the strengths. The limits are due to the high degree of risk and uncertainty, which is due to the low degree of real convergence of the economy, but also to other factors such as the regional context, the lack of openness of the economy, the diversification of exports and services. The degree of complexity arises from the adaptation and study of the chronological interrupted series 1967–2019 for the branch – information and communications, subgroup GDP, categories of resources, which themselves have specific asymmetries and nuances. The basic ARIMA equations are generally used in conjunction with three sets of assumptions regarding the formation of the gross domestic product, referring to the elasticity of aggregate demand or excess sensitivity supply in the goods and labour markets. Another hypothesis concerns the rigid wage and sticky prices, including deflation with an positive output gap only in the telecom market. Also, the salary is rigid, while the price level is adjusted based on the market of goods and commodities, so that the excess supply appears only in the labour market. Finally, in a third assumption, both markets are assumed to be mutually adjusted. The multipliers of fiscal and monetary policy, besides the conclusions that can be drawn about economic policy, are obviously different in these three assumptions. The article presents a synthetic model that supports the three particular sub-regimes of assumptions of a single adapted ARIMA model, namely the trajectory of New Keynesian Small and Closed Economy Model – a balance in the goods and services, the labour market and the national financial system. In conclusion, the model aims not only to redefine the area of macroeconomic forecasting but also to offer a future perspective of adopting combined techniques such as the Stochastic Dynamic General Equilibrium (K-SDGE) Model with sticky prices and wages – technique, but also the scenario method. This framework is appealing because it has straight forward model setup,

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transparent mechanisms, sharp empirical analysis, and multiple important applications such as rational expectations.

Keywords: economic growth and aggregate productivity, the gross domestic product, innovation and communications, cross-country output convergence, prediction and forecasting methods, time series analysis and modelling, ARIMA modelling, Box-Jenkins method.

1. Introduction

The central motivation of our theoretical-empirical analysis arises from the desire for better understanding the variations of the long-term economic growth, in the context of the high-technology businesses that target the small and medium-sized enterprises in our country. The main contribution of the study is that it explains why models based entirely on endogenous growth, change of factors, perception in business, possibility of innovation can change the saving rates and thus increase the possibilities of the production, accompanied by the development of new pattern – the art of investing and developing within innovation-development (R&D) sector. The model get started from the hypothesis of the existence the discrepancy between the economic growth rates statistically registered not only in the European regional context, but also in the specific case of the economy of the Republic of Moldova. The painting appears to be separated from two distinct elements. On the one hand, the group of states from Central and Eastern Europe (Romania, Republic of Moldova and Ukraine), more specific with increases of over 5 % per year of GDP, which are facing market constraints in the path of “to be” innovative and in the end generate high-tech products for export, by the other hand countries in the group OECD (Organization for Economic Co-operation and Development) which reaches a rate of 1-3 % and generating know-how product, including industrial robotics for pharmaceutical and medical sphere.

Why is this happening? How to better understand this trans-regional phenomenon, explaining the assumptions of the well-known Solow model, which is the reference point for understanding economic growth in general term. More and more, economists in the Eastern Europe, including Poland and Romania, may ask themselves often if there is no generic parallel with the well-known boom period of the 70s, when the big industrial concerns (E.g. FIAT in Italy), have made a significant duty to the economic miracle, characteristic to be as “Asian tiger”, a nickname given to the Southeast Asian economies, such as Indonesia, Singapore, Malaysia, Thailand and South Korea, and generating 5-7 % GDP economic growth annually, truly transforming countries, in just two decades, into highly developed countries aimed for innovation, sectorial development and research.

We do not come with any intention to rely on parallels and frameworks of comparisons from those times and times, especially because of the fact that the geo-political context and regional configuration were completely different. Many authors have made a significant contribution to the development of this area of research (Eichner et al., 2010), which find these spectacular period of growth on behalf of small and medium-sized companies, generically named by new SMEs, generators of innovations and technologies.

From now on, our theoretical analysis will focus exclusively on the field of development, innovations and technologies. The periods from the end of the twentieth century gave birth to new economic thinking, which saw new engines generating economic growth in entrepreneurship and innovation. Keynes and Marx's classical theories, based on macroeconomic balance, are connected with Schumpeter's ideas as the leader of that fermentation in the innovation-development sector targeting small and medium-sized enterprises (Heilbroner, 1984). Schumpeterian thinking from a European perspective, has a strong resemblance to the activity of when it linked economic progress with the social-economic context of the regions. As the socio-economic settings are different for the case of the Republic of Moldova, it is imperative to reflect on the comparative perspective (Bronwyn, Ziedonis, 2001). However, we consider that the model in its approach, can find its origin of inspiration within the Anglo-Saxon and the Nippon-Rhine approach.

The comparison of models has attracted the attention of many academics, such as M. Kamien and N. Schwartz (1982) with empirical studies in entrepreneurship. The authors place the issue of strong trans-regional development in the context of national systems of innovation, development. We also, consider that the inclusion of the economic theory of the two models of regional development: Anglo-Saxon and the Nippon-Rhineland – significantly contributes to shaping the regional perspectives characteristic of the Republic of Moldova.

To begin with, we intend not to bring Schumpeter's criticism, but to focus instead on seeking the validity or extension of his theory.

More fundamentally, we should probably look back to the origin of thought in the context of historical periods of economic advancement, recorded by the aforementioned regions. It is worth mentioning that since the mid-20th century, the economies of the Federal Republic of Germany and Japan have been focused mainly on attracting investments in the industrial sector, rather than in IT or Telecom, as it's currently case, when the industry have been emancipated by technological parks and innovation systems that have generated, structural changes of economies some even irreversible.

Government have been increasingly interested in allocating funds and grants, to those who decide to introduce technology and innovation into their models. In fact, every time the public administration proposed to establish a general framework, which will promote economies of scale, and which would propel the system to equilibrium (in some cases in dynamics), to a new stationary state. In order to understand the dynamics of these changes it is imperative to reflect on the global dynamic framework of change, and the presence of "creative destruction", in other words, which stimulated entity to develop their economy, relying on technologies and innovations, and others not. In the current context, at least for the Republic of Moldova, the concept of innovation needs clarification, and it is unlikely to be easily identified by a variable or dimension, or of the type of equation with simple regressions, or polynomial function, like specialists in econometrics, who expressed the term error (residual variable) or white noise, into contribution or share due to certain changes in the sector of innovation, development and technologies. If we limit ourselves to the classical definition, innovation follows the theoretical definition of invention that has successfully been perceived in the social-media, ignoring the elements of the political economy, which describes perfect competition and information asymmetry when capital mobility exists. Other types of innovation, such as innovation in company management (for example, [Heilbroner, 1984](#)) and organizational innovation ([Hammond, 1984](#)), are explicitly left out of the equation.

In many situations, inventions that describe the market are not only dependent on the efforts of individual firms, but must be viewed as part of industry or market sectors (e.g., industrial investments in electric cars) or as part of the small business incentive framework (innovation or business incubators). The classical economic theories examine the entrepreneur as being at the centre of the innovation process, contributing to the creation of the balance/imbalance inherent situation of the free market system. Perhaps the most important feature of perfect competition is that the entrepreneur strives to achieve profit maximization (perhaps even temporarily), that is, a profit above the one accepted in the industry, where he runs his business. In this way, the competitive process has a dynamic form, being constrained by the intention to seek balance in the medium term. The competitive process is normally driven by the entrepreneur, self-management mechanism, strategic frame, meaning that entrepreneurs are by themselves entities that act rationally, seeking to innovate. The entrepreneur's function is to innovate on a path that microeconomic theory perceives as "new combinations of knowledge" – explicit elements that are – inscribed in the model in the form of constraints: the creation of new products; creation of new production methods; entering new markets; introduction of new products and services; and the development of new forms of organization of small and medium-sized enterprises (SMEs).

This model schematically describes the basis of the business cycle based on Schumpeterian innovation, in which the radical innovator is copied by other players, based on a stock of information as "exogenous". The stock being diminished, thus ends the cycle of innovation. Likewise, it would put an end to the "pure" profit of the entrepreneur and thus marginalize the wave of creative destruction. However, it should be mentioned that innovation processes are characteristic of large companies, where the first three hypotheses are drawn, namely:

Hypothesis 1: Large firms are more capable than smaller firms of generating routine innovation by capturing economies of scale.

Hypothesis 2: Small firms play a decisive role in creating a monopolistic competition.

Hypothesis 3: The greater the market power is, the greater incentive to be engaged in innovation, due to the possibility of lowering costs.

According to Schumpeter, the concept of creative destruction comes to explain that innovation has become an unconditional necessity and synonymous with the survival and growth of companies.

However, there are historical moments, which have shown that regional networks play an important role in the process of innovation and resizing of companies (Basile, 2001). Specifically, it is often mentioned the phenomenon of "Third Italy", introduced by Arnaldo Bagnasco (1977), referring to the northeast and central area of Italy, characterized by a concentrated presence of small and medium-sized enterprises in the field of industry, clothing and textiles. Therefore, the trans-regional and national innovation systems not only became decisive, but it were also considered by natural need for R&D. The phenomenon of creative destruction can be considered as inherent in the case of "industrial areas" in "third Italy" (Brusco, 1982). In these industrial districts, groups of small and medium-sized enterprises (SMEs) are simultaneously engaged in cooperative behaviours, remaining in perfect competition. SMEs cooperate for survival activities, such as training, research and development, but remaining competitive in terms of outcomes. The artisan cooperatives in the textile industry, thus become sources of innovation. Different organizations, such as the private associations of the craftsmen the national chambers of commerce, the associations of the textile activities and the regional development agency have formed cluster information centres. The implications of these industrial districts are able to outline the entrepreneurial behaviour, while taking advantage of economies of scale for innovation.

As mentioned in the first part, institutional arrangements play a major role in even small producers' ability to gain access to information and opportunities to innovate. Taken in part, the small, independently operating producer could not afford the investment needed to engage sufficiently in innovation. In addition, collective effort reduces inefficiency and minimizes costs in terms of effort. In this respect, the ability of smaller companies to collaborate on European cluster networks, not only reduces risk and investment potential, but also builds the capacity to compete outside the regional and national borders, and even to assume them, drawing the courage to develop a new entrepreneurial dimension. The innovation-development model increases its efficiency when it includes in equations both the significant role played by internal resources including human and information technologies: product innovation seems positively associated with the employment of professional technicians, who may demand additional research and development costs – up to at some point, when the temporary equilibrium is reached, in the short term. In the fact, this approach it is not exempted from risks associated with market failure such as moral hazard and adverse selection. Moral risk also, generates unjustified costs, which could explain the cause of decisions taken in the context of asymmetric information. As a result, signals should be issued in order to allow for highlighting, mapping and sketching of scenarios that cannot be taken over by the companies that generate rudimentary bottlenecks in the investment in innovation-development. According to the statistical data, the Republic of Moldova represents a market for about 53600 SME units, generating revenues of over 137.5 billion of Moldovan LEU annually. A pretty big sum if we refer to the gross domestic product. In context of our economy, companies should be more concerned to accept the innovation as being the factor of excluding unfair competition, resulting in higher profits in the medium term. Even if the initial investment essentially presents risks, uncertainty, random walk and multidirectional properties. Of these we can mention, the national political factor, represented by activists, social leaders, politicians, and policy makers who can generate externalities, in the context of decision making (influencing more or less the value of investments, including those in the research category or R&D).

In conclusion, a highly competitive and global business environment, does not call into question the survival of the company itself, this factor depends directly on its ability to manage and develop its business model. Whichever model one chooses, the companies are finally forced to accept, the two ways, either with reference to the atomicity and homogeneity of the products, or the possibility of continuing the metamorphosis chain, similar to the economies in transition. In addition, there are companies that do not perceive competition as generating a function of minimum (in case of costs), and rather one of maximum (in case of profits). Narrowing the analysis of the investment-innovation process at the level of each company, Foray (2004) distinguishes knowledge-based economies as those that require continuous and rapid change due to the nature of technology and scientific discoveries, which are unexpected and unpredictable. In addition, this requires companies to engage in a process of constant updating of technical knowledge. The old certainties under the aegis of Adam Smith's "invisible hand", or today's integrated, diversified and hierarchical business world, are replaced by uncertainty and low marginal costs as the world embraces the knowledge economy and monopolistic type competition as European cluster.

2. Discussion and results

Data. Although the techniques specific to the linear forecasting model are simple and easy to apply, in reality, there are data whose modelling demands a different form than the linear one. Some of these, such as polynomial or exponential models, can be reduced by certain transformations to the linear model, the way they are generically called, linearizable models when there is a danger of confusion with the linear model itself. The present approach to look for a suitable model for modelling the forecast of the information and communications branch of the Republic of Moldova, based on the current realities of the country. The Republic of Moldova can be considered a small and open economy, based on digital services, high-tech products and IT; and the penetration rate of access to information of over 68 % (with reference to the access of the population to the Internet). Next, we try to build a forecast model using the data obtained from the National Bureau of Statistics of the Republic of Moldova, information illustrated in the table below, (Figure 1, pg. 7). The econometric results, including the tests revealed a potential of 10-14 % annually, and taking into account the structure in GDP (6.8-7 %), the gross added value of the branch would generate 1. pp each year to the total growth of the gross domestic product. Econometric testing revealed a potential of 10-14 % annually, and taking into account the structure in the GDP (6.8-7 %), the GAV of the branch would generate every year 1 p.p. to increase the gross domestic product. In the process of creating a sequential data set, the period 1967-1994, GDP calibration has been used (transforming economy GDP backward-looking starting with 95Q1, based on 4 autonomously assumptions "Ex ante" specifically:

1. Buying power of one U.S. dollar compared to 1775 Continental currency up to 2012, using Consumer Price Index for All Urban Consumers: Housing in U.S. City Average (CPIHOSSL), collected from Federal Bank of Saint Louis;
2. Structure of economy GDP, categories of resources, assuming that from 1967–1994, Republic of Moldova has been subject of a big and closed economy abbreviated to BCE (obs. not to be confused with European Central Bank, an European Authority), is an economy that participates in international trade, but is closed enough compared to its trading partners; furthermore it describing export-import sensitivity refers to its Long Run Aggregate Supply (LRAS);
3. CPI, is expected to be 2-4 % annually between 1967–1992;
4. Firms and technology, was not count significantly cause in error term or disturbance (epsilon) of the regression model, it has a limited consideration of innovative plant.

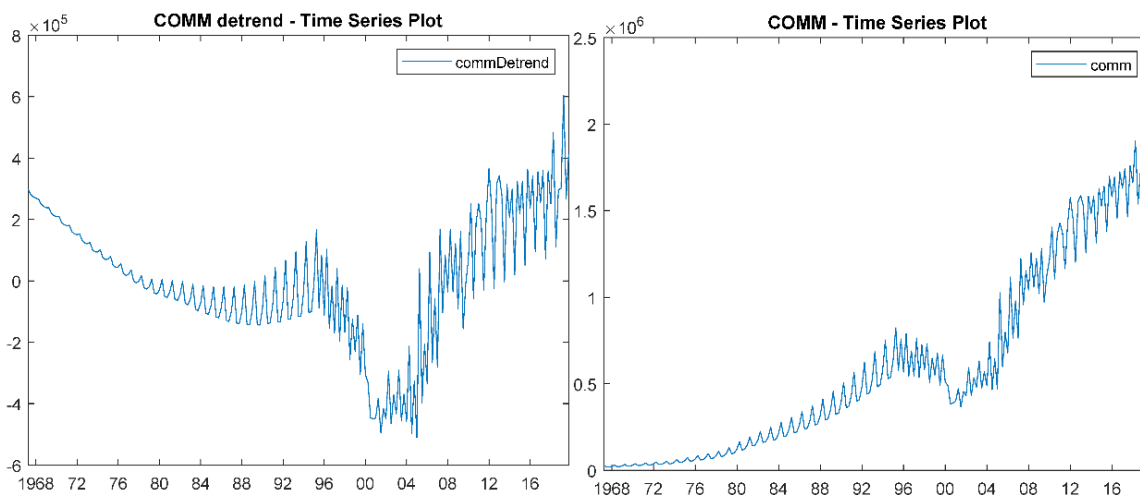


Fig. 1. Quarterly evolution of the communication series (abr. COMM) – thousands lei / Quarterly evolution of the detrend communication series (abr. COMM) – thousands lei
Source: Developed by the author based on NBS data

Econometric testing. Debating econometrics and its short-comings yours truly often gets the response from econometricians that “ok, maybe econometrics isn’t perfect, but you have to admit that it is a great technique for empirical testing of economic hypotheses.” A stationary time series is one whose properties do not depend on the time at which the series is observed. Thus, time series

with trends, or with seasonality, are not stationary – the trend and seasonality will affect the value of the time series at different times. On the other hand, a white noise series is stationary – it does not matter when you observe it, it should look much the same at any point in time. Some cases can be confusing – a time series with cyclic behaviour (but with no trend or seasonality) is stationary. This is because the cycles are not of a fixed length, so before we observe the series we cannot be sure where the peaks and troughs of the cycles will be.

Tests for stationarity (unit-root). A stationary series, y_t , follows an AR (p) process if the condition is met under DF statistics (Dickey, Fuller, 1979):

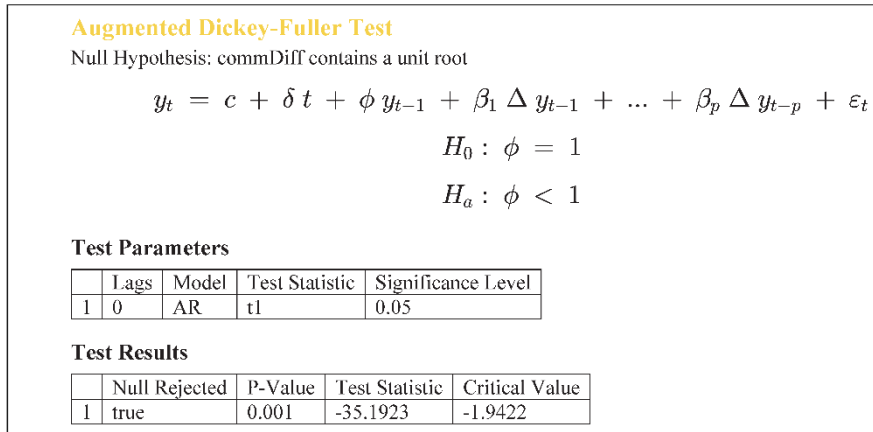


Fig. 2. Difference communication series and the stationary tests Augmented Dickey Fuller
Source: Developed by the author based on NBS data

The Phillips-Perron test (Phillips, Perron, 1988) is constructed to perform a nonparametric correction of Dickey-Fuller criteria in conditions of autocorrelation and/or heteroskedasticity of errors. If the errors are not autocorrelated and not heteroskedastic, then the Phillips-Perron test leads to the same results as the simple Dickey-Fuller test.

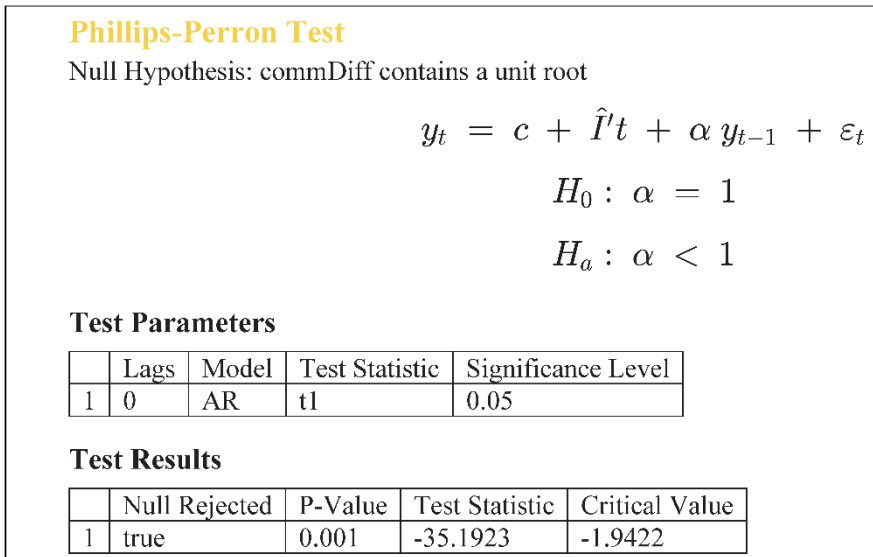


Fig. 3. Difference communication series and the stationary tests Phillips-Perron
Source: Developed by the author based on NBS data

The null hypothesis of the KPSS test (Denis Kwiatkowski, Peter C. B. Phillips, Peter Schmidt & Yongcheol Shin, 1992) is that the analyzed time is stationary, around a constant (c_t), or a trend

linear determinists ($c_t + \delta_t$). KPSS writes the time series (y_t) as a sum between a deterministic trend, a random process (u_{2t}) and the error (u_{1t}), which is assumed to be stationary:

KPSS Test

Null Hypothesis: commDiff is trend stationary

$$y_t = c_t + \delta t + u_{1t}$$

$$c_t = c_{t-1} + u_{2t}$$

$$u_{2t} \sim i.i.d(0, \sigma^2)$$

$$H_0 : \sigma^2 = 0$$

$$H_a : \sigma^2 > 0$$

Test Parameters

	Lags	Include Trend	Significance Level
1	0	true	0.05

Test Results

	Null Rejected	P-Value	Test Statistic	Critical Value
1	false	0.1	0.0042291	0.146

Fig. 4. Difference communication series and the stationary tests KPSS

Source: Developed by the author based on NBS data

The null hypothesis of the Laybourne-McCabe test (B.P.M. McCabe & S.J. Leybourne, 1994) assesses that a univariate time series (y_t) is a trend stationary $AR(p)$ process, against the alternative that it is a nonstationary ARIMA (p, 1, 1) process.

Leybourne-McCabe Test

Null Hypothesis: commDiff is a trend stationary $AR(p)$ Process

$$y_t = c_t + \delta t + b_1 y_{t-1} + \dots + b_p y_{t-p} + u_{1t}$$

$$c_t = c_{t-1} + u_{2t}$$

$$u_{1t} \approx i.i.d(0, \sigma_1^2)$$

$$u_{2t} \approx i.i.d(0, \sigma_2^2)$$

$$H_0 : \sigma^2 = 0$$

$$H_a : \sigma^2 > 0$$

Test Parameters

	Lags	Include Trend	Test	Significance Level
1	0	true	var2	0.05

Test Results

	Null Rejected	P-Value	Test Statistic	Critical Value
1	false	0.1	0.0012256	0.146

Fig. 5. Difference communication series and the stationary tests Laybourne-McCabe

Source: Developed by the author based on NBS data

All stationarity tests revealed the presence of a unitary root of the series, so the series has a stochastic or perhaps even random character, over some time segments. In order to eliminate the phenomenon of non-stationarity, the detrend or differencing procedure was chosen. Based on the results obtained by validating the econometric model, the author proposes the following recommendations: it is appropriate to increase investments in R&D, by attracting FDI. More is required for some time, the acceleration of the development of the productive sectors, which would allow to move the stationary balance to a new point (to be seen Chapter 1: The Solow Growth Model from the book of D. Romer entitled Advanced Macroeconomics, 5th edition, USA, McGraw-Hill Education; 2018) with higher production capacity, to continue the implementation of the Association Agreement/Deep and Comprehensive Free Trade Area (AA/DCFTA, 2014) within assistance programs funded by the European Union.

Tests for autocorrelation. The Ljung–Box test (named for Greta M. Ljung and George E.P. Box, 1978) is a type of statistical test of whether any of a group of autocorrelations of a time series are different from zero. Instead of testing randomness at each distinct lag, it tests the "overall" randomness based on a number of lags.

Ljung-Box Q-Test

Null Hypothesis: The first m autocorrelations of commDiff are jointly 0

$$H_0 : \rho_1 = \rho_2 = \dots = \rho_m = 0$$

$$H_a : \rho_j \neq 0, j \in 1, \dots, m$$

Test Parameters

	Lags	DOF	Significance Level
1	20	20	0.05

Test Results

	Null Rejected	P-Value	Test Statistic	Critical Value
1	true	0	1565.7037	31.4104

Fig. 6. Difference communication series and the autocorrelation Ljung-Box Q-Test

Source: Developed by the author based on NBS data

Tests for heteroskedasticity. An uncorrelated time series can still be serially dependent due to a dynamic conditional variance process. A time series exhibiting conditional heteroscedasticity or autocorrelation in the squared series, is said to have autoregressive conditional heteroscedastic (ARCH) effects. Engle's ARCH test is a Lagrange multiplier test to assess the significance of ARCH effects. Consider a time series $(r_t^2) = \alpha_0 + \alpha_1 r_{t-1}^2 + \dots + \alpha_L r_{t-L}^2 + \varepsilon_t$, where $\alpha_0 + \alpha_1 r_{t-1}^2 + \dots + \alpha_L r_{t-L}^2 + \varepsilon_t$ is the conditional mean of the process, and (ε_t) is an innovation process with mean zero. Suppose the innovations are generated as $(\varepsilon_t) = \sigma_t \zeta_t$, where (ζ_t) is an independent and identically distributed process with mean 0 and variance 1. Thus, $E(\varepsilon_t, \varepsilon_{t+L}) = 0$ for all lags $L \neq 0$ and the innovations term (ε_t) are uncorrelated. Let (H_0) denote the history of the process available at time (t) . The conditional variance of (r_t) is $\text{Var}(r_t | H_{t-1}) = \text{Var}(\varepsilon_t | H_{t-1}) = \text{Var}(\varepsilon_t^2 | H_{t-1}) = \varepsilon_t^2$. Thus, conditional heteroscedasticity in the variance process is equivalent to autocorrelation in the squared innovation process.

Engle's ARCH Test

Null Hypothesis: commDiff exhibits no ARCH Effects

$$r_t^2 = \alpha_0 + \alpha_1 r_{t-1}^2 + \dots + \alpha_L r_{t-L}^2 + \varepsilon_t$$

$$H_0 : \alpha_j = 0, j = 0, \dots, L$$

$$H_a : \alpha_j \neq 0, j \in 0, \dots, L$$

Test Parameters

	Lags	Significance Level
1	1	0.05

Test Results

	Null Rejected	P-Value	Test Statistic	Critical Value
1	true	1.0277e-11	46.275	3.8415

Fig. 7. Difference communication series and the heteroskedasticity tests Engle's ARCH
Source: Developed by the author based on NBS data

Tests for random-walk. The forecasts from a random walk model are equal to the last observation, as future movements are unpredictable, and are equally likely to be up or down. Thus, the random walk model underpins naïve forecasts.

Variance Ratio Test

Null Hypothesis: commDiff is a random walk

$$y_t = c + \phi y_{t-1} + \varepsilon_t$$

$$H_0 : \phi = 1$$

Test Parameters

	IID Innovations	Period	Significance Level
1	false	2	0.05

Test Results

	Null Rejected	P-Value	Test Statistic	Critical Value	Ratio
1	true	3.0387e-14	-7.5967	1.96	0.15759

Fig. 8. Difference communication series and Variance Ratio test
Source: Developed by the author based on NBS data

The Box-Jenkins method. ARMA (autoregressive moving average) models are univariate models – models by which dependent variable is modelled on its own observations. This model class includes:

- Autoregressive models (AR);
- Models with mobile environments (MA).

ARMA models – which specifically combine the two types of processes. When data have a trend, the autocorrelations for small lags tend to be large and positive because observations nearby in time are also nearby in size. So the ACF of trended time series tend to have positive values that slowly decrease as the lags increase. When data are seasonal, the autocorrelations will be larger for the seasonal lags (at multiples of the seasonal frequency) than for other lags. When data are both trended and seasonal, you see a combination of these effects.

Differencing. Transformations such as logarithms can help to stabilise the variance of a time series. Differencing can help stabilise the mean of a time series by removing changes in the level of a time series, and therefore eliminating (or reducing) trend and seasonality.

As well as looking at the time plot of the data, the ACF plot is also useful for identifying non-stationary time series. For a stationary time series, the ACF will drop to zero relatively quickly, while the ACF of non-stationary data decreases slowly. Also, for non-stationary data, the value of r_t is often large and positive. The $AR(p)$ process is stationary if the absolute values of the roots of its characteristic polynomial are strictly less than 1. For a stationary autoregressive process, the mean of the process is finite and independent of time; the process returns to the mean (it is mean reverting). If the process is non-stationary, the average is not a finite value. The additional conditions for the process to be stationary (in covariance) are: 1. The variance of the process does not depend on time; 2. Covariance does not depend on time. Because most financial time series have the characteristics of processes autoregressive, $AR(p)$ models are the most widely used forecasting models. But, certain series follow other types of processes, called mobile environment $MA(q)$ processes. E.g, according to the statistical tests presented in the specialized literature, the S&P stock index 500 follows an $MA(q)$ process rather than an $AR(p)$.

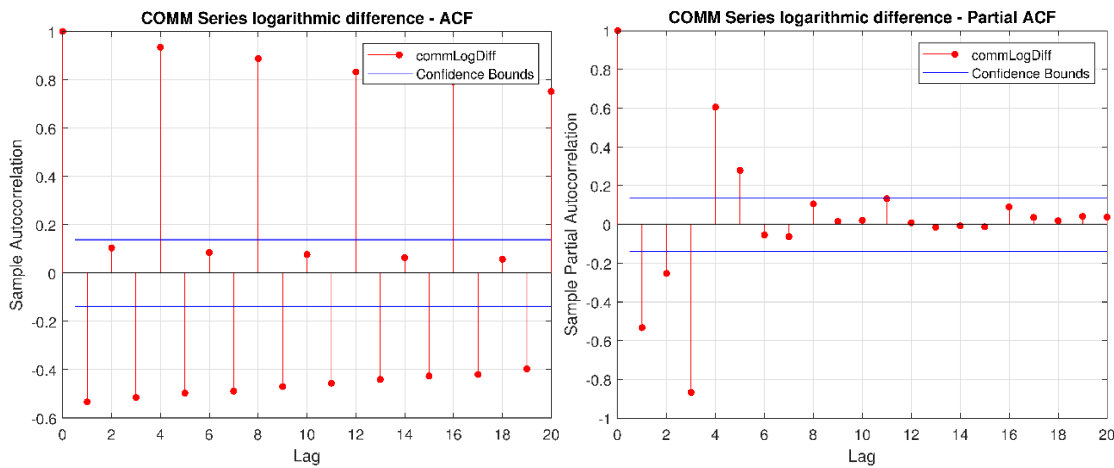


Fig. 9. Logarithmic difference communication series and functions ACF, PACF

Source: Developed by the author based on NBS data

The most suitable model is chosen using various analysis criteria. Thus, it is chosen the model that has the highest value for the adjusted R or the value the lowest for the residue variance or dispersion. It is also chosen the model with the lowest values for the information criteria (Akaike, Schwartz). The $AR(p)$ process is stationary if the absolute values of the roots of its characteristic polynomial are strictly less than 1. For a stationary autoregressive process, the mean of the process is finite and independent of time; the process returns to the mean (it is mean reverting). If the process is non-stationary, the average is not a finite value. In order to choose the correct model, ACF and PACF functions must be checked, (Figure 9, pg. 10).

Set up the Model. The chosen model is one of autoregressive type $AR(3)$, with including the seasonal component. This was chosen for the following two reasons: 1. The branch started to have seasonality since last years. 2. There is the premise of a bigger growth if we evaluate the fact that in the last 2 years, the "series" has taken a breakthrough, generated by structural changes in the industry, with the role of generating new jobs and investments in technologies.

$$y'_t = c_t + \delta t + \varphi_1 y'_{t-1} + \dots + \varphi_p y'_{t-p} + u_{1t} \quad (1)$$

$$c_t = c_{t-1} + u_{2t} \quad (2)$$

$$u_{1t} \approx i.i.d(0, \sigma_1^2) \quad (3)$$

$$H_0: \sigma^2 = 0 \quad (4)$$

$$H_a: \sigma^2 > 0 = 0 \quad (5)$$

Where, (y'_t) , is the differenced series (it may have been differenced more than once). The "predictors" on the right hand side include both lagged values of (y'_t) and lagged errors. We call this an ARIMA(p, d, q) model, where:

- (p) = order of the autoregressive part;
 $(1 - \phi_1 B - \dots - \phi_p B^p) \leftarrow AR(p)$
- (d) = degree of first differencing involved;
 $(1 - B)^d y_t \leftarrow d, differences$
- (q) = order of the moving average part.
 $c + (1 + \theta_1 B + \dots + \theta_q B^q) u_{1t} \leftarrow MA(q)$

The Dickey-Fuller test verifies the null hypothesis (H_0), (ϕ) = 1 (non-stationarity) against the alternative hypothesis, (ϕ) $\neq$ 1 (stationarity). Based on previous section, we've rejected the null hypothesis (H_0), against the alternative hypothesis (H_1), if $t < (\tau \phi)$, where ($\tau \phi$) is one of the critical (negative) values in the Dickey-Fuller distribution table. The equation of the model is represented in (Box 8, pg. 13). As a result, the value of a series in a given period depends on the value of the series in the previous period and a random error term whose expected value is 0. Thus, the best forecast of the series value is its previous value. This model is widely used in the analysis of financial markets and especially the exchange rate change. This process is non-stationary (explosive), and therefore has no average. The simplest method of testing the process is to test the term $\varepsilon_t = y_t - y_{t-1}$ (representing the first difference in the series): testing the average of the series ε_t : which must be zero; testing the stationarity of the series ε_t : the series must be stationary. The information and communications ACF and PACF functions highlights the ascending character of the series, also presents the seasonal character from 2014. The cyclical variation highlights the fact that the branch is exposed to shocks, but also to the uncertainty that results from the real business-cycle theory, RBC theory (to be seen Chapter 5: Real-Business-Cycle Theory from the book of D. Romer entitled Advanced Macroeconomics, 5th edition, USA, McGraw-Hill Education; 2018). The chosen model is one of Autoregressive type AR (3), with including the seasonal component. This was chosen for the following two reasons: 1. The branch has no seasonality until the last years. 2. There is the premise of a bigger growth if we evaluate the fact that in the last 2 years, however, the branch has taken a breakthrough, generated by structural changes in the industry, with the role of generating new jobs and investments in technologies.

ARIMA(3,1,0) Model Seasonally Integrated with Seasonal MA(1) (Gaussian Distribution) (SARIMA_commLog)

Seasonal ARIMA model of time series commLog with the following equation:

$$(1 - \phi_1 L - \phi_2 L^2 - \phi_3 L^3)(1 - L)(1 - L)y_t = (1 + \Theta_1 L)\varepsilon_t$$

Model Estimation

Estimation Results

Parameter	Value	Standard Error	t Statistic	P-Value
Constant	0	0		
AR{1}	-0.98882	0.029739	-33.2501	2.0378e-242
AR{2}	-0.96571	0.039237	-24.6121	9.3657e-134
AR{3}	-0.95462	0.024689	-38.6661	0
SMA{1}	-0.45776	0.035139	-13.0273	8.5633e-39
Variance	0.0052016	0.00028141	18.4836	2.7976e-76

Goodness of Fit

AIC	-500.8143
BIC	-484.175

Fig. 10. The equation of the COMM Series Model and the Goodness of Fit
 Source: Developed by the author based on NBS data

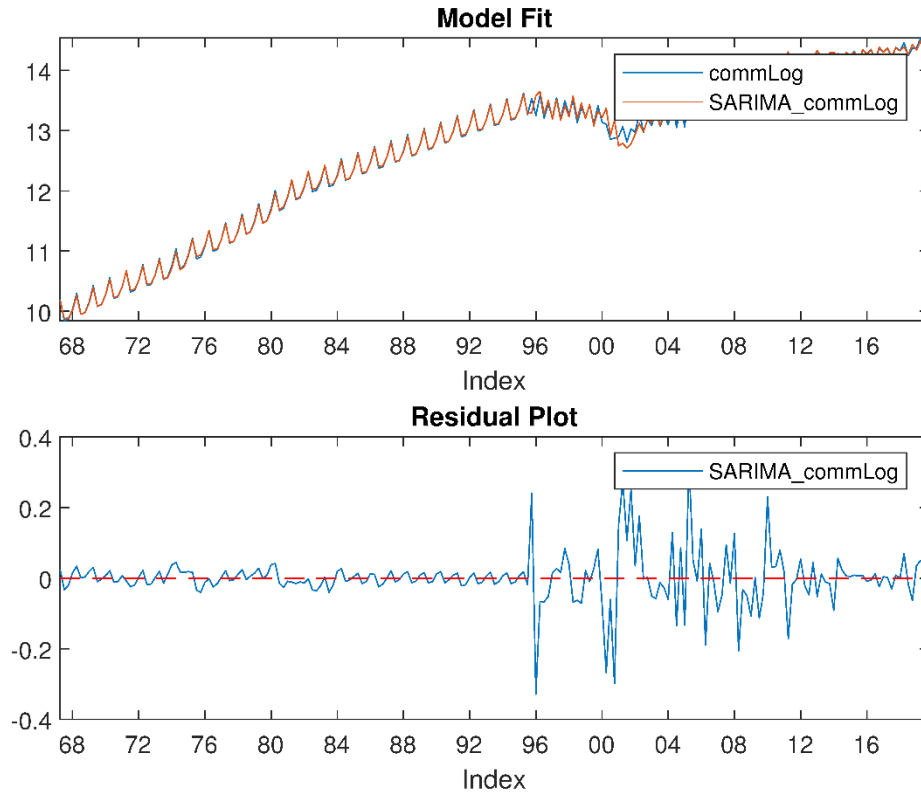


Fig. 11. Relevance of the trend logarithmic communication series forecast model (abr. COMMLOG) – the Fit model/SARIMA_COMMLOG model Residual distribution characteristics.
Source: Developed by the author based on NBS data

Model matching (Model Fit procedure) shows that the ARIMA model series follows with a high degree of accuracy the trend of the commLog logarithmic series. Of these models, the best is the ARIMA (3,1,0)(0,1,1)₄ model (i.e., it has the smallest AICc value, and smallest p-value) showed in (Table 1, pg. 13). The residual variation shows that the errors are normal, independent and identically distributed, with zero mean, which also verifies the conditions of the fundamental-Gauss-Markov hypotheses, namely:

Table 1. Model selection, BJ method

Model	AICc	BICc
ARIMA(3,1,0)(0,1,2) ₄	-501.9	-482.0
ARIMA(3,1,0)(0,1,1) ₄	-500.8	-484.1
ARIMA(3,1,0)(1,1,1) ₄	-497.1	-477.1
ARIMA(3,1,0)(1,1,0) ₄	-505.8	-489.2
ARIMA(3,1,0)(2,1,2) ₄	invalid	invalid
ARIMA(3,1,0)(2,1,1) ₄	-518.1	-494.8
ARIMA(3,1,0)(2,1,0) ₄	-504.0	-484.1

Source: elaborated by the author based on the NBS information

- normality of errors: $\varepsilon_i \in N, \forall i = \overline{1, n}$;
- error independence: $\text{cov}(\varepsilon_i, \varepsilon_j) = 0, \forall i, j = \overline{1, n}, i \neq j$;
- errors are identically distributed (homoskedastic model): $M(\varepsilon_i) = 0, V(\varepsilon_i) = \sigma^2, \forall i = \overline{1, n}$.

Once the shape of model is specified, together with the numerical value of the parameters, we can use the model for the forecast. Basically, the forecast calculation answers the question: “What is the future, unobserved value (apart from the data obtained by the NBS), which can be calculated using an Autoregressive AR (3) Model. For the graph we included the confidence interval for a forecast value (the default value is 95 %). Of these models, the best is the ARIMA(3,1,0)(0,1,1)₄ model (i.e., it has the smallest AICc value, and smallest p-value)

Output parameters: the fundamental information related to the ARIMA model (coefficients, graphical representation, forecast, confidence intervals, etc.) incorporated in an interactive graphical interface. We will finally present two real problems taken over, namely that the economy is vulnerable to risks and uncertainty results highlighted in (Table 2, pg. 13). Thus, as an alternative method of forecasting, the Monte Carlo simulation method was chosen. It will finally be seen that the model is very well suited to the ARIMA model, the associated technique that involves testing whether the model can be used for future calculations. Naturally, it is assumed that the model can be used for forecasting. With the analysis of the observed points together with the curves that describe the confidence intervals in the graph, one can advance the hypothesis that the model obtained by the simulation method is relevant. Trend, error spread indicators can be simply estimated using the Quantile-Quantile Plot option. The time series diagram shows that the SARIMA Model follows the normal distribution.

Table 2. GDP growth rates of GDP information and communication branch, %

Information and communication sector (GDP)					
Year	Q1	Q2	Q3	Q4	annual
	Actual/forecast (*)				
2014	3,5	4,4	2,7	3,1	3,4
2015	3,7	5,0	4,4	3,3	4,1
2016	3,1	5,6	1,4	3,2	3,2
2017	3,1	0,7	2,1	1,8	2,0
2018	9,0	5,0	-1,6	5,0	4,3
2019	8,1	12,36	8,6	8,3	9,2
2020	5,9	-6,9	*8,9/**9,0	*7,1/**9,3	*7,2/**4,6
2021	*5,5/**10,0	*8,0/**28,1	*8,3/**8,9	*7,0/**8,8	*7,1/**13,10
2022	*5,9/**8,0	**9,1	**8,9	**8,8	**8,7
2023-2031	-	-	-	-	**8,8

Note: the data presented with (*), asterisk – represents forecast data on 23AUG19, (**), asterisk – represents forecast data on 13SEP20

Source: elaborated by the author based on the NBS information

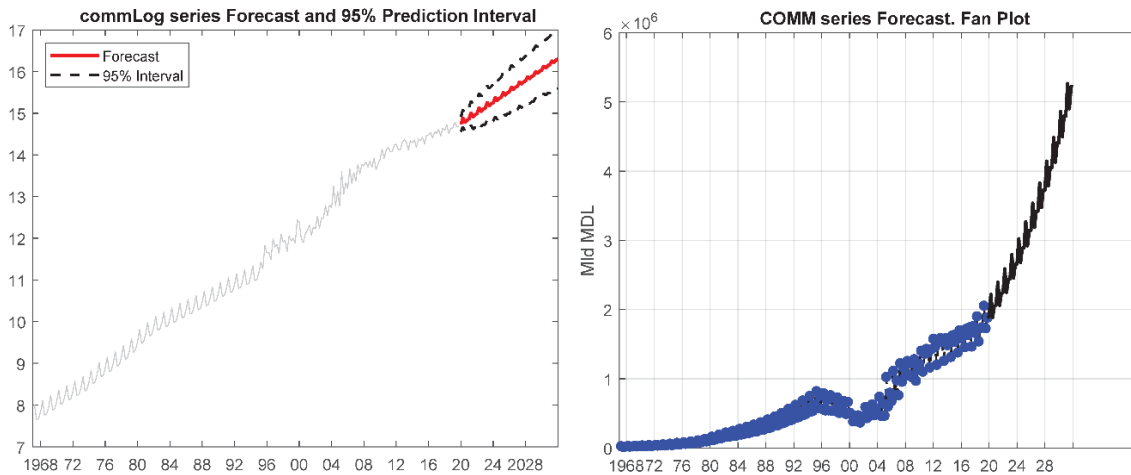


Fig. 12. Forecasts of quarterly series COMM communications using a deterministic trend model (Forecast) and a stochastic trend model (95 % Interval) and Fan Plot chart
Source: Developed by the author based on NBS data

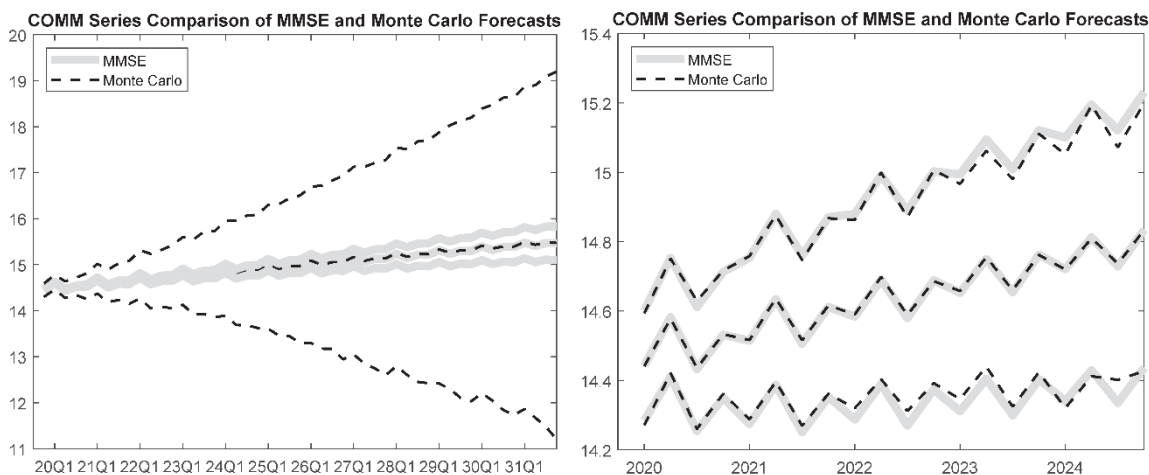


Fig. 13. Econometric calculation technique - simulation method "Monte Carlo" Scenarios – I and II
Source: Developed by the author based on NBS data

We consider that the economic sector of information and communications can be a design pattern for attracting foreign direct investment (FDI) in our country, also taking into account the National Institute of Economic Research (NIER) objectives, to provide a theoretical-empirical framework for policy makers. From a scientific point of view, our growth theory is based on the phenomenon “A Treia Românie” (the third Romania), 1998–2016, period of high economic growth, namely :

- If two countries have the same rate of investment but different levels of income, the country with lower income will have higher growth.
- If two countries have the same level of income but different rates of investment, then the country with a higher rate of investment will have higher growth.
- A country that raises its level of investment will experience an increase in its rate of income growth (R. Barro & X. Sala-i-Martin, Economic Growth, Second Edition, 2004).

3. Conclusion

Moreover, the data presented by the NBS highlights the fact that the net flow of FDI in the national economy has increased considerably since 2013. We also consider that the analysed sector could be considered a model for innovation and development taking into account the perspective of the series and the expected economic growth of 10-14 % (potential GDP). The author intends to

evaluate in another form of analysis the gross domestic product, as an extension to the present study. The main objective of the forecasting model came from the need to create more detailed forecasts, so far, in order to improve the performance of the companies in the field, but also to increase the incomes, the profits and the satisfaction of the consumers at the microeconomic level. Also, a hybrid forecast model can be the foundation of an early warning system, which would transmit the information more accurately to the small and medium-sized enterprises (SMEs) sector, to prevent asymmetric shocks and which would ultimately lead to the optimization of economic processes, improving the accuracy of making optimal decisions, but also evaluating potential system risks.

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