Abstract: E-commerce is one of the industrial sectors created as a result of technological progress, and has created new jobs for the economy. However, this sector is conditioned not only by the level of digitalization of each state, but also by the speed of integration of technology in the business environment. The main purpose of the article is to present the impact of e-Commerce development on the labor market. It also considers impact on the labor market of human capital with advanced technological skills. It focuses on data from a particular period situated between two major crises (the economic crisis of 2008 and the health crisis of 2020). We want to know to what extent a technology-created sector can compensate for technological unemployment. To test the working hypothesis, we developed a panel regression model for a sample of 28 European states. The results indicate that 99.5% of the variation in the labor market activity rate of people aged 15 to 64 years in the selected sample of states is explained by the model. This confirms that the development of e-Commerce and an increase in the percentage of technology-specialized human resources contribute to the increase in activity rate in the labor market. As a result, the labor market must be assisted in keeping up with technology by restructuring the education system, or introducing courses that maintain competitiveness and continuous development.

Keywords: E-commerce; labor market; job creation; digitalization

1. Introduction

Technology has had a different impact on the economy in all European states. The development of ITC solutions is the foundation of modern economic organizations in the knowledge economy [1]. This rapid evolution of ITC solutions has influenced all industries to some extent. Every economic sector has seen an opportunity for development, and more. By adopting novel technologies, companies on the market remain competitive and in the public eye. Thus, the world economy is in a transition from an industrial era to a knowledge-based information age, and the role of ICT solutions is becoming indispensable within the labor force [2].

The magnitude of the phenomenon of digitalization of the economy has determined the need to measure it. Thus, the European Commission has developed a composite index that describes exactly the level of development of a state from the perspective of its digital economy and the digitalization of society. One of the basic pillars of this index refers to the integration of technology into economic activity. More specifically, the integration of technology means digitizing business processes and digitizing sales channels (e-Commerce), which are among the most important features of the digital age [3].

E-Commerce is one of the most profitable economic branches and has further growth potential. However, to be successful, the e-commerce market needs high quality websites that attract users [4]. This growth potential makes it an attractive economic sector for candidates in the labor market. It can be said that e-Commerce is a field created by the Industrial Revolution 4.0, and which creates new jobs. It offers the prospects of a competitive market that is highly dependent on specialized human resources. The opportunities that
this sector offers the workforce are undeniable, but it also requires additional effort on the part of human resources to access them [5]. E-Commerce has a positive impact on the labor market by promoting the social inclusion of people who have been excluded from the labor market for subjective reasons [6]. Here we are talking about the inclusion of people with disabilities who can have a job, the inclusion of women with children, and any segment of the population that can perform a paid activity at a distance. However, the e-Commerce sector is directly related to the development of technology.

Unfortunately, Romania is at the bottom of the rankings when we talk about digitalization. In terms of integrating technology into the economy, Romania ranks second-to-last in Europe. Also, from the perspective of e-Commerce, only three states are behind us. The cause of reduced digitalization in Romania is due to the lack of expertise in technology.

The main purpose of this research is to assess the impact of e-Commerce technology and advanced technology skills on the European labor market. Why do we want to highlight this aspect? We want to explore the possibilities of developing an inclusive labor market. An inclusive labor market is a labor market that allows and encourages all people of working age to participate in paid work [7]. Thus, in the first part of the paper, we will describe the impact of e-Commerce on the labor market, and also the impact that digital training has on the labor force. Studies carried out by other researchers have taken as their main objective the employment rate in correlation with the evolution of e-Commerce; we present a case study conducted in Europe by which we highlight the extent to which activity rate is influenced by e-Commerce and advanced knowledge of the use of technology. The difference in perspective comes from the idea that certain people inactive in the labor market have the possibility of work as a result of the opportunities and flexibility offered by e-Commerce. Of course, the possibilities offered by knowledge of technology do nothing but facilitate access to the labor market, overcoming barriers related to the workplace. Moreover, a deeper understanding of the indicators that describe the level of adoption of e-Commerce, as well as those that refer to the labor market’s level of knowledge in the field of ICT, can help formulate measures aimed at developing the labor market.

Finally, we will discuss possible regulations for the development of e-Commerce, and the expansion of demand in the labor market. We will assess the possibility of expanding the possible human resources left out of the labor market due to health, family situation, or even discouragement from society, and how proper training of human resources would serve sustainable development of the economy.

2. Literature Review

2.1. E-Commerce and Its Impact on the Labor Market

Trade is the second largest generator of employment in the European Union. In 2016, this sector generated around 15% of the workforce in the European Union [8]. E-commerce emerged half a century ago, when Electronic Data Interchange (EDI) technology appeared, and a shift towards people being able to shop online began about 20 years later [9]. The emergence of e-Commerce has had an economic and social impact by changing the market, driving globalization, increasing interactivity in the economy, and increasing the importance of time [10]. The sale–purchase process of goods and services has become much more convenient and efficient through e-Commerce. This does not mean that this sales channel will replace the traditional ones, but it will be complementary. According to the European Commission, only 17.5% of small and medium enterprises in Europe sold products online, only 1.4 percentage points more than in 2016 [11]. Economically developed countries immediately benefit from e-commerce (because the ICT infrastructure facilitates expansion of the e-commerce industry [12]), while developing countries will benefit in the long run [13]. However, the retail industry is one of the sectors exposed to automation, and e-Commerce is seen as an advanced form of technology [14].

Some researchers say that digitalization will create new jobs, change the structure of current ones, the work conditions will change, and thus the labor market will experience
a new division of labor [15]. There are studies showing that in times of economic calm, digitalization has led to an increase in employment in the labor market [16].

E-Commerce is a very lucrative industry for labor, if we consider the flexibility offered by remote work. As a sector created by the digital economy, e-Commerce is known for its positive impact on the labor market, creating jobs [17] and reducing social inequality [18]. Furthermore, the World Bank stated in 2016 that the emergence of e-commerce platforms has led to an increase in employment opportunities for those excluded from the global labor market [19]. In other words, e-Commerce can be the industry that promotes the principles of an inclusive labor market by increasing the opportunities of people previously outside the labor market (women, young people, and the unemployed) [20]. While it reopens the door to the labor market for discouraged workers and creates new opportunities, this part of the trade industry is putting some pressure to redefine the skills of the workforce [21].

Although it is a sector that has created jobs, it cannot develop in the same way in all states, due to the lack of skilled labor [22,23]. A study showed that in order to develop the field of e-Commerce, specialists are required with skills and knowledge in three basic topics: marketing, social media and technical solutions [24]. The most sought-after e-Commerce specialists will be skilled in artificial intelligence, augmented or virtual reality, mobile applications, design, animation, and video processing [25]. The high-skilled industry requires experts with concentrated skills in their fields of activity [26]. World Economic Forum projections indicate rapid growth of new jobs in sales, marketing, and content. In 2020 the data extracted from the LinkedIn social platform indicated a number of approximately 87 new opportunities in the three previously mentioned fields (out of 10,000 new opportunities), in 2022 it is expected to increase to 125 new opportunities in these fields [27].

2.2. Digital Skills and Its Impact on the Labor Market

According to Eurostat, in Europe in 2018, almost 360,000 students graduated with bachelor degrees in the fields necessary for e-Commerce (ITC, social and behavioral science, marketing and advertising, mathematics and statistics), out of the approximately 2.5 million graduated students, representing 14.7% of all students [28]. The developing education system must address four main dimensions: vocational education, entrepreneurial education, financial education, and digital education [29]. Why is digital education important? According to the 2014 European Skills and Jobs Survey, more than 70% of EU employees reported that they needed ICT skills to perform tasks at work [30]. Furthermore, by 2022, 133 million new jobs were predicted to be created as a result of the division of labor between people, machines, and algorithms, and the most requested skills will be those of advanced use of technologies [31].

Therefore, the European Commission draws attention to the fact that only 58% of the population in Europe has basic skills to use the Internet [32]. Furthermore, Romania is in penultimate place in terms of human capital with digital skills [32]. However, the adoption of cloud computing, big data, and e-Commerce remain the main priorities in the business environment [33], which offer growth potential for the labor market.

In conclusion, the employment rate is positively influenced by the digital transformations that society is facing, due to the various opportunities that the digital economy has generated. The hypothesis we want to verify in this context is whether the employability of individuals (employed and unemployed) can be increased by the same levers. More specifically, we want to identify whether e-Commerce and advanced knowledge of technology can lead to an increase in the percentage of people active in the labor market.

3. Methodology

We used a panel regression model to capture exactly the impact of e-Commerce and the level of technology training on the rate of labor market activity. This methodological approach ensures a spatiotemporal perspective on the phenomenon. For the model, we selected 28 European countries, and the indicators were measured over a 5-year period.
(2015–2019). The indicator analyzed, the activity rate, represents the percentage of people aged between 15 and 64 years available in the labor market. This indicator shows us the labor force that the market has at a given time. The variables used to explain the activity rate are the index showing the level of e-Commerce adoption in Europe, and that showing the level of advanced technical skills of human resources in the 28 European states. The level of e-commerce adoption is a numerical variable with values between 0 and 100. This indicator represents the weighted average of the percentage of SMEs that sell online (at least 1% of turnover), the percentage of SME turnover in e-Commerce, and the percentage of SMEs that have had sales in other EU countries. The weighting level of the three component subcategories is equivalent; each variable has a weight of 33%. The variable indicating the level of advanced training in the field of technology is also a composite indicator with values between 0 and 100. This indicator is a weighted average of the percentage of ICT specialists (percentage of total employees), the percentage of women specialists in the field of ICT (as a percentage of the total number of employed women) and of the percentage of graduates in the field of ICT (as a percentage of the total number of graduates).

To reduce variability we standardized these three variables by logarithm. The estimation of the model was made with the help of the statistical software Eviews8.

The estimated regression model is: \( y_{it} = \beta_0 + \beta_k x_{ki} + u_{it}, \) \( k = 1, 2, 1, 2, 1, 2, 28, 1, 2, 1, 2, 1, 2, 1, 5. \) where \( \beta_0 \) is the free term of the equation, \( \beta_1 \) (the parameter of the variable “e-commerce adoption level”) and \( \beta_2 \) (the parameter of the variable “level of advanced training in the field of human resource technology”) are the parameters of the model variables, \( u_{it} \) is the residual component of the model. The residual component includes three effects: the unobserved effect specific to each state (\( \alpha \)), the unobserved effect specific to time (\( \mu \)) and the residual unobserved effect (\( \epsilon \)) [34]. Therefore, the panel regression model can also be written in extended form: \( y_{it} = \beta_0 + \beta_k x_{ki} + u_{it}, \) \( k = 1, 2, 1, 2, 28, 1, 2, 1, 5. \)

Unobserved effects indicate the impact of unobserved variables on each state for each year. To assess the phenomenon’s effect on the labor market in the 28 states for the 5 years of analysis, it is useful to estimate both the fixed effects model and the model with random effects.

- Panel regression with fixed effects:

  Fixed effects are statistically significant if there is a correlation between the explanatory variables and the unnoticed effect specific to the spatial component. The initial estimated regression model becomes: \( y_{it} = \beta_0 + \beta_k x_{ki} + a_i + \epsilon_{it}, \) \( k = 1, 2, 1, 2, 28, 1, 2, 1, 5. \)

  In this case the residual component of the new model must meet the properties of the classical regression model (homoscedasticity, non-correlation, and normality).

- Panel regression model with random effects:

  In the panel regression model, if there is no correlation between the explanatory variables and the unnoticed effect specific to the individual or specific to time, then the model can be said to have random effects [34]. The estimator of the random effect model is obtained by the generalized least squares method applied to the following equation:

  \[
  y_{it} - \theta \bar{y}_i = (1 - \theta)\beta_0 + (x_{ki} - \theta \bar{x}_k)\beta + (u_{it} - \theta \bar{u}_i), \quad k = 1, 2, \quad i = 1, 2, 28, \quad t = 1, 5, \quad \theta = 1 - \frac{\sigma^2_{\epsilon}}{\sqrt{\sigma^2_{\epsilon} + \sigma^2_{u}}},
  \]

  where \( \sigma^2_{\epsilon} \) is the dispersion of the residual unnoticed effect, \( \sigma^2_{u} \) is the dispersion of the unnoticed effect on the individual, and \( T \) is the number of time periods.

  To make the model meaningful, the estimator of the random effects model must be consistent and efficient. Within the model with random effects, another parameter BE (Between Estimator) is estimated, using the method of least squares applied to the transformed model: \( \bar{y}_i = \beta_0 + \bar{x}_k \beta + a_i + \bar{u}_i, \) \( k = 1, 2, \) \( i = 1, 2, 28. \)

  This estimator is consistent if the individual effects and explanatory variables are uncorrelated and not efficient, because the variation between individuals is taken into account. The RE (Random Estimator) estimator is a weighted sum of the FE (Fixed Estimator) and BE (Between Estimator) estimators.

  The choice of the optimal model is made based on the Hausman-Wu test. The null hypothesis states that the FE estimator is consistent and the RE estimator is consistent and
4. Results

The working hypothesis from which we started is that the economic sector of e-Commerce has a positive influence on the labor market. We chose for the analysis a period of economic calm between two global crises: the economic crisis of 2008 and the epidemiological crisis of 2020. The chosen time interval is 2015–2019, when the European economy had already healed after the financial crisis and found itself on the eve of a new collapse. Therefore, our study period avoided possible disturbances in the labor market. The novel approach is this extension from the employment rate to the activity rate, in order to assess the increase in the share of human capital (employed or unemployed) as a result of the digitalization of the economy. In the following, we note the reasons for this approach.

Analyzing the impact of the e-Commerce industry, and also that of the level of specialization in the field of ICT, on human resources in the labor market, can help decision makers to improve people’s living standards by acting on the indicators that we have used. E-Commerce directly influences the employment rate by creating new jobs [13]. E-Commerce can also indirectly influence the employment rate, starting from the idea that the consumer in the digital age wants to buy products quickly and safely [35]. We have chosen a broader perspective on the impact that e-Commerce has on the labor market. Thus, in our model we used an index showing the level of integration of e-Commerce technology at the level of each state. This composite indicator includes the number of companies that sell online, the number of companies that sell online abroad, and also e-Commerce turnover. Increasing the number of e-commerce companies may increase the demand for skilled labor. Moreover, the number of companies that sell in other EU countries can lead to an increase in fully remote jobs, which may be favorable for discouraged people in the labor market. Moreover, e-Commerce turnover indicates the financial stability of a company, and can also highlight a company’s ability to invest in technology. We chose this composite indicator so that there is no need to consider indicators separately, being a correct measure to assess the level of adoption of e-commerce in selected European countries.

Advanced skills and development, the second basic variable in the analysis, is also a composite index. This index includes several dimensions relevant to our study. The first dimension consists of the number of employees in the ICT field. Knowledge in the field of ICT makes employees more attractive in the labor market, given the context of digital transformation in which the world economy is engaged. Another important indicator included in the index is the number of women employed in the field of ICT. This indicator can be seen to demonstrate reducing discrimination towards the integration of women in technical fields and providing the opportunity for women to work remotely, so they no longer fall into the category of discouraged human capital. The last component of the index refers to the number of graduates of studies in ICT-related fields. This component is essential for the labor market, especially to increase the employment rate within the labor market.

Digitization of the economy and the measurement of this concept was theorized and analyzed by the European Commission in order to highlight the benefits of technology, and we correlated this with the impact on the labor market. As a first step in our analysis, it was important to understand the context in which the European states find themselves from the perspective of digitalization, via the reported project of the European Commission.

Starting in 2014, the European Commission laid the foundations of a large-scale project, called the “Digital Single Market”. The project pursued three basic aspects: easy access for consumers and businesses to goods and services at the European level, regulation of the online market to ensure fair competition and data security, and also maximizing the growth potential of the digital economy [36]. Related to this project, there was a need for a measure to estimate the performance of each European state in terms of digitizing the economy. Thus, a composite index was developed that summarizes the main digital performance
indices for each state [37]. The five basic pillars of the DESI (Digital Economy and Society Index) are: connectivity, human capital, internet use, technology integration, and digital public services (Figure 1). The DESI index is a weighted average of the five components mentioned above. Therefore, connectivity and human capital have a similar weight in the calculation of the DESI indicator, together totaling 50%. The use of the Internet and digital public services also each have the same weight in calculating the average, together accounting for 30%. The technology integration subdivision has a share of 20% in the DESI index.

According to data taken from the European Commission, we can see that the digitalization index of the economy is constantly changing. The countries of northern Europe have a high level of digitalization of the economy, while the Balkan states are at the bottom of the rankings. It should be noted that DESI 2019 is the indicator measured in 2018. Thus, we decided that a possible impact could not be assessed immediately, but should be carried out at a later time. Below it can be seen that the evolution of the indicator from 2015 compared to 2019 is not significantly different (Figure 2).
According to data taken from the European Commission, we can see that the digitalization index of the economy is constantly changing. The countries of northern Europe have a high level of digitalization of the economy, while the Balkan states are at the bottom of the rankings. It should be noted that DESI 2019 is the indicator measured in 2018. Thus, we decided that a possible impact could not be assessed immediately, but should be carried out at a later time. Below it can be seen that the evolution of the indicator from 2015 compared to 2019 is not significantly different (Figure 2).

Figure 2. (a) DESI by components in 2015; (b) DESI by components in 2019.

In the case study, we use two subdivisions of the DESI index: human capital and technology integration, as defining elements for a labor market during digital transformation. Integration of technology is, in turn, a composite index that includes two dimensions: business digitalization and e-Commerce (Figure 1). E-Commerce has a 40% share of the structure of the technology integration index, with the remaining 60% representing the indicator of business digitization. Between 2015 and 2019, the popularity of e-Commerce spread to almost all European countries, except Romania, the Czech Republic, and Croatia (Figure 3). It can be seen that in 2019, compared to 2015, the growth index is negative in the case of those three states (Figure 3). Although Slovenia and Lithuania are not among the leading digitalized countries, it is noted that they had the highest growth between 2015 and 2019 in terms of online commerce (Figure 3).
negative in the case of those three states (Figure 3). Although Slovenia and Lithuania are not among the leading digitalized countries, it is noted that they had the highest growth between 2015 and 2019 in terms of online commerce (Figure 3).

**Figure 3.** E-Commerce in Europe.

The human capital index is also made up of two other indicators: people with basic internet skills and people with an advanced level of technology use. In this case, the weight of the two indices is similar (50%). If we evaluate the indicator for advanced technology skills in 2019, compared to 2015, we notice that in Greece, Cyprus, the Czech Republic and Malta, we are dealing with a decrease (Figure 4). Meanwhile, the Baltic States particularly show an increase in the specialization in technology of human capital (Figure 4).

**Figure 4.** Advanced skills growth.

In light of the economic framework presented above, as well as the researchers’ observations, we developed our case study. To confirm or invalidate the working hypothesis,
we estimated a panel regression model to identify the impact of the spread of e-commerce and advanced levels of technology use on activity rate at the European level in 2015–2019 (Appendix A). Thus, we estimated several models to obtain the one that provides the most information and is best from a statistical point of view.

First, we estimated two models with fixed effects. In the first model, the fixed component is represented by the spatial dimension (Figure A1), and in the second model, the fixed component is represented by the temporal dimension (Figure A2).

Two statistically significant models are obtained (we can see in Table 1 that the p-value is zero in both cases, which can reject the null hypothesis), with representative coefficients (the p-value for the two variables is less than 0.05).

Table 1. Impact of e-commerce and advanced skills on activity rate.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model 1</th>
<th>p-Value</th>
<th>Model 2</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOG(ECOM_)</td>
<td>0.0474</td>
<td>0.0000</td>
<td>0.0492</td>
<td>0.0000</td>
</tr>
<tr>
<td>LOG(HU_ADV_)</td>
<td>0.0480</td>
<td>0.0023</td>
<td>0.0604</td>
<td>0.0000</td>
</tr>
<tr>
<td>C</td>
<td>4.0315</td>
<td>0.0000</td>
<td>3.9904</td>
<td>0.0000</td>
</tr>
<tr>
<td>F-statistic</td>
<td>104.1574</td>
<td>0.0000</td>
<td>116.2402</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

If we select according to the explanatory power of the model, the first model would be stronger. In model 1 about 96% of the variation is explained by exogenous variables, while in model 2 only 34% of the variation is explained by variables (Table 2). For greater accuracy, we used the information criteria Akaike and Schwarz, and also the criterion of maximum likelihood, to decide which of the two models with fixed effects is better. Thus, the best model from a statistical point of view is the first, because the informational criteria are minimal and the likelihood is maximized.

Table 2. Model selection criteria.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-squared</td>
<td>0.964863</td>
<td>0.344001</td>
</tr>
<tr>
<td>Akaike info criterion</td>
<td>−5.7070</td>
<td>−3.1087</td>
</tr>
<tr>
<td>Schwarz criterion</td>
<td>−5.0767</td>
<td>−2.9616</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>429.4933</td>
<td>224.6108</td>
</tr>
</tbody>
</table>

We focused on model 1, in which fixed effects are present at the cross-sectional level, and we tested whether these unobserved effects are statistically significant (Figure A3). The Chow test (Table 3) shows that individual fixed effects exist and are statistically significant, for a significance level of 1%.

Table 3. Chow Test estimation.

<table>
<thead>
<tr>
<th>Effects Test</th>
<th>Statistic</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-section Chi-square</td>
<td>411.1538</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

We also estimated a model with random effects, to confirm whether the first model has a higher economic significance. According to the methodology, a probability higher than the set value of the p-value = 0.01 confirms that both the fixed effects model and the random effects model can be used.

Although the estimated random effects model is significant, it is not as strong as the fixed effects model (in Table 4 we can see that statistical probability is greater than level of significance of 5%). Therefore, we considered the optimal model is that with fixed transverse effects.
Table 4. Hausman Test estimation.

<table>
<thead>
<tr>
<th>Test cross-section random effects</th>
<th>Chi-Sq. Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-section random</td>
<td>0.240322</td>
<td>0.8868</td>
</tr>
</tbody>
</table>

The panel regression model with fixed effects is valid and statistically significant (in Table 5 we can see that the probability of the F-statistic is lower than the level of significance of 5%), and the model residues meet the homoscedasticity and nonautocorrelation properties (Figure A6). In order to fulfill the normality property, it was necessary to correct the model with fixed effects.

Table 5. Model summary.

<table>
<thead>
<tr>
<th></th>
<th>Fixed Effects Model</th>
<th>Random Effects Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-squared</td>
<td>0.9649</td>
<td>0.2997</td>
</tr>
<tr>
<td>F-statistic</td>
<td>104.1574</td>
<td>29.3156</td>
</tr>
<tr>
<td>Prob(F-statistic)</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Equation of the estimated panel regression model (Table 6): \( \log(empl_i) = 4.0231 + 0.0417 \times \log(ECOM_i) + 0.0559 \times \log(HU_ADV_i) + \alpha_i \), where \( i = 1, 28 \), \( \alpha_i \) —the coefficients for each state.

Table 6. Weighted model estimation.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOG(ECOM_i)</td>
<td>0.0417</td>
<td>0.0000</td>
</tr>
<tr>
<td>LOG(HU_ADV_i)</td>
<td>0.0559</td>
<td>0.0000</td>
</tr>
<tr>
<td>C</td>
<td>4.0231</td>
<td>0.0000</td>
</tr>
<tr>
<td>F-statistic</td>
<td>744.5636</td>
<td>0.0000</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.994931</td>
<td></td>
</tr>
</tbody>
</table>

Thus, the share of people aged 15 to 64 in Europe active in the labor market is explained by the e-Commerce spread index and the digital employee performance index of 99.5%. When the e-Commerce spread index increased by one percentage point and the other variables remained constant, the activity rate increased on average by about 1.04 percentage points. Furthermore, with an increase of one percentage point in people with advanced knowledge of technology, the activity rate increased on average by about 1.06 percentage points.

5. Discussion

Currently, the retail industry is profitable and has expanded worldwide. This is largely because it satisfies indispensable human needs. Of course, as a result of the adoption of the digital economy, the industry has changed. The Internet has given people regardless of geographical area unlimited access to various products and services. This has led to an increase in market competitiveness, and also an increase in the quality of products and services. Up to a point, products and services are the same. Difference is achieved by advertising done in the right way and at the right time. Whole teams of specialists from different fields of expertise are behind actions including personalization of products and offers, content creation, promotion, and the entire infrastructure that makes it possible to sell and buy online. E-Commerce is in itself an innovative technology and is one of the economic sectors that has emerged in the Fourth Industrial Revolution. E-Commerce has
changed the economy in a way that has also impacted the labor market. It is an economic sector that has created new jobs and continues to do so.

Changes in technology should not be seen as negative for the workforce, but rather as an opportunity. The e-Commerce industry offers a number of opportunities to the inactive, to those specialized in technology, and also to those who have suffered due to technological unemployment. Our study confirms once again that the development of e-Commerce in Europe has had a positive impact on the labor market activity rate. We wanted to highlight through this study that in addition to the employed workforce there is also a discouraged part of the workforce that can take jobs thanks to new innovations in technology. E-Commerce can create logistics jobs as a result of a much higher demand for goods [38]. It can also create high-level jobs for IT specialists, as well as medium-term jobs for people who have so far been outside the labor market (people with disabilities, housewives and inexperienced young people). Furthermore, in a historical context of strong digitalization, advanced knowledge of technology use is a positive factor that increases the potential of active human capital to be employed. This research indicates another argument for increasing investment in education of any kind, especially in the direction of technology. Somehow, the education system must be able to reduce the period in which new technologies are adopted in educational institutions. This is vital for the labor market and especially for society. The labor market must have high quality and well-prepared human capital that employers demand. Otherwise, the labor force will polarize, leading to a deepening of social differences.

6. Conclusions

The labor market faces a certain imbalance caused by the transformations of the economy brought about by the evolution of technologies. Evolution itself is not the problem, but rather the speed with which it spreads. The problem we are talking about is mainly the ability of the labor market to meet the demands of the economy for human capital up-to-date with the needs of the digital age.

As mentioned above, the transition to a digital economy or knowledge-based information age is increasing the importance of IT solutions to the detriment of the human workforce [2]. This makes us think of the economic sector of e-Commerce, which is a result of the digital age and which supports the creation of new jobs and attractive opportunities for specialists. So, we can say that this whole process of economic transformation has positive aspects. E-Commerce is a profitable economic sector with a consistent contribution to GDP (it was estimated that in 2021 it would grow to 4.6% of GDP [39]). Thus, we can say that e-Commerce has a two-way influence on economic growth and on the well-being of human resources. According to our model, an increase in e-Commerce profit has a positive impact on the labor market activity rate, being part of the indicator that describes the level of adoption of e-commerce in the economy. The positive impact is even greater with the more companies selling online, the higher the number of companies that sell online in other European countries. A large number of companies that sell online in foreign markets can also support the globalization of the labor force by removing borders-related barriers. From this point of view, e-Commerce can provide the opportunity to work for people with disabilities and others who have been left out of the workforce for various reasons. E-Commerce is an important engine for the labor market, as it is an industry in which the employee does not have to be physically at work.

In the case of e-Commerce, the state can make a double gain if we return to the two-way impact mentioned earlier. Higher profits generate higher the taxes, obviously with the fiscal specifications that we will not detail here. As we saw in the research, more employees in the field of e-commerce will contribute to increased budgets from salary taxes. Why would e-Commerce companies hire more employees from a country where they pay taxes and not from a country with a lower salary level? The measure we consider appropriate to address this dilemma is a simple one, but one that could be effective (obviously after performing some simulations or a pilot program), specifically the reduction of certain taxes...
that the company pays according to the employee’s country of tax residence. Moreover, on
the same principle, government institutions could identify those jobs suitable for people
with disabilities and encourage e-Commerce companies to hire them, thus increasing labor
market activity rates.

In addition to the industrial sector, the level of human resource development is very
important in the new economic context. Demands on the labor market have changed
considerably, both in terms of soft skills and technical skills. To remain relevant on the
labor market, one must be up-to-date with the new market trends. More precisely, ICT
knowledge is the main skill that can ensure an individual’s longevity in the labor market.
Our model highlights the fact that the level of development of ICT skills available in the
labor market in European countries ensures a higher number of people active in the labor
market. The index used is composed of three indicators, each of which can support the
positive impact of technological knowledge on the labor market. Governments can take
action to improve these indicators, with the aim of obtaining human capital adapted to
change. Following the research, we deduced that the increase in the number of graduates
in the field of ICT primarily ensures the increase of active human capital and that they can
easily find a job immediately after graduation. The related effects of this increase could
bring about an increase in quality of life, because jobs that require ICT skills are very well
paid. Another very important element that can be highlighted in research is the indicator
that shows the integration of women in the field of ICT. Here is an example of one of the
goals of sustainable development that refers to gender equality, and the opportunities
offered by ICT can encourage women to become active in the labor market by accessing
remote work.

Government institutions can also influence the reduction of technological unem-
ployment by providing support to employers who are more willing to offer employee
development courses in the field of ICT. This measure could be very useful, especially for
states in which the existing system of professional reconversion is deficient. In other words,
the state allocates unemployment benefit to companies that invest in the employee, while
the latter remains employed. In the short term it is the same expense for the state, but in
the long run it contributes to the growth of the economy because the employee continues
to pay taxes to the state, and the number of those discouraged out of the labor market will
be smaller.

Our research can contribute to the development of existing literature by addressing
a hotly debated topic in the context of the impact of the digitalization of the economy
on the labor market. We have identified the fact that e-commerce, as a sector created by
technological development, has a positive impact on the growth of human capital in the
labor market. Of course, it was necessary to involve in the analysis the level of training of
human capital with respect to the use of ICT technologies. We believe that the results of our
research could be a good tool for generating measures that are beneficial to the labor market
and to society in general. In fact, we believe that any research that explains the impact
of external factors on the labor market is developed with the ultimate goal of identifying
solutions to reduce poverty and social exclusion and to increase people’s quality of life.

7. Limitations

The results of the estimated model could be more robust if we had an interval of more
than five years, but the data for all indicators were available only for this time period. It
would have been interesting to consider the share of people with advanced technology
in the field of e-Commerce, instead of the share of people with advanced knowledge of
technology. This could not be done due to the lack of data. As a study topic related to this
article, we intend to identify other industries created by technology that have a positive
impact on the labor market.
Author Contributions: Conceptualization, E.T.; Methodology, C.-E.B. and D.M.; Software, C.-E.B.; Supervision, E.T.; Writing—original draft, C.-E.B.; Writing—review & editing, E.T. and D.M. All authors designed the research and analysed the data. All authors wrote the paper, read, and approved the final manuscript. All authors have read and agreed to the published version of the manuscript.

Funding: This paper was co-financed by The Bucharest University of Economic Studies during the PhD program.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Figure A1. Cross-sectional fixed effects model summary.

Figure A2. Period fixed effects model summary.
Figure A2. Period fixed effects model summary.

Figure A3. Cross-sectional fixed effects tests.

Figure A4. Random effects–Hausman Test.
Figure A4. Random effects–Hausman Test.

Figure A5. Random effects model summary.

Figure A6. Cross-section fixed effects model summary.
References


