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Assuring SME's Sustainable Competitiveness in the Digital Era. A Labour Policy between Minimum Wage Guaranteed and ICT Skill Mismatch

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Abstract: The aim of this paper is to analyze the real impact of ICT skill mismatch on SME's sustainable competitiveness in presence of minimum wage guaranteed.   As part of public policies – the minimum wage need to maintain a balance between increasing employment and not being a burden for the companies, leading them to bankruptcies, especially in times of disruptive change in which economy have to be more resilient.

The rapid progress in information and communication technologies has dramatically redefined the rising unemployment as a result of skills mismatch.

This paper aims to understand, on one side if, there is a match between the supply demand of ICT skills and how increasingly powerful digital technologies affect skills, jobs, and the demand for human labour. On the other, if increasing productivity and a fair minimum wage could be an integrated approach in stimulating SME's in increasing sustainable competitiveness.

Keywords: ICT skills mismatch, guaranteed minimum wage, SME's sustainable competitiveness, employment, public policies

1. Introduction

This paper focuses on the relation among ICT skills mismatch, minimum wage and SME's sustainable competitiveness to fill research gaps existing in literature.

The fast technological development is imposing the acquisition of new skills to respond to current and future needs of firms and labour markets [1], changing organizational processes and individual job profiles [2]. Consequently, the world is moving towards a digital "people-driven economy" [3] in which, attracting and retaining human resources have become strategic imperatives [4]. In this context being able to capture the talents ("war for talent") and "matching workers' skills to the most appropriate jobs within the firms" [5] are becoming real priorities for the company, creating an "economic value of a magnitude that few other economic processes can" [5].

The literature, from a managerial perspective, highlights that in labour world ICT skills mismatch (a lot of workers have jobs that are not commensurate with their background, or they are overeducated or undereducated) is causing important implications at both strategic, managerial and operational levels [6-10]. To the strategic level skill mismatch implies a new policy formulation and overall goal setting with the specific focus on the positioning of the organization in its environment. At the operational level, the day-to-day management of the organization is carried out under the umbrella of the managerial plans. Consequently, to the managerial level mismatch requires the study and identification of the new adequate skills for resources that is information, knowledge and capabilities of which the company needs. In this framework, a critical factor is the minimum wage guaranteed. A concept born for social assistance that could, yet, shift the decision of the unemployed, as rational choice, between spending the free time as a free rider being on welfare or, readapting the skills in order to be employed. There is a general consensus among economists that the provision of social protection–meaning, putting in place various instruments for assuring income security is an economic and social necessity [11]. Indeed, the rational choice of spending the free time as a free rider

or accepting the minimum wage guaranteed (the higher it is, the bigger the incentive to work) for the skills it requires (the lower they are, the bigger the incentive the employment barriers), could create an inactivity trap [12-15]. The danger is that a generous social assistance "may lock low-skilled workers into persistent low-wage employment", generating a potential disincentive to work [16-17].

The minimum wage is part of the social policies meant to reduce disparities and to decrease poverty, being welcomed by the most economists [18]. As a social policy that aims to increase employment and reduce poverty, an increase in the minimum wage could change the person's decision from spending his/her free time into working because of the new satisfactory salary level. However, the minimum wage is not an arbitrary value that can be set freely by the government based on electoral promises, but has to keep in mind basic economic notions as productivity and inflation. An increase of the minimum wage disconnected from productivity can lead to bankruptcies and inflation. An arbitrary value of the minimum wage set too high could have the opposite effect as public policy aimed for as increasing employment, ultimately leading to bankruptcies and unemployment.

Despite this, little research has been currently conducted to assess the real impact of ICT skill mismatch on SME's sustainable competitiveness in presence of minimum wage guaranteed and their impact on employment.

In this paper sustainable competitiveness is considered as an umbrella that combines the interests that underlie sustainable development and competitiveness. It represents the appropriate context for considering the relation between public policies and competitiveness, for this reason, the purpose of this article is to explore:

1. The dynamics that link ICT skills mismatch and SME's sustainable competitiveness and economic growth in technological era [19], to observe their effects for labour market in general and for employed world in particular, in European countries;

2. The impact of the minimum wage guaranteed in the European labour market (without Croatia due to lack of data for the period 2007 – 2015), analysing with a longitudinal model the described effects with an explorative investigation in Romania.

Starting from these results, we would identify if there were a relationship among ICT skill mismatch, SME's competitiveness and employment.

Our Hypothesis 1 (H1) is that ICT personnel and their tertiary education for ICT (adding skills) has a positive effect on jobs creation and employment.

In addition, we are setting up our second Hypothesis, that is comprised of Hypothesis 2.1 and 2.2, which is based on the relations between minimum wage guaranteed, SME's sustainable competitiveness and employment.

In hypothesis 2.1 we are assuming that that increase in ICT skills will encourage employment and stimulate sustainable growth and thus on competitiveness of SMEs.

In hypothesis 2.2 we are assuming that the ICT skills will have a negative impact on social exclusion by the creation of jobs.

Our third hypothesis (H3) is regarding positive impact of the minimum wage on the job creation and employment. If this thesis were verified, we would demonstrate a new and original relationship between the increasing ICT education and decreasing the risk of social exclusion and poverty, in presence of minimum wage guaranteed for achieving competitiveness of firms, by using a VAR model

The present paper is organized as follows. After the Introduction (Section I), Section II highlights current state of knowledge on skill mismatch, guaranteed minimum wage and SME's competitiveness. Section III describes the Research Method used to analyse the European labour market and the Romania' case study while the empirical findings are in Section IV with the implication of ICT skills on employment and of the impact of guaranteed minimum wage on employment. In Section V there are the conclusions, followed by implications for the research in Section VI.

2. Current State of Knowledge

ICT skills mismatch

Skill mismatch, considered initially from researchers [20] as a temporary phenomenon, was analysed diffusely from the late 1980s, turning on the debate on the importance of job characteristics in determining wages.

In general, the term skills mismatch can describe situations in which workers' skills exceed or lag behind those employers seek. It highlights a non-conformity among "individuals' preferences, interests, needs, skills, demographic characteristics, and required qualifications, physical" and "mental demands, stability, compensation, benefits, and locations of the jobs they do" [21]. Literature identifies the skill mismatch as one of the three dimensions of job mismatch: qualification mismatch, skill mismatch, and field-of-study mismatch [22]. In particular, "qualification mismatch compares a worker's acquired qualifications with those required by his/her current job", while "Field-of-study mismatch analyses the level of match between an individual's field of study and his/her job" [22]. Skills mismatch dimension involves various contributions that could offer useful insights. Specifically, in the last years the studies on skill mismatch are focusing on the effects that technology, communication, work systems, organizational processes and all the aspects of life, has produced on skills. In this background, in which information and knowledge are fast, ICT skill mismatch in the workplace has important empirical implications.

In wider terms, we could be defined as phenomenon that occurs when workers haven't the skills needed to carry out successfully required job tasks. It's a very broad concept and it includes a variety of measures. Commonly, literature identifies different categories of skill mismatch:

i)   Vertical mismatch [23-25]. The level of education or qualification is less or more than required, measured in terms of under-skilled or skill deficit, over- skilled or skill surplus, required skill. ICT skill deficit can be an obstruction for the firms to the challenges that disruptive technologies impose. Therefore, companies that do not adapt to the new skill technological reality could lose their competitiveness.

ii) Horizontal mismatch [23, 25, 26]. The skills are inappropriate for the job. Individuals, who adapt quickly to new technological work demand, have more chances to be re-employed. Instead, hesitant workers could have more difficulties and it's probable that they have to accept positions that are not in line with their skills [27]. In fact, ICT skill underutilization, due to the lack adoption of new skills by firms, could result in a atrophy of the workers' skills, in a productivity and economic growth decrease [24, 28].

iii) Skill gaps [24, 29-31]. Demand or supply for a particular type of skill exceeds the supply/demand of people with that skill - usually measured in terms of unfilled and hard-to-fill vacancies. IC&T skill shortages occur when a company cannot find suitably qualified workers and under-skilled workers man vacant posts. This could have negative consequences to economic growth because skill shortages slow the rate at which more efficient technologies and approaches to work organization are adopted [32].

iv) Skill obsolescence (skills previously used in a job are no longer required and/or skills have deteriorated over time., [33-34]. According Allen and de Grip [35] there are two models of skill obsolescence: the dynamic model and the static model. In the first model, workers are in dynamic companies where ICT job contents constantly change. In this context companies invest to overcome obsolescence so there is "a constant research of the balance between shifts in the skills requirements of the job and the updating of skills". In the static model, skill obsolescence cause unemployment because this approach assumes that an employee's ICT skill level remains moderately stagnant throughout their career.

This literature has come to light that recent changes require the optimization of the use of IC&T skills to encourage worker's satisfaction, SME's competitiveness and economic growth [36-38].

Guaranteed wage on labour market

The guaranteed minimum wage was implemented, for the first time, in the United States in 1938 during the Roosevelt administration. Defined as "The statutory wage established legally to guarantee to the employees from disadvantaged categories an income that corresponds to the minimum amount for subsistence determined in relation to the given social environment", the guaranteed minimum wage for payment has become a reality since the first half of the 20th century in most countries of the world [39]. In Europe, for example, most States have regulated guaranteed minimum wages after negotiations between the government and social partners [40].

Introduction of the guaranteed minimum wage, as well as its level over time, has prompted the attention of researchers, encouraging often positions tributary to some currents of thought referring to Keynesism or neo-liberalism, and producing literature both pros and cons.

The literature in favour of introducing the guaranteed minimum wage and adjusting it according to socio-economic conditions point out some positive aspects. Sutch in 2010 [41], for example, has noticed that the guaranteed minimum wage promotes continuous education and training, which has as the effect of increasing skill levels and labour productivity and, on this basis, increasing the average wage in the economy. Following the same logical pattern, Fox in 2013 [42] has reported a relationship between raising the guaranteed minimum wage and raising the standard of living by reducing the number of people affected by poverty, leading to a decrease in public spending on social programs and budget transfers to people affected by poverty. Other authors, such as Freeman, in 1994 [20], concluded that the guaranteed minimum wage stimulates consumption, which leads to an increase in global demand that determines a growth in the number of jobs available and ultimately stimulates employability. It emerges; moreover, that raising the guaranteed minimum wage forces companies to rethink technological processes, intensify as much as possible the automation of work processes and thus increases the efficiency of industrial production by reducing wage costs [43]. Legally established guaranteed minimum wage per economy causes employees to specialize and access better-paid jobs [44].

The specialized literature also highlighted a number of negative aspects related to the introduction of the guaranteed minimum wage and its increase according to the political agenda. Abbott in 2000 [45] has drawn attention that increasing the guaranteed minimum wage hurries low-efficiency entities into insolvency and generates additional expenses on unemployment benefits thus generating a series of macroeconomic imbalances. Increasing the guaranteed minimum wage affects to a larger extent small and medium enterprises than large companies and multinational companies [46]. It is accompanied by long-term unemployment growth [47] but also a constant inflationary pressure generated by companies' pricing policy meant to maintain high profit margins [48]. The rise of guaranteed minimum wage generates complacency behaviour by stimulating low-skilled jobs [49], with distortive effect on the rational choices of workforce by disappearance of the motivation to prepare for accessing a better-paid job in a longer time horizon. The effect of this behaviour is reflected in a slowdown in labour productivity and therefore economic growth.

Thus, we observe that the literature in favour of guaranteed minimum wage take into account that it can encourage a decrease in unemployment by stimulating employment. However, a minimum wage at a high level will determine unemployment by increasing production costs, generating bankruptcies through non-competitiveness for small and medium-sized enterprises with low efficiency but a high share of participation in the national economy.

ICT Skills mismatch, guaranteed minimum wage and SME's competitiveness

Fostering innovation by ICT and SME's sustainable competitiveness are by no means mutually exclusive [50]. Most studies regarding this issue [51-52] have identified that innovation is positively correlated to firm growth on the medium and long run. Literature analysis highlights that innovation by ICT can lead to economic growth in three important ways. First, innovation gives a companies a competitive advantage, which can translate in increasing exports and stimulating employment effects in the short term. Second, innovation's consequences translate to a virtuous cycle of expanding employment, i.e. the emergence of information technology drove sustainable economic growth, stimulating hundreds of thousands of newly created jobs [53], that in caeteris paribus conditions, led

to additional job growth in supporting industries for recognizing and evaluating employee benefits [54]. Finally, when innovation generates higher productivity, it also generates increased wages and lower prices, and in caeteris paribus conditions is expanding domestic economic activity and creating jobs [55].

In this scenario, it is very important how the company's choices and the government's policies are correlated. In literature we two main different approaches (Figure 1): wage led growth [56-57] and capital led growth [58].

In this regard, Figure 1 shows that wage led growth policy (pro-labour) has results as strong increase of wages and lower wage dispersion, while pro-capital distributional policy has a lower share of wages in total expenditures and higher dispersion.

| | Distributional policies | | Other factors |
	Pro-capital	Pro-labour	
Policies	• No guaranteed minimum wage • Low bargaining power of collective workers' associations • Wage moderation	• Increase of guaranteed minimum wage • Stronger bargaining power of collective workers' associations	• Technological innovations • Globalisation • Financialisation
Results	• Weak increase of wages • Lower share of wage in total expenditures • Higher wage dispersion	• Strong increase of wages • Stable or increasing wage share in total expenditures • Lower wage dispersion	

Source: interpretation after Marc Lavoie, Engelbert Stockhammer [57]

Figure 1 – Pro-capital and Pro-labour distributional policies

The wage led growth theory starts from the premise that, during the last decades, the wages growth did not keep up with the increase of productivity, a situation that led to the period with the highest income inequality. During the past decade, the European economy was stimulated by a capital led growth approach, so, according to Stockhammer [59], the companies did not increase the wages proportionately to the increase of ICT workers skills and of their productivity.

Polarizing revenue distribution and lowering the share of wage costs play an important role in perpetuating unequal firm growth. Thus, a salary-based policy can promote stable growth. In this scenarios, the government can intervene easily by the introduction of a guaranteed minimum wage stimulating a wage led growth economy, done on the expense of a profit led growth.

We consider that a strategy of wage led growth, starting with the guaranteed minimum wage must be correlated with the diminish of the skills mismatch for optimum results.

This strategy could lead to diminish of the ICT skill mismatch, increased employment, lower social exclusion and economic growth.

3. Research Methodology

The complexity of the thematic area has led us to constitute a longitudinal model to analyse the effects of ICT skills mismatch and of the guaranteed minimum wage on SME's competitiveness and

economic growth. To highlight the disparities of the ICT mismatch between demand and supply of jobs, it is important to see whether the EU labour market is Keynesian or Neo-classical. In this way, we have analysed the relationship between employment and economic growth by using an OLS panel for EU27 (except Croatia) for the period between 2000 and 2016 and, then, we have tested the implications of ICT skills on employment with a VAR model to show the impact on SME's sustainable competitiveness.

Among all countries analysed, a specific situation is emerging in Romania. Romania is a upper-middle to high income country and it has one of the lowest unemployment rate in the EU (4,9% at national level at the end of December 2017 and 4,3% in September 2018). Romania has increased the guaranteed minimum wage of approximately 3,5 times in 10 years' time (from 117 euro in 2007 to 409 in 2018) and the highest economic growth in the EU in 2017, of 6,9%. Moreover, considering that Romania has one of the lowest productivity in the EU (about 60% of the EU average), the Romanian companies are complaining about the lack of skilled workforce in the context of one of the highest ratio of welfare personnel to employment in the EU. Consequently it has in the same time both a Keynesian and Neoclassical labour market such as at the EU level. For this reason, we have chosen to focus the study on Romania's labour market, one of the most dynamic ICT markets in the European Union, using two OLS-type simple regressions.

3.1. Analysis of Keynesian and Neo-liberal Labour market in European system

We consider that a Keynesian labour market is where the job supply is insufficient and people are job seeking, but they lack the opportunities, thus the demand being clearly higher than the supply. A Neo-classical type is one in which potential employees, currently without a job, have to make a rational choice between taking advantage of their spare time or working for a salary, while determining the minimum level of income they shall accept.

A guaranteed minimum wage will create distortions in the choices of the unemployed, leading to a reduction in unemployment based on the rational choice of the unemployed to get a job.

It is very important to identify the type of unemployment that exists in the EU, since each type of unemployment requires specific measures and treatments. Keynesian type-based unemployment will require investments' growth and facilities granted to employers, while neo-classical unemployment will have to provide incentives to the unemployed who are still finding unattractive the job offers in the economy, some preferring a minimum guaranteed income at the expense of a salary that requires 40 hours of weekly work.

In order to understand whether the EU unemployment is of Keynesian or Neo-classical type, we will test through two OLS-type panel regressions the following relations:

$$f(Y) = \alpha L + \beta \ (1)$$

for Keynesian unemployment, meaning that GDP (Y) and its evolution is the dependent variable that takes into account the employed workforce (L);

$$f(L) = \alpha Y + \beta \ (2)$$

for neo-classical unemployment, meaning that the employed workforce (L) is considered the dependent variable and whether it is in concordance with the evolution of GDP (Y).

The data for the period 2000 – 2016 were collected from EUROSTAT and were differentiated by 1st degree and a logarithm, covering a sufficiently long period in which there were numerous changes in the European economy.

As a result of the analysis of the fact that in the first relationship the coefficient is lower, it can be noticed the unemployment prevailing in the European economy is of Keynesian type, in the sense that there are insufficient jobs so the state has to promote through public policies the creation of new jobs.

Even though the newly created jobs are wage sensitive in the sense that people will still maintain an inactive status if the jobs are poorly paid. Thus, it is important to be taken into account the relationship between labour supply and demand referring to the elasticity of labour supply in terms of the increase in the guaranteed minimum wage. In a large study [58], based on the centralization of

64 studies on the impact of the guaranteed minimum wage increase on unemployment, it turns out that this impact is insignificant and the results are clustered around zero in terms of elasticity.

Table 1– Panel OLS results for European labour market

Dependent Variable: DL_GDP					Dependent Variable: DL_LABOUR				
Variable	Coefficient	Std. Error	t-Statistic	Prob.	Variable	Coefficient	Std. Error	t-Statistic	Prob.
DL_LABOUR	**1.391**	0.114	12.119	0	**DL_GDP**	**0.183**	0.015	12.113	0.000
C	0.036	0.003	13.371	0	C	-0.002	0.001	-1.847	0.065
R-squared	0.254	Mean dependent var		0.044	R-squared	0.254	Mean dependent var		0.006
Adjusted R-squared	0.252	S.D. dependent var		0.062	Adjusted R-squared	0.253	S.D. dependent var		0.023
S.E. of regression	0.054	Akaike info criterion		-3.003	S.E. of regression	0.020	Akaike info criterion		-5.032
Sum squared resid	1.243	Schwarz criterion		-2.985	Sum squared resid	0.164	Schwarz criterion		-5.013
Log likelihood	650.738	Hannan-Quinn criter.		-2.996	Log likelihood	1088.917	Hannan-Quinn criter.		-5.025
F-statistic	146.722	Durbin-Watson stat		1.406	F-statistic	146.722	Durbin-Watson stat		1.178
Prob(F-statistic)	0				Prob(F-statistic)	0			

Source: own processing

However, even though the unemployment rate at EU 28 level was 7.7% at the end of 2017, and 9.1% at the Euro Area, the job vacancy rate in the EU is decreasing, being at 2.3% în the EU 28, as we can see in Chart 1.
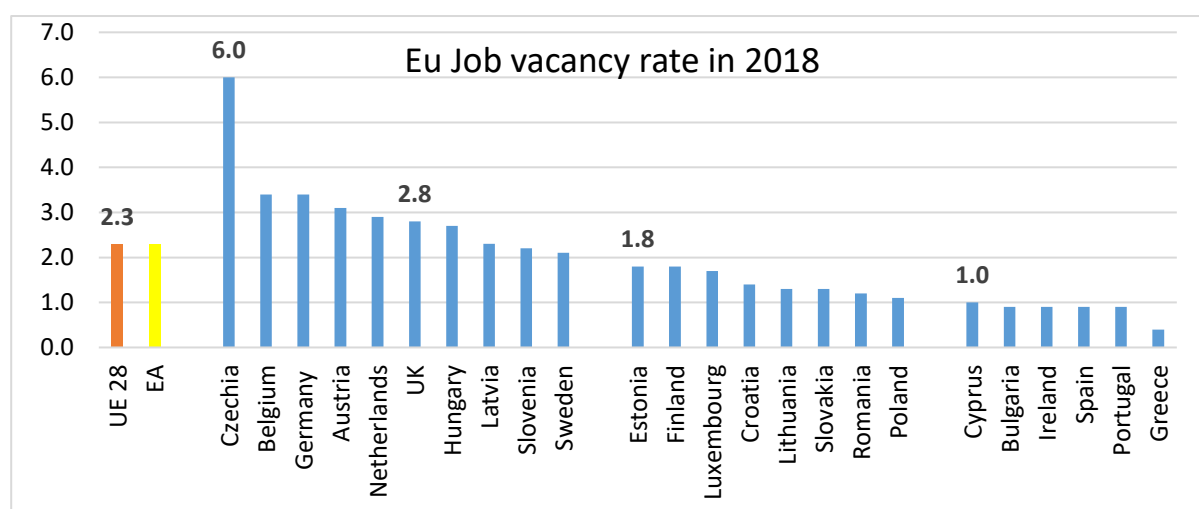

Chart 1 – EU job vacancy rate

At the end of 2018, only in Germany there were more than 1.4 million job vacancies, with more than 800.00 in the UK or 120.000 in Spain alone where the unemployment was 14.5% at the end of 2018, one of the largest in the EU.

A considerable amount of vacancies where also recorded in 2018 in the ICT sector, one of the best paying sector of the European economy (with more than 150.000 vacant jobs, in Germany alone more than 80.000 jobs).

3.2. An explorative investigation in Romanian labour market

In the light of the results of the analysis in the European system the study focuses on the case of Romania. One country with the largest GDP growth in the EU (7% in 2017), one of the lowest unemployment rates (less than 5% in December 2017) and one of the lowest guaranteed minimum wage in the EU (about 409 starting 1st of January 2018) and one of the highest IT sector gross added value evolutions (a 93% increase in 2016 compared to 2010 as opposed to 25% for EU 28 since 2010).

In Romanian labour market unemployment being on a downward trend, but here we are entering the post hoc ergo propter hoc trap, since we are unable to establish with certainty how much of this decrease is guaranteed to increase in guaranteed minimum wage.

In order to understand whether Romanian unemployment is of Keynesian or neo-classical type, we will test through two OLS-type simple regressions the following relations:

(1) for Keynesian unemployment, meaning that GDP (Y) and its evolution is the dependent variable that takes into account the employed workforce (L);

(2) for neo-classical unemployment, meaning that the employed workforce (L) is considered the dependent variable and whether it is in concordance with the evolution of GDP (Y).

We have used the same variables as for case study above but used quarterly and since 2007, the year that Romania became a EU member.

Table 2 - OLS results for Romanian labour market

Dependent Variable: DL_EMPLOYMENT					Dependent Variable: DL_GDP				
Variable	Coeffi-cient	Std. Error	t-Statistic	Prob.	Variable	Coeffi-cient	Std. Error	t-Statistic	Prob.
DL_GDP	**0.077**	0.022	3.431	0.002	**DL_EMPLOY-MENT**	**3.148**	0.917	3.431	0.002
C	-0.005	0.005	-0.905	0.371	C	0.035	0.033	1.087	0.284
R-squared	0.241	Mean dependent var		-0.003	R-squared	0.241	Mean dependent var		0.028
Adjusted R-squared	0.221	S.D. dependent var		0.036	Adjusted R-squared	0.221	S.D. dependent var		0.230
S.E. of regression	0.032	Akaike info criterion		-4.013	S.E. of regression	0.203	Akaike info criterion		-0.299
Sum squared resid	0.037	Schwarz criterion		-3.928	Sum squared resid	1.529	Schwarz criterion		-0.213
Log likelihood	80.263	Hannan-Quinn criter.		-3.983	Log likelihood	7.826	Hannan-Quinn criter.		-0.268
F-statistic	11.775	Durbin-Watson stat		2.183	F-statistic	11.775	Durbin-Watson stat		2.619
Prob(F-statistic)	0.001				Prob(F-statistic)	0.001			

Source: own processing

The data for the first trimester of 2007 - the third quarter of 2017 were collected from EUROSTAT and were differentiated by 1st degree and a logarithm was used starting from the date of Romania's accession to the European Union. Thus, in our opinion we have covered sufficiently long period in which there were numerous changes in the direction of the increase of the guaranteed minimum wage in Romania.

By applying the OLS type model, in the case of first relationship (1), a GDP coefficient of 0.077, while employment has 3,148. So, the Romanian labour market has the same Keynesian type of market, one that has insufficient jobs.

Our study, unfortunately, only tells half of the story of the Romanian economy, because a territorial analysis leads us to the conclusion that both types of unemployment are present in the Romanian economy. Starting from the fact that at the level of the national economy in the fourth quarter of 2017 there were 54.663 job vacancies   in the economy and that in December 2017 in Romania there were over 350,000 unemployed persons. In addition, there are counties where unemployment rates ranged between 1.07 % in Bucharest and the Western part of Romania, while the eastern counties have unemployment of more than 10% (Annex 2). Romania, just like many countries of the EU has disparities issues at territorial level where the two types of unemployment coexist in the Romanian economy.

We consider that in the West, North-West and Centre Regions as well as Bucharest is manifested a neoclassical type unemployment, the potential employees (in a very small number) having the opportunity to work but the salary is being unsatisfactory. The South-West, South, South-East, and North-East regions show a Keynesian type unemployment, with unemployed people unable to get employed due to lack of jobs. This fact leads to the need to adopt differentiated policies and programs at regional level. We believe that there is a need for a guaranteed minimum wage in Romania in order to increase employment and to decrease the risk of social exclusion due to unemployment and poverty.

For economic development and an efficient labour market, foreign direct investments need to be stimulated. During the implementation of the catching up policy, economic competitiveness must be preserved, the correlation between raising the guaranteed minimum wage and increasing productivity being a must have. In the case of Romania, productivity is on an upward trend with the possibility of raising the guaranteed minimum wage, not in a populist manner that falls within a political-electoral cycle but rather considering a medium-term vision.

As we have showed above Romania, has one of the highest IT sector gross added value evolutions, thus having a competitive advantage. Also, an advantage of the Romanian economy is that low workforce costs ensure an increased competitiveness which determines a high level of attractiveness for foreign direct investments, given that labour productivity is higher than the wage level, (59,4% compared to 33%) thus making the relationship between wage growth and labour productivity extremely important.

4. Findings

The impact of ICT Skills on employment and SME's sustainable competitiveness

As we have seen in the first part of this study, there is a clear mismatch between the demand of supply of jobs in the EU market, present also in the IT sector with more than 160.000 vacant jobs and also in the mismatch of skills within the IT sector. As stated above, our hypothesis (H1) is that ICT personnel (and implicitly ICT jobs) has a positive effect on job creation.

Basic economics tells us that the elasticity of the labour supply is related to guaranteed minimum wage, and wage is related to productivity and training [60], especially in the IT sector [61]. So, a possible explanation for this mismatch of skills could be the level of training that the employers in the IT sector are demanding.

We are trying to analyse these issues with a panel VAR model for EU 27 (except Croatia due to lack of data) for the period between 2007 and 2015.

It is important to mention that unemployment is generating social exclusion [62] due to low incomes and the increase of poverty. Also, we believe that an increase in employment in the ICT sector will bring an increase in the gross added value, will have a positive impact on GDP due to the increase of productivity, an increase in the number of employed persons and will have a negative impact on social exclusion of the unemployed.

So, the variables we have taken into consideration for this case study are: Gross Domestic Product per capita at PPS, Gross Added Value in IT sector, Number of IT personnel with tertiary education, number of IT personnel with tertiary education and non-tertiary education, number of persons employed and risk of social exclusion of the unemployed.

The model proposed in order to make our research is:

$$GDP_{1,t} = \alpha_2 + \Delta \sum_{j=1}^{j} \beta_{1,j}\, GDP_{1,t-j} + \Delta \sum_{j=1}^{j} \delta_{1,j}\, GAV_{1,t-j} + \Delta \sum_{k=1}^{k} \varepsilon_{1,j}\, IThigh_{1,t-j} + \Delta \sum_{k=1}^{k} \epsilon_{1,j}\, ITtotal_{1,t-j}$$
$$+ \Delta \sum_{k=1}^{k} \theta_{1,j}\, Exclusion_{1,t-j} + \Delta \sum_{k=1}^{k} \theta_{1,j}\, Employment_{1,t-j} + u1_t$$

Where:

GDP = Gross Domestic Product per capita at PPS

GAV = Gross Added Value in IT sector

IThigh = Number of IT personnel with tertiary education

ITtotal = Number of IT personnel with tertiary education and non-tertiary education

Employment = number of persons employed

Exclusion = risk of social exclusion of the unemployed

$$GAV_{1,t} = \alpha_2 + \Delta \sum_{j=1}^{j} \beta_{1,j}\, GDP_{1,t-j} + \Delta \sum_{j=1}^{j} \delta_{1,j}\, GAV_{1,t-j} + \Delta \sum_{k=1}^{k} \varepsilon_{1,j}\, IThigh_{1,t-j} + \Delta \sum_{k=1}^{k} \epsilon_{1,j}\, ITtotal_{1,t-j}$$
$$+ \Delta \sum_{k=1}^{k} \theta_{1,j}\, Exclusion_{1,t-j} + \Delta \sum_{k=1}^{k} \theta_{1,j}\, Employment_{1,t-j} + u1_t$$

$$IThigh_{1,t} = \alpha_2 + \Delta \sum_{j=1}^{j} \beta_{1,j}\, GDP_{1,t-j} + \Delta \sum_{j=1}^{j} \delta_{1,j}\, GAV_{1,t-j} + \Delta \sum_{k=1}^{k} \varepsilon_{1,j}\, IThigh_{1,t-j} + \Delta \sum_{k=1}^{k} \epsilon_{1,j}\, ITtotal_{1,t-j}$$
$$+ \Delta \sum_{k=1}^{k} \theta_{1,j}\, Exclusion_{1,t-j} + \Delta \sum_{k=1}^{k} \theta_{1,j}\, Employment_{1,t-j} + u1_t$$

$$Exclusion_{1,t} = \alpha_2 + \Delta \sum_{j=1}^{j} \beta_{1,j}\, GDP_{1,t-j} + \Delta \sum_{j=1}^{j} \delta_{1,j}\, GAV_{1,t-j} + \Delta \sum_{k=1}^{k} \varepsilon_{1,j}\, IThigh_{1,t-j}$$
$$+ \Delta \sum_{k=1}^{k} \epsilon_{1,j}\, ITtotal_{1,t-j} + \Delta \sum_{k=1}^{k} \theta_{1,j}\, Exclusion_{1,t-j} + \Delta \sum_{k=1}^{k} \theta_{1,j}\, Employment_{1,t-j} + u1_t$$

$$\text{Employment}_{1,t} = \alpha_2 + \Delta \sum_{j=1}^{j} \beta_{1,j} \, \text{GDP}_{1,t-j} + \Delta \sum_{j=1}^{j} \delta_{1,j} \, \text{GAV}_{1,t-j} + \Delta \sum_{k=1}^{k} \varepsilon_{1,j} \, \text{IThigh}_{1,t-j}$$

$$+ \Delta \sum_{k=1}^{k} \varepsilon_{1,j} \, \text{ITtotal}_{1,t-j} + \Delta \sum_{k=1}^{k} \theta_{1,j} \, \text{Exclusion}_{1,t-j} + \Delta \sum_{k=1}^{k} \theta_{1,j} \, \text{Employment}_{1,t-j} + \text{u1}_t$$

After we have estimated the VAR, we have seen if our model is satisfying all the necessary VAR tests. Thus, the VAR satisfies the stability condition as shown in Table 3. It is ensured in this way the essential condition for VAR stability. If this test were not passed, it could not go further with the VAR methodology.

Table 3 –VAR satisfies the stability condition

Root	Modulus
0.999497	0.999497
0.330901 - 0.401447i	0.520246
0.330901 + 0.401447i	0.520246
-0.220393 - 0.055168i	0.227193
-0.220393 + 0.055168i	0.227193
0.072755	0.072755

No root lies outside the unit circle.

VAR satisfies the stability condition.

Source: own processing

The number of lags is chosen from 1, as apparent from Table 4. Thus, a change with a unit of the independent variable will have an effect on the dependent variable within one year.

Table 4 – Selection of number of lags

Lag	LogL	LR	FPE	AIC	SC	HQ
0	86.80363	NA	2.02e-09	-2.992727	-2.771729	-2.907497
1	**268.4650**	**316.2254***	**9.25e-12***	**-8.387593**	**-6.840605***	**-7.790981***
2	284.2230	23.92887	2.06e-11	-7.637891	-4.764914	-6.529896
3	306.6568	29.08072	3.87e-11	-7.135435	-2.936469	-5.516059
4	349.5572	46.07829	3.93e-11	-7.391008	-1.866053	-5.260250
5	397.1344	40.52874	4.20e-11	-7.819794	-0.968849	-5.177653
6	451.9835	34.53459	5.09e-11	-8.517908*	-0.340973	-5.364385

Source: own processing

Also, VAR satisfies the condition of heteroscedasticity, according to Table 5. Similar to the autocorrelation test mentioned above, this condition is respected, being an essential condition in validating the VAR methodology.

Table 5 – Heteroscedasticity test

Joint test:

Chi-sq	df	Prob.
944.7042	567	0.0000

Source: own processing

The VAR satisfies the autocorrelation condition, as shown in Table 6. This condition is respected by using the LM autocorrelation test, being an essential condition in validating the VAR methodology.

Table no. 6 – Compliance with the autocorrelation conditions of LM test

Lags	LM-Stat	Prob
1	62.00175	0.0045

Source: own processing

Following the verification of VAR stability conditions and the tests ensuring data accuracy, we performed the impulse functions to observe the impact of the ICT personnel, both with tertiary education and the total number of ICT workers on employment, on social exclusion, on gross added value within the ICT sector and on GDP per capita.

As we ca see from the Figures below, the ICT personnel has a positive impact on employment, on gross added value and on GDP per capita for the hole period of 6 years that we have considered.
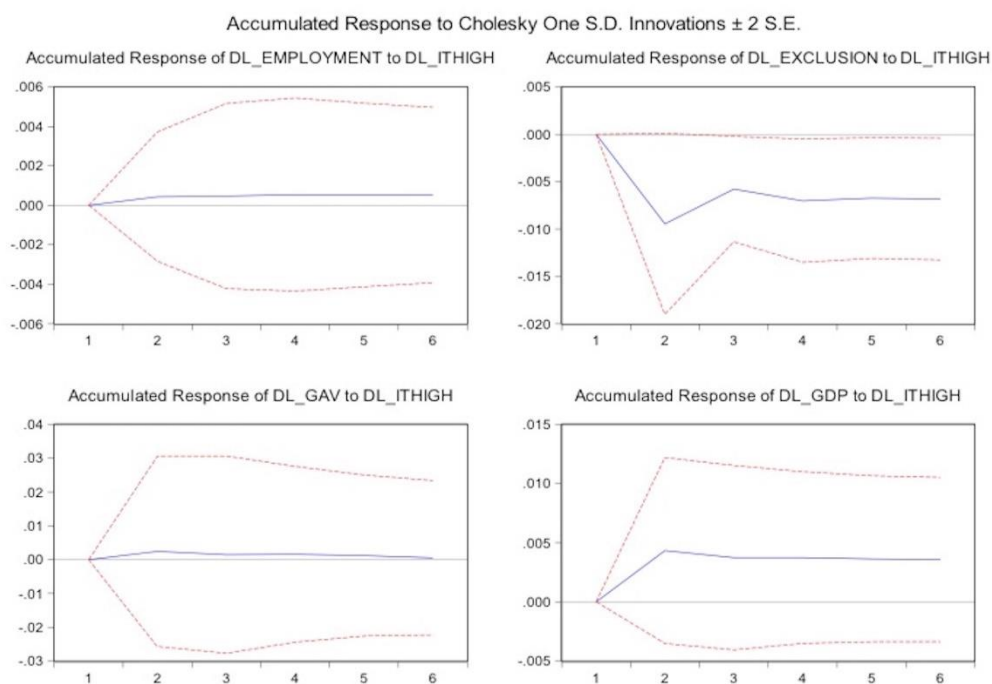

Figure 2 - Impact of IT personnel with tertiary education on employment, social exclusion, gross added value and GDP per capita

Thus, our Hypothesis - H1 and H 2.1- were validated and in these condition we ca state that ICT personnel and skills has a positive effect on employment and growth.

Also, very important, the ICT personnel has a negative impact on social exclusion, thus an increase on the number on ICT personnel is influencing in a negative manner the social exclusion of the unemployed. The fact that ICT personnel has a negative impact on social exclusion is important as the gross added value produced by the IT sector is decreasing the risk of poverty.

Also, Hypothesis 2.2 was validated and we can state that ICT personnel and skill has a negative effect on social exclusion.
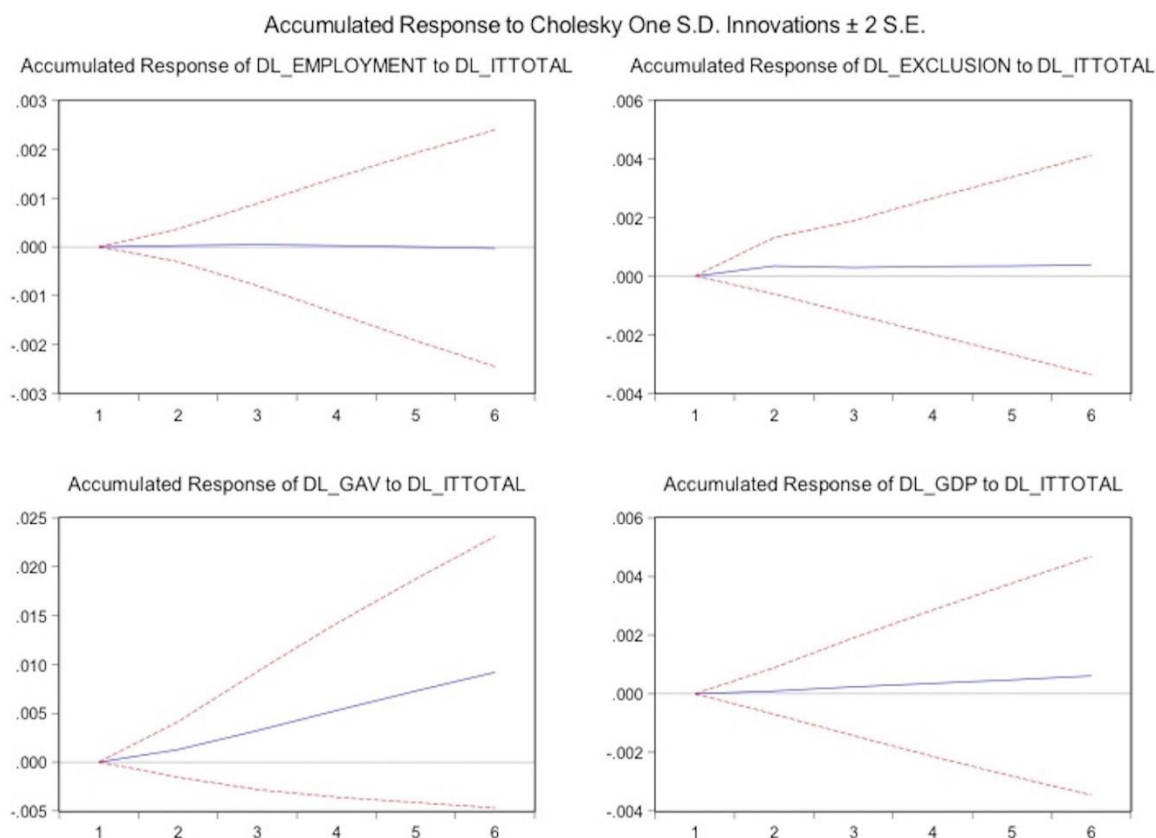
Accumulated Response to Cholesky One S.D. Innovations ± 2 S.E.

Accumulated Response of DL_EMPLOYMENT to DL_ITTOTAL

Accumulated Response of DL_EXCLUSION to DL_ITTOTAL

Accumulated Response of DL_GAV to DL_ITTOTAL

Accumulated Response of DL_GDP to DL_ITTOTAL

Figure 3 - Impact of total IT personnel (tertiary education and no tertiary education) on employment, social exclusion, gross added value and GDP per capita

The impact of guaranteed minimum wage on employment and SME's sustainable competitiveness

Also, we have identified that an increase in employment is reducing the social exclusion phenomena in our case study, thus being very important for the public policies to increase the employment by stimulating the change of perception of the unemployed. In accordance with our hypothesis - H 2.1 and H 2.2 -, we have seen that ICT personnel and skills have a positive impact on employment and a negative impact on social exclusion. However, in the case of our third hypothesis (H3) an useful tool is the evolution and the implications of the minimum wage on employment. Our hypothesis, as stated above, is that the increase of the minimum wage is stimulating employment and job creation.

The pros and cons for the guaranteed minimum wage have been well documented in a multitude of studies staring from 1938, since the "The Fair Labor Standards Act" [63]. [64] Brown (1988) has stated that the guaranteed minimum wage could cause job losses and was not well targeted on the persons that was supposed to help.
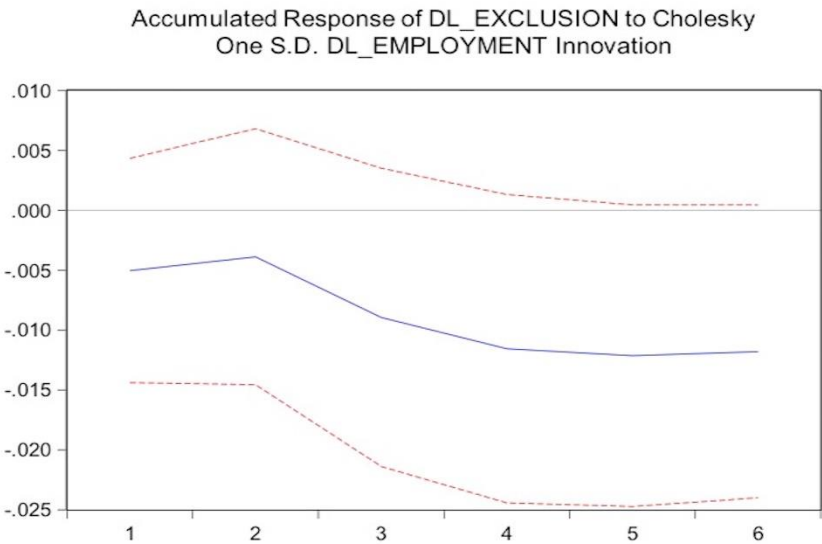
Figure 4– Impact of employment on social exclusion

Although the guaranteed minimum wage is seen as a tool for redistributive goals, the necessity for a minimum wage is still a very debatable subject and there is no consensus on the employment effects of the guaranteed minimum wage [65].

Still, large numbers of researches have come up with the conclusion that the employment effect is elusive since the labour market has large deviations from perfect competition, unlike the products market [66].

An interesting case is the case of Romania, that has applied a wage led growth strategy starting January 2017, increasing the guaranteed minimum wage several times during the last ten years and addressing the issue by increasing still, staring from January 2019 and January 2020. This evolution can be observed in Figure 5. If we analyse the basic facts, we can see that during the last years, the total number of employed persons grew steadily in the same pace the guaranteed minimum wage.
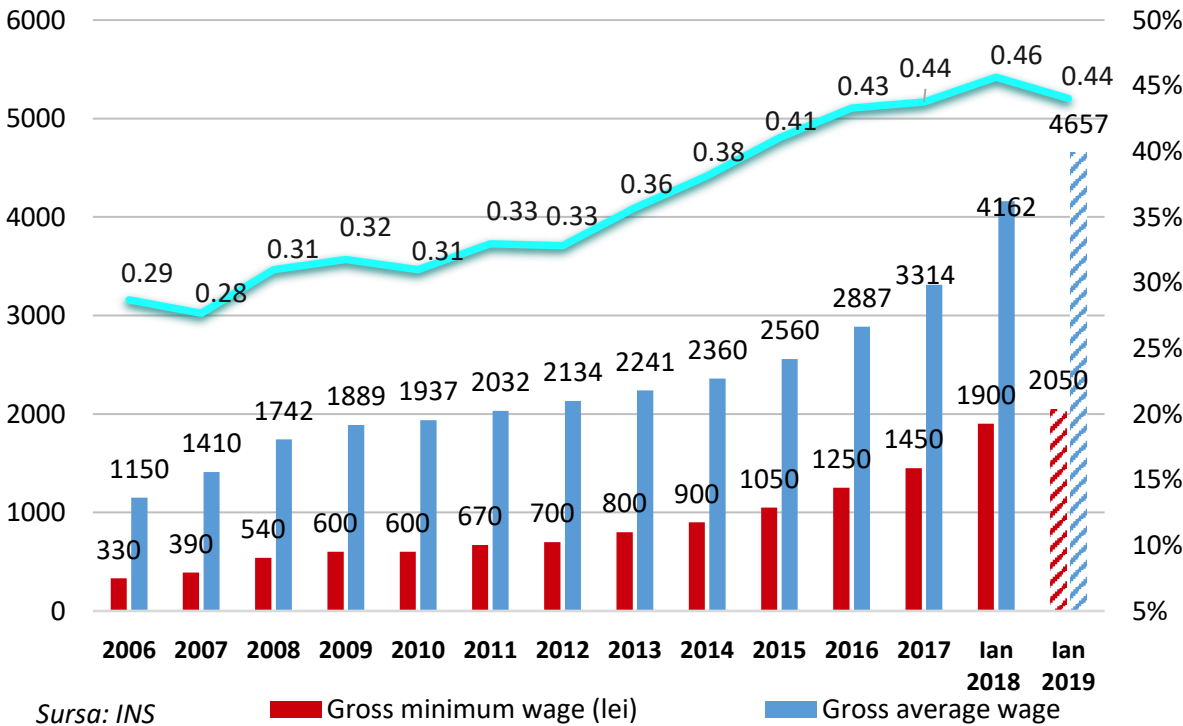

Figure 5 – The evolution of the minimum wage in Romania 2006 - 2019

We have to keep in mind that Romania has the largest emigration process of any EU 28 country (almost 3.6 million in 2017 according to the UN), has a falling birth rate and an increasing ageing population. So, taking into considerations that the vast majority of emigrants from Romania can be considered active population, able to work, and in spite of emigration process, the country has encountered an increase in employment, we can state that the increase in the guaranteed minimum wage has had an impact on the Romanian labour market, increasing the employment. During the last 10 year, the Romanian economy managed to create an additional 800.000 new jobs, but measuring the impact of the increase of guaranteed minimum wage on these new jobs is not that simple.

In this regard, we have analysed the data form Eurostat and the Romanian National Statics Institute and drew a few conclusions.

As we can see in Figure 6, by increasing the guaranteed minimum wage, the Romanian authorities have increased the share of personnel with guaranteed minimum wage in the total number of employees. So, if in 2010 there were 334 thousand persons employed with guaranteed minimum wage out of a total of 4.1 million employees (8.2%), in 2017 there were 1.37 million persons with guaranteed minimum wage out of a total of 4,9 million employees (28.3%).
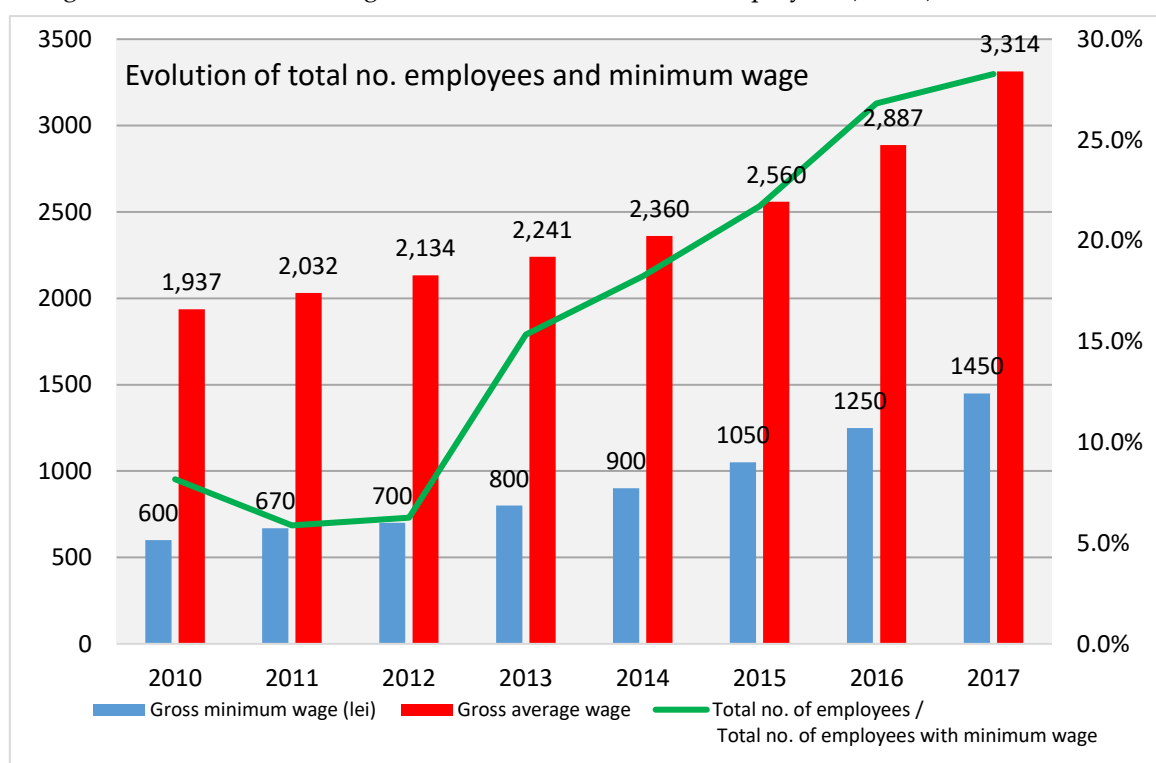

Figure 6 - Evolution of total no. employees and minimum wage

In our opinion we can state that the guaranteed minimum wage did had a positive effect on employment, by the increase of the number of new jobs by more than 800.000 in just 10 years, but the consequences were that the total number of guaranteed minimum wage persons has increased in the total number of employees, from 8% to 28%.

So, in regard to our third hypothesis (H3), we can state that the minimum wage has had a positive effect on job creation and employment. Nevertheless, the Romanian labour market has focused on the creations of low added value jobs and not the jobs with higher added value such as the ICT sector.

Another consequence of this wage led growth was that, during the years, the share of guaranteed minimum wage in the average wage has increased, causing a lower wage dispersion and an slower increase of productivity compared to the wages. So, in Figure 7, we can clearly see a decoupling of the wages from the productivity

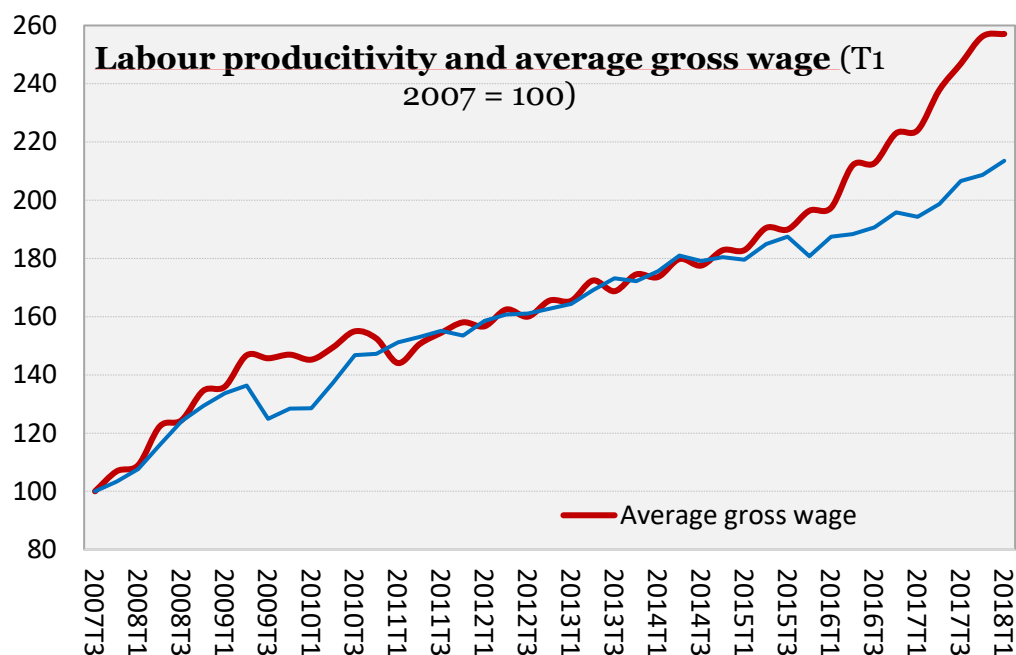**Labour producitivity and average gross wage** (T1 2007 = 100)

Figure 7 – The evolution of labour productivity and wages in Romania 2007 – 2018

We conclude that in Romania the wage led growth policy has topped-out, reaching it's full potential of growth for the time being. In this approach, the wages cannot increase anymore, and the most exposed to the risk of unemployment, in our opinion will be the persons with the lowest ICT skills and the guaranteed minimum wage.

5. Conclusions

We have examined the impact of ICT skill mismatch and guaranteed minimum wages on SME's sustainable competitiveness in European countries in the context of Keynesian and liberal markets. The empirical analysis was based on two approaches for our case studies: one at an European level, considering the EU labour market, and a second targeting a specific country, Romania, that has one of highest ICT sector share and GDP, and also a country that has implemented a wage led growth.

By analysing the European labour market for a time frame of 16 year (2000 – 2016) we have determined that the European labour market to be of Keynesian designation, which is very important as the EU, as a whole, has insufficient jobs and high unemployment.

Despite the fact that the EU has large regional disparities, and by analysing the case of Romania, for the same time span, we have come up to the same conclusion, that is, the Romanian labour market is Keynesian with insufficient jobs.

For the second part of our analysis we tried to see if the ICT skills and the minimizing of the skills mismatch can increase employment, create jobs, increase GDP per capita and thus decrease social exclusion. We have analysed quarterly data for the period of 2007 – 2015 for every EU country (except Croatia) and found out that the ICT skills can increase employment and decrease social exclusion, which confirms the literature review regarding innovation and job creations.

Therefore, our hypothesis H1 and H2.1 has proven that ICT personnel and skills has a positive effect on employment and growth. Also, our results are showing that, as we have anticipated, an educated workforce in the ICT sector has a larger impact on the variables selected for the VAR model increasing employment and decreasing social exclusion.

We have seen that there is a clear difference between the impacts of the tertiary education ICT personnel and the non-tertiary education personnel on GDP, gross added value, employment and social exclusion. Therefore, our hypothesis H 2.2 was verified, showing that ICT skills and ICT personnel have a negative effect on social exclusion.

However, although the European labour market is a Keynesian type of labour market, having insufficient jobs for the unemployed workforce, there are still a large number of vacant jobs in the European economy, as we have showed above. The same principle applies to the ICT labour market, where there are still a large number of vacant jobs, being a clear sign of certain mismatch in the demand and offer of skills between the unemployed and the employers. A possible explanation could be the level of training, tertiary or non-tertiary education

For the third topic that we have approached, regarding the guaranteed minimum wage and job creation, we have discussed about the Romanian economy and labour market that recently has started a strong wage led growth approach. We have seen that during the last decade the total new jobs created increased by nearly a quarter but the total number of the guaranteed minimum wage jobs increased from 8% out of the total jobs to 28% of total jobs.

So, the increase of guaranteed minimum wage is creating jobs but it creates low wage jobs and not necessarily an increase in wellbeing. Therefore, we consider that our third hypothesis (H3) was verified but the effects of the minimum wage are unsatisfactory since the creation the employment has grew by low paying jobs with little effect on wellbeing.

All policy makers have to keep in mind that increasing employment within the economy is of the upmost importance and also, a clear orientation of any responsible policy maker has to be the reduction of social exclusion and the combat of poverty. In order to achieve these objectives, the policy makers can implement a public policy in order to increase employment thru the increase of the minimum wage guaranteed.

However, an increase in the minimum wage that is taking into consideration the increase in productivity in our opinion is a healthy approach for stimulating economic growth and to increase SME competitiveness. However, a minimum wage that is set arbitrary by the government is going to develop into an unsustainable public policy with negative implications that will lead to unemployment and inflation.

As we have seen in the VAR model and results, an increase in employment has a negative impact on social exclusion, so the policy makers has to set certain incentives for reducing unemployment, a guaranteed minimum wage could be an instrument in this approach, the Romanian case being an interesting approach.

Also, we have seen that an increase in ICT personnel skills and training will determine an increase in the gross added value of the ICT sector in the GDP together with an increase of employment combined with a decrease of social exclusion. A guaranteed minimum wage approach has to keep in mind that the level of minimum wage has to be linked to productivity and economic performance in order to keep an economy competitive and sustainable in the long run.

6. Research Implication

This research puts in evidence the scientific progress on the specific topic, streaming research processes that drive efficient and effective systems to manage higher organizational labour market to improve performance and economic returns.

In particular, the technological implications for the workforce in terms of employment skills mismatch can be an opportunities in times of disruptive change in which economy have to be more resilient. This study can be useful for corporate management, public, no-profit and private companies, Human Resource Management, customers, citizens to improve the decision making process in labour market.

The emerging economies also face a number of challenges. Rapid advances in automation and the use of robots together with some re-shoring of jobs in advanced economies may limit the jobs potential of an expanding manufacturing sector. This may make it harder to escape the middle-income trap and to ensure a more even sharing of increased prosperity. It could also make it harder to generate the job growth required to provide employment opportunities for the large number of young people entering the labour market each year in many of the emerging economies. Moreover, providing these large cohorts of young people with the right skills to find good jobs will also be a

major challenge. Going forward, some of these challenges include the design and implementation of policies which will:

1) Prepare young people for the jobs of the future by ensuring that they are equipped with the right type of skills to successfully navigate through an ever-changing, technology-rich work environment, and give all workers the opportunity to continuously maintain their skills, up skill and/or riskily throughout their working lives.

2) Design labour market institutions (e.g. guaranteed minimum wage; employment protection; health and safety regulations) which encourage employers to seize the opportunities offered by technological change and globalization, while making sure that the risks are not borne disproportionately by workers in the form of low pay, precariousness and poor working conditions.

3) Re-think social security systems to minimize the chances of people slipping through the holes by: (i) tailoring or adapting them to the new forms of employment; or (ii) decoupling them entirely from people's work status and history.

4) Strengthen activation frameworks to mitigate some of the inevitable adjustment costs of moving towards more globalised and technologically advanced economies by helping those workers who have been displaced by changing skills needs into a new job quickly.

5) Promote new forms of social dialogue which allow tailored solutions to new challenges to emerge at the firm-level, while strengthening the voice of those workers who are increasingly working independently and separated by distance, language and legal context.

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