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EDITORIAL

Upon completion of the double-blind peer review process, Issue 1 Volume 25 Year 2023 of the scientific journal *Economic Horizons,* whose publisher is the Faculty of Economics of the University of Kragujevac, contains three original scientific papers and three review papers.

Starting from the fact that technological innovations make continuous changes on the labor market, the author *Joshua Adeyemi Afolabi* strives to perceive the link between employment and innovations in Nigeria's economic sectors by employing the autoregressive distributed lag (ARDL) model. It is concluded that that link is present in the short run, that technological advancement encourages employment in the service sector and, with a lag of one quarter, in the agricultural sector. The robustness of these findings is checked by expanding the model with additional variables - the manufacturing value as per sectors, the inflation rate and the participation of the domestic loans to the private sector in the gross domestic product. The results confirm that technological development does encourage employment and the reallocation of the workforce, based upon which the author suggests the full operationalization of technological innovations in all Nigerian economic sectors, all aimed at solving the unemployment issue.

Highlighting the fact that the question of the influence which macroeconomic fundamentals exert on the foreign-exchange rate fluctuations in the emerging-market countries and the inflation targeting regime is still an open one, the coauthors *Haryo Kuncoro* and *Fafurida Fafurida* do research in the way in which a deficit of the current account on balance of payments and the volume of foreign-exchange reserves influence foreign-exchange rate volatility in Indonesia. By applying the threshold nonlinear quantile regression model, they draw a conclusion that both variables have a statistically significant influence. A deficit of the current account on balance of payments exerts an influence on foreign-exchange rate volatility once the threshold of two percent of the gross domestic product has been exceeded. Given the fact that this influence is asymmetric, the paper indicates the possibility of the imbalance of balance of payments to endanger the credibility of the monetary policy in the inflation targeting regime. Therefore, the need to maintain an optimal stock of foreign-exchange reserves which may serve to mitigate foreign-exchange rate fluctuations, whereas the Central Bank is focused on achieving the targeted inflation rate, is pointed to.

Employing panel data regression models, the author *Maja Putica* researches the influence that business and institutional determinants have on annual effective tax rates in the Republic of Serbia's banks. Using the accounting and current effective tax rate as the measure of the real tax burden, the authoress concludes that the real tax burden of the banks in the Republic of Serbia is substantially lesser than the legal one. The results of the analysis obtained through the application of a few models being developed in the paper reveal that the tax burden is under the biggest influence of the consolidation of the assets and capital of the acquiring bank as a consequence of mergers and acquisitions. The current effective tax rates are reduced as the bank grows in size, but only up to a certain level. The key implication of the carried-out analysis says that the banks in the Republic of Serbia can manage the tax burden through the regulation of the capitalization level and the size.

Based upon the research done in the determinants of unemployment amongst the young in Morocco through the application of a logistic model, the coauthors *Marwa El Foutoun, Ahmed Kchikeche* and *Driss Mafamane* indicate the three possible groups of factors. The first group consists of the geographical and sociodemographic characteristics of the young, namely their sex, age, marital status and residence. The second group comprises socioeconomic factors, such as the family background of the young and the number of employed persons in the household. Ultimately, the third group of factors pertains to the different formal education levels. The authors come to an interesting conclusion

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that graduate students in Morocco are more likely to be unemployed than it is the case with the persons having no diploma at all; however, this probability also varies depending on the type of the diploma.

Examining the connectedness between networking and innovativeness of social enterprises from eleven European countries, the coauthors *Ana Aleksić Mirić, Zorica Aničić* and *Marina Petrović* point out the fact that networking is one of the key characteristics of these organizations. The research results indicate that networking is an important factor when the innovative behavior of the social enterprises established prior to the year 2000 is concerned, but its significance has been lost in the new millennium. These findings are explained by the fact that networking in the 21st century is becoming deeply rooted into everyday business operations of the organizations and is a necessary condition for doing business. Of the factors influencing innovativeness in these social enterprises, the following ones are singled out: the economic activity type; the significance assumed to an enterprise's growth through an increase in the number or scope of its business activities and/or an increase in the number of the employed; the degree of the mutual trust of the organizational members and the highest acquired education level of the owner or manager of the social enterprise.

Analyzing the relationships between smart governance, cashless payments and regional income in the Province of North Sumatra, Indonesia, the coauthors *Dias Satria, Tiara Juniar Soewardi* and *Joshi Maharani Wibowo* point to the generally positive attitude expressed by the respondents towards the electronification of regional payment transactions. Initiated in the COVID-19 pandemic conditions, this process has the potential to intensify the economic activity and increase tax income. Employing the Structural Equation Model-Partial Least Square (SEM-PLS) models on the primary data collected via the questionnaire, the expected performances due to the adoption of new technology, the social influence and technical conditions are being proven to exert a statistically significant positive effect on the acceptance of the cashless payment of tax. The ways in which the Indonesian Government can intensify a form of regional transactions like this one reflect in the support to education in the advantages of cashless payments, the improvement of the banking and information-telecommunication infrastructures and the building of the public's trust in its capacities in this domain.

On behalf of the Editorial Board of the Journal and on my own behalf, I hereby express my gratitude to the authors of the contributions published in this Issue of the Journal. Simultaneously, my special gratitude is owed to the peer reviewers whose constructive and critical comments and suggestions made to the authors of the submitted manuscripts have contributed to raising the quality of the published papers to a higher level.

In January 2023, the Faculty of Economics made a change in the Editorial Board of the Journal. The members of the former convocation of the Editorial Board contributed to the *Economic Horizons* scientific journal continuously receiving increasingly high rates from the international bases and the domestic Serbian Citation Index base.

This is the occasion to express gratitude to the members of the former convocation of the Editorial Board on behalf of the Faculty of Economics of the University of Kragujevac, as the publisher of the *Economic Horizons* scientific journal, the Editorial Board of the Journal, and on my own behalf. My special gratitude goes to Vlastimir Leković, PhD, a full professor in retirement, whose unselfish engagement in and commitment to editing the Journal contributed to the outstanding international reputation of the Journal. I also thank the eminent representatives of the academic community, whose acceptance of the membership on the Editorial Board of the Journal allows them to contribute to the reputation of both the *Economic Horizons* and the Faculty of Economics of the University of Kragujevac.

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Editor-in-Chief
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Milena Jakšić is a full professor at the Faculty of Economics of the University of Kragujevac. She received her PhD degree at the Faculty of Economics of the University of Kragujevac, in the narrower scientific field of General Economics and Economic Development. The key areas of her scientific-research interests are the financial system, financial markets, financial instruments and financial institutions.

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EMPLOYMENT EFFECTS OF TECHNOLOGICAL INNOVATION: EVIDENCE FROM NIGERIA'S ECONOMIC SECTORS

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Technological advancement continues to revolutionize the labor market and has particularly intensified the debate on its employment effect across developing and developed economies. Employing the Autoregressive Distributed Lag (ARDL) framework, this study provides insights into the employment-innovation nexus across the Nigerian economic sectors using the quarterly data from 2011Q1 to 2021Q4. The findings reveal that the employment-innovation nexus is a short-run phenomenon in Nigeria and that technological innovation enhances employment generation in the service sector and the agricultural sector, but it takes a quarter before the positive employment effect occurs. Overall, the results suggest that technological innovation improves employment and reallocates labor across the sectors, which suggests the need to fully operationalize technological innovation across the Nigerian economic sectors in order to tackle the prevailing unemployment conundrum in the country.

Keywords: technological innovation, sectoral employment, ARDL, labor market

JEL Classification: C22, E24, O14

INTRODUCTION

Technological advancement continues to revolutionize the global economy, charting the new paths that were otherwise impracticable in past centuries. The emergence of the fourth industrial revolution (Industry 4.0), the quest for developing knowledge-based economies and the growing spate of globalization further present new opportunities for increased technological advancement. The increasing importance of technological innovation in contemporary times has attracted the attention of academics, researchers and policymakers, among other stakeholders. Thus, there is a growing literature on the determinants and effects of technological innovation (Gyeke-Dako, Oduro, Turkson, Baffour & Abbey, 2016; Piva & Vivarelli, 2017; Krousie, 2018; Okumu, Bballe & Guloba, 2019; Sithole & Buchana, 2021). However, there seems to be a lack of consensus on the labor market effects of technological innovation in the literature, with some studies revealing that technology has employment-creating effects (Piva

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& Vivarelli, 2017; Okumu *et al*, 2019), whereas others argue that it has destructive effects on employment (Campa, 2014; Krousie, 2018; Sithole & Buchana, 2021). Some studies have also shown that technological innovation reallocates labor across economic sectors (Cang, 2017; Yildirim, Yildirim, Erdogan & Kantarci, 2020).

The "creative destruction" concept put forward by J. A. Schumpeter (1942) suggests that technological innovation creates new jobs and destroys old ones, leaving some people better-off and others worse-off. It encourages capital-intensive operations and favors skilled labor, which leads to skill-biased technological change, routine-biased technological change and job polarization (Acemoglu & Autor, 2011; Goos, Manning & Salomons, 2014). The proponents of technological innovation argued that it produced more middle-skill jobs, improved productivity, raised the wage rate of skilled and semi-skilled labor, and increased product varieties, especially in the technology utilizing sector (Aguilera & Barrera, 2016; Piva & Vivarelli, 2017). Recently, the indispensability of technological innovation has been brought to the fore during the COVID-19 pandemic era, as it facilitated product and service delivery despite the lockdown orders of various national governments (Bolaji, Adeoti & Afolabi, 2021; Olanrewaju & Afolabi, 2022).

There is growing advocacy for the full adoption of technological innovation in Nigeria, yet with less consideration for its potential impact on the labor market outcomes, particularly employment. Diverse policy and institutional efforts devoted to the improvement of the adoption of technological innovation and abating unemployment in Nigeria are yet to yield optimal outcomes. For example, Nigeria's ranking on the Global Innovation Index in 2021 is unimpressive, as the country ranked 118 out of 132 countries, thus reflecting low-level technological absorption in the country (World Intellectual Property Organization, 2021). All the more so, the Nigerian labor market is highly saturated given the fact that the unemployment rate is continuing to soar, rising from 7.5% in the first quarter of 2015 to 33.3% in the last quarter of 2020, with youth unemployment contributing remarkably to the growing unemployment rate (National Bureau of Statistics, 2021). This indicates the fact that Nigeria consistently misses out on reaping demographic dividends (Ogunjimi & Oladipupo, 2019) and is likely to be vice-ridden by various social vices and exposed to security challenges (Oji & Afolabi, 2022). Technological innovation can disrupt the labor market, reallocate labor and even displace high-skilled labor, such as doctors, web developers and architects (United Nations, 2017).

Given the fact that the employment effect of technological innovation may differ across economic sectors, this study contributes to the literature by examining the sectoral employment effect of technological innovation in Nigeria. Past studies have provided overwhelming evidence on the employment-innovation nexus, particularly in developed countries, with little evidence on developing economies, including Nigeria (Matuzeviciute, Butkus & Karaliute, 2017; Piva & Vivarelli, 2017; Krousie, 2018; Sithole & Buchana, 2021; Yildirim *et al*, 2020). Most of the studies on the employment-innovation nexus are firm-level and industry-level, with but a few pieces of evidence from aggregate-level studies (Gyeke-Dako *et al*, 2016; Okumu *et al*, 2019). The firm-level studies on the subject matter have two major weaknesses: they fail to fully account for indirect compensation effects (Cang, 2017) and they do not account for the possible crowding-out effects of innovative firms in the labor market (Vivarelli, 2012).

Therefore, this study fills these observed research gaps by conducting a macro-level study on the employment-innovation nexus in Nigeria, with a particular emphasis being placed on sectoral employment. It hinges the relationship between the researched sectoral employment and the matching theory proposed by C. A. Pissarides (1985; 1990). The quarterly data on the selected macroeconomic variables spanning 2011Q1 and 2021Q4 are sourced from reputable databases so as to test the following research hypotheses:

H1: Technological innovation has a statistically significant impact on sectoral employment in Nigeria.

H2: Technological innovation reallocates labor across the Nigerian economic sectors.

The Autoregressive Distributed Lag (ARDL) framework developed by M. H. Pesaran, Y. Shin and R. Smith (2001) is used to analyze the quarterly data and test the research hypotheses.

Following this introductory section, the paper is structured into the following sections: in Section Two, a brief review of the literature and the theoretical framework adopted in this study are presented; Section Three explains the research methodology, while Section Four comprises the empirical analysis. Finally, the conclusions of the study are given in Section Five.

A BRIEF REVIEW OF THE LITERATURE

There is a quantum of empirical evidence on the nexus between technological innovation and employment. However, there seems to be no consensus on the direction and magnitude of the relationship. Some empirical studies have found that technological innovation is employment-generating (Reenen, 1997; Gyeke-Dako *et al*, 2016; Piva & Vivarelli, 2017; Okumu *et al*, 2019), whereas some other studies have alluded to the fact that technological innovation adversely affects employment (Vivarelli, 2013; Cang, 2017; Yildirim *et al*, 2020). Even more so, there are studies that have found that technology has mixed effects on employment (Postel-Vinay, 2002; Vicini, 2016; Dachs, 2018; Sithole & Buchana, 2021). Some other studies have found no significant relationship between the two macroeconomic variables (Aguilera & Barrera, 2016; Matuzeviciute *et al*, 2017).

The key argument in support of the positive relationship between technological innovation and employment is the fact that, through investment in research and development activities, technological innovation makes the production of new product varieties possible, offering consumers a broad range of products to demand (Okumu *et al*, 2019; Sithole & Buchana, 2021), which is likely to stimulate aggregate demand and compel producers to increase production in order to reach the increasing demand level. One of the most feasible means to address the excess demand problem is to hire more labor to raise the production level. Thus, most producers resort to hiring more labor, thereby reducing the number of the people in the unemployment pool (Raifu & Afolabi, 2022), in which way technological innovation creates new jobs through the introduction of new products (the phenomenon called "product innovation") and fosters employment prospects (Vicini, 2016; Dachs, 2018). In fact, M. Piva and M. Vivarelli (2017) argued that product innovation significantly improved employment growth, particularly in high- and medium-tech sectors.

On the other hand, the employment-reducing effect of technological innovation has been closely linked to process innovation - improvement in the production process (Reenen, 1997; Sithole & Buchana, 2021). The argument behind this is that improvement in technology translates to machines replacing humans or reducing the number of humans in the production process, which worsens unemployment, reduces welfare and broadens income gaps. Specifically, B. Dachs (2018) argued that the lopsided digitalization cost distribution resulting from the skill-biased nature of technological change worsened unemployment and income inequality. Thus, process innovation significantly contributes to job displacement, especially that of low-skilled workers. F. Postel-Vinay (2002) argued that improvement in technological innovation accelerated job obsolescence, thus inducing job displacement, simultaneously lowering employment below its equilibrium level. However, M. Vivarelli (2013) argued that process and product innovation were interrelated, and that process innovation did not always lead to job destruction. Providing support for this stance, I. M. Okumu, E. Bbaale and M. M. Guloba (2019) showed that process innovation had the employment-enhancing effect among African manufacturing firms although J. V. Reenen (1997) argued that only the dominance of product innovation over process innovation would make that possible.

P. Li (2021) evaluated the employment effect of technological innovation in China. The result of the

impulse response function showed that technological innovation destroyed jobs in the short run but created jobs in the long run. In a similar fashion, V. Palekhova and O. Kramarenko (2020) examined the employment effect of technological innovation in the financial sector of South Korea, Ukraine, and the United Kingdom. The results showed that the employment level declined as the innovation level increased although the employment effect of innovation varied across the three countries. Precisely, the magnitude of the impact is higher in South Korea and the United Kingdom than in Ukraine. J. I. Ubah, E. K. Bowale, J. O. Ejemeyovwi and Y. Okereke (2021) also evaluated the employment effects of both technological innovation and electricity access in Nigeria using data from 1960 to 2017. The result showed a significant inverse relationship between technology and employment in Nigeria, indicating the fact that technology caused job destruction. Employing the Structural Vector Autoregression (SVAR) model, G. Kindberg-Hanlon (2021) showed that technologies complemented and substituted labor, the substitution effect being more dominant in the short run. Given the high technological development rate in developed countries, employment-displacing technological change is found to be more prevalent in advanced countries with industrial jobs being the most at risk of automation.

Moreover, Y. J. Cang (2017) argued that the nature of the employment effect of technological innovation depended on the geographical location and political regime under consideration. For the United States, the study showed that technology destroyed employment in rural and low-tech regions, and that the adverse employment effect of technological innovation was more pronounced in the Obama regime than in the Bush and Clinton regimes. C. Krousie (2018) supported this stance by alluding to the fact that technological innovation displaced labor in the United States although not substantially, as there were more high-skilled than low-skilled labor in the country. Exploring the possibilities of how artificial intelligence would influence the future of work, R. Campa (2014) argued for an imminent end of work and the end of robots while predicting disparity in the future of human societies influenced by the factors such as political awareness, the democratic rule and infrastructural development.

THE THEORETICAL FRAMEWORK AND METHODOLOGY

This study is built on the theoretical foundation of search and matching theory, the choice of which is based on its exceptional ability to clearly explain the dynamics of the labor market with regard to workers' displacement and rehiring often caused by frictional unemployment (the skill mismatch) and structural unemployment (technology-induced unemployment) (Pissarides, 1990; Mortensen & Pissarides, 1998). The search and matching model describes and explains creative job destructions and the formation of new jobs, which is one of the major thrust of this study. This theory models markets where frictions inhibit economic activities from instantaneously adjusting to market dynamics. The key assumptions underlying search and matching theory are the high heterogeneity of workers and jobs and the risk-neutrality of workers seeking to maximize their utility per unit of time. The unemployed search for jobs following frictional or structural unemployment and can only be matched with the jobs for which they have requisite skills so as to maximize their labor efficiency. C. A. Pissarides (1985) argued that, in the case of uneven matches, some of the least productive employers/workers might become less profitable following a negative aggregate shock, which could lead to the retrenchment of workers and an increase in the number of the labor force in the unemployment pool. On the other hand, employers may immediately hire new workers during or after a positive aggregate shock, given the fact that job hires are conditional on imperfect matching technology.

Drawing from the foregoing discussion, the theoretical model analyzing the effects of technological innovation on employment in Nigeria can be written as follows:

$$EMP = f(GDP, INN) \tag{1}$$

where EMP, GDP and INN denote employment, the real GDP (a proxy for the aggregate shock) and technological innovation, respectively. However, in order to capture sectoral effects, employment and the real GDP are disaggregated across the sectoral lines - agriculture, industry and service. In addition, following D. C. Yildirim *et al* (2020), the two key macroeconomic variables (the inflation rate and credit to the private sector) are incorporated in the model as the control variables. Their inclusion hinges on the fact that they are significant drivers of employment in each economic sector and their omission from the estimated model may result in the omitted variable bias (Dogan & Inglesi-Lotz, 2020). Thus, equation (1) can be disaggregated into the three equations as follows:

$$AGR\_EMP_t = \alpha_1 + \alpha_2 INN_1 + \alpha_3 AGR\_Y_t + \alpha_4 INF_t + \alpha_5 CPS_t + \varepsilon_{2t} \quad (2)$$

$$IND\_EMP_t = \beta_1 + \beta_2 INN_1 + \beta_3 IND\_Y_t + \beta_4 INF_t + \beta_5 CPS_t + \varepsilon_{3t} \quad (3)$$

$$SER\_EMP_t = \delta_1 + \delta_2 INN_1 + \delta_3 SER\_Y_t + \delta_4 INF_t + \delta_5 CPS_t + \varepsilon_{4t} \quad (4)$$

where *AGR_EMP, IND_EMP,* and *SER_EMP* denote employment in the agricultural sector, employment in the industrial sector, and employment in the service sector; *INN* stands for innovation; *AGR_Y,* IND_Y, and *SER_Y* denote the agricultural output, the industrial output, and the service output, respectively, and *INF* and *CPS* denote inflation and domestic credit to the private sector, respectively. Some of the common measures of innovation in the literature are information and communication technology (ICT), research and development (R&D) spending, and patents. However, the World Intellectual Property Organization (WIPO) developed a composite index, the Global Innovation Index (GII), that comprehensively captures all innovation indicators. Following V. Palekhova and O. Kramarenko (2020), the GII is adopted in this study as the measure of technological innovation. Based on economic theories, technological innovation could either enhance or destroy employment. Thus, the GII coefficient is expected to have either a positive or a negative sign. The coefficients of the sectoral output and credit to the private sector, however, are expected to have positive signs as these variables have a direct effect on employment prospects (Yildirim *et al*, 2020). On the other hand, inflation reduces real income and the purchasing power of producers, subsequently hampering their capability to employ more labor (Ogunjimi, 2019; Aminu & Ogunjimi, 2019). Thus, the inflation coefficient is expected to be negative.

The Autoregressive Distributed Lag (ARDL) approach developed by M. H. Pesaran, Y. Shin and R. Smith (2001) is adopted so as to estimate the specified models. The approach is selected for the three major reasons. First, it has an inherent capacity (the bounds test) to check for the existence or otherwise of the long-term relationship among the variables. Second, it accommodates stationary and nonstationary series, provided they are not I(2), i.e. integrated of order two. Third, it simultaneously generates both short- and long-term estimates (Pesaran *et al*, 2001). The ARDL version of the equations 2, 3 and 4 is written as follows:

$$\Delta AGR\_EMP_t = \gamma + \alpha AGR\_EMP_{t-1} + \alpha_1 INN_{t-1} + \alpha_2 AGR\_Y_{t-1} + \alpha_3 INF_{t-1} + \alpha_4 CPS_{t-1} + \sum_{j=1}^{n} o_j \Delta AGR\_EMP_{t-j} + \sum_{j=0}^{n} o_j \Delta INN_{t-j} + \sum_{j=0}^{n} o_j \Delta AGR\_Y_{t-j} + \sum_{j=0}^{n} o_j \Delta INF_{t-j} + \sum_{j=0}^{n} \varnothing_j \Delta CPS_{t-j} + \varepsilon_{1t} \quad (5)$$

$$\Delta IND\_EMP_t = \delta + \beta IND\_EMP_{t-1} + \beta_1 INN_{t-1} + \beta_2 IND\_Y_{t-1} + \beta_3 INF_{t-1} + \beta_4 CPS_{t-1} + \sum_{j=1}^{n} \theta_j \Delta IND\_EMP_{t-j} + \sum_{j=0}^{n} \theta_j \Delta INN_{t-j} + \sum_{j=0}^{n} \theta_j \Delta IND\_Y_{t-j} + \sum_{j=0}^{n} \theta_j \Delta INF_{t-j} + \sum_{j=0}^{n} \theta_j \Delta CPS_{t-j} + \varepsilon_{2t} \quad (6)$$

$$\Delta SER\_EMP_t = \rho + \omega SER\_EMP_{t-1} + \omega_1 INN_{t-1} + \omega_2 SER\_Y_{t-1} + \omega_3 INF_{t-1} + \omega_4 CPS_{t-1} + \sum_{j=1}^{n} \varphi_j \Delta SER\_EMP_{t-j} + \sum_{j=0}^{n} \varphi_j \Delta INN_{t-j} + \sum_{j=0}^{n} \varphi_j \Delta SER\_Y_{t-j} + \sum_{j=0}^{n} \varphi_j \Delta INF_{t-j} + \sum_{j=0}^{n} \varphi_j \Delta CPS_{t-j} + \varepsilon_{3t} \quad (7)$$

where Δ is the first difference operator; γ, δ and ρ are the intercepts; and ε_{it} is the white noise residuals. The equations 5, 6 and 7 were estimated in the stepwise manner. In the baseline models, only technological innovation was first regressed on sectoral employment, but the other explanatory variables were subsequently introduced into the model, which essentially served to gain an insight into the individual effect of technological innovation on sectoral employment before and after the introduction of the control variables. The 2011Q1 to 2021Q4 quarterly data on the variables of interest were sourced from the Central Bank of Nigeria (CBN), the World Bank (WB) and the World Intellectual Property Organization (WIPO) databases. Each of the variable has different frequencies. Thus, all the variables were converted into quarterly series using the quadratic data smoothing statistical method (Oloko & Yusuf, 2021). The sources and description of each variable are presented in Table 1.

RESULTS AND DISCUSSION

Descriptive statistics

Table 2 provides the basic descriptive statistics of the key variables of interest. It shows the dominance of the Nigerian service sector given its average contribution to the aggregate output (52.4 per cent) and employment (51.2 per cent), which suggests that the Nigerian service sector absorbs more labor and contributes more to the aggregate output than the agricultural and industrial sectors put together. This impressive performance has been attributed to the relative adoption of technological innovation by actors and players in the Nigerian service sector (Ogunjimi, 2020a, 2020b; Afolabi, Olanrewaju & Adekunle, 2022). On the other hand, however, the relatively low contribution of the agricultural and industrial sectors to both the aggregate output and employment in Nigeria is linked to neglecting these sectors in the wake of Nigeria's discovery of crude oil in commercial quantities in the 1970s (Afolabi & Ogunjimi, 2020; Afolabi & Oji, 2021). The average value of the innovation score in Nigeria is also very low and the country ranks perpetually low on the global innovation index, failing to make the top 100 innovative countries in the world (WIPO, 2021), which implies the fact that Nigeria would have to import technology just as it does when other merchandise products are concerned so as to meet the demand of the contemporary knowledge-based economy. On the other hand, the average inflation rate in Nigeria is double-digit, while the average share of domestic

Table 1 The data description

Variables	Measurement	Source
Agricultural sector employment (AGR_EMP)	% of the total employment	WB (2021)
Agricultural sector output (AGR_Y)	% of the GDP	CBN (2021)
Industrial sector employment (IND_EMP)	% of the total employment	WB (2021)
Industrial sector output (IND_Y)	% of the GDP	CBN (2021)
Service sector employment (SER_EMP)	% of the total employment	WB (2021)
Service sector output (SER_Y)	% of the GDP	CBN (2021)
Technological innovation (INN)	Global Innovation Index	WIPO (2022)
Inflation (INF)	%	CBN (2021)
Domestic credit to private sector (CPS)	% of the GDP	CBN (2021)

Source: Author

credit to the private sector in the total GDP ranges between 0.1 per cent to 31.8 per cent for the period under consideration. Interestingly, the standard deviation of all the variables, except for domestic credit to the private sector, is relatively low, suggesting that the variables are not broadly dispersed from their respective mean values.

Table 2 The descriptive statistics

Variables	Mean	Minimum	Maximum	Standard Deviation
AGR_EMP	37.06	34.89	40.98	1.70
IND_EMP	11.72	9.86	12.05	0.60
SER_EMP	51.22	49.16	53.11	1.20
AGR_Y	24.27	19.65	30.77	3.17
IND_Y	23.35	18.05	28.83	2.50
SER_Y	52.38	46.79	55.67	2.45
INN	23.86	19.52	30.69	2.75
INF	12.23	7.82	18.45	3.22
CPS	5.29	0.10	31.77	9.68

Source: Author

The unit root test

The unit root test is highly important in time-series and panel studies for the determination of the stationary properties of variables, which guides the choice of the estimation technique so as to avoid generating unreliable estimates. The Phillip Perron (PP) and Augmented Dickey Fuller (ADF) approaches are adopted in this study. These unit root test approaches test the null hypothesis (the variables contain the unit root) against its alternative. The decision to accept/reject the hypothesis depends on the probability values of each variable. If the probability value exceeds 10 percent, the null hypothesis will be accepted; it will be rejected otherwise. The unit root test results reported in Table 3 account for the fact that some variables are stationary (I(0)) while others are not (I(1)). Specifically, the variables have a mixed order of integration, which satisfies one of the conditions for adopting the ARDL framework.

The cointegration test

The findings generated from the unit root test indicate the imperative of determining whether there is a long-term relationship among the variables or not in order to account for it in the ARDL estimation. The bounds test is used in this regard, which tests the null hypothesis of no long-term relationship, which is rejected if the F-statistic exceeds the upper bound critical value but is accepted if it falls below the lower bound critical value. However, uncertainty surrounds the long-term relationship if the F-statistic falls within the range of the upper and lower bound

Table 3 The results of the unit root tests

Variables	Phillip Perron (PP)			Augmented Dickey Fuller (ADF)		
	Level	1st Difference	I(d)	Level	1st Difference	I(d)
AGR_EMP	-3.19**a	-	I(0)	-2.23a	-2.70***a	I(1)
IND_EMP	-6.09*a	-	I(0)	-5.91*b	-	I(0)
SER_EMP	-1.39b	-3.22**a	I(1)	-2.28b	-3.07**a	I(1)
INN	-3.02b	-3.55**a	I(1)	-4.19**b	-	I(0)
AGR_Y	-8.12*b	-	I(0)	-2.42b	-2.97**a	I(1)
IND_Y	-11.70*b	-	I(0)	-2.59b	-4.14*a	I(1)
SER_Y	-10.19*b	-	I(0)	-1.99b	-3.09**a	I(1)
INF	-2.11b	-3.32**a	I(1)	-2.99b	-3.69*a	I(1)
CPS	-1.44a	-5.20*b	I(1)	-1.61a	-5.29*b	I(1)

Note: * p<0.01, ** p<0.05, *** p<0.1. 'a' and 'b' denote the model with the constant and the model with the constant and the trend, respectively. I(0) and I(1) indicate stationarity at the level and the first difference, respectively.

Source: Author

critical values. In this light, the bounds test results reported in Table 4 are indicative of the nonexistence of the long-term relationship between sectoral employment and technological innovation in Nigeria as the result of the baseline models shows that their respective F-statistics fall below the lower bound critical values at all the significance levels. In a similar fashion, the results of the alternative models show the nonexistence of the long-term relationship among the variables in the employment models in the agricultural and service sectors, whereas the result indicates uncertainty for the employment model in the industrial sector. Succinctly, the link between sectoral employment and technological innovation is a short-term phenomenon in Nigeria, which is suggestive of the fact that whatever impact technological innovation has on sectoral employment, that impact is not permanent.

Model estimation and discussion

Following the cointegration test results that indicate the nonexistence of the long-term relationship between sectoral employment and technological innovation, the short-term ARDL model is estimated, and the result is given in Table 5. It shows that the effect of technological innovation on employment differs across the sectors. For the agricultural sector, technological innovation has an instantaneous negative impact on employment generation but creates jobs after a period of one quarter. Expectedly, an increase in the adoption of technological innovation in the agricultural sector fosters the replacement of humans with machines as the latter can perform agricultural tasks faster and more efficiently, which explains the immediate negative impact of technological innovation on employment in the agricultural sector and corroborates the finding of J. I. Ubah, E. K. Bowale, J. O. Ejemeyovwi and Y. Okereke (2021), who argued that technology induced job destruction in Nigeria.

In addition, the low level of technological knowhow in Nigeria contributes to the adverse impact of technological innovation on employment in the agricultural sector. This result corroborates the finding of N. Kumar, K. S. Suhag, J. Kumar and R. Singh (2010), who showed that machinery displaced human labor through improvement in farm technology. In a similar manner, technological innovation has a positive but statistically insignificant effect on employment in the industrial sector. This technology-induced employment improvement in the industrial sector could be attributed to the increase in the agricultural output and employment that makes raw materials available for the industry. Given the fact that access to raw material is a major factor hampering the performance of the Nigerian industrial sectors, technological innovation is a viable tool to not

Table 4 The bounds test result

Significance Level (k=4)	Lower Bound	Upper Bound	Models	F-statistic
10%	2.45	3.52	AGR_EMP	2.48
5%	2.86	4.01	IND_EMP	3.74
1%	3.74	5.06	SER_EMP	1.52
Significance Level (k=1)				
10%	4.04	4.78	AGR_EMP	2.86
5%	4.94	5.73	IND_EMP	1.79
1%	6.84	7.84	SER_EMP	0.80

Note: k denotes the number of the explanatory variables; AGR_EMP, IND_EMP and SER_EMP denote the employment models in the agricultural, industrial and service sectors, respectively. The critical values are obtained from Pesaran *et al* (2001), Case III: Unrestricted intercept and no trend.

Source: Author

only increase the agricultural output but also enhance industrial performance in terms of their contribution to the aggregate output and employment. This result gives credence to the stance of A. Aminu and I. A. Raifu (2019), who alluded to the fact that technology fostered intersectoral linkages and improved the aggregate output and employment.

The narrative is also similar when speaking about the service sector as technological innovation has a significant and instantaneous positive impact on employment in this sector. Given the fact that technological innovation is a product of R&D activities, its deployment and adoption in the service sector for various purposes, including employment, suggest the existence of intra-industry linkages. Comparatively, technological innovation has a more positive impact on the service sector than on the agricultural and industrial sectors, indicating that technological innovation creates more jobs in the service sector than in the other economic sectors in Nigeria. This stance is supported by A. Aminu and I. A. Raifu (2019) and M. Bolaji, J. O. Adeoti and J. A. Afolabi (2021), who alluded to the fact that the service sector benefited more from technological innovation than the other Nigerian economic sectors. Overall, technological innovation not only influences sectoral employment through employment creation and destruction but also reallocates labor across the sectors. Thus, technological innovation plays a complementary role, rather than a substitutionary one, with the labor market outcomes in the Nigerian economic sectors.

The diagnostic tests show that the model results are fit for policy formulation as the models are correctly specified and free from both serial correlation and heteroscedasticity. The adjusted R-squared statistics also show that the models have good fits, and the probability of the F-statistics indicates the models' significance. However, the residuals are not normally distributed for the agricultural and industrial employment models. U. Knief and W. Forstmeier (2021) argued that the non-normality of residuals did not affect the reliability of the estimates. Thus, the results of the agricultural and industrial employment models remain reliable.

There are different determinants of employment in the literature other than technological innovation

Table 5 The employment-innovation nexus in Nigeria

Variables	AGR_EMP Model	IND_EMP Model	SER_EMP Model
D(AGR_EMP(-1))	0.521* (0.1265)		
D(IND_EMP(-1))		0.490* (0.1057)	
D(SER_EMP(-1))			0.595* (0.1250)
D(INN)	-0.128* (0.0237)	0.011 (0.0086)	0.119* (0.0263)
D(INN(-1))	0.063** (0.0296)		-0.063** (0.0296)
C	1.192** (0.5053)	1.066* (0.2502)	1.240 (0.9399)
Adjusted R-squared	0.721	0.807	0.570
F-statistic	27.42 [0.0000]	58.26 [00000]	14.60 [0.0000]
Post-Estimation Tests			
Jarque-Bera	49.18 [0.0000]	192.36 [0.0000]	0.29 [0.8653]
Breusch-Godfrey Serial Correlation LM Test	0.78 [0.6784]	1.71 [0.4257]	4.50 [0.1054]
Heteroskedasticity Test: ARCH	0.01 [0.9402]	0.11 [0.7448]	0.02 [0.8858]
Ramsey RESET Test	0.31 [0.5790]	1.54 [0.2603]	1.23 [0.2764]

Note: * p<0.01, ** p<0.05, *** p<0.1. The numbers in block brackets and parentheses are the probability values and the standard errors, respectively.

Source: Author

(Palekhova & Kramarenko, 2020; Ubah *et al*, 2021). Therefore, the employment-innovation model is extended to account for the role of the sectoral output, inflation and domestic credit to the private sector. The results are presented in Table 6. Compared to the previously estimated employment-innovation model, there is no difference in the sign of the impact although the magnitude of the impact (of technological innovation on sectoral employment) reduces when the control variables are introduced. For the sectoral output variables, the results reveal that the sectoral output has a positive but insignificant effect on employment across the three sectors under consideration, which suggests that sectoral employment is not primarily driven by the sectoral output in Nigeria. The impact of domestic credit to the private sector appears to be mixed across the sectors. Consistent with the a priori expectation, domestic credit to the private sector exerts a positive influence on employment in the agricultural sector but has a devastating employment effect in the service sector. The result appears to be statistically insignificant for the industrial sector, implying that domestic credit to the private sector is not a determinant of employment in the industrial sector. The finding on the positive link between employment in the agricultural sector and domestic credit to the private sectors corroborates the finding of J. A. Afolabi, B. U. Olanrewaju and W. Adekunle (2022), who showed that domestic credit to the private sector as a measure of financial development had growth-enhancing and employment-generating effects in Nigeria.

The model diagnostics show that the estimated models have a good fit, which is far better than the baseline model (the model with only technological innovation as the explanatory variable) as the explanatory variables provide more explanations to the variation in sectoral employment. All the explanatory variables also jointly predict sectoral

Table 6 The role of the other factors in the employment-innovation nexus

Variables	AGR_EMP Model	IND_EMP Model	SER_EMP Model
D(AGR_EMP(-1))	0.434* (0.0889)		
D(IND_EMP(-1))		0.528* (0.0956)	
D(SER_EMP(-1))			0.431* (0.1071)
D(INN)	-0.094* (0.0207)	0.004 (0.0078)	0.093* (0.0234)
D(INN(-1))	0.046** (0.0216)		-0.044*** (0.2398)
D(AGR_Y)	0.004 (0.0045)		
D(IND_Y)		0.0004 (0.0037)	
D(SER_Y)			0.008 (0.0059)
D(INF)	0.010 (0064)	-0.017* (0.0054)	0.011 (0.007)
D(INF(-1))		0.015* (0.0055)	
D(CPS)	0.028* (0.0059)	-0.001 (0.0009)	-0.030* (0.0066)
C	1.142* (0.3252)	1.282* (0.2790)	-1.272* (0.4599)
Adjusted R-squared	0.827	0.836	0.763
F-statistic	40.18 [0.0000]	42.91 [0.0000]	23.13 [0.0000]
Post-Estimation Tests			
Jarque-Bera	3.19 [0.2027]	78.07 [0.0000]	0.29 [0.8653]
Breusch-Godfrey Serial Correlation LM Test	4.23 [0.1204]	4.18 [0.1237]	4.50 [0.1054]
Heteroskedasticity Test: ARCH	0.05 [0.8249]	0.96 [0.3281]	0.02 [0.8858]
Ramsey RESET Test	0.004 [0.9494]	2.83 [0.1546]	1.23 [0.2764]

Note: * p<0.001, ** p<0.05, *** p<0.1. The numbers in block brackets and parentheses are the probability values and the standard errors, respectively.

Source: Author

employment as depicted by the probability value of the respective models. In a similar fashion, the postestimation test results show the reliability of the model estimates for policy prescriptions as the models have a correct specification, are homoscedastic and not serially correlated. In addition, the residual of each model is normally distributed, except for the model of employment in the industrial sector. In general, the diagnostic and postestimation test results signal the soundness of the policy options that might emanate from the findings.

CONCLUSION

Employing the ARDL framework and using the quarterly data spanning the period between 2011Q1 and 2021Q4, this study focused on demystifying the effect of technological innovation on employment across the Nigerian economic sectors. The analysis was carried out in two stages. First, the employment-innovation nexus was evaluated. Second, the role of the sectoral output, inflation and domestic credit to the private sectors in the employment-innovation nexus was thereafter analyzed. The result of the ARDL models revealed that the relationship between employment and technological innovation in Nigeria was a short-term phenomenon. The short-term estimates revealed the fact that technological innovation improved employment creation in the service sector but reduced employment generation in the agricultural sector. However, employment generation occurred one quarter after technological innovation had been introduced. The results also signaled the reallocation of labor across the Nigerian economic sectors.

The empirical results of the preset hypotheses suggest that the hypotheses should be accepted. The synopsis of the results of the hypotheses reads as follows:

- Technological innovation substantially improves employment generation in the service sector, as well as the agricultural sector, although the magnitude of the impact is higher in the service sector than in the agricultural sector.
- The agricultural sector's employment-creating capacity is less responsive to changes in technological innovation than the service sector's as it takes about three months before the introduction of the new technology can generate employment in the agricultural sector.
- Technological innovation has the labor-reallocating capacity as it displaces and absorbs labor across the considered sectors.

The key practical policy implication of these findings is the need to fully operationalize and adopt technological innovation, especially in the Nigerian agricultural and service sectors, which can be done by implementing extant science, technology and innovation (STI) policies and formulating the new policies that mainstream innovation into sectoral productive operations as well. This effort will not only increase the productivity of the existing employees across the sectoral groups, but it will also create new jobs that will reduce the number of the labor force in the unemployment pool.

The key limitations of this study are twofold. First, it assumes linearity in the technology-employment nexus in Nigeria. Second, the data paucity limited the scope of the study. The findings of this study remain valid notwithstanding these limitations. Future research may explore nonlinear approaches so as to evaluate the asymmetric relationship between technological innovation and employment in Nigeria and other developing countries.

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CURRENT ACCOUNT IMBALANCES AND EXCHANGE RATE VOLATILITY: EMPIRICAL EVIDENCE FROM INDONESIA

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Whether macroeconomic fundamentals affect the exchange rate volatility in emerging markets with an inflation-targeting regime or not is highly challenging. In this paper, the impact of the current account deficits and foreign reserves on the volatility of real exchange rates. Applying threshold quantile regression models related to Indonesia over the period from 2005(7) to 2021(12), it is concluded that both variables play an important role in controlling the exchange rate instability. Both coefficients are also found to have an upward linear pattern. The asymmetric impact of current account balance holds. Claiming that a two-percent current account deficit in the GDP is the safe amount of the deficit that will not significantly affect the foreign-exchange rate is justified as such. The asymmetric behavior of the current account balance has the potential to trigger real exchange rate volatility, thereby undermining the monetary policy within the framework of the inflation targeting regime. Accordingly, the optimal stock of foreign reserves might avoid imposing dual goals of inflation targeting and exchange rate stability.

Keywords: current account, foreign reserves, exchange rate, asymmetric response, quantile regression

JEL Classification: E58, F31, F32, O24

INTRODUCTION

The 1997-1998 Asian Currency Crisis and the 2008 Global Financial Crisis made emerging markets pay more attention to external economic factors. Alongside successful stabilization programs, the main external factors determining the fluctuation of exchange rates are challenging. On the one hand, huge current account deficits underlie the financial instability problem (Kaminsky, Lizondo & Reinhart, 1997; Calderon, Chong & Loayza, 2002). In relatively noncompetitive environments, the emerging market's exchange rates are more volatile than those in developed economies (Chițu & Quint, 2018).

Additionally, the main cause for the currency/monetary crisis is the shortage of foreign reserves in developing countries in Asia (Edwards, 2004; Levy-Yeyati, Sturzenegger & Gluzmann, 2013). Countries

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preserve foreign reserves as a surprise absorber to cope with sudden brief fluctuations in worldwide payments (Aizenman & Lee, 2007). High international reserves reduce vulnerability to speculative attacks (Cheung & Qian, 2009) and limit exchange rate depreciation (Arslan & Cantú, 2019). The growth and level of foreign reserves are also a signal to global financial markets for the credibility and solvency of those countries' monetary policies (Andriyani, Marwa, Adnan & Muizzuddin, 2020).

Others argue that the current account deficits should be less of an issue when financed by capital and/or financial inflows (Frankel & Rose, 1996; Chinn & Prasad, 2003). Capital market liberalization can compensate for current account imbalances (Steiner, 2013) and therefore lower exchange rate instability. Hence, liquid currencies and stable financial markets are necessary to attract capital and/or financial inflows (Verma & Bhakri, 2021), which in turn boosts foreign exchange in supply and eventually softens exchange rate volatility.

However, holding huge foreign reserves is not risk-free in terms of the opportunity cost (Green & Torgeson, 2007), lost aggregate income or welfare (Chan, 2007), or even the disruption of financial markets (Mohanty & Turner, 2006). In a similar fashion, covering a current account deficit after capital and/or financial inflows suffers a capital reversal or a sudden stop in capital inflows, which may exert adverse pressure on exchange rate volatility. Therefore, optimal foreign reserves in relation to a benefit and a cost is desirable for exchange rate stabilization (Islam, 2021).

Indonesia is a good example to discuss those issues on. Suffering a sky-rocketing inflation rate, dropped economic growth and the heavy currency depreciation during the 1997-1998 Asian financial crisis enforced Indonesia' monetary authority to implement various economic recovery agendas. In relation to the stabilization programs, the Central Bank switched the monetary policy frameworks to and fully adopted the inflation targeting (IT) regime in July 2005. All the fundamental changes made were aimed at achieving a stable currency (the Indonesian rupiah) both in terms of inflation and exchange rates, the single goal as mandated by the new Law on the Central Bank.

In line with the independence of the Central Bank, the monetary authority discarded capital flow restrictions, removed interest rate limitations, replaced fixed exchange rates with a flexible exchange rate system, and deregulated almost the entire financial system. As a result, during the 2008 global financial crisis, Indonesia enjoyed relatively low inflation and stable exchange rates compared to the previous crisis. Unfortunately, Indonesia's current account has fallen into deficit since late 2011. The target of the two-percent current account deficit to the GDP ratio often was not reached. M. N. Nugroho, I. Ibrahim, T. Winarno and M. I. Permata (2014) show that the exchange rate depreciated 12.7 percent month-on-month once the current account deficit exceeded the GDP threshold of two percent.

Many researchers found that the Indonesia' current account deficits are unsustainable (Nurmalindah & Safuan, 2013; Asmarani & Falianty, 2015) or even insolvent (Garg & Prabheesh, 2022). To finance the unsustained current account imbalances, the country relies on the capital and financial flows accumulated in foreign reserves. The growth of international reserves has been remarkable in recent years. The foreign currency reserves have amounted to about 12.7 percent of the GDP at the end of 2020 and were capable of covering imports for nine months ahead, which is much longer than the conventional minimum standard of the three months' import.

Despite the substantial progress of the sectoral economy and the monetary policy management in Indonesia so far, the current account deficit remains chronic in nature. Indonesia's most exported products are raw materials, whereas manufactured export products are supported by raw materials, intermediate goods, and capital equipment derived from imports. The strong correlation between exports and imports implies that the debt service payment plays a more dominant role in the current account imbalance. As will be shown, the current account imbalances and the foreign reserves are separately analyzed in conjunction with exchange rate movements, and some studies have not taken into account their joint effect yet.

Accordingly, the purposes of this article include the investigation of (a) whether there are sufficient foreign exchange reserves to finance current account imbalances in order to hedge exchange rate instabilities or not; and (b) whether the maximum two percent current account deficit to the GDP ratio is empirically justified to maintain exchange rate performance and satisfy the optimal hoarding of foreign exchange reserves. Hence, the hypotheses to be tested in this study are as follows:

H1: Current account imbalances provoke exchange rate volatility.

H2: The accumulation of foreign reserves has a positive significant effect on the alleviation of exchange rate volatility.

H3: A two-percent current account deficit to the GDP ratio has no discernible impact on the declining of exchange rate volatility.

This article adds to the empirical literature on the international monetary policy in emerging markets with an IT regime. Combining the two fundamental macroeconomic variables in a unified method, quantile regression, which permits the outlier observations that often emerge in developing countries, is used. A nonlinear threshold quantile regression model is also designed so as to capture the asymmetric change in the exchange rate volatility position throughout the distribution.

This paper is organized as follows: in Section 2, a review of the empirical literature is given; the research methodology and the data used for the estimation are described in Section 3; Section 4 contains the estimates and the discussion of the results obtained, while conclusions are presented in Section 5.

REVIEW OF EMPIRICAL LITERATURE

The current account balance comprises the balance of trade in goods/services and net investment earnings from foreign assets plus net transfers. In general, a current account deficit is a consequence of an increasing net trade deficit where the value of imports is greater than the value of exports. As a result, there will be a leakage in terms of the net money outflow from a home's income circulation. Consumers and producers pay for the imported goods/services in their own currency, which in turn is converted into the counterpart country's currency. Hence, an increasing current account deficit causes an increased supply of a home currency in foreign exchange markets, resulting in the external value of the domestic currency drops.

Persistent exchange rate depreciation can be induced by fundamental factors, such as low productivity growth in the traded goods/services industry or the unexpected terms of a trade shock (Roubini & Wachtel, 1999). In a free-floating exchange rate regime, the increasing net trade deficit might also have been generated by a fall in the value of exports, which will lead to the supply of foreign currency shifts to the left, which causes the home currency depreciation. In a managed or fixed exchange rate regime, this could reflect the mismatch between the monetary policy in place and the exchange rate policy, resulting in an overvalued exchange rate (Bubula & Ötker-Robe, 2003).

An overvalued exchange rate may trigger a decrease in savings when domestic residents intertemporally substitute current consumption for future consumption. It will further broaden the current account imbalance and decrease foreign reserves. A decline in foreign reserves can be reinforced by the expectations of the future devaluations that will drive capital outflows. Large capital outflows may also induce exchange rate depreciation in a flexible exchange rate system. If it is not accompanied by long-term fundamental factors, it can cause undervaluation. Eventually, the weakening of external imbalances retards a country's ability to achieve the conditions of exchange rate stability.

The empirical studies concerning the impact of current account imbalances on exchange rate fluctuations offer a diverging result. D. K. Das (2016) points out the fact that current account imbalances have a negative impact on the real effective exchange rate in the case of developed countries. For developing

countries, current account imbalances distort the stability of the exchange rate. In contrast, S. T. Jawaid and S. A. Raza (2013) observe that there is a long-term positive association, as well as a reciprocal causal relationship, between current account deficits and the exchange rate. However, P. Dybka and M. Rubaszek (2017) find that the exchange rate has a very limited effect on the current account balance for the largest number of developing countries.

Although current account imbalances adversely affect exchange rate stability, the effect of foreign reserves on exchange rate fluctuations in IT regimes provides ambiguous results. Foreign reserves accumulation has a limited impact on exchange rate volatility (Petreski, 2012). Foreign reserves might potentially turn the exchange rate into a nominal anchor and support inflation targets (Osawa, 2006). Unexpected changes in financial dollarization greatly influence nominal exchange rates (Fabris & Vujanovic, 2017). Nevertheless, foreign reserves mitigate exchange rate volatility in the IT period compared to the pre-IT period (Fermo & Lemence, 2014).

For individual IT countries, foreign reserves have a mixed impact on exchange rate stability. The decrease in Slovakia's foreign reserves has a greater impact on the exchange rate than the increase in its foreign reserves (Banerjee, Zeman, Ódor & Riiska Jr, 2018). S. Stevanovic, I. Milenkovic and S. Paunovic (2022) note that, for Albania and Romania, the adoption of the IT regime has no meaningful impact on macroeconomic instability. Declining South Korean foreign reserves boost exchange rate volatility in the long run (Law, 2019). The sufficiency of foreign reserves in Chile is more sound to manage exchange rate volatility primarily when the level of the exchange rate is high (Hansen & Morales, 2019). Meanwhile, the foreign reserves stock in Turkey is completely ineffective to overcome exchange rate volatility and its movements (Tümtürk, 2019).

Purely in the case of Indonesia, the related studies are limited. Most studies pay more attention to exchange rate misalignment rather than exchange rate volatility. Indeed, exchange rate misalignment may ultimately create exchange rate volatility (Grossmann & Orlow, 2022). S. Sidiq and H. Herawati (2016), for example, say that, against the US dollar, the rupiah is undervalued during free floating exchange rate regime. Based on the Big Mac index, T. S. Nababan (2016) shows that rupiah is undervalued against the US dollar. There is the evidence that the mismatch of the rupiah as a currency is underestimated for the largest number of the observation periods (Rasbin, Ikhsan, Gitaharie & Affandi, 2021).

While adequate foreign reserves induce the exchange rate to return to the long-term equilibrium levels (Kuncoro & Santoso, 2022), the policy rate (as the main instrument in the IT regime to anchor a future inflation expectation) fails to cope with exchange rate volatility (Kuncoro, 2020). Exchange rate stabilization in Indonesia seems to put too big an emphasis on controlling foreign reserves, thus leading to neglecting the improvement of current account imbalances, ultimately resulting in persistent exchange rate volatility. The failure of market intervention to reduce exchange rate deviation from its equilibrium level is harmful towards the likelihood of currency crises (Heriqbaldi, Widodo & Ekowati, 2020).

Accordingly, there is no widespread agreement on how foreign reserves affect exchange rate volatility and a further consideration is needed. It is worth noting that most studies analyzing exchange rate volatility have ignored current account conditions. Only few studies put foreign reserves in their analytical approaches. Therefore, the exchange rate is volatile for a particular country and not necessarily always for another since both current account imbalances and foreign reserves are a country's specifics. This study fills these empirical gaps and explores the role of current account imbalances and foreign reserves on exchange rate volatility in Indonesia, one of the biggest developing countries with the IT regime.

RESEARCH METHOD AND DATA

The foregoing empirical studies on the foreign exchange market generally rely on the GARCH

model (Generalized Autoregressive Conditional Heteroscedasticity) to measure volatility. Models such as GARCH focus on estimating the conditional mean function. The mean effect is obtained by the conditional inversion of the mean. The standard deviation from the conditional mean regression is interpreted as a measure of volatility. As a result, the distributional effects are not fully characterized and covariate influences are distorted, especially when the independent variables are highly heterogeneous.

These issues seem to be relevant to current account imbalances. Indonesia's current account deficit (as many researchers have pointed out) is unsustainable and the current account imbalance will rarely return to its mean. In other words, current account imbalances do have unit roots or are nonstationary. The presence of current account data stationarity suggests that the economy can generate a future trade surplus to meet all of its external debt. The non-stationarity of the current account imbalance may result from a structural collapse and country-specific characteristics (Roubini & Wachtel, 1999).

To address this fundamental issue, some authors involve two-regime threshold cointegration (Hansen & Seo, 2002), unit roots and fractional integration (Cunado, Gil-Alana & de Gracia, 2010), and Granger causality, Johansen cointegration, ARDL (autoregressive distributed lag) bound tests, and the simultaneous equation system (Behera & Yadav, 2019), whereas others use different approaches, such as nonlinear models to capture structural breaks (Chen, 2011), regime change or threshold (Afonso, Huart, Jalles & Stanek, 2019), and vector autoregression (Jin, Wang & Zhao, 2021). Cointegrating regression analysis is also employed to solve those econometric obstacles (Ozdamar, 2015) but with divergent results.

A. Y. Huang, S-P. Peng, F. Li and C-J. Ke (2011) and Ü. O. Tümtürk (2022) employ quantile regression to forecast exchange rate volatility without incorporating the current account balance or foreign reserves in their analytical models. The application of quantile regressions in the current account balance and foreign reserves analysis offers some advantages. Quantile regression produces a robust estimator even if the set data on the dependent variable contain some outlier observations. Quantile regression is also a good choice when the set data observations suffer highly heterogeneous conditions. Quantile regression can yield the unique estimator for each quantile. It is therefore possible to assess the position of established data on the distribution of the dependent variables with the most effective policy choices available.

Current account balances have deteriorated in terms of currency depreciation as developing countries have not taken steps to stimulate export growth and are heavily dependent on imports, such as Indonesia (Kandil, 2009). G. Adler, K. S. Chang and Z. Wang (2021) emphasize the fact that monetary authorities with the dual goals of the IT and exchange rate stability make foreign exchange reserves more inclined to exceed the exchange rate. They imply that most unconditional exchange rate volatility distributions are typically right-skewed. Right-skewed exchange rate volatility and a pervasive current account imbalance and foreign reserves distributions suggest that the corresponding coefficient increases with quantiles, which further implies that the impact of the current account imbalance and foreign reserves on exchange rate volatility is greater for upper quantiles.

Unconditional quantile regression models can be applied to examine the volatility of the exchange rate (Koenker & Bassett, 1978). The exchange rate refers to the real term (*RER*):

$$RER_t \frac{ER_t}{P_t} \tag{1}$$

Real exchange rate volatility (*XV*) is assumed to be affected by the current account balance (*CA*), foreign reserves (*FR*), and other control variables (*Z*):

$$XV_t = a + b\, ca_t + c\, fr_t + d\, Z_t + \varepsilon_t \tag{2}$$

where the lower-case represents the ratio to the GDP and ε is the disturbance term.

Real exchange rate volatility is the standard deviation divided by its mean. Each variable is calculated by

moving the average for the 12 consecutive months:

$$XV_t = \sqrt{\frac{\sum_i^{12} (RER_i - \overline{RER})^2}{n-1}} \div \overline{RER} \quad (3)$$

The coefficients *a*, *b*, *c*, and *d* are the unknown parameters to be estimated for various quantile values. The signs *b* and *c* are expected to be negative, the other coefficients also potentially negative or positive. By changing the quantile value from 0 to 1, it is possible to conditionally see the full distribution of the explanatory variables across the regressors.

The current account balance could be a deficit, a balance, or a surplus. The current account balance is rarely met in the real world. The deficit and surplus states have different impacts on exchange rate volatility. In line with B. E. Hansen and B. Seo (2002), unconditional exchange rate volatility is estimated by splitting up the current account balance into a deficit and a surplus:

$$d_1 = \begin{matrix} 1 - if\ ca_t > 0 \\ 0 - if\ ca_t \le 0 \end{matrix} \text{ and } d_2 = \begin{matrix} 1 - if\ ca_t < 0 \\ 0 - if\ ca_t \ge 0 \end{matrix} \quad (4)$$

where *d* is a dummy variable. Substituting (4) for (2), it follows that:

$$XV_t = a + b_1 \left[d_1 \times ca_t \right] + b_2 \left[d_2 \times ca_t \right] + c\ fr_t + d\ Z_t + \varepsilon_t \quad (5)$$

The symmetric impact of the deficit and surplus states ($b_1 = b_2$) on exchange rate volatility can be exerted using the Wald test. To solve the asymmetric and nonlinearity problems often arising on financial markets and being comparable to the GARCH method, refer to Equation (5).

Similarly to (4), a tolerable current account imbalance ratio can also be set, let us say *l* percent is set as the threshold:

$$d_3 = \begin{matrix} 1 - if\ ca_t > l_1 \\ 0 - if\ ca_t \le l_1 \end{matrix} \text{ and } d_4 = \begin{matrix} 1 - if\ ca_t < l_2 \\ 0 - if\ ca_t \ge l_2 \end{matrix} \quad (6)$$

and then

$$XV_t = a + b_1 \left[d_3 \times ca_t \right] + b_2 \left[d_4 \times ca_t \right] + c\ fr_t + d\ Z_t + \varepsilon_t \quad (7)$$

Because the focus is on volatility, reliable long-term historical data on current account balances, exchange rates, and international reserves are needed. The exchange rate is the US dollar price against the local currency (the Indonesian rupiah). Current account balances record a country's transactions with the rest of the world, primarily its net trade in goods and services, as well as its net income from cross-border investments and payments, and its net transfer over a period of time. Current account balances are stated in millions of US dollars. The international reserve basket contains various foreign financial assets under control of the Central Bank. Denominated in millions of US dollars, it can be used to finance any balance of payments.

The GDP is also stated in millions of US dollars. The real term of the exchange rate is converted from the price levels that deal with the CPI (consumer price index, 2012 = 100). Transforming exchange rate volatility into a real term means that our model inherently incorporates the inflation rate. In a similar fashion, dividing current account imbalances and foreign reserves by the GDP means that our model inherently takes into account growth rates (Figure 1). The sample periods range from 2005(M7) to 2021(M12), capturing the IT regime adoption. The total observations include 198 sampling points. All monthly data were obtained from Bank Indonesia, whereas the other data were obtained from the IMF.

RESULTS AND DISCUSSION

All the variables of interest are summarized in Table 1. The descriptive statistics indicate that each mean is close to the corresponding median. The close proximity of the mean to the midpoint value indicates that all the considered variables are normally distributed. While the real exchange rate volatility to reserves ratio peaks and troughs are relatively small, the data about the current account series vary to a great extent. The high variability of the current account balance is supported by the high standard deviation around its mean.

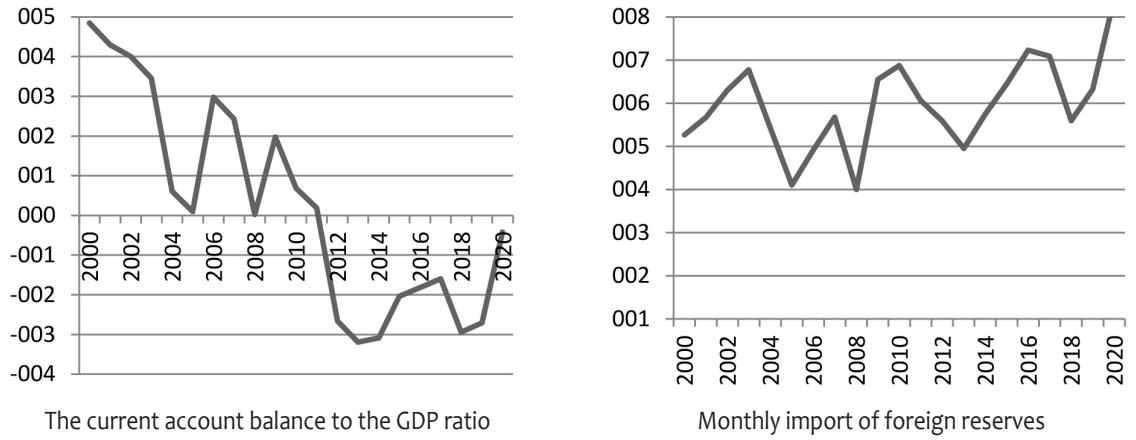

Figure 1 The current account balance and foreign reserves in Indonesia

Source: Authors

Separating the current account imbalance into a deficit and a surplus offers a clearer explanation about the source of that variability. The biggest portion of the current account imbalance over the period of observation is not equitably distributed. The current account surplus and deficit are evident in 75 and 123 cases, respectively. The mean value of the deficit is also slightly higher than that of the surplus. Moreover, the biggest portion of the current account deficit values are stationed in the lower tail, as is indicated by the negative value of skewness. High current account volatility is a common feature of many developing countries (Kandil, 2009).

The non-zero skewness value indicates that all the series data are asymmetrically distributed. For example, the bottom of the foreign reserve distribution is thicker than the top of it. Also, the kurtosis coefficient is greater than 3. This indicates that the shape of the real exchange rate volatility to foreign reserves ratio distributions are sparser (moderate) than the normal distribution. The synchronous distributions among the current account, foreign reserves, and the exchange rate volatility series data raise plausible questions about how closely related they are.

Table 1 The descriptive statistics

	XV	ca	ca > 0	ca < 0	fr
Mean	0.0362	-0.0073	0.0175	-0.0224	0.0141
Median	0.0300	-0.0107	0.0165	-0.0214	0.0140
Maximum	0.1025	0.0567	0.0567	-0.0002	0.0189
Minimum	0.0060	-0.0597	0.0000	-0.0597	0.0103
Std. Dev.	0.0237	0.0231	0.0135	0.0120	0.0012
Skewness	1.3153	0.3932	0.9445	-0.6468	0.2070
Kurtosis	4.0066	2.6907	3.5178	3.4438	4.2826
Jarque-Bera	65.4469	5.8908	11.9877	9.5852	14.9853
Probability	0.0000	0.0526	0.0025	0.0083	0.0006
Observations	198	198	75	123	198

Source: Authors

To assess the pattern of the harmonic movement among exchange rate volatility, foreign reserves, and the current account balance, the correlation matrix is calculated as shown in Table 2. The opposite synchronous pattern is between the reserves and real exchange rate volatility (-0.18), whereas the correlation between the current account balances and real exchange rate volatility is pairwise positive (0.47). Based on these figures, real exchange rate volatility can be said to be tied to the current account dynamics. Since the current account balance is deficit-dominated, real exchange rate volatility is more directly related to growing current account deficits. They will be explored in more detail using econometric methods, as discussed in the previous section.

Table 2 The correlation matrix

	XV	ca	fr
XV	1.0000	0.4707	-0.1843
ca	0.4707	1.0000	-0.0205
fr	-0.1843	-0.0205	1.0000

Source: Authors

Does a high current account imbalance variability imply stationarity? Does relatively low instability in foreign reserves and real exchange rate volatility pretend to be non-stationary? Table 3 performs the Augmented Dickey-Fuller (ADF) and ADF with structural breaks unit roots test results for the basic series data. The null hypothesis that there is a unit root can be rejected for each variable, which implies that the series data are stationary. This implies that all the variables are integrated in the order of zero (*I(0)*).

The same test is applied to the first-difference series data. Structural breaks are found in 2007, 2008, and 2011. High current account imbalance variability arose in 2007 in accordance with the peak of the commodity boom. As a natural resource exporting country, the peak commodity boom triggered foreign exchange reserves. However, the foreign exchange reserves dropped in 2011, when the current account balance began to be a deficit. The high volatility of the real exchange rate in 2008 took place in connection with the Global Financial Crisis of 2008. The capital outflows induced a lack of foreign exchange in the domestic financial market, resulting in the nominal exchange rate being sharply depreciated.

Table 3 The unit roots test

	Level		First-difference		
	t-stat	Prob.	t-stat	Prob.	Break point
XV	-3.3005	0.0161	-9.0339	< 0.01	2008M11
ca	-2.9193	0.0449	-13.5492	< 0.01	2007M01
fr	-4.6661	0.0001	-16.1140	< 0.01	2011M12

Source: Authors

Although there is a structural rupture in all the series data, the null hypothesis that there is a unit root in the time series for each variable can be rejected at the 5% or even 1% significance level. These stationary series data tests are important in order to ensure that the analytical model is an error-free regression and produces time-invariant estimates. They also suggest that the impact of the shock disappears over time and that the data for the three series evolve towards the long-term average. Ultimately, the three variables tend to approximate the long-term equilibrium relationship predicted by the related theory.

Different results are obtained for the foreign reserves. The coefficient of foreign reserves is found to be negative and significant only for the upper quantiles. The coefficients *c* in the quantiles of 0.50, 0.75, and 0.90 in the conditional median are statistically significant (Table 4). The quantile process estimate shows an upward linear trend. The higher foreign reserves stockpiling, the lower exchange rate volatility. This result is similar to many researchers' findings, as is highlighted in the review of the empirical literature section. They suggest that the efficacy of foreign reserves accumulation is different depending on the degree of real exchange rate volatility.

Separating the current account imbalances with respect to the surplus and the deficit as specified in Equation (4) generates an interesting result. As presented in Table 5, the regression results display

that the current account deficit ratio ($ca < 0$) affects the real exchange rate volatility for all quantiles. Surprisingly, the current account surplus ($ca > 0$) provokes real exchange rate volatility, in particular the quantiles 0.75 and 0.90, which is consistent with the studies of S. T. Jawaid and S. A. Raza (2013) and D. K. Das (2016). Compared to those studies, this study empirically proves that the impact of the current account deficit shows an upward linear trend throughout the unconditional real exchange rate volatility distribution.

A similar result is obtained for the foreign reserves. The stock of foreign reserves lowers exchange rate volatility in the higher quantiles, primarily in the quantile 0.75. This result confirms the study by E. Hansen and M. Morales (2019). The impact of the foreign reserves is stronger when the real exchange rate suffers high volatility rather than low volatility. In addition, most symmetric tests infer that there is no different effect of the deficit and surplus countries on real exchange rate volatility. Hence, the effectiveness of the availability of foreign reserves differs depending on the degree of accumulation. Considering each current account imbalance state, this allows the Central Bank or the monetary authority to further achieve optimal foreign reserves.

Furthermore, imposing two percent as a tolerable threshold for the current account deficit ratio as in Equation (7) provides an optimal level. As depicted in Table 6, the impact of a more than two percent current account deficit ratio could lower real exchange rate volatility by about 0.8 basis points in the top 10 percent of the distribution. This finding supports the study by M. N. Nugroho *et al* (2014). While they show that the exchange rate at level will drop after a current account deficit exceeding the threshold of the

Table 4 The estimation results of the simple quantile regression

	Quantile				
	0.10	0.25	0.50	0.75	0.90
C	0.05*	0.05**	0.07***	0.09***	0.13***
ca	0.19***	0.18**	0.31***	0.66***	0.87***
fr	-2.23	-1.72	-2.58**	-2.68*	-3.91***
Pseudo R^2	0.04	0.06	0.08	0.18	0.30
Adj R^2	0.03	0.05	0.07	0.17	0.29
S.E.R	0.03	0.03	0.02	0.02	0.04

Note: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively; S.E.R. denotes Standard Errors Residuals

Source: Authors

Table 5 The estimation results of the extended quantile regression

	Quantile				
	0.10	0.25	0.50	0.75	0.90
C	0.06***	0.05**	0.07***	0.10***	0.10***
ca < 0	0.48***	0.28*	0.29**	0.42***	0.66***
ca > 0	-0.14	0.06	0.36	1.14***	1.52***
fr	-2.65*	-1.78	-2.50*	-3.61**	-2.34*
Pseudo R2	0.06	0.06	0.08	0.20	0.31
Adj R2	0.05	0.05	0.06	0.19	0.30
S.E.R	0.03	0.03	0.02	0.02	0.04
Symmetric	No**	Yes	Yes	No**	Yes

Note: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively; S.E.R denotes Standard Errors Residuals

Source: Authors

Table 6 The estimation results of the threshold quantile regression

	Quantile				
	0.10	0.25	0.50	0.75	0.90
C	0.05**	0.05**	0.08***	0.09***	0.08***
ca < -0.02	0.47***	0.41***	0.34***	0.43***	0.80***
-0.02 < ca < 0	0.78***	0.93***	0.78***	0.91***	2.03***
ca > 0	-0.22	-0.19	0.28	1.05***	1.22*
fr	-2.10	-1.65	-2.73**	-2.82**	-0.73
Pseudo R^2	0.08	0.09	0.09	0.21	0.34
Adj R^2	0.06	0.07	0.07	0.20	0.32
S.E.R	0.03	0.03	0.02	0.02	0.04
Symmetric	No**	No*	Yes	No***	No***
Slope equality test	Quantile	0.25	0.50	0.75	0.90
	0.10	2.12	5.03	34.47***	55.95***
	0.25		4.83	32.72***	53.17***
	0.50			14.95***	37.97***
	0.75				20.64***

Note: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively; S.E.R denotes Standard Errors Residuals

Source: Authors

two percent of the GDP, this paper is more concerned with volatility.

Allowing the current account deficit ratio to be no less than two percent of the GDP could lower real exchange rate volatility by about 2.03 basis points in the top 10 percent of the distribution. Meanwhile, the current account surplus tends to induce real exchange rate volatility. It seems that the 'fear of capital mobility' (Steiner, 2013) works together with the 'fear of appreciation' (Levy-Yeyati *et al*, 2013). Foreign exchange market players are sensitive to the foreign reserve stock. At the same time, capital needs and/or capital inflows to finance current account deficits also make foreign exchange market participants responsive to the local currency appreciation.

Accordingly, the Central Bank's target of maximum two percent Indonesia's current account deficit to GDP ratio is justified here. The current account deficit ratio no lower than two percent seems to be desired. In this position, the existing stock of the foreign reserves enables it to maintain the exchange rate against instability. Moreover, the symmetry test results show that the slope coefficients are quite different. The slope coefficients substantially differ across the 0.75th and 0.90th pairwise quantiles, implying that adequate foreign reserves are required to overcome the excessive exchange rate volatility induced by the current account imbalances.

It is also necessary to test whether the results of the simple model are equal to the extended models that incorporate the classification of the current account imbalances. Table 6 also presents the Wald test for the equality of slope coefficients across the quantiles. Obviously, there are some different slope coefficients across quantiles. All the slope coefficients in the quantiles 0.75 and 0.90 pairwise substantially differ from the others, as is found in the individual symmetric tests. These results show that the different slope coefficients are not only intra-quantile but inter-quantile coefficients as well.

Overall, the sign, magnitude, and significance of the current account imbalances and foreign reserve coefficients do not substantially alter. The current account imbalances and the stock of foreign reserves successfully explain the dynamics of exchange rate volatility. Although there is a structural break, real

exchange rate volatility remains predictable with respect to the disequilibrium process. Therefore, the conclusions presented in this paper are robust independently of the control variables to be added in the econometric model.

CONCLUSION

This paper aims to evaluate the impact of current account imbalances and foreign reserves availability on real exchange rate volatility in the IT regime. To the best of the authors' knowledge, this study could be considered as a pioneer investigating the effectiveness of the IT regime to curb exchange rate volatility by connecting it to current account imbalances and foreign reserves. Considering the case of Indonesia over the period from 2005(7) to 2021(12), the results of quantile regression show that the current account imbalance enhances exchange rate fluctuations, and that the availability of foreign exchange reserves moderates exchange rate volatility. Thus, the hypotheses H1 and H2 can be accepted. It is also found that the coefficients of the two main macroeconomic variables tend to increase linearly. The estimate of the regression quantile is greater at higher quantiles than at lower quantiles.

Current account imbalances differently affect real exchange rate volatility. The quantile process estimates for the deficit state are significantly lower than those for the surplus states. However, allowing the current account deficit ratio to be no less than 2 percent of the GDP has a greater effect on the upper quantile of the real exchange rate volatility distribution. This confirms the third hypothesis. The corresponding slope coefficient can be interpreted as the increasing effect of both variables on exchange rate volatility. In this position, capital and/or financial inflows enable keeping the exchange rate against instability.

Given the different effect of current account imbalances on real exchange rate volatility holds not only intra-quantile but also inter-quantile, improving external competitiveness should be an integral part of the macroeconomic stabilization policy. Current account imbalances will stimulate imported inflation. It then seriously boosts the domestic inflation rate and thereby ruins the credibility of the IT monetary policy. Foreign reserves accumulation generated from capital and/or financial inflows can control exchange rate volatility. Accordingly, the optimal stock of foreign reserves might avoid imposing dual goals of IT and exchange rate stability.

The issue of current account imbalances and foreign reserves in relation to exchange rate volatility is open to reinvestigation. The current account imbalances (i.e. the deficit and the surplus) referred to in this study are treated as a discrete variable. Further research is advisable to accommodate continuous change in current account imbalances. Since exchange rate fluctuations consist of both appreciation and depreciation, the distinction of changes in foreign reserves to accommodate each state is also strongly recommended. Eventually, those methodological improvements allow the implementation of the better-specified monetary policies oriented towards minimizing the economy's vulnerability to external shocks in the IT regime.

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BUSINESS AND INSTITUTIONAL DETERMINANTS OF EFFECTIVE TAX RATES IN SERBIAN BANKS

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The objective of the current paper is to study the influence of the selected business and institutional determinants on the annual effective tax rates in banks in Serbia. Panel data regression models are applied on 113 observations, covering the period from 2017 to 2021, where the accounting and current effective tax rates are used as a measure of the actual tax burden. The results show that the effective tax rate in banks in Serbia is significantly below the statutory level. Furthermore, for each data set, the coefficients of changes in the effective tax rate are calculated, and the most adequate model is selected using the Hausman and Breusch-Pagan tests. In the first model, the biggest change in the effective tax rates is caused by change in leverage, merger and acquisition processes and the bank size. The presence of loan loss provisions in the model completely highlights the impact of profitability and leverage. Finally, in the last model, banks with a profit before tax can manage effective tax rates and tax burdens by regulating capitalization levels. The results of this study are of interest for economy creators and for business managers in banks, helping them in effective tax planning and managing the results.

Keywords: tax burden, effective tax rate, leverage, loan loss provisions, capitalization, profitability

JEL Classification: G21, H21

INTRODUCTION

The topic of the importance of income taxation gains in the context of the income and expenses recognized in the tax balance and the determinants that affect the effective tax rate is viewed through the concept of tax planning in the function of managing the bank's results. The effective tax rate reveals the actual level of a bank's tax burden and reflects the income and expenditure management policy. It is especially emphasized in the countries with a double reporting system, where every business entity, including a bank, is obliged to prepare and submit financial reports, as well as a tax balance, thus creating a possibility of accounting results correction. In those countries, it is certain that banks will have a lower rate compared to the one determined at the state level. Also, considering the crucial role of banks in a country's financial system, expressed especially in crisis conditions, countries stimulate their operations in a way that banks enjoy additional tax exemptions

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compared to the private sector companies. In Serbia, the taxation of banks' profits differs from the taxation of the private sector companies in terms of regulations on thin capitalization, the write-off of loan receivables and tax treatment on off-balance placements (Vržina, 2018). In this context, differences in tax treatment are also mentioned, which may arise when multinational banks open their offices in countries with low taxes, such as Serbia, or use different types of tax privileges, such as intergroup lending.

Research in the effective tax rate determinants primarily focuses on internal (traditional) and external (institutional) factors. At the same time, it is an important fact that out of the total number of papers, there are but a small number of those examining the variability of the effective tax rate focusing on the banking sector. Most of these analyses were performed on the example of public or private companies in the United States, whereas some are performed in China, Australia or in the European Union countries.

Regardless of the observations or the data type used in the analysis, the largest number of the determinants of the effective tax rate are unique for any business entity. The determinant used in a lot of studies is the size of a bank as interpreted from the point of view of the tax shield. The one is that the political component has a significant impact on reducing a tax burden on banks. In addition to the company size, the level of the effective tax rate also depends on the success of the company's business operations, and the most common measure used in scientific papers is return on assets rate (ROA) or return on equity (ROE). As a determinant, leverage has also been the subject matter of many researchers in the traditional context, primarily where a greater participation of external financing sources reduces the effective tax rate. The fact that changes in leverage are limited due to the requirements determined by the Basel criteria should also be taken into account. In the recent literature, the loan loss provision appears to be a determinant of the bank's effective tax rate. These are potential loan receivables write-offs that are under continuous monitoring due to their significant impact on a bank's results and consequently on the effective tax rate, within which loan losses are approached as future events based on forecasts and provisions. The fact that their tax treatment is prescribed by law also speaks of the importance of this determinant.

The subject matter of the research study conducted in this paper is the actual tax burden of banks in the territory of the Republic of Serbia, as well as the analysis of the business and institutional determinants of effective tax rates. Consequently, the paper tests the hypotheses of the influence of each determinant, simultaneously considering previous research in this area. Given the above research focus, the research objective includes providing a well-founded assessment of the tax policy of banks in Serbia by considering the real level of effective tax rates and identifying their change under the influence of various determinants, aimed at encouraging effective tax planning and results management. The methodological instruments applied in the research process are divided into phases according to the research subject matter. The Wilcoxon rank test is used to compare the real and statutory levels of the effective tax rate, then the influence of each selected determinant on the effective tax rate is examined using a panel regression model, where the assessment of the most adequate model is made using the Hausman and Breusch-Pagan test. Before the model implementation, the tests were conducted so as to determine the relationship between the variables and the adequacy of the selected values for the model calculating the variance inflation factor and multicollinearity.

In the domestic literature, only a few papers on the effective tax rate in banks in Serbia were published in previous years, but not a single one deals with the analysis of its determinants. To the author's knowledge, this is the first paper in Serbia in which the impact of the selected determinants on effective tax rates in banks is analyzed. In this research study, two tax rates are used in order to better understand and interpret the results and differences in the tax rates. In addition to the usual determinants of the effective tax rate, this paper examines the influence of certain institutional determinants of banks due to their importance for the Serbian banking market,

as well as the influence of one business determinant subject to a change in standards, which is important for the banks' business results.

The results of the research can be useful to both economists and bank managers in terms of providing additional information on tax issues, all for the purpose of effective tax planning. Bank owners can be interested parties because of the effective tax rate predictive power on their income.

The remainder of this paper is organized as follows: after the Introduction, Section 2 analyzes the main determinants on the effective tax rate through a Literature Review and the development of the hypotheses tested in this paper. Section 3 discusses on the methodology of the empirical research, including the selection of variables in the research sample. In Section 4, the results of the basic model and the model with control variables are summarized, while presenting the importance of the obtained indicators, compared to the previous research. Finally, conclusions and possibilities for future research areas are given in the last section.

LITERATURE REVIEW

Business determinants of the effective tax rate

The analysis of the impact of a bank size on the effective tax rate is based on the two opposing theories that interpret the cause-and-effect relationship between these variables from a political perspective. On the one hand, the confirmation of the hypothesis of political costs, according to which large companies bear a greater tax burden, can be found in the papers by researchers J. L. Zimmerman (1983), F. J. Delgado, E. Fernández-Rodríguez and A. Martinez-Arias (2014), Y. M. Salaudeen and U. C. Eze (2018), Ç. A. Hazir (2019). On the other hand, researchers T. M. Porcano (1986), G. Richardson and R. Lanis (2007) and Y. A. Sudibyo and I. R. Bawono (2016) confirmed the hypothesis that large companies achieved greater tax savings due to a greater political influence and financial opportunities. For the period from 2013 to 2017, S. Vržina (2018) came to the conclusion that larger banks in Serbia had higher accounting and current effective tax rates. Profitability mainly follows the size of the company (Delgado *et al*, 2014; Salaudeen & Eze, 2018; Hazir, 2019), which also indicates a higher tax burden for more successful banks (Omer, Molloy & Ziebart, 1993; Plesko, 2003; Díaz, Rodríguez & Arias, 2011; Fernández-Rodríguez, García-Fernández & Martínez-Arias, 2021; Lazăr & Andrieș, 2022). However, some researchers came to different results, according to which more profitable companies would pay less tax only if there were an effective tax planning system in that company (while controlling for the company size) (Rego, 2003) or if there were a strong political influence (Ajili & Khlif, 2020).

Researchers such as C. P. Stickney and V. E. McGee (1982), X. Liu and S. Cao (2007), O. Inua (2018) and Ç. A. Hazir (2019) confirm that, despite their leverage growth, banks with a greater share of foreign financing sources have a more favorable tax treatment of interest compared to dividends. S. Vržina (2019) draws the opposite conclusion when the influence on the annual effective tax rates in Serbia is considered, but the indicator is not statistically significant. According to S. Gupta and K. Newberry (1997), a positive effect may be present if the sample includes the companies with tax returns or pre-tax losses. Bearing this in mind, the authors S. Lazăr and A. M. Andrieș (2022) put forward a hypothesis on the influence of the equity capital of banks in the European Union on the level of the effective tax rate: high equity capital in the structure of the total capital-low leverage-high effective tax rate. In the recent literature, the movement of leverage has been studied under the conditions of constant tax rates with the introduction of additional tax fees for banks (for example, the fees introduced by certain European countries). The effect of reducing banking leverage in such conditions is only present in countries with lower tax rates (Chaudhry, Mullineux & Agarwal, 2015).

Given the aforementioned research studies, the following hypotheses are tested in the paper:

H1: Banks with a larger volume of assets have a higher effective tax rate.

H2: Banks with a higher level of profitability have a higher effective tax rate.

H3: Banks with a higher level of leverage (borrowed capital) have a lower effective tax rate.

H4: Banks with a higher share of equity capital have a higher effective tax rate.

Institutional determinants of the effective tax rate

Some researchers emphasize the synergistic importance of mergers and acquisitions due to the realization of tax benefits and a reduction in the tax burden (Grubert, Goodspeed & Swenson, 2007; Zelenović & Babić, 2018). Targeted companies can achieve a reduction in the effective tax rate by 3% on average and can reach up to 8% if the buyer company implements an aggressive tax policy (Belz, Robinson, Ruf & Steffens, 2013). Companies in the seller role with a realized loss prior to taxation experience a drop in the effective tax rate on average up to 6.7% to 7.9% (Duarte & Barros, 2018). The trend of the consolidation of the banking sector in Serbia started in 2001, and the process is actively continuing in the form of a strategy for growth and competition on the market. Therefore, according to N. Miković (2022), the acquisition process was carried out on 15 banks in the period from 2017 to 2021. There are five banks in the research sample included in the paper, namely: Expobank took over Marfin Bank (2017), Alta Bank took over Jubmes Bank (2019), Eurobank took over Direct Bank (2021), Postal Savings Bank took over MTS Bank (2021), OTP Bank took over Vojvođanska Bank (2019) and Societe Generale Bank (2021). AIK Bank completed the process of acquiring Sberbank and NLB Bank completed the process of acquiring Commercial Bank in 2022, and Raiffeisen Bank's acquisition of RBA Bank is still ongoing.

The ownership structure can be viewed in two ways. Most research shows that the tax burden of state-owned companies will be significantly lower due to tax incentives (Tran & Yu, 2008; Mahenthiran & Kasipillai, 2012). The situation is different if the banking sector, which is dominated by privatization as a part of financial integration and the development of the banking market, making the number of state-owned banks very small, is concerned. In the Serbian banking sector as of 31st December 2021, two state-owned banks (Postal Savings Bank and Srpska Bank) are actively operating, while the remaining 21 are majority privately-owned. On the other hand, banks with the capital origin in foreign countries move their operations to countries with a lower tax burden and achieve tax savings in a favorable business environment (Huizinga & Nicodème, 2006). S. Claessens, A. Demirgüç-Kunt and H. Huizinga (2001) claims differently. Their research in the sample of domestic and foreign banks from 80 countries in the period from 1988 to 1995 showed that foreign banks bore a greater tax burden in developing industries. The Serbian banking market is dominated by foreign banks, i.e. 17 foreign banks out of 23 in total, which is the total number of the banks operating on 31 December 2021, with a share of 83% in total assets.

Given the aforementioned research studies, the following hypotheses are tested in the paper:

H5: Mergers and acquisitions processes in banks reduce the effective tax rate.

H6: Privatization processes in banks reduce the effective tax rate.

H7: An increase in the share of foreign capital in the banking sector reduces the effective tax rate.

Control determinants

N. Bayraktar and Y. Wang (2004) state that the presence of foreign banks significantly determines the loan loss provisions level. This item gains in importance with the adoption of the new International Financial Reporting Standard (IFRS) number 9 - Financial Instruments. Its implementation for Serbian banks started on 1st January 2018 (National Bank of Serbia, 2017) in accordance with the Law on Corporate Income Tax. As the expenses based on the

loan loss provisions represent a tax-sensitive category, their effect will directly reflect in the reduction of the effective tax rate. Research done by S. Lazăr and A. M. Andrieș (2022) confirms the negative relationship between these two variables. In this paper, loan loss provisions are assumed to lead to a reduction in the effective tax rate.

V. Todorović, J. Bogićević and S. Vržina (2019) point at the importance of including banks with pre-tax losses observations in the analysis (those banks may have an income tax liability or carry forward losses from previous years and reduce tax liabilities). Considering this, researchers S. Gupta and K. Newberry (1997), Ç. A. Hazir (2019), and S. Lazăr and A. M. Andrieș (2022) include companies with a pre-tax loss in the analysis by limiting the values of the calculated effective tax rate, the lower value being 0% for the companies that, despite a negative result, had a tax refund, and the upper value of the rate 100% for the companies that paid tax and obtained a negative result, with the aim of providing adequate data in the sample.

DATA AND RESEARCH METHODOLOGY

Data and the sample selection

The sample consists of 23 commercial banks active at the end of 31st December 2021, covering the five-year period from 2017 to 2021. The list of the banks is presented in the Appendix.

The paper used publicly available data on the banks from the official website of the National Bank of Serbia and the financial data from the financial reports retrieved from the official websites of the banks. The data on the loan loss provisions are found in the Notes to the financial reports, the Risk Management section, the Credit Risk item, the "Loans and Receivables from Clients" category. Loan loss provisions are considered as summary for all three levels.

For this research, an unbalanced panel of data with 113 observations was formed, out of which 94 observations had an income before taxation and the remaining were the observations with a loss before taxation. The unbalanced panel results from the fact that the research did not include the data for OTP bank (formerly Societe Generale Bank JSC Belgrade) for the years 2018 and 2017, given the fact that the financial reports for those years were not available on the website at the time of the research in question. The unbalanced panel is not a preferred model in the literature, bearing in mind certain limitations of its application, such as the impossibility of conducting an analysis of one unit in each time period of the research, which results in a limited possibility of preventing the influence of the heterogeneity of the unit on the results, causing the model to be biased towards one class instead of objectively looking at the whole set observation.

Research model

In this paper, the effective tax rate is used as a measure of the income tax burden and a dependent variable. In theory, it is recommended that more than one effective tax rate should be used in analysis (Omer, Molloy & Ziebart, 1991).

Namely, the first dependent variable used in this research is the accounting (total) effective tax rate (in the paper ETR 1). S. Vržina (2018) used this rate as the measure of the tax burden. In line with the International Accounting Standard 12 "Income Taxes", the accounting (total) effective tax rate is given below:

$$\text{Average Annual Accounting Effective Tax Rate} = \frac{\text{tax expense (income)}}{\text{accounting income}} \quad (1)$$

where the tax expense (income) is the total amount of tax consisting of the current tax for the current accounting period which the loss resulting from a reduction in deferred tax assets and the creation of deferred tax liabilities is added to, and/or which the gain from the creation of deferred tax assets and a reduction in deferred taxes is subtracted from. The accounting income represents a gain or a loss of the period before the tax expense deduction.

A more realistic measure in the calculation of the tax burden is the current effective tax rate (in the paper ETR 2). It eliminates the influence of the permanent difference between accounting income and taxable income by putting the current tax expenditure in the ratio of income before taxation:

$$\text{Average Annual Current Effective Tax Rate} = \frac{\text{current tax expense (income)}}{\text{accounting income}} \quad (2)$$

where the current tax expense (income) is the amount of tax paid in the current accounting period. The accounting income represents a gain or a loss of the period before the tax expense deduction.

In the paper, the influence of the independent variables (determinants) on the effective tax rate is examined and classification into business and institutional is made in accordance with the reference literature in this area. The relationship between the independent and dependent variables in this paper can be interpreted using predictive signs, which is shown in Table 1. The model also includes the control variable of loan loss provisions.

The research section of the paper is organized in three parts, within the framework of the applied methodology and the research objectives.

- Two different models are used calculate the effective tax rate, where certain values are modeled at 0% and 100% (based on the research by S. Gupta and K. Newberry (1997) and Ç. A. Hazir (2019)). The values of the effective tax rate in each year are compared with the statutory tax rate using the Wilcoxon rank test (applied in the research by S. Vržina (2018)) in order to determine the differences and calculate the actual tax burden of banks. It is based on the hypothesis that there is a statistically significant difference between the statutory and effective tax rates.
- The impact of individual determinants on the effective tax rate is calculated, as well as the level of the changes that determine the growth of or a decline in the tax burden on the banks. The hypotheses are tested using the panel regression models - Ordinary Least Squares, the Fixed effects model and the Random effects model, for both effective tax rate types. The decision to apply the appropriate method for each dataset in the analysis was made using the Durbin-Wu-Hausman test and, if necessary, the Breusch-Pagan test, as applied in the research by S. Gupta and K. Newberry (1997).
- The robustness of the results is verified by changing the variables and changing the observations. The first test introduces the "loan loss provisions" independent variable into the sample and the second test excludes the banks with pre-tax losses from the sample. The difference in the results from the original ones is evaluated.

Table 1 The independent variables and the predictive sign

Determinants (variables)		Measure	Sign
business	Size (SIZE)	A natural logarithm of the total assets (in 000 RSD)	+
business	Leverage (LEV)	(Income before taxes / Total assets) x 100	-
business	Profitability (ROA)	(Total liabilities / Total assets) x 100	+
business	Capitalization (CAP)	(Equity capital / Total assets) x 100	+
institutional	Mergers and acquisitions (M&A)	The bank that participated in the process (the customer) 1, otherwise 0	-
institutional	Privatization process (POW-SOW)	A private bank is marked with 1, a state-owned bank with 0	-
institutional	Share of foreign capital (D-F)	A domestic bank is marked with 1, a foreign one with 0	-
control	Loan loss provisions (LLP)	(Provisions/Total assets) x 100	-

Source: Author

The model used to calculate the effect of the determinants on the effective tax rates is given in the Equation 3:

$$ETR_{it1} \text{ or } ETR_{it2} = \beta_0 + \beta_1 x\ SIZE_{it} + \beta_2 x\ LEV_{it} + \beta_3 x\ ROA_{it} + \beta_4 x\ CAP_{it} + \beta_5 x\ M\&A_{it} + \beta_6 x\ POW\text{-}SOW_{it} + \beta_7 x\ D\text{-}F_{it} + dummy\ variable\ for\ years + \varepsilon_{it} \quad (3)$$

where i represents the bank, t represents the year in the period from 2017 to 2021, and β is the regression coefficient. The dependent variable can be EPS_{it1} (the accounting effective tax rate) or EPS_{it2} (the current effective tax rate).

The data are statistically processed using the STATA computer software version 13.0, whereas the confidence levels $\alpha = 0.05$ are used to determine statistical significance.

RESEARCH RESULTS AND DISCUSSION

Calculation of the effective tax rate

The calculation of the tax burden in the Serbian banks for the observed period from 2017 to 2021 shows that the accounting and current effective tax rates are continuously below the statutory tax rate although a slight growth trend is evident. In accordance with the aforementioned, 96% of the banks had a lower accounting effective tax rate (107 observations out of a total of 113 in the sample), as well as a lower current effective tax rate (108 observations out of a total of 113 in the sample), compared to the statutory tax rate. The results are presented in Figure 1. Average rates were calculated for the entire set of observations, taking into account the modeled values of the effective tax rate used in the paper.

The arithmetic mean of both effective tax rates is significantly below the statutory, except in two years (the average accounting effective tax rate in 2017 is 13.59% and the average current effective tax rate in 2021 is 14.30%). Leaving out the influence of the two banks that, despite the loss, paid tax in all years (due to the modeled effective tax rate at 100%), the average current tax rate would be at a much lower level, considering the fact that 10 banks reported current tax at the level of 0% in their balances in 2021.

Table 2 shows the results of the descriptive statistics. Since there is one bank with the effective tax rate of 0% in the sample for each year, the minimum value of the rate is zero. The current effective tax rate reaches a maximum value of 100% in all the years, which indicates that within each year there was at least one bank with a realized loss before taxation, so for such cases in the paper the effective tax rate is modeled at 100%. The maximum value of the accounting effective tax rate deviates from 100% in three years, when, despite the pre-tax loss, two banks achieved tax income (API Bank and MOBI Bank) and when the

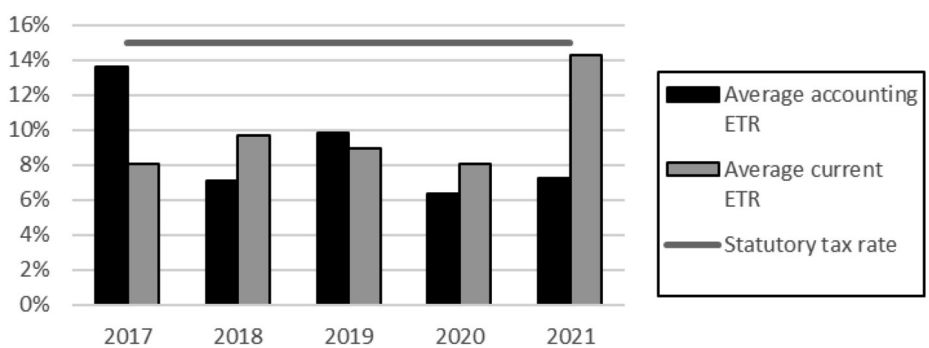

Figure 1 The trend of the accounting and current effective tax rates comparing to the statutory tax rate

Source: Author

Table 2 The descriptive statistics and the Wilcoxon test on the effective tax rates

Panel A. Observations with the accounting effective tax rate							
Year	*n*	SD	Median	Mean	Min	Max	Z (Wilcoxon)
2017	23	28.115	1.035	13.599	0.000	100.000	-2.530[b]
2018	23	8.010	4.235	7.061	0.000	30.370	-3.108[b]
2019	23	21.361	0.000	9.848	0.000	100.000	-2.877[b]
2020	22	8.325	2.850	6.394	0.000	33.280	-3.409[b]
2021	22	6.522	6.850	7.248	0.000	19.320	-3.845[b]
Panel B. Observations with the current effective tax rate							
Year	*n*	SD	Median	Mean	Min	Max	Z (Wilcoxon)
2017	23	21.270	0.010	8.069	0.000	100.000	-3.311[b]
2018	23	21.254	0.345	9.740	0.000	100.000	-3.158[b]
2019	23	21.046	0.070	8.968	0.000	100.000	-3.235[b]
2020	22	20.859	0.000	8.033	0.000	100.000	-3.481[b]
2021	22	27.812	6.090	14.308	0.000	100.000	-2.488[b]

The statutory tax rate = 15% for the examined period; b - level of statistical significance 0.05.

Source: Author

total tax rate was reported as 0% (MOBI Bank). Due to the absence of the normal distribution of data, the results are observed via the median. In 2021, there was a sharp increase in the effective tax rates, as a result of which the median values also increased compared to the previous years. The increase in the accounting tax rate was due to a larger number of the banks with recognized deferred tax income, whereas the increase in the current tax rate was the result of a more paid tax expense in that year and the value of the effective tax rate modeled at 100% due to the negative financial result recorded at two banks. The results of the Wilcoxon test confirm the hypothesis of a statistically significant difference between the statutory and effective tax rates at the significance level of 0.05. The results are in line with the findings of S. Vržina (2018).

Multicollinearity testing

Before the model implementation, it is necessary that a multicollinearity test calculating the linear relationship among the explanatory variables in the regression model should be performed. The absence of collinearity among the independent determinants was confirmed by calculating the Variance Inflation Factor (VIF). The result of the VIF test is presented in Table 3. It is observed that all the variables have a VIF coefficient lower than 10, based on which it can be concluded that the independent variables in the model are not highly correlated with each other (O'Brien, 2007). The mean VIF of 2.06 is also below the limit level.

Table 3 The variance inflation factors (VIF) test

Independent Variables	VIF	1/VIF
SIZE	2.64	0.378085
LEV	2.00	0.500657
ROA	1.54	0.648205
CAP	4.22	0.237060
M&A	1.12	0.890274
POW-SOW	1.45	0.691473
D-F	1.41	0.707383
Mean VIF	2.06	

Source: Author

Stationarity testing

Given the fact that an unbalanced data panel in used in the research, Fisher's unit root test is applied so as to confirm stationarity, combining the p-values from the unit root tests using the four methods proposed by I. Choi (2001). In Fisher's test, all the panels contain a unit root and are non-stationary (the null hypothesis) or at least one panel is stationary (the alternative hypothesis). In this paper, the results of all four tests for both effective tax rates reject the null hypothesis that the panels contain a unit root, implying that at least one panel is stationary at the 5% level of statistical significance. This means that there are no unit roots in the panels under the given test conditions (including the panel mean and the time trend). Table 4 shows the results of Fisher's test.

Analysis of the determinants of the effective tax rates

By applying regression models and appropriate tests for selecting the most relevant model and assessing the fulfillment of the standard model assumptions, a conclusion is drawn that the influence of the determinants on the effective tax rates is best described by the random effects model (Table 5). The first model examins the influence of the determinants on the first set of data in this paper covering all 113 observations. As can be seen, based on the results of the Hausman test, both p-values are greater than 0.05 in the panel with the accounting and current effective tax rates, which is indicative of the fact that the random effects model is the appropriate model. Also, in the panel with the accounting effective tax rate where the p-value is 0.0003 and in the panel with

Table 4 Fisher's unit root test

		ETR 1		ETR 2	
		Statistics	p-value	Statistics	p-value
Inverse chi-squared	P	175.2790	0.0000	70.6051	0.0113
Inverse normal	Z	-5.8726	0.0000	-3.2140	0.0007
Inverse logit t	L*	-10.4753	0.0000	-4.3467	0.0000
Modified inv. chi-squared	Pm	13.4783	0.0000	2.5653	0.0052

Source: Author

Table 5 The Hausman and Breusch-Pagan model selection test

ETR 1	Result	Conclusion
Hausman test	chi2(4) = (b-B) ' [(V_b-V_B)^(-1)](b-B) =7.39 Prob>chi2 = 0.1165	Random effects model
Breusch-Pagan test	chibar2(01) = 11.91 Prob > chibar2 = 0.0003	Random effects model
ETR 2		
Hausman test	chi2(4) = (b-B) ' [(V_b-V_B)^(-1)](b-B) =1.07 Prob>chi2 = 0.8989	Random effects model
Breusch-Pagan test	chibar2(01) = 50.32 Prob > chibar2 = 0.0000	Random effects model

Source: Author

the current effective tax rate where the p-value is 0.0000 and both are less than 0.05, the Breusch-Pagan test evaluates that the random effects model should be applied.

Table 6 shows the regression coefficient scores obtained, with explains the impact of the banks' business and institutional determinants on the effective tax rate with the statistical significance of the impact on that change (p value). There is a comparative overview of the coefficients obtained by applying the ordinary least squares, the fixed effects model and the random effects model.

The obtained results of the adjusted R^{2} indicate a very low explanatory power of the model below 0.05 level for both effective tax rates. However, within the model, several determinants can be singled out with a statistically significant influence on the banks' effective tax rates.

The results of the random effects model are presented below. In the model with the accounting effective tax rate, only the "leverage" variable has a statistically significant effect on the accounting effective tax rate at the level of 1%, where an increase in leverage by 1% decreases the tax rate by 0.83%. The results are consistent with the research carried out by C. P. Stickney and V. E. McGee (1982), X. Liu and S. Cao (2007), O. Inua (2018) and Ç. A. Hazir (2019). In the panel with the current effective tax rate, the influence of leverage is not statistically significant. The random effects model in the panel with the current effective tax rate is statistically significant for the determinant size (at the level of 10%), capitalization (at the level of 5%), and mergers and acquisitions (at the level of 10%). The biggest change in the current effective tax rate is caused by change in the "mergers and acquisitions" determinant, where its increase by 1% lowers the rate by 17.14%. The result is in line with the findings of T.

Table 6 The regression panel model with the original data set

	ETR 1			ETR 2		
	Fixed-effect	Random-effect	Ordinary least squares	Fixed-effect	Random-effect	Ordinary least squares
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
SIZE	14.30245 (p=0.365)	2.022367 (p=0.714)	-0.6950407 (p=0.856)	51.29576 (p=0.002**)	14.87268 (p=0.071*)	4.530438 (p=0.374)
LEV	0.000821 (p=0.999)	-0.8338045 (p=0.001***)	-0.7236761 (p=0.001***)	-0.4243554 (p=0.566)	-0.1005125 (p=0.765)	0.0710505 (p=0.798)
ROA	-1.204921 (p=0.176)	-0.9927682 (p=0.212)	-0.8518625 (p=0.274)	1.556539 (p=0.090*)	1.122536 (p=0.210)	-0.0339541 (p=0.974)
CAP	1.110631 (p=0.140)	-0.0048548 (p=0.984)	-0.0945882 (p=0.579)	1.133039 (p=0.143)	0.9405987 (p=0.009**)	0.531624 (p=0.013**)
M&A	0	-6.73183 (p=0.216)	-6.185444 (p=0.086)	0	-17.14328 (p=0.051*)	-14.03267 (p=0.004**)
POW-SOW	0	-5.217761 (p=0.579)	-4.552595 (p=0.457)	0	5.716542 (p=0.709)	7.544946 (p=0.354)
D-F	0	-6.886395 (p=0.260)	-7.390821 (p=0.065)	0	-2.351658 (p=0.8103)	-3.862523 (p=0.465)
_cons	-123.6901	69.60898 (p=0.227)	83.03669 (p=0.039**)	-382.0249 (p=0.012**)	-117.6517 (p=0.169)	-44.55984 (p=0.401)
Note: *p<0.1; **p<0.05; ***p<0.001						
	R-squared 0.2115			R-squared 0.2048		
	Adj R-squared 0.1589			Adj R-squared 0.1518		
	Prob>chi² 0.0006			Prob>chi² 0.0009		
Number of observations: 113						

Source: Author

Belz *et al* (2013). In the period covered by the research work, the effect of mergers and acquisitions on the current effective tax rate was confirmed for the banks that successfully carried out acquisitions in previous years in the territory of the Republic of Serbia, such as Expobank, Addiko Bank, Halkbank, and Alta Bank, in whose balance sheets the amount of the current income tax expenditure is zero. It can be concluded that, in the observed period, there are more banks playing the role of buyers with the completed acquisition process that had zero current tax. The next determinant causing the greatest change is the size, where its growth of 1% increases the current effective tax rate by 14.87%, thus confirming the hypothesis of the political costs that larger banks are exposed to a greater tax burden. The results confirm the previous research in this area done by J. L. Zimmerman (1983), F. J. Delgado *et al* (2014), Y. M. Salaudeen and U. C. Eze (2018), Ç. A. Hazir (2019) and S. Vržina (2018) in the field of banking. In the observed period, the largest banks in Serbia reported the largest amount of the total and current tax expenditures, such as Aik Bank, Banca Intesa, Raiffeisen Bank, Unicredit Bank. With the increase in capitalization, there is an increase in the current effective tax rate 0.94%, which is in line with the results of S. Lazăr and A. M. Andrieș (2022).

As a determinant, profitability did not stand out either in terms of a statistically significant influence or in terms of the size of the changes in the random effects model. An increase in the banks' profitability decreases the accounting effective tax rate by 0.99% (in accordance with the research conducted by the author S. O. Rego (2003)) and increases the current effective tax rate by 1.12%, which is confirmed in the papers by T. C. Omer *et al* (1993), G. A. Plesko (2003) and E. Fernández-Rodríguez *et al* (2021).

To summarize, the hypotheses set in this paper are confirmed for the following determinants: the bank size, leverage, mergers and acquisitions, and the share of foreign capital. The determinants "profitability" and "capitalization" confirmed the research hypothesis only for the current tax rate, and the determinant "privatization process" confirmed the hypothesis only for the accounting effective tax rate.

Results after including the "loan loss provisions" determinant in the model

The results verification was carried out by including the "loan loss provisions" determinant in the model, which brings us to the second model in this paper. Performing the Hausman and Breusch-Pagan tests on the data set containing the "loan loss provisions" variable showed that there was a change in the adequacy of the model that should be applied compared to the model tested on the original variables. In table 7, there are the results of the tests. In the panel ETR 1, Breusch-Pagan test indicates that the ordinary least squares model is more appropriate, considering the p-value 0.1132 greater than 0.05. In the panel with ETR 2, the Hausman test proposes the fixed effects model as a more appropriate model.

Table 7 The Hausman and Breusch-Pagan tests

ETR 1	Result	Conclusion
Hausman test	chi2(5) = (b-B) ' [(V_b-V_B)^(-1)](b-B) =3.06 Prob>chi2 = 0.6908	Random effects model
Breusch-Pagan test	chibar2(01) = 1.46 Prob > chibar2 = 0.1132	Ordinary least squares model
ETR 2		
Hausman test	chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)=18.25 Prob>chi2 = 0.0026	Fixed effects model
Hausman-ov test	chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)=18,25 Prob>chi2 = 0,0026	Fixed effects model

Source: Author

In the cases where the Hausman test confirms the existence of the statistically significant difference between the model coefficients, in favor of the fixed effects model as in this case, then the ordinary least squares model is not suitable for use (Dougherty, 2011). Consequently, there was no need to perform the Breusch-Pagan test in the current tax rate panel.

The presence of loan loss provisions in the ordinary least squares completely overshadows the statistically significant impact of the "leverage", "profitability" and "share of foreign capital" determinants on the effective tax rates. Also, loan loss provisions themselves have a statistically significant influence on the accounting effective tax rate.

Table 8 accounts for the results of the tests. In the ordinary least squares model, the panel with the accounting effective tax rate, the growth of each determinant by 1% leads to a decrease in the effective tax rate, from which it follows that the credit risk management policy covers every segment of the banks' operations, influencing all the variables of this model, which indirectly reflects in the effective tax rate. Despite "leverage" and "provisions" having the most significant influence (p=0.00), a decline in the effective tax rate under their influence is very small (-0.90 and -0.18, respectively). The paper confirms the hypothesis set by S. Lazăr and A. M. Andrieș (2022). In the fixed effects model, the bank size and its profitability are the most statistically significant

Table 8 The regression panel model with loan loss provisions

	ETR 1			ETR 2		
	Fixed-effect	Random-effect	Ordinary least squares	Fixed-effect	Random-effect	Ordinary least squares
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
SIZE	13.77834 (p=0.391)	-1.301389 (p=0.774)	-2.042849 (p=0.556)	52.843980 (p=0.002)**	8.938954 (p=0.223)	2.731426 (p=0.553)
LEV	-0.109641 (p=0.901)	-0.8918349 (p=0.000***)	-0.9042379 (p=0.000***)	-0.0979 (p=0.914)	-0.1436747 (p=0.639)	-0.1699577 (p=0.506)
ROA	-1.263366 (p=0.176)	-1.913859 (p=0.015)	-2.201034 (p=0.004**)	1.729186 (p=0.072)*	0.3916962 (p=0.678)	-1.834785 (p=0.069)*
CAP	0.9953968 (p=0.280)	-0.0081891 (p=0.967)	-0.050984 (p=0.741)	1.473441 (p=0.120)	0.8505882 (p=0.007)**	0.631364 (p=0.003)**
LLP	-0.0292502 (p=0.827)	-0.1766153 (p=0.000***)	-0.1854563 (p=0.000***)	0.0864051 (p=0.530)	-0.1471396 (p=0.034)**	-0.2475412 (p=0.000)***
M&A	0	-8.259009 (p=0.058*)	-8.069201 (p=0.015**)	0	-17.62322 (p=0.017)**	-16.54705 (p=0.000)***
POW-SOW	0	-8.567659 (p=0.254)	-8.545317 (p=0.128)	0	3.095058 (p=0.810)	2.215587 (p=0.765)
D-F	0	-9.856129 (p=0.044**)	-10.02533 (p=0.007**)	0	-5.512307 (p=0.510)	-7.378976 (p=0.128)
_cons	-108.0079 (p=0.509)	107.8986 (p=0.023**)	115.8275 (p=0.002**)	-428.3501 (p=0.012)	-59.79695 (p=0.434)	-0.7917615 (p=0.987)
Note: *p<0.1; **p<0.05; ***p<0.001						
	R-squared 0.3619			R-squared 0.3575		
	Adj R-squared 0.3128			Adj R-squared 0.3081		
	Prob>chi² 0.0000			Prob>chi² 0.0000		
Number of observations: 113						

Source: Author

variables. An increase in bank assets by 1% leads to the current effective tax increase by more than 50%. Observing the original data set and the set with the "provisions" variable included, the fixed effects model shows that change in the bank size leads to the largest shifts in the effective tax rate, through its growth that goes up to over 50%. Profitability has a statistically significant effect in both panels.

In the examined model, the hypotheses of this paper are confirmed for the determinants with the 1%, 5% and 10% levels of significance: the bank size (ETR 2), leverage (ETR 1), profitability (ETR 1 and ETR 2), loan loss provisions (ETR 1) and mergers and acquisitions (ETR 1).

Results after excluding the banks with a pre-tax loss from the model

The second verification of the results was carried out by excluding the banks with a pre-tax loss from the model (without the "loan loss provisions" determinant), thus creating the third model of this paper. A negative financial result is present in 19 observations. In other words, six banks operated with a pre-tax loss in the observed time period (API Bank, Mirabank, Mobi Bank, Bank of China, Expobank and OTP Bank), whereby Mirabank and Mobi Bank constantly had a loss. The results presented in Table 9 indicate the fact that the fixed effects model is more appropriate for the panel with the accounting effective tax rate and the random effects model is more appropriate for the panel with the current effective tax rate. In the cases where the Hausman test confirms the existence of a statistically significant difference between the model coefficients, namely in favor of the fixed effects model in this case, then the ordinary least squares model is not suitable for use (Dougherty, 2011). Consequently, there was no need to perform the Breusch-Pagan test in the current tax rate panel.

The results of the panel regression models are shown in Table 10.

By excluding the banks with a negative pre-tax financial result, the "capitalization" determinant gains in importance. The banks with a profit before tax can manage effective tax rates and tax burdens by regulating capitalization levels, which is additionally supported by the Basel capital requirements. If the equity capital share increases by 1%, only for the banks operating at a profit, it will lead to a decrease in the accounting effective tax rate by 0.33% and an increase in the current effective tax rate by 0.12%. S. Lazăr and A. M. Andrieș (2021) came to the same findings. The significant influence of the "bank size" determinant dominates in the current effective tax rate panel, as well as in all previous calculations performed for the current effective tax rate. For the banks operating at a profit before tax in the observed time period, an increase in the bank's assets by 1% leads to an increase in the current effective tax rate by 11.46%.

In the examined model, the hypotheses set in this paper are confirmed for the "bank size" (ETR 2) and "capitalization" (ETR 2) determinants with the 1% level of significance.

Table 9 The Hausman and Breusch-Pagan tests

ETR 1	Result	Conclusion
Hausman test	chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)= 2.89 Prob>chi2 = 0.5759	Random effects model
Breusch-Pagan test	chibar2(01) = 3.56 Prob > chibar2 = 0.0295	Random effects model
ETR 2		
Hausman test	chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)=33.39 Prob>chi2 = 0.0000	Fixed effects model

Source: Author

Table 10 The regression panel model with the excluded banks with a pre-tax loss

	ETR 1			ETR 2		
	Fixed-effect	Random-effect	Ordinary least squares	Fixed-effect	Random-effect	Ordinary least squares
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
SIZE	5.75480 (p=0.596)	-4.281385 (p=0.107)	-4.874507 (p=0.012)**	11.45949 (p=0.072)*	-1.232369 (p=0.584)	-3.217497 (p=0.024)**
LEV	-0.2643343 (p=0.643)	-0.2771783 (p=0.157)	-0.4158164 (p=0.012)**	-0.2616895 (p=0.429)	-0.1835364 (p=0.195)	-0.1450662 (p=0.232)
ROA	0.511036 (p=0.800)	0.2847851 (p=0.593)	0.570115 (p=0.284)	-0.020731 (p=0.952)	0.2283673 (p=0.501)	1.08525 (p=0.007)**
CAP	-0.2016628 (p=0.797)	-0.3279384 (p=0.038)**	-0.3974515 (p=0.002)**	0.122159 (p=0.788)*	0.2288229 (p=0.078)*	-0.3554083 (p=0.000)***
M&A	0	-2.511004 (p=0.354)	-2.031509 (p=0.281)	0	-4.903898 (p=0.038)*	-3.848523 (p=0.007)**
POW-SOW	0	-2.653191 (p=0.544)	-3.950368 (p=0.194)	0	3.895744 (p=0.309)	3.209968 (p=0.155)
D-F	0	-4.771381 (p=0.109)	-5.642143 (p=0.008)**	0	-4.589048 (p=0.075)*	-4.783514 (p=0.003)**
_cons	-14.7970 (p=0.895)	72.90445 (p=0.016)**	90.70104 (p=0.000)***	-66.64242 (p=0.306)	32.31067 (p=0.184)	45.67595 (p=0.009)**

Note: *p<0.1; **p<0.05; ***p<0.001

R-squared 0.2127
Adj R-squared 0.1486
Prob>chi² 0.0036

R-squared 0.4218
Adj R-squared 0.3747
Prob>chi² 0.0000

Number of observations: 94

Source: Author

CONCLUSION

The research presented in this paper covered the banking sector of Serbia, all the banks operating on 31st December 2021, making a sample of 113 observations for the five-year time period from 2017 to 2021. The empirical research included two types of effective tax rates, the accounting and the current effective tax rates, examining how the "business" and "institutional" determinants affected them.

The research results in the observed period show that the average accounting and current effective tax rates are continuously below the statutory tax rate, on the basis of which it can be concluded that the real tax burden of the banks in Serbia is significantly less than the legal one. In Serbia, the statutory tax rate on a bank's income during the observed period is 15%, while the average accounting effective tax rate for the entire period is at the level of 8.83% and the average current effective tax rate is 9.82%. It is possible that the elimination of the modeled values of the effective tax rate at 100% would lead to the average current tax rate being at an even lower level, considering that 10 banks in their balance sheets for the year 2021 reported current tax at the level of 0%. In other words, they have no current tax expenses. It is concluded, and simultaneously confirmed by earlier research, that the law in Serbia enables banks to have significant tax incentives, primarily motivated by investments and the development of the economy and society. Competition among banks on the Serbian market leads to mergers and acquisitions, which additionally

has a positive effect on lowering effective tax rates, which is confirmed in the findings of this paper in the part dealing with the influence of the determinants on effective tax rates. The research results obtained on the original sample show that changes in mergers and acquisitions, such as growth by 1%, compared to other business and institutional determinants, reduces the current tax liability by 17.14%, and growth in the bank size by 1% increases the current effective tax rate by 14.87%. According to the foregoing, it can be concluded that the consolidation of assets and capital as a result of mergers and acquisitions reduces the current effective tax rate only up to a certain level (up to a certain size of the bank), that is to say as the bank grows, current effective tax rates start to grow as well at some point. Loan loss provisions are the key segment in banks' operations, and the fact is that they are increasingly attracting more and more attention from the theoretical point of view and through banks' practical operations in terms of credit risk management. In the model that includes provisions, a 1% increase in every determinant leads to a reduction in the accounting effective tax rate to a certain extent, where a 1% increase in a bank's assets leads to an increase in current tax by more than 50%. Profitability, leverage and provisions in that model have a statistically significant impact on the tax burden even though the tax rates slightly change. The research results for the model that excludes the banks with pre-tax losses show that the banks can manage effective tax rates and tax burdens by regulating capitalization levels and their size. The other determinants in the model are not significant and do not lead to larger shifts in tax rates.

Based on the presented results, a conclusion can be made that the banks enjoy low tax rates due to their business policy and the policy of the state in which they operate. Monetary policymakers manage the statutory tax rate with special care, and despite the potential for an increase in effective tax rates, they are aware of the risks that would be caused, such as the banks' ability to shift the tax burden to their clients through an increase in the prices of banking products and services. Tax policy management in the modern world implies that banks take into account every business segment and every influencing factor that, as shown, can cause changes in the effective tax rate to a certain extent. Some determinants are amenable to simpler management, some are not. The real tax burden of the banks in Serbia expressed through the current effective tax rate is, in all the models of this paper, under the greatest influence of changes in mergers and acquisitions and the bank size, which are the processes actively taking place in the banking market of Serbia in the last few years.

The above conclusions are subject to certain limitations. As a potential disadvantage, it can be pointed out that this work covers only one group of the determinants that affect the actual tax burden of banks. Also, in order to neutralize the negative values in the analysis, the tax rates are modeled, which can distort the research results. This was partly resolved in the model with omitted observations with a pre-tax loss. Suggestions for future research can include several, such as extending the timeframe used in the analysis, applying other types of effective tax rates, as well as including banks from the countries of the region. The analysis of the determinants of the effective tax rate can be the basis for a later analysis on how these effects lead to the tax burden spillover on end-to-end users.

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APPENDIX

The list of the sampled banks

No.	Name	No.	Name
1	Hypo-Alpe-Adria Bank (present name: Addiko Bank)	13	NLB Bank (present name: NLB Commercial Bank)
2	AIK Bank	14	Mirabank
3	Jubmes Bank (present name: Alta Bank)	15	Telenor Bank (present name: Mobi Bank)
4	VTB Bank (present name: API Bank)	16	Sber Bank (present name: AIK Bank)**
5	Banca Intesa	17	Opportunity Bank (present name: 3 Bank)
6	Postal Savings Bank	18	Vojvođanska Bank, Societe Generale Bank (present name: OTP Bank)
7	Bank of China	19	Procredit Bank
8	Credit Agricole Bank (present name: RBA Bank)*	20	Raiffeisen Bank
9	Marfin Bank (present name: Expobank)	21	Srpska Bank
10	Erste Bank	22	Unicredit Bank
11	Eurobank (present name: Eurobank Direct)	23	Commercial Bank***
12	Halkbank	-	-

*In 2022, the acquisition process of Raiffeisen Bank over RBA Bank started.
** In 2022, the acquisition process of AIK Bank over Sber Bank was completed.
*** In 2022, the acquisition process of NLB Bank over Commercial Bank was completed.

Source: Author, based on the National Bank of Serbia's website

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EXPLORING YOUTH UNEMPLOYMENT IN MOROCCO: EVIDENCE FROM MICRO-LEVEL DATA

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This paper explores youth unemployment in Morocco using the Labor Force Survey of the 2019 data to estimate a logit model. The paper provides the evidence for the three categories of possible determinants of youth unemployment in Morocco. The first set of determinants are the geographic and sociodemographic characteristics such the sex, age, the marital status and the area of residence. Secondly, the socioeconomic factors such as the young people's family background and the number of workers per household play a decisive role in explaining youth unemployment in Morocco. Thirdly and finally, the results obtained in this study show that (regardless of their diplomas) young graduates are more likely to be unemployed than persons without a diploma. However, the influence a diploma type has on the probability of being unemployed varies according to the diploma type. The results obtained shed a light on the important characteristics of youth unemployment in Morocco and should serve as a guide for future research in more specific knowledge gaps.

Keywords: labor market, youth unemployment, graduate unemployment, qualified labor, logit model

JEL Classification: J21, J24, J64, J71

INTRODUCTION

Unemployment in Morocco is a special phenomenon. It disproportionately affects the most important part of the workforce - the youngest, the most qualified, and the most expensive to train and replace. According to the High Commission for Planning (HCP), the unemployment rate in Morocco reached 11.4% in 2022. Furthermore, while the overall unemployment rate is high, the decomposition of unemployment by the age group paints a grimmer picture. In fact, the unemployment rate reached 18.4% for the individuals aged 25 to 34, and 31.7% for those between 15 and 24 years of age. Other discrepancies can be observed between the unemployment of males (9.5%) and females (17.8%), rural unemployment (5.2%) and urban unemployment (15%), and unemployment between graduates (17.7%) and nongraduates (4.1%). These differences could result from multiple factors such as the sex or age-based discrimination, a

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mismatch between graduates' skills and employers' needs, or discrepancies between job opportunities in rural/urban areas. These observed trends could reflect the impact of individual characteristics on unemployment. Because of the ecological fallacy, however, any inference about the causal relationship between these characteristics and the probability of being unemployed should use an appropriate research design.

While youth entrepreneurship can be a solution to youth unemployment, an inadequate business environment, financial constraints, and excessive taxation yet remain barriers to self-employment by the young in developing countries (Bogetić, Đorđević & Ćoćkalo, 2011). Designing policies to reduce youth unemployment is necessary to limit its adverse effects on developing countries' human resource allocation (Njifen, 2015). Doing so requires a deeper understanding of the individual characteristics related to youth unemployment (Tasci & Tansel, 2005).

Much of the previous analysis of youth employment in Morocco used aggregate data. While this may yield valuable insights, it neglects much of the individual characteristics of the young and unemployed. Thus, this paper aims to examine the individual characteristics of young workers and their impact on the probability of being employed. While the analysis carried out in this paper is exploratory, the objective is to shed light on the vulnerabilities of young Moroccan workers to guide future research in more specific knowledge gaps.

Light is particularly shed on the significance of Moroccan young workers' geographic, sociodemographic and socioeconomic, and educational characteristics and how they influence the probability of being employed. A binary logistic model is used in the paper to analyze the micro-level data sourced from the Labor Force Survey of 2019.

The rest of the paper is divided into four sections. The first section discusses the theoretical and empirical literature. The second section describes the data and the empirical methodology. In the third section, the research results are presented, whereas in the final section, conclusions are drawn together with the implications of the research results.

LITERATURE REVIEW

The determinants of unemployment are a highly discussed issue in the literature. However, youth unemployment is a special dimension of the issue that requires a special lens of analysis. The reviewed studies on the psychological impact of youth unemployment by A. Furnham (1985) point out the fact that unemployment causes stress, self-esteem deterioration, and change in young people's expectations for their access to the labor market. Also, the determinants of youth unemployment are multidimensional and include demographic factors, changes in the economic environment, including the labor market, as well as the factors related to education, work experience, and training (Furnham, 1985).

In this section, some theoretical and empirical literature on the determinants of youth unemployment is discussed from the microeconomic perspective of rational economic agents in accordance with the scope of the empirical analysis made.

Youth unemployment: A theoretical overview

A prominent explanation of youth unemployment hinges on the rational choices of workers. Under perfect market conditions, many labor market models consider unemployment as a voluntary decision made by rational individuals refusing to work by determining the optimal combination between work and leisure (Chadi, 2010). In an extension of the seminal critique of perfect rationality in G. J. Stigler (1961), the application of search theory to the labor market indicates the existence of the informational asymmetries that increase the cost of job search and, consequently, reservation wages (Stigler, 1962). Reservation wages are directly affected by a worker's level of education and qualification, i.e. the more skilled the worker, the higher his/her reservation wage. In this context, youth unemployment can be explained by economic agents' rational voluntary choices. In other words, the decision to participate in the labor market is a result of the trade-off

between continuing job seeking and the available job opportunities in the market. Individuals can either accept or refuse the market's real equilibrium wage based on the opportunity cost of each option. Consequently, higher reservation wages make young, educated individuals more inclined to decide to stay unemployed.

Following the same analytical framework, J. R. Harris and M. P. Todaro (1970) divide the labor market into two sectors: the formal sector, offering high wages with very limited job opportunities, and the informal sector, offering unlimited job opportunities with lower wages. Within this framework, the unemployed choose to voluntarily stay unemployed, seeking the opportunity to improve their economic situation rather than taking available low-paying jobs in the informal sector. According to B. Boudarbat (2006), the same logic could be applied to the duality between the public and the private sectors. Accordingly, because of higher reservation wages or discrepancies between jobs in the formal/informal and public/private sectors, young people may voluntarily prefer unemployment to inadequate employment.

While the first group of theoretical explanations focus on young workers' internal decision-making process, another set of theoretical works put a greater emphasis on the external factors explaining youth unemployment. According to these studies, the existence of spatial and skill disparities may play an important role in wage setting and unemployment. For instance, D. Houston (2005) argues that the presence of skills and spatial mismatches often explains imbalances in the distribution of jobs between regions, which would subsequently be the origin of unemployment. J. R. Harris and M. P. Todaro (1970) explain the high urban unemployment rate in developing countries by a large wage gap between jobs in urban versus rural areas, which encourages the migration towards urban areas or international markets. Faced with this situation, young individuals can either make a voluntary decision to remain unemployed, accept overeducation in the local market, or move towards regions with better opportunities for skilled labor. However, various constraints associated with the third option, such as the high monetary costs of job search and moving out and the inflexibility of the situation of young married women, force young skilled workers either to remain unemployed or to accept overeducation and the underutilization of their skills in local markets (Njifen, 2015). According to these explanations, youth unemployment can be explained by the disproportionate effect of mobility costs on workers at the start of their careers.

The relevance of human capital theory to the labor market analysis has attracted researchers' attention in recent decades (Petrović, 2010). Hence, a lack of investment in human capital remains one of the most discussed determinants of youth employment. According to the proponents of human capital theory (Becker, 1962; Mincer, 1975), discrepancies between education and employers' needs are the important determinants of youth unemployment. For instance, J. Mincer (1975) examined the effects of education on the income derived from employment. According to Mincer, education is considered as an investment in an inventory of "skills" or a formation of "human capital". The acquisition of a stock of knowledge and skills through formal education allows the improvement of workers' productivity that is likely to be put to use in employment. Therefore, pursuing formal education makes workers more productive and more efficient in the labor market. G. S. Becker (1962) argues that a lack of investment in one component or in more components of human capital may reduce youth employability and lead to unemployment. Becker distinguishes between the three components of human capital: general theoretical knowledge industry/company-specific training and the state of health required to mobilize both. However, these components, especially the first two, are not substitutable and failures in the acquisition and maintenance of one component or more components are the origin of unemployment.

In the same vein, L. Mauro and G. Carmeci (2003) argue that young graduates' lack of professional experience is the main determinant of youth unemployment. Young graduates must acquire firm and industry-specific knowledge through on-the-job activities so that educated human capital can become productive, which reduces the productivity of the

untrained. Thus, hiring the practices that place more emphasis on professional experience contributes to the unemployment of educated youth. A vicious cycle is thus created in the segments of employment where having on-the-job training requires employment for young workers looking for their first job (Njifen, 2015). Therefore, according to human capital theory, youth unemployment arises because of the underinvestment of young workers in one component or in more components of human capital.

In conclusion, it is unlikely that youth unemployment is the result of one single factor. Several theoretical explanations can simultaneously be correct. Ultimately, unemployment is a dynamic, complex, and multidimensional economic phenomenon. An empirical examination of the characteristics of youth unemployment is then necessary to draw relevant conclusions.

A review of the empirical literature

A significant body of empirical literature has examined the determinant of youth unemployment from a microeconomic perspective. These studies have confirmed the role played by age, the sex, geography, and education in determining labor market outcomes. The review the empirical literature presented herein starts by examining some examples of international studies before focusing the attention on the Moroccan case.

H. M. Tasci and A. Tansel (2005) analyzed the determinants of the transition of Turkish workers between different states of the labor market. The first phase of the study consists of the calculation of the probabilities of transition between the labor market states. The second phase consists of the estimation of multinomial logistic models in order to investigate the determinants of the transition of men and women between different states of the labor market. The results show that women in urban areas are more likely to be unemployed. Furthermore, single individuals are more likely to be unemployed. Finally, the probability of losing the job decreases for older and more educated individuals.

G. B. N. Njikam, R. Marc and L. Tchoffo (2005) also analyze the characteristics of youth unemployment in Cameroon using two econometric models. The first analyzes the gains of the labor market participation for young people. The second is based on the multinomial logistic model of labor market participation that distinguishes between young people and adults. The authors conclude that having a higher degree does not boost one's chances of finding a job. Young graduates have high reservation wages. Therefore, they try to make their degree worthwhile by seeking secured jobs. The results also confirm the fact that young women are faced with discrimination in terms of the salary and the responsibilities entrusted to them. Later, I. Njifen (2015) use the decomposition techniques of Blinder and Oaxaca to analyze the characteristics of youth unemployment in Cameroon and the gap in this unemployment according to the gender and a diploma. The findings reveal the presence of gender discrimination in hiring, as well as the explanatory role of education and the area of residence in the worsening of youth unemployment.

The youth unemployment issue has always attracted the attention of researchers in Morocco. In particular, M. Bougroum, A. Ibourk and A. Trachen (2002), N. El Aoufi and M. Bensaïd (2005), B. Boudarbat (2006), J. Ait Soudane, S. Sohli and M. Chiadmi (2020), F. Berahou and A. Abdouni (2021), Y. Idhadj and K. Louizi (2021) analyzed the Moroccan labor market so as to study the determinants of the unemployment of a significant part of the labor force in Morocco from a microeconomic perspective. For example, B. Boudarbat (2006) analyzed the evolution of employment and the wage situation in Morocco using the micro-data from the Labor Force Survey of 1998 in order to show that young graduates prefer stable and well-paid work and, therefore, "voluntarily" risk long periods of unemployment. The results show that while job opportunities and wages have improved for unskilled workers, there is still a significant and gradual decrease in returns to education. Furthermore, N. El Aoufi and M. Bensaïd (2005) examined the unemployment of young graduates based on the population census data of 2004. The authors addressed the different components of the labor market, learning outcomes, the education

and training system, and its relevance to the labor market requirements. They suggested that the prevalence of youth unemployment was linked to a multitude of factors, namely, demographic factors, the imbalance between labor supply and demand, the effects of economic policies, and the orientations of the development model adopted in Morocco after independence. Furthermore, J. Schonholzer (2008) explored the factors that affect access to employment among young vocational training graduates in Morocco. Using a simple logistic model, the author concluded that the gender, certain traits of the father, some types of diplomas, specific sectors of the economic activity, and graduation from public institutions significantly improve the probability of accessing a job. Finally, M. Bougroum *et al* (2002) used a multinomial logistic model to analyze the role of certain key characteristics (diploma characteristics, age, the gender, income, the household size and the situation of a young person inside the household) in the determination of young graduates' access paths to the labor market. The authors emphasize the fact that there is no theoretical framework that holistically encapsulates the phenomenon of graduate unemployment which public decision-makers could base their policies on.

More recently, J. Ait Soudane *et al* (2020) analyzed the role of soft skills and both human and social capital in explaining the difficulties encountered by young graduates in gaining access to employment in Morocco. Using a probit model, the authors showed that the study level and field play a determining role in explaining young graduates' employment. The results also show that relational skills are the selection filters most used by employers. In addition, F. Berahou and A. Abdouni (2021) shed light on the career paths of 1621 university graduates of the class 2009 over the first three years after graduation using the optimal matching classification algorithm to determine the different career paths of the individuals and revealed the existence of six distinct career paths. The authors then estimated a multinomial logit model to analyze the impact of the different factors influencing the probability of belonging to a typical career path. The results confirm the existence of the gender discrimination and the influence of the family characteristics such as the level of parental education. Finally, they show that the impact of the diploma type on access to employment. In particular, the results show that holders of bachelor's degrees are the segment of the sample which is the most vulnerable to unemployment. Also, Y. Idhadj and K. Louizi (2021) explored the time needed to escape unemployment and the factors likely to lengthen it, based on the data collected from 468 graduates sourced from a retrospective study of the young people who had benefited from the integration contracts between 2015 and 2019. The results of the estimates from the Kaplan-Meier survival model show that the higher the education level, the greater the risk of lengthening the duration of unemployment. Finally, they show that a significant part of the variance in the duration of the graduates' unemployment is essentially due to their job search methods.

DATA AND METHODOLOGY

To do empirical research, the literature review was used to formulate the following hypotheses about the determinants of youth unemployment in Morocco:

H1: Women are more likely to be unemployed than men.

H2: In older individuals, there is a lower probability of being unemployed.

H3: Living in an urban area increases the probability of being unemployed.

H4: Being married decreases the probability of being unemployed.

H5: A higher level of education increases the probability of being unemployed.

H6: A higher level of parental education reduces the probability of being unemployed.

H7: Individuals living with a greater number of employed workers in their household are less likely to be unemployed.

To test these hypotheses, a binary logistic regression model is used to predict the probability of being unemployed for a young person.

Econometric methodology

A binary logistic regression model (also known as a binary logit model) is a predictive model that can be used to predict the probability of a certain binary outcome (Wilson & Lorenz, 2015). For an overview of the logit model, see D. W. Hosmer and S. Lemeshow (1991).

The general equation of a logit model can be expressed as follows:

$$Y = \log\left(\frac{p_1}{1-p_1}\right) = \beta_0 + \beta_1 X_1 + \ldots + \beta_k X_k \qquad (1)$$

where p_1 is the probability of the occurrence of the event Y outcome given a set of explanatory variables X_1 to X_k and their estimated coefficients β_i (i = 0 to k). The estimation of the coefficients of the explanatory variables is based on their ability to predict the event so that the predictions of the outcome Y are as close as possible to the observed values. The probability p_1 of the occurrence of an event (Y = 1) varies according to the values of the explanatory variables according to the following logistic function:

$$P(Y=1 \mid X) = \frac{e^{(\beta_0+\beta_1 X_1+\ldots+\beta_k X_k+\varepsilon}}{1+e^{(\beta_0+\beta_1 X_1+\ldots+\beta_k X_k+\varepsilon}} \qquad (2)$$

The logistic model predicts a probability ranging between 0 and 1 for each individual. If this probability is close to 1, the occurrence of the event to be predicted (namely, being unemployed, for the purpose of this study) is more probable, and if this probability is close to 0, the occurrence of the event is unlikely. Logistic regression aims to find a specification (a group of explanatory variables) that improves the predictivity of the model compared to the initial basic model (the model without explanatory variables, often called "step 0").

How well the logit model fits in is determined by the four main statistics: the -2log likelihood statistic (-2LL) that illustrates the difference between the base model (step 0) and the estimated model (with the explanatory variables), the pseudo-R-squared statistics (Cox & Snell, 1989; Nagelkerke, 1991), representing the estimate of the variance explained by the model, and the Pseudo-R2 (McFadden, 1974) used as the estimate of the explained variability of the model.

$$R^2_{\text{McFadden}} = \frac{-2LL_{base} - (-2LL_{model})}{-2LL_{base}} \qquad (3)$$

The fitted model is then interpreted using odds ratios. An odds ratio is the odds of the occurrence of the outcome event $Y = 1$ after one unit change in the predictor divided by the original odds that the event happens. To obtain the odds ratio (OR) in the case of a categorical variable, the reference category must be defined, and ORs will then be defined in opposition to this reference situation. The choice of a reference modality is important for interpretation as it cannot be dissociated from the qualitative analysis of the results. If the variable X has n modalities, (n-1) odds ratios will be calculated as follows:

$$Odds - ratio(ni) = \frac{Odds_{mi}}{Odds_{mr}} \qquad (4)$$

with m_i being the modality i of the variable and m_r being its reference modality.

Data

This study is based on a representative sample sourced from the National Employment Survey (NES) of 2019. NES is an annual survey conducted by the HCP and aims to provide information about the situation and evolution of the labor force in Morocco. Access to the survey's database is very restricted and limited to a controlled environment due to data confidentiality and other privacy concerns. The dataset made available to the authors[1] in its raw state contains 15 variables and more than 142,000 individuals. However, to obtain relevant data for the research question, the dataset was further processed using two filters. First, in order to limit the data to young people, only the individuals between 15 and

29 years of age were selected. Second, the individuals not seeking employment were excluded as we were mainly interested in the determinants of youth unemployment, not in their access to the labor market. The final dataset consists of 25,589 individuals, which represents 18% of the initial dataset.

Model specification

The outcome variable is the labor market states of young people, which is the binary variable that takes 0 if the individual is unemployed, and 1 if the individual is employed. The choice of the explanatory variables is based on intuition and the review of the empirical literature. All the variables and their modalities are summarized in Table 1.

Note: It should be noted that the Moroccan higher education system is in line with the French LMD (Bachelor's-Master's-Doctorate) higher education system. There are some slight differences between the French system and the international system. For instance, it has been possible to obtain a bachelor's degree in Morocco in only three years since the 2003 education reform.

The explanatory variables are classified into three categories. The first category contains the explanatory variables that represent the demographic characteristics of the individual and his/her geographical environment. These variables are the individual's sex, area of residence, marital status, and the age group the individual belongs in. According to hiring discrimination theory, a possible explanation

Table 1 Data description

Variables	Modalities
Labor market states	0: Employed 1: Unemployed
Sex	0: Male 1: Female
Area of residence	0: Rural area 1: Urban area.
Marital status	0: Single 1: Married 2: Others
Age group	0: 15 - 18 years of age 1: 19 - 24 years of age 2: 25 - 29 years of age
The highest degree (1)	0: The individual has no diploma 1: The individual holds a high-school diploma or a lower-level diploma 2: The individual holds a two-year undergraduate degree or a bachelor's degree 3: The individual holds a master's or engineering degree 4: The individual holds a PhD 5: The individual holds a two-year professional diploma
The highest degree obtained by the household head	0: The individual has no diploma 1: The individual holds a high-school diploma or a lower-level diploma 2: The individual holds a two-year undergraduate degree or a bachelor's degree 3: The individual holds a master's or engineering degree 4: The individual holds a PhD 5: The individual holds a two-year professional diploma
The number of employed workers per household	0: No workers 1: One worker 2: Two workers 3: Three workers 4: Four workers, or more

Source: Authors

for young female unemployment could be employers' prejudice against women for irrational reasons. It could also be systemic, historical, or cultural (Aigner & Cain, 1977). In addition, the young people who live in urban areas are less likely to be unemployed compared to those living in rural areas (Harris & Todaro, 1970). Finally, the marital status is also one of the factors that influence the possibility of being unemployed. The fact that a young person is married reduces his/her chances of being unemployed as newlyweds may find themselves forced to work to support themselves and fulfill their familial obligations (Tasci & Tansel, 2005). Faced with this situation, they are ready to voluntarily accept the jobs that do not correspond to their qualifications. The last variable in this category is the age group the individual belongs in given the fact that older individuals are perceived by employers to have more professional experience. In general, employers prefer recruiting experienced professionals to fresh graduates.

The second category of explanatory variables contains the variables representing the characteristics of the individual's education. The highest diploma obtained by the individual classified by the educational institution type (universities, engineering schools, and professional training institutions) are used as a proxy for this variable. The literature on the impact of higher education on employment is ambiguous. On the one hand, higher education increases workers' skill level and allows them to integrate in a bigger part of the labor market. On the other hand, the higher the worker's education, the lower the job opportunities in the market that meet their reservation wage requirements. In addition, educated workers find themselves to be overqualified in local markets dominated by the jobs that require unskilled labor.

The third category represents a set of socioeconomic factors. These variables allow for the analysis of the individual's familial environment and the impact of the level of education and the financial stability of the household on the chance of being unemployed. The first variable in this group considers parents' education. Educated parents can comparatively offer better financial support for quality education and can also offer their offspring training on job search and networking opportunities. The second variable is a proxy for the financial stability of households.

RESULTS

In this section, the initial model estimation, the specification and validation tests, as well as the final model estimates are presented.

The initial model estimation

Choosing the right logit model given a multitude of the explanatory variables is based on the contribution of each variable to the accuracy of the model's predictions. The modeling process starts with the estimation of the multiple iterations of the initial "step 0" model that only accounts for the constant. The -2LL statistic is computed for each iteration and the iteration that minimizes the -2LL statistic is retained. The consequent steps (i.e. models) are specified using the forward selection method based on the significance of the score statistic. The results of this analysis show that all the explanatory variables have a significant score statistic[2].

The cross-classification analysis of the initial model allows evaluation of the predictive accuracy of the "step 0" model. The analysis shows that the sample contains 19,590 employed and 5,999 unemployed individuals. By classifying all the individuals into those employed (the most frequent event), the "step 0" model correctly classifies 76.6% of the individuals. This value will be used later as the baseline to assess the quality of the model.

The final model selection and validation

As is discussed before, three statistics are used to evaluate the model fit (Table 2). The best model is the one with the highest value of Cox et Shell's and Nagelkerke R-squared and the lowest -2LL statistics. The value obviously rises for each step, and it can be concluded that the final model is the best fit.

Table 2 The model fit statistics

Step	-2LL	Cox et Shell R2	Nagelkerke R2
7	15686.45	0.379	0.571

Source: Authors

Using the McFadden (1974) Pseudo-R-squared statistic, the final model can be said to predict 44% of the variance in the outcome.

Examining the cross-classification tables of each estimated step allows choosing the best step. As is shown before, the "step 0" model correctly classifies 76.6% of the sampled young people. The results[3] of the cross-classification analysis show that the steps 2 to 6 steadily increase the model's accuracy so as to reach 86.5%, which is the highest accuracy. However, the step 7 model is slightly less accurate than the step 6 one (86.4% versus 86.5%, respectively), but the benefit of the added independent variable outweighs the loss of 0.1% of the model accuracy. Finally, to ensure that the model is adjusted well to the data and that it effectively predicts the group which it belongs in, the list of the observations with the standardized residual value greater than 2 is analyzed, simultaneously paying attention to those located within the three standard deviations. A total of 495 of the total of 25,589 young people are found to have the residual values of more than three standard deviations, which represents 2% of the sample.

Results interpretation

Table 3 summarizes the estimation results of the final model. It presents the coefficients associated with each variable, their standard errors, the odds ratios, and the confidence intervals for each odds ratio.

The obtained results confirm all the research hypotheses (H1-H7) set at the beginning of the paper. The analysis of the indicators of the individuals' demographic and sociodemographic characteristics reveals some interesting findings. First, being a woman increases the probability of unemployment. The probability of unemployment for a woman is 1.7 times greater than that of a man. Second, unemployment in Morocco is an urban phenomenon, that is to say individuals living in rural areas are 37.3% less likely to be unemployed. Third, young single people are more likely to be unemployed. As the results show, being married reduces the probability of being unemployed by 80%. In addition, being widowed or divorced reduces the probability of being unemployed by 71%. Finally, the chance of being unemployed decreases with the individual's year of age. For instance, young people aged 15 to 18 are 3.4 times more likely to be unemployed than those of 25 to 29 years of age. These results are supportive of discrimination theory and show the vulnerability of young single females to unemployment. The greater chance that the married will find employment can be attributed to the effects of familial responsibilities on the reduction of reservation wages.

The results pertaining to the individuals' education and training account for the fact that young graduates are more likely to be unemployed than young people without diplomas. Remarkably, the impact of having a diploma on the probability of being unemployed varies according to the type of the diploma obtained. Compared to the reference category, young people with a high-school degree or a lower-degree diploma stand a 2.2 times as great a chance of being unemployed. However, the chances of individuals holding other types of diplomas are far greater. Notably, the individuals with a two-year undergraduate degree or a bachelor's degree are the most vulnerable segment of educated youth to employment (OR = 7.3). Furthermore, the holders of a master's or engineering degree are better off compared to the holders of a bachelor's degree, but they are still worse off than the young people with a high-school degree. Obtaining a master's or engineering degree significantly increases the probability of being unemployed compared to the reference category (OR = 3.6). In addition, vocational training is still ineffective in reducing unemployment as professional diploma holders are still 4.7 times more likely to be unemployed compared to the reference category, but they are still better off than the holders of the degrees requiring the same number of the years of study (2-3-year undergraduate degrees). Finally, the results reveal that the additional years of education necessary to obtain a PhD degree do

Table 3 The logit regression results

Modalities	β	OR	CI (95%)	
Sex (Ref. = Male)				
Female	0.545*** (-0.046)	1.725	1.576	1.889
Residence (Ref.= Urban)				
Rural	-0.467*** (0.053)	0.627	0.565	0.695
Marital status (Ref. = Single)				
Married	-1.609*** (0.085)	0.2	0.169	0.236
Other	-1.236*** (0.215)	0.29	0.19	0.443
Age group (Ref. = [25-29])				
[15-18]	1.216*** (0.072)	3.372	2.926	3.886
[19-24]	0.749*** (0.046)	2.116	1.934	2.315
The highest degree obtained (Ref. = No diploma)				
A high-school diploma or a lower-level diploma	0.805*** (0.061)	2.236	1.983	2.522
A two-year undergraduate degree or a bachelor's degree	1.989*** (0.09)	7.305	6.126	8.71
A master's or engineering degree	1.287*** (0.139)	3.624	2.762	4.754
PhD	1.529*** (0.467)	4.612	1.845	11.528
A two-year professional diploma	1.541*** (0.083)	4.668	3.968	5.493
The highest degree obtained by the head of the household (Ref. = No diploma)				
A high-school diploma or a lower-level diploma	-0.36*** (0.052)	0.698	0.63	0.773
A two-year undergraduate degree or a bachelor's degree	-0.889*** (0.143)	0.411	0.311	0.544
A master's or engineering degree	-1.099*** (0.209)	0.333	0.221	0.502
PhD	0.155 (0.368)	1.168	0.568	2.402
A two-year professional diploma	-0.651*** (0.123)	0.521	0.41	0.663
The number of employed workers per household (Ref. = Four workers or more)				
No worker	24.969 (897.583)	6.98E+13	0	-
One worker	3.505*** (0.129)	33.281	25.846	42.853
Two workers	1.755*** (0.129)	5.783	4.488	7.451
Three workers	0.752*** (0.14)	2.121	1.614	2.789
Constant	-4.799*** (0.141)	0.008		

Note: *, ** and *** indicate the 10%, 5% and 1% significance levels, respectively.

Source: Authors

not improve the young people's chances of finding a job. The probability of being unemployed for young people with a PhD exceeds that of the young people who have only obtained a master's or engineering degree.

Finally, the results show the influence the socioeconomic factors exert on unemployment. For instance, the risk of becoming unemployed decreases with an increase in the level of the education of the head of the household (in terms of the years of study). Furthermore, the number of active workers in the individual's household influences his/her probability of being unemployed. The results show that the number of active workers in the household considerably reduces the probability of being unemployed as the probability of being unemployed compared to the reference category (4 or more employed workers) ranges from 33.3 times for the young people living in households with only one person employed to 2.1 times for those living in households with three people employed.

CONCLUSION

The characteristics of youth unemployment in Morocco are explored using the micro-level data sourced from the Labor Force Survey of 2019. Based on the literature review, a total of seven hypotheses were set about the determinant of youth unemployment in Morocco. To verify these hypotheses, a logit model was estimated to determine the impact of education and various individual and environmental characteristics on youth unemployment. The results obtained confirm all the research hypotheses (H1-H7) set herein, in particular the sex, age, the area of residence, the marital status, the diploma of the head of the household, and the number of active workers per household, all being the determinants of youth unemployment in Morocco. Among these factors, the sex and age have the most significant influence on the probability of being unemployed. These results can be considered as the evidence of sex- and age-based discrimination and they can be interpreted using the paper by G. S. Becker (1957) who argued that certain groups were less represented in the labor market because of the recruiters' unwillingness to interact with them as a result of one's personal taste or prejudice, as D. J. Aigner and G. G. Cain (1977) argue. Age-based discrimination could also be interpreted using human capital theory, which implies that younger workers could be less recruited because they had less time to acquire the necessary professional experience. The results support the recent studies by F. Berahou and A. Abdouni (2021) and Y. Idhadj and K. Louizi (2021), but contradict the earlier research done by B. Boudarbat (2006), who found that being a woman did not affect unemployment, suggesting that the female unemployment rate was due to the fact that female workers prioritized their family obligations of labor market participation. This shift could be the result of the changing attitude of women towards employment during the last two decades.

The worker's family background also affects his/her access to the labor market given the fact that better educated parents can offer better professional orientation to their offspring. The number of employed workers in the household could also be correlated with its financial stability and capacity to offset costs associated with job search and mobility, as argued by I. Njifen (2015). These results are in line with the M. Bougroum *et al* (2002) earlier findings. It should be noted that family support, financial or otherwise, is often a factor neglected in the reviewed literature and deserves further analysis in future studies.

In addition, the results show that young graduates (regardless of the diploma they may have) are more likely to be unemployed than young people without diplomas (the reference category). These results are in line with the B. Boudarbat (2006) findings that the level of schooling increases the probability of unemployment, which could be explained by a mismatch between the number of the skilled workers that graduate from higher education institutions and the number of the vacancies that require skilled workers. However, in a fashion similar to J. Ait Soudane *et al* (2020) and F. Berahou and A. Abdouni (2021) findings, the influence of higher education on the probability of being unemployed is shown to vary according to the type of the diploma obtained. These

illustrate the key differences in returns on higher education investment in terms of unemployment. This finding can be explained using human capital theory. The quantitative mismatch between the supply and demand of skilled workers may play the key role in explaining unemployment amongst youth graduates. Furthermore, J. Ait Soudane *et al* (2020) suggest that additional characteristics such as social capital and soft skills are needed to allow graduates to find employment.

Overall, the results obtained in this paper show that youth unemployment can be explained by a multitude of factors. The theories explored in the literature review all play a role in explaining youth unemployment. These results are in line with M. Bougroum *et al* (2002) conclusion that there is no unique theoretical explanation for youth unemployment in Morocco.

The results obtained in this study are not without limitations, either. The scope of the results is mainly limited by the nature of the micro-level data used in this study. For instance, being a cross-sectional dataset, NES does not allow for an analysis of the evolution of non-immutable characteristics over time. In addition, while the logit model provides a great insight into the impact of the worker's characteristics on his/her access to the labor market, on the one hand, it does not answer the question "why", on the other. In other words, the results show young workers' unemployment-relevant characteristics without informing about the reason for such importance.

The analysis made in this paper can be a valuable step point for future research. For instance, it would be interesting to explore the reasons lying behind the observed impact of the types of diplomas on the probability of being unemployed so as to investigate why graduates from some programs are more successful in finding jobs than others. A mixed-methods approach can be valuable in investigating such issues by also gaining an insight into recruiters' perspectives.

ENDNOTES

1 The sample used in this study was obtained as a part of an internship carried out by the first author within the Statistics Department of the HCP.

2 Due to space limitations, these results are not reported, but they are available from the authors upon request.

3 Due to space limitations, these results are not reported, but they are available from the authors upon request.

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NETWORKING EFFECTS ON SOCIAL ENTERPRISES' INNOVATIVENESS

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In the paper, the connection between networking and the innovativeness of social enterprises is explored. The research is motivated by the idea of understanding the impact of networking on the innovation of this special type of organizations that, due to its hybrid nature, has the potential to respond to today's economic and social challenges. The research is based on a sample of 837 social enterprises from 11 European countries. The results showed that networking was one of the key features of these organizations, as more than 90% of the surveyed organizations cooperated with other organizations, but also that networking itself did not affect the innovation of social enterprises. A more detailed analysis shows the differences that the networking forms and organizational age have on innovation.

Keywords: networking, innovativeness, social enterprises, organizational age

JEL Classification: M14, O31, O35

INTRODUCTION

The factors that drive innovativeness in social enterprises are explored in this paper. Research in the work of social enterprises in Serbia (Žarković-Rakić, Aleksić-Mirić, Lebedinski & Vladisavljević, 2017; Aleksić-Mirić, Petrović & Aničić, 2018; Aleksić-Mirić, Petrović & Aničić, 2019;) shows that social enterprises' awareness of their social mission, their attitude that innovation is important, the financing obtained through grant schemes and the involvement of their owners, boards, customers, and nongovernmental organizations in the organizational decision-making system are among the most important drivers of innovativeness in social enterprises in Serbia. Research in social enterprises in Europe shows that innovation is also influenced by the availability of financing (Schätzlein, Schlütter & Hahn, 2023), changes in the external environment, a company's growth orientation, the employment of paid staff instead of volunteers, previous experience in founding/managing a social enterprise, motivation for work in/with a social enterprise, satisfaction with professional life, the level of education and disability. The research presented in this paper aims to understand the effects that networking has on the innovation of this special type of organizations, which, due to their dual nature (Searing, Poledrini,

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Young & Nyssens, 2022) and efforts to simultaneously achieve economic and social goals in a harmonious balance (Cho, Kim & Oh, 2022; Mas-Machuca, Akhmedova & Marimon, 2023), have increasingly been attracting attention from the professional and academic public and have the potential to respond to today's economic and social challenges. The paper examines a possible existence of differences in the behaviour of social enterprises depending on their age, so all the examined enterprises are classified into two groups - the so-called "old" generation of enterprises, which includes the organizations founded in the period from 1944 to 2000, and the so-called "new" generation of companies, which includes the organizations founded after 2000.

The foregoing can be systematized through the following research questions:

RQ 1a. Does networking significantly affect the innovation of social enterprises?

RQ 1b. Do all forms of networking affect the innovation of social enterprises?

RQ 2a. Does the age of social enterprises change the conclusions about the impact of networking on innovation?

RQ 2b. What forms of networking influence innovation in the so-called "new" and "old" generations of social enterprises?

RQ 3. What factors influence innovation in the so-called "new" and "old" generations of social enterprises?

The paper is structured as follows: Section 2 provides an overview of the relevant literature; Section 3 presents the methodology used; Section 4 deals with the research results, only to be followed by the discussion in Section 5; finally, the Conclusion Section summarizes the research findings.

LITERATURE REVIEW

Questions about the networking and social enterprises has relatively recently attracted more attention in academic research. A lately published analysis by D. Littlewood and Z. Khan (2018) reflects a systematic review of the literature on social enterprises and networks. Based on a review of 77 top journals in the field of business economics and management, they conclude that there is an increase in interest in researching the relationship between social enterprises and networks, the diverse applications of the network perspective, concepts and theories, a diverse research methodology and still a very large area for further research to be done.

In the critical review of the organizational innovation literature, R. A. Wolfe (1994) identified the three major streams of research: (1) the diffusion of innovation research that focuses on exploring the pattern of innovation through a population of potential adopter organizations, (2) the organizational innovativeness research that focuses on exploring what it is that determines organizational innovativeness, and (3) the process theory research that addresses the issue of the processes organizations go through in implementing innovation. The drivers of organizational innovativeness are mostly examined within the second and third research areas, as identified by R. A. Wolfe (1994). Within this research corpus, several topics of importance emerged:

- *The importance of innovativeness in different contexts.* (1) innovations and the awareness of their importance (Alegre & Chiva, 2008; Madhoushi, Sadati, Delavari, Mehdivand & Mindahost, 2011; Aleksić Mirić *et al*, 2018); (2) innovation and previous experience and education (Maidique & Hayes, 1984; Lefebvre & Lefebvre, 1992; Kolvereid, 1996; Shane, 2000; Charney & Libecap, 2000; Kuratko, 2005; Ucbasaran, Westhead & Wright, 2009); (3) innovation and the environment (Lawrence & Lorsch, 1967; Miller & Friesen, 1983; Davis, Morris & Allen, 1991; Russell & Russell, 1992; Naman & Slevin, 1993; Damanpour & Gopalakrishnan, 1998; Tidd, 2001; Koberg, Detienne & Heppard, 2003; Jansen, Van Den Bosch & Volberda, 2006); (4) innovation and the company size (Schumpeter, 1942; Rothwell & Zegveld, 1982; Acs & Audretsch, 1987; Arrow, 1993; Rogers, 2004; Wagner & Hansen, 2005; Laforet, 2008; Erić Nielsen, 2015);

- *Innovativeness and networking.* The main source of innovation is gradually moving from the individual firm to its network (Pittaway, Robertson, Munir, Denyer & Neely, 2004; Rogers, 2004; Eggers, Kraus & Covin, 2014; Chesbrough & Bogers, 2014; Mokhtarzadeh, Mahdiraji, Jafarpanah, Jafari-Sadeghi & Cardinali, 2020; Hilmersson & Hilmersson, 2021); the primary motive for connecting is not only to reduce costs or reduce risk, but also to facilitate access to complementary technologies (Narula, 2004; Savović, Zlatnović & Nikolić, 2021), gain new or complementary competencies or conquer new or complementary markets (Pittaway *et al*, 2004), and speed up product market entry (Hilmersson & Hilmersson, 2021); network connections not only expand the knowledge base of SMEs, but they also allow them easier access to both technical and commercial resources (Parida, Pemartin & Frishammar, 2009); too much networking may also lead to reduction in overall innovation (Lee, Ginn & Naylor, 2009);
- *Collaboration with different types of partners affects a company's innovation.* Cooperation with similar companies is much more important for improving the innovative performance of companies than connecting companies with research institutions, intermediary institutions and government agencies (Zeng, Xie & Tam, 2010); the role of consumers, suppliers, competitors, consultants, universities, and governmental organizations (De Jong & Hulsink, 2012); the role of network configuration and the certain types of partners in creating innovations (Pittaway *et al*, 2004).

RESEARCH METHODOLOGY

The data for this study were drawn from the field research based on an online survey. The link to the questionnaire was sent by e-mail to the selected social enterprises together with an explanation introducing the purpose of the survey and the benefits gained from their participation in it. The respondents were the owners or managers of social enterprises aged 18 years and over. In the case when the non-founders responded to the questionnaire, they did that in the capacity of the person to whom the owner had delegated decision-making rights and authority to manage the organization in the owner's best interest. The sample consisted of 837 social enterprises operating in 11 European countries (in alphabetical order: Albania, Austria, Denmark, England, France, Germany, Italy, Poland, Serbia, Scotland and The Netherlands) .

The questionnaire consisted of several modules. The first three modules were designed so as to capture data on the respondents' personal characteristics (such as their gender, age, education, previous experience in founding/managing a social enterprise, motivation, etc.), as well as the general characteristics of the enterprise itself (such as its type, size according to the number of employees, ownership structure, year of establishment, sector of economic activity, sales turnover, etc.). The other two modules were devoted to the following dimensions of social enterprises: access to financing, the main challenges and constraints for social enterprises, the role of innovation during the lifecycle of the enterprise, the influence of different categories of stakeholders on the decision-making process of the enterprise and the entrepreneurs' social capital.

Innovative social enterprises (ISE) are defined as an organization which has made innovations in products in the last three years, namely those whose managers or owners responded positively ("yes") when answering the question "Has your organization innovated in terms of products, the process, finance, or marketing in the last three years?" in the questionnaire. All the other organizations, namely those whose managers or owners responded "no" when answering the stated question, are categorized into social enterprises that have not innovated in the last three years (NISE). The terms "new" and "old" generations of social enterprises are also used in this paper. The organizations founded in the period from 1944 to 2000 are named the "old" generation of social enterprises, whereas the organizations founded after 2000 are referred to as the "new" generation of social enterprises.

Statistical analysis was performed using the t-test for testing the equality of the means, the z-test for testing the equality of the proportion, the hi-square test and some nonparametric tests in order to confirm the results obtained using parametric tests. For the numerical variables, the t-test was used for testing the equality of the means between ISE and NISE. As the answers offered in the questionnaire follow the Likert item logics, namely 1 - Completely disagree, 2 - Disagree, 3 - Neither agree nor disagree, 4 - Agree, 5 - Completely agree, the test results were checked by applying nonparametric tests. The analysis showed the same results. In order to make statistical inferences in the chapter, the p-value of 0.05 was used. The results of the conducted statistical analysis where the null hypothesis of the equality of the means or proportions were tested are accounted nfor in the tables bearing the symbols "="/"No" or "≠"/"Yes". In the case when the null hypothesis is not rejected, the symbol "=" or "No" are used, which means that the tested factor does not have any influence at all. When the null hypothesis of the equality of the means/ proportions is rejected, the symbols "≠" or "Yes" are used, which means that innovativeness is influenced by the factor. Almost all the variables used in this research study, especially so the key "innovativeness" and "networking" variables, are categorical, so using other more advanced statistical techniques is limited .

RESEARCH RESULTS

The results obtained after the statistical analysis are grouped into three segments: cooperation within the same field of work; cooperation among SEs and innovativeness; and organizational age, cooperation and innovativeness.

Cooperation in the same field of work

To answer the first research question, a comparison of the column proportion and the tested null hypothesis that ISE and NISE cooperated with other organizations in the field of work in the same proportion was conducted. The result of that test is presented in the second column of Table 1 as the equality sign, i.e. the percentage of the ISE that cooperated with other organizations was statistically equal to the percentage of the NISE that cooperated with other organizations. In other words, it can be inferred that cooperation, i.e. networking, has no effect on the innovativeness of social enterprises. The very same table also shows that more than 90% of the organizations surveyed cooperated with other organizations in their field of work. This applies to both ISEs and NISEs.

Table 1 Networking and innovativeness - the column proportions comparison

Questions/Factors	Test results	Innovative social organizations	
		Yes	No
Do you cooperate with other organizations in your fields of work (as indicated above)?	Yes = No	93.7% 6.3%	91.2% 8.8%

Source: Authors

In order to gain a better insight into the forms of cooperation of social enterprises, the structure of the cooperation of the surveyed social enterprises was analyzed. Table 2 demonstrates the fact that at the very most they cooperate with other social enterprises (82.7%), only to be followed by cooperation with local authorities (75.1%), private businesses (64%) and civil society organizations (61.2%), whereas at the very least with a national authority (48.5%).

Table 2 Cooperation intensity

Cooperation with	Percent of cases	Responses	
		N	Percent
Other social enterprises	82,7%	535	24,9%
Local authority	75,1%	486	22,7%
Civil society organizations	61,2%	396	18,5%
Private businesses	64,0%	414	19,3%
National authority	48,5%	314	14,6%
Total	331,5%	2145	100%

Source: Authors

Cooperation among SEs and innovativeness

As mentioned in the theoretical framework of the paper, there are numerous studies showing that networking affects company innovativeness. What is different about this research, and why do the results show that networking does not affect the innovation of social enterprises? One possible explanation is that the type of business cooperation affects this relationship.

A more detailed analysis reveals that collaboration with other social enterprises affects the innovativeness of social enterprises, i.e. the statistical analysis made suggests that innovative social enterprises cooperate more with other social enterprises. The other cooperation forms examined do not report to affect the innovativeness of social enterprises, which is obvious from the second column of Table 3. Namely, in the first row of the table, the null hypothesis reading that the percentage of cooperation with other social enterprises in ISE and in NISE is the same was tested. The results of comparison of the column proportions shows that this null hypothesis is rejected, i.e. the percentage of the cooperation of ISE with other social enterprises is statistically greater than that of NISE. In the other rows, the null hypothesis reading that the percentage of the other forms of the cooperation of ISE and NISE are equal. The sign in the second column is an equality sign "=", which means that the null hypothesis is not rejected.

Organizational age, cooperation and innovativeness

In order to see whether the significance of networking in achieving innovativeness changes depending on the age of social enterprises or not, and what forms of networking are significant in achieving innovativeness in the group of the so-called "old" and "new" generations of social enterprises, the impact of the cooperation forms on innovativeness was tested. The results of the analysis are given in Table 4. Namely, in the organizations established before 2000, innovativeness is influenced by cooperation with other social enterprises, local authorities, civil society and national authorities. Specifically, ISE cooperates with other social enterprises, local authorities, civil society and national authorities to a statistically higher percentage than NISE does. In the organizations founded after 2000, no influence of the cooperation type on innovativeness was found, i.e. the same was cooperation intensity in both ISE and NISE.

Table 3 Cooperation and organizational innovativeness-column proportions comparisons

Cooperation with	Test results		Innovative social organizations	
			Yes	No
Other social enterprises	≠	Yes	85.8%	73.5%
		No	14.2%	26.5%
Local authority	=	Yes	75.7%	71.1%
		No	24.3%	28.9%
Civil society organizations	=	Yes	62.3%	53.0%
		No	37.7%	47.0%
Private businesses	=	Yes	67.1%	56.6%
		No	32.9%	43.4%
National authority	=	Yes	48.8%	39.8%
		No	51.2%	60.2%
Total			416	83

Source: Authors

Based on the results and in the context of the outlined theoretical framework, it can be argued that the year 2000 is the turning point when networking and its importance in innovative behavior of social enterprises are concerned. Though networking proved to be an important factor for the innovative behavior of the SEs established prior to 2000, its importance has faded in the new millennium. This result is argued to originate from the fact that, after the year 2000, networking has become deeply embedded in the everyday functioning of all types of organizations in a manner so as to become the *sine qua non* of doing business. In that context, its potentials

Table 4 Cooperation and organizational innovativeness in the so-called "old" and "new" organizations - the column proportions comparison

Cooperation with		1944-2000			2001-2010		
		Innovativeness		Test results	Innovativeness		Test results
		ISE	NISE		ISE	NISE	
Other social enterprises	Yes	92.1%	62.1%	Yes (≠)	83.8%	79.6%	No (=)
	No	7.9%	37.9%		16.2%	20.4%	
Local authority	Yes	81.2%	51.7%	Yes (≠)	73.6%	81.5%	No (=)
	No	18.8%	48.3%		26.4%	18.5%	
Civil society organizations	Yes	65.3%	27.6%	Yes (≠)	61.7%	66.7%	No (=)
	No	34.7%	72.4%		38.3%	33.3%	
Private businesses	Yes	66.3%	51.7%	No (=)	68.3%	59.3%	No (=)
	No	33.7%	48.3%		31.7%	40.7%	
National authority	Yes	54.5%	24.1%	Yes (≠)	46.9%	48.1%	No (=)
	No	45.5%	75.9%		53.1%	51.9%	
Total		101	29		303	54	

Source: Authors

to stimulate innovativeness were adequate before 2000, whereas after 2000, networking has become the business practice necessary for survival *per se*.

Furthermore, having been intrigued by those results concerning the difference between the so-called "old" and "new" SE generations, the authors searched to explore if there were the other reasons for such results. Therefore, whether the influence of certain factors on innovation differed in the so-called "old" and "new" SE generations was examined. The results of the analysis are presented in the tables below (Table 5, Table 6, Table 7 and Table 8).

The influence of a lot of factors on innovativeness having been examined, the results were presented in four tables with the same four columns. The first column shows the questions in the questionnaire that represent the factors whose influence was examined. In the other columns, the result of the carried out statistical analysis is presented as "Yes", when the results imply that the factor influences innovativeness, and as "No", when the results imply that the factor does not influence innovativeness; finally some are presented in the text form when the forms of the influence exerted by the factor are listed. The third column shows the results of the testing for all the surveyed social enterprises, the forth shows the results of the testing for the so-called "old" generation, whereas the last column shows the results of the testing for the so-called "new" generation of social enterprises. The factors influencing innovativeness both in the so-called "old" and "new" generations of enterprises are listed in Table 5. The factors influencing innovativeness in neither the so-called "old" nor the so-called "new" generation of enterprises are listed in Table 6. In Table 7 and Table 8, the factors that affect innovativeness in the so-called "old" but not in the so-called "new" generation of enterprises and the factors that affect innovativeness in the so-called "new" but not in the so-called "old" generation of enterprises, respectively, are presented.

As has already been explained in the foregoing, the result "Yes" shown in the tables means that a

Table 5 The factors influencing innovativeness both in the so-called "old" and "new" generations of enterprises

Question/Factor	Factor influences innovativeness		
	All	"Old" generation	"New" generation
Is contributing to solving a social or environmental issue an objective of your organization?	Yes	Yes	Yes
How satisfied are you with your professional life in general?	Yes	Yes	Yes
Which of the following sources of funding are available for social enterprises in your country?	Personal savings, crowdfunding, microcredit, social investment, private investment	Personal savings, private investment	Grants from projects, donations, crowdfunding, private investment
Where did your organization obtain the funds to start its activity?	Bank loans	Donations/ fundraising,	Bank loans, grants from projects, personal savings
How important was innovation in the start-up phase of your organization, i.e. in terms of products, the process, finance, or marketing?	Yes	Yes	Yes
How important is such innovation now?	Yes	Yes	Yes
Did you innovate in response to change in your external environment?	Yes	Yes	Yes
The enterprise has a large network of business relations.	Yes	Yes	Yes
Costumers and users influence decision-making.	Yes	Yes	Yes
The third-sector organizations and Non-Governmental Organizations (NGOs) influence decision-making.	Yes	Yes	Yes
What stakeholder engagement practices do you use?	Surveys and user satisfaction evaluation, Stakeholder involvement in reporting activities (e.g. sustainability reporting), social media	Social media	Public meetings, surveys and user satisfaction evaluation, social media

Source: Authors

particular factor influences innovativeness in the social enterprises, namely the percentage of the ISEs that answered "yes" to that question statistically differs from (is statistically greater than) the percentage of the NISEs that answered "yes" to that same question. Namely, the result "No" means that the percentage of the ISEs that answered "yes" is equal to the percentage of the NISEs that answered "yes". For example, in order to see whether employing paid staff affects innovativeness in the so-called "old" generation of social enterprises or not, refer to the result presented in Table 7, at the point of the intersection of the first row and the third column. "Yes" in that cell means that, in the so-called "old" generation of social enterprises, the percentage of the ISEs that employ paid staff is statistically different from (greater than) the percentage of the NISEs that employ paid staff, i.e. employing paid staff does influence innovativeness in the so-called "old" generation of social enterprises.

Table 6 The factors influencing innovativeness neither in the "old" nor in the "new" generation of enterprises

Question/Factor	Factor influences innovativeness		
	All	Old generation	New generation
Is your organization's core income independent of grants, donations, bequests, or benefactions?	No	No	No
Does your organization invest any profits to fund its core activities?	No	No	No
Are you the founder of the enterprise?	No	No	No
Does your current position give you a possibility of deciding on/ managing the major issues in the enterprise (e.g. the strategy, the enterprise objectives, the activities to be run, the organization of teamwork, etc.)?	No	No	No
Is /(has) anyone in your family (been) an entrepreneur?	No	No	No
On my team, people generally cooperate effectively.	No	No	No
I can generally cooperate with my team members.	No	No	No
Shareholders/Investors influence decision-making.	No	No	No
State and public administration influence decision making.	No	No	No
Sex	No	No	No
Did you attend any vocational education or training courses relevant for your current position?	No	No	No

Source: Authors

DISCUSSION

The presented results provide answers to the questions, "How does networking influence the innovativeness of social enterprises?", "What are the effects that different forms of networking have on the innovativeness of social enterprises?", "Does organizational age change the obtained results?", and "Why does networking not affect innovativeness in the same way in the so-called "old" and "new" generations of social enterprises?". The findings of the presented research study can be summed up as follows:

- *The network homogeneity effect on innovativeness*. More than 90% of the surveyed organizations cooperate with other organizations in their core operations field. This applies to both the ISEs and the NISEs. If understanding who social enterprises cooperate with is more focused on, then it can be noticed that they cooperate most with other social enterprises (82.7%), then with a local authority (75.1%), then private businesses (64%) and civil society organizations (61.2%), whereas the least cooperation is noticed with the national authority (48.5%). A more detailed analysis reveals that cooperation with other social enterprises affects the innovativeness of enterprises, i.e. innovative enterprises cooperate to a statistically greater extent with other social enterprises. The other examined forms of cooperation have not shown to affect a company's innovativeness.
- *The fading importance of networking on innovativeness*. In the so-called "old generation" organizations (actually those founded between 1944 and 2000), networking has an impact on innovativeness. Namely, a statistically higher percentage of the ISEs cooperate with other SEs, a local authority, civil society and the national authority than the NISEs do. In the so-called "new generation" organizations, no impact of cooperation on innovativeness has been demonstrated. In other words, there is no statistical difference in cooperation of the ISEs and NISEs with the other explored organizational types.

Table 7 The factors influencing innovativeness in the "old" but not in the "new" generation of enterprises

Question/Factor	Factor influences innovativeness		
	All	Old generation	New generation
Does your organization employ paid staff?	Yes	Yes	No
Have you been involved in founding a social enterprise before this one?	Yes	Yes	No
Have you managed a social enterprise before this one?	Yes	Yes	No
What is your main motivation to work in/ found a social enterprise?	Yes	Yes The creation of a personal employment opportunity	No
Which funds do you actually use for your activity?	Grants from projects	Grants from projects, donations/fundraising	No
The owner/Board of Directors influence(s) decision-making.	Yes	Yes	No
Employees influence decision-making.	Yes	Yes	No
The community influences decision-making	Yes	Yes	No
I generally trust the people on my team.	Yes	Yes	No

Source: Authors

Table 8 The factors influencing innovativeness in the "new" but not in the "old" generation of enterprises

Question/Factor	Factor influences innovativeness		
	All	Old generation	New generation
Is your organization involved in any economic activity, such as selling goods and services?	No	No	Yes
Is it important for your organization to grow? (e.g. to increase the number or range of activities, recruit more employees, etc.?)	Yes	No	Yes*
Suppliers influence decision-making.	Yes	No	Yes
On my team, people generally trust each other.	Yes	No	Yes
What is your highest educational qualification?	Yes, university-undergraduate	No	Yes*
Do you identify yourself as a person with severe disabilities?	Yes	No	Yes

Note: * Statistically significant at the 0.1 level.

Source: Authors

To explain why the impact of networking on innovativeness is different in the so-called "old" and "new" generations of social enterprises, a more detailed analysis of the impact of the factors on innovation before and after 2000 was conducted. The results of the analysis show that the factors that influence innovativeness both in the so-called "old" and "new" generations of enterprises are contributing to solving a social or environmental issue as an objective; satisfaction with professional life in general; the sources of funding available for social enterprises in your country; the sources of funding for starting

the organizational activity; innovation is important in the organizational start-up phase, namely in terms of products, the process, finance, or marketing; innovation is important in the current phase; innovation as a response to change in the external environment; a large network of business relations; the influence exerted by customers and users on decision-making; the influence of the third-sector organizations and NGOs on decision-making, and the stakeholder engagement practices in place. The factors not influencing innovativeness in either the so-called "old" and "new" generations of enterprises are as follows: innovation is important in the organizational start-up phase, namely in terms of products, the process, finance, or marketing; the independence of the organization's core income of grants, donation, bequests, or benefactions; the investment of profits in funding the core activities; the respondent-related factors (the respondent is the founder of the enterprise, the respondent's family history of entrepreneurship, the respondent's sex); a possibility of the respondent to make decisions on/manage the major issues in the enterprise (e.g. its strategy, the enterprise's objectives, the activities to be run, the organization of teamwork etc.); the effectiveness of team cooperation; general cooperation with team members; the influence that shareholders/investors have on decision-making; the influence the state and public administration have on decision-making, and relevant vocational education or training. The following factors influence innovativeness in the so-called "old" but stopped influencing innovativeness in the SE founded after the year 2000: employing paid staff; involvement in founding a social enterprise before this one; the respondent's history of managing a social enterprise; the main motivation to work in/found a social enterprise; the activities funding types; the Influence the owner/board of directors have on decision-making; the influence the employees have on decision-making; the influence the community has on decision-making; trust in the people on the team. There are but few factors that did not influence innovativeness in the "old-generation" enterprises but started influencing innovativeness in the "new-generation" enterprises and they are as follows: the organization is involved in the economic activity, such as selling goods and services; the importance of organizational growth (e.g. increasing the number or range of activities, recruiting more employees, etc.); the influence suppliers have on the decision-making process; trust among the team members.

CONCLUSION

This paper is namely aimed at investigating the effects that networking has on the innovativeness of social enterprises. The results show that networking is a characteristic of social enterprises, that cooperation with other organizations is a normal way of their operation, and that this fact is independent of innovativeness as a characteristic of an enterprise. A more detailed analysis shows that cooperation with other social enterprises is a characteristic of innovative social enterprises, compared to noninnovative social enterprises, which supports the conclusion that similarities support innovativeness. In this sense, encouraging the mutual cooperation of social enterprises through various forms of formal or informal social networks, collaborative communities and interorganizational connections may have a positive effect on their networking, since the other investigated forms of cooperation do not show that they affect the innovativeness of enterprises. The results also reveal that networking has a greater impact on innovation in the so-called "old" than in the so-called "new" generation of social enterprises.

This research study provides a better understanding of social enterprises' operations in terms of their innovation and networking, as well as the factors that may influence them. When the limitations of the paper are concerned, they imply that on the paper was written based upon the data collected from 11 European countries. Therefore, the relevant conclusions refer to these countries, with a limited applicability in other contexts. In order to verify the validity of these conclusions in other countries, new research should be conducted. The sample of social enterprises is not random, which can be considered as a shortcoming. Almost all the variables used in this research study, especially "innovation" and

"networking" being the key variables, are categorical, so the use of other more advanced statistical techniques is limited.

ENDNOTES

1 These countries were in the FP7 research project Enabling the Flourishing and Evolution of Social Entrepreneurship for Innovative and Inclusive Societies and the data were collected from them.

2 Due to a large number of the tables that contain the results of the tests with p-values, the foregoing results are presented together with the original outputs from the SPSS piece of software in the Dropbox folder, the link of which is given below: https://www.dropbox.com/sh/n8fnyasb78ip41s/AAARVl4r2szACAYGuEVyEIJ0a?dl=0

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SMART GOVERNANCE: PAYMENT TRANSACTION ELECTRONIFICATION ACCEPTANCE IN NORTH SUMATRA PROVINCE, INDONESIA

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The policy of the electronification of regional payment transactions (ERPT) is one of the innovations implemented by Indonesia due to the COVID-19 pandemic so as to increase the economic activity and revenue. This study is aimed at increasing the understanding of smart governance, the contactless economy, and regional income in North Sumatra Province, Indonesia, and globally the new normal and the post-COVID-19 eras. This research study was carried out using the primary data obtained through questionnaires in 2021 applying the purposive sampling method and processed using the Structural Equation Model-Partial Least Square (SEM-PLS) models. Based on the six hypotheses proposed in this study, the results show that performance expectancy, the social influence, and the facilitating condition have a positive and significant impact on the behavioral use of the noncash payment transactions of taxes and levies in North Sumatra Province. On the other hand, the effort expectancy has no significant impact on the cashless transaction of paying taxes and levies in the North Sumatra Province.

Keywords: contactless economy, smart governance, regional payment transaction electronification

JEL Classification: G28, H59

INTRODUCTION

The COVID-19 pandemic has generated a new trend in people's behavior. It was initially the contact economy, where individuals had to be physically present, whereas now the economy has become contactless (Manimuthu, Dharshini, Zografopoulos, Priyan & Konstantinou, 2021). This behavior requires that relevant stakeholders should develop an appropriate technology, such as digital payments, which is necessary for the industrial era 4.0 (Brunkhorst, 2020; Trütsch, 2020; Faturohman, Farras Ar Rasyid, Rahadi, Darmansyah & Afgani 2021). Through technology, all trade transactions, public services, tourism and financial services are encouraged to be carried out without any face-to-face contact (Lee &

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Lee, 2020; Baber & Tripati, 2021; Yamin, Darmawan & Rosyadi, 2021), which is possible to achieve if there are trailblazers encouraging the implementation of digitalization in every region and in every country.

As the regulators and providers of public services, governments have played a major role in ensuring people's welfare, and as the driving instrument of the country's progress (Liu & Qi, 2021). The same situation is also visible in Indonesia, where the Indonesian Government plays the major role in the population's wellbeing at both the regional and the national levels (Nartin & Musin, 2022).

Since 2019, the Indonesian Government has been using a technology-based strategic approach better known as "smart governance" so as to implement smart city programs in 100 Indonesian cities/districts (Anindra, Supangkat & Kosala, 2018; Yudono, Satria & Erlando, 2019; Firman, Sumatono, Muluk & Setyowati, 2022). In this sense, the COVID-19 pandemic is/was the momentum for the Indonesian and regional governments to digitize regions in order to implement the "smart governance" approach. The implementation of smart governance is to promote regional revenues and build a resilient region through price and inflation control; access to digital financial literacy; e-tourism-based tourism development; e-commerce-based micro-, small and medium-sized business development, and so forth (Yudono *et al*, 2019; Pareti, Flores, Gonzalez & Pareti, 2022). Smart governance in Indonesia plays the major role in the COVID-19 era and the new normal with the aim to overcome various social issues, especially so when the economy in urban areas is concerned (Firman *et al*, 2022).

North Sumatra Province is one of Indonesia's urban areas managed applying smart governance. Since 2020, the North Sumatra Provincial Government has taken advantage of the COVID-19 momentum to accelerate, implement and develop the policy of the electronification of regional payment transactions (ERPT) through the noncash payment of taxes and levies. This policy was implemented as a resilience strategy intended to increase the gross domestic product (GDP) optimization and encourage economic growth in North Sumatra Province. The implementation of the ERPT policy in North Sumatra Province in 2020-2021 had to face various obstacles in the field. One of them was the weak digital mindset of the community to make noncash payments of taxes and levies through the digital system. The related studies by J. Erjavec and A. Manfreda (2022) note that people are often afraid of adopting or reluctant to adopt a new system in their lives.

The research studies linking smart governance, the contactless economy, and regional income are very limited, especially in Indonesia. Over the last ten years, the largest portion of the research related to smart governance, the contactless economy, and regional income has been done separately. This study was carried out so as to fill the gap in the literature and to increase the understanding of smart governance, the contactless economy, and regional income in North Sumatra Province, Indonesia, and globally as well. Furthermore, the research for the largest part focuses on the cashless payment system of the consumer's preference and growth in the economy, whereas this research is focused on the impact of the contactless economy on regional income and the development of government revenue.

The research study was carried using the ERPT as the main subject so as to investigate and examine the acceptance of the noncash payments of taxes and levies policy implemented by smart governance in North Sumatra Province. The main data used in this study are the primary data collected through a survey in the form of an online questionnaire in the nine cities/districts with the implemented ERPT by Bank Indonesia, North Sumatra Province, in 2021. Then the data were processed and analyzed using the SEM-PLS (Structural Equation Model-Partial Least Square) models.

LITERATURE REVIEW

Regional financial transaction electronification

Financial transaction electronification is a response to the development of the digital world in the financial sector, which aims to create a technology-based effective and efficient payment system (Lee & Lee, 2020). The development of the digital payment system has attracted the attention of the government and other policymakers in that it made them review and develop the digital financial system that is safe, practical, efficient, and contactless for users/the public (Yue, Korkmaz, Yin & Zhou, 2022). T. Trütsch (2020) stated that, through the development and utilization of digital payment systems, people tended to increase consumption, which had a positive effect on the value of transactions made. It happens because noncash payments reduce the transaction costs that occur when cash payments are made (e.g. the costs of the time needed to make transactions) (Trütsch, 2020).

The development of financial transaction electronification in Indonesia has been carried out since 2014, marked by the implementation of the "*Gerakan Nasional Non Tunai*" or the "National Noncash Movement" (NNCM) in Indonesia. The NNCM is the noncash payment policy based on the automatic teller machine (ATM), debit, credit, and e-money cards to create the *Less Cash Society* (LSC) ecosystem in Indonesia (Kusumastuti & Tinangon, 2019). Initially, the noncash payments based on the NNCM policy were carried out utilizing inter- or intrabank transfers, which on its part resulted in the inefficiency of noncash transaction electronification due to a large number of ATMs and Electronic Data Capture (EDC) that had to be provided, as well as high interbank transaction fees. To overcome this issue, Bank Indonesia (BI) issued the National Payment Gateway (NPG) policy, the interbank network system in Indonesia initiated by Bank Indonesia, which had previously been concentrated on international payment products, such as Visa and Mastercard, to integrate and streamline cashless payment channels nationally (Kusumastuti & Tinangon, 2019).

In 2020, global digital financial transactions underwent a rapid reform and growth due to the economic shock caused by COVID-19 (Fu & Mishra, 2022). This growth was made possible because, during COVID-19, it was difficult for people to leave their homes and make economic transactions in cash. The same condition also occurred in Indonesia, marked by the implementation of safety measures so as to prevent the spread of the COVID-19 virus, such as Large-Scale Social Restrictions (*Pembatasan Sosial Berskala Besar*), health protocols in the new normal era, and many others (Wibowo & Hariadi, 2022). This condition certainly forces people to shift from cash payments to noncash payments.

Since then, the Indonesian government has perceived the cashless payments trend as the opportunity to reform and accelerate the electronification of the national financial transactions that enable inclusive and sustainable economic growth through the use and advancement of the existing financial-based technologies, such as e-commerce, Quick Response Code Indonesia Standard (QRIS), and Internet Banking. Policymakers believe that the acceleration of the implementation of the financial transaction electronification policy is vital in order to promote the digital economic ecosystem that may trigger consumption and facilitate the distribution of financial aid to the public and also minimize negative externalities in the COVID-19 recession era (Li, Kim, Lang, Kauffman & Naldi, 2020; Trütsch, 2020; Suryono, Budi & Purwandari, 2021; Fu & Mishra, 2022; Yue *et al*, 2022). Thus, the Presidential Decree of the Republic of Indonesia Number 3 of 2021 concerning the Task Force for the Acceleration and Expansion of Regional Digitization was issued so as to support the acceleration of the financial transaction electronification policy implementation in Indonesia. Thus, the Electronification of Regional Payment Transactions (ERPT) Policy is being implemented in 34 provinces of Indonesia.

ERPT is an integrated effort to replace cash payments with noncash payments in order to increase the accountability and transparency of the regional financial management. The ERPT regulation begins with the NNCM, which BI and the Government

initiated in 2014 in order to create the LSC. In line with the NNCM, the Presidential Instruction Number 10 of 2016 concerning the Prevention and Eradication of Corruption was issued in 2016 and 2017, one of them containing directions for the acceleration of the implementation of noncash transactions in all ministries/institutions (K/L) and the local governments. The issuance of the Government Regulation Number 12 of 2019 concerning Regional Financial Management implies the promotion of the acceleration of the ERPT program. Circular letters outline the local governments' obligation to implement an electronic-based government system in regional financial management.

The ERPT has a role to support various economic activities, including:

- PAD optimization,
- the improvement of the local government financial management,
- improved access to finance, and
- the systematic reinforcement of financial control.

In its implementation, the electronification of transactions within local government is mapped based on the four indices, namely the level of implementation, the realization of or a contribution to PAD, and strategic readiness and support, which is then measured using a 1-100 scale and divided into the four levels including initiation (0-10), developing (>10-40), advanced (>40-70), and digital (>70-100).

Smart governance

Smart governance is implemented by the government seeking to improve performance or overcome the existing problems in the region through innovation and the use of cutting-edge technology. A government can be called "smart" when it has a clear and equitable division of the roles in its governance process, when it is able to efficiently and effectively manage and use data, involving the community in making decisions on regional governance (Anindra *et al*, 2018; Liu & Qi, 2021; Tomor, Przeybilovicz & Leleux, 2021). In addition, smart governance is also defined as smart government management in order to streamline the economic, political, legal and regulatory sectors, simultaneously without eliminating the existing societal norms and values through the use of technology (Tomor *et al*, 2021). Through the use of technology and the community involvement in government, smart governance aims for data transparency, information, and government policies, as regulated in the Law Number 14 of 2008 on the Openness of Public Information (Mutiara, Yuniarti & Pratama, 2018).

Several studies stated that smart governance usually referred to smart countries or smart cities. In Barcelona, the implementation of technology and information into the governance activity will effectively increase urban growth and the policy impact (Bakici, Almirall & Wareham, 2013). A recent study conducted in Europe has also shown the relevance between a smart city and smart governance based on demographical and geographical uniqueness in the respective area (Tomor *et al*, 2021). The goal of smart governance was the same everywhere, which means it was aimed at efficiently increasing people's welfare through the diverse use of technology (Bakici *et al*, 2013; Mutiara *et al*, 2018; Tomor *et al*, 2021; Pareti *et al*, 2022).

Contactless economy

The contactless economy is an economic revolution in the form of social phenomenon that has led to a shifting trend between society and a market behavior because of safety and health measures in the COVID-19 period (Lee & Lee, 2020; Trütsch, 2020; Manimuthu *et al*, 2021). The contactless economy trend is one of the best momentums to accelerate the application of the equal digitization of the global economy. One of the contactless economy's innovations is the cashless payment method introduced so as to replace cash payments in any and all economic activities (Lee & Lee, 2020; Trütsch, 2020; Bae & Chang, 2021).

Many countries have started implementing the contactless economy in every possible aspect. In Thailand, China, and Nigeria, the governments have begun to implement the contactless economy through the mobile QR Code Payment system drives as a

cashless payment policy in order to support financial transactions for both the public and the private sectors in order for them to be more efficient, more transparent, safer, and at a lower cost. In the exchange activity, people also want a cashless economy system which is user-friendly and safe to use (Yakean, 2020; Manimuthu *et al*, 2021; Zhong & Moon, 2022).

In an earlier study related to smart governance and the contactless economy's qualitative methods, a secondary literacy study (Bakici *et al*, 2013; Yakean, 2020; Liu & Qi, 2021) or an in-depth interview (Tomor *et al*, 2021) were used. Z. Tomor *et al* (2021) pointed out the three factors that had an influence on the smart city:

- the intergovernmental state structure,
- local political power relations, and
- the urban governance model.

Smart governance is created by linking all the three factors.

HYPOTHESIS DEVELOPMENT

In this study, the Unified Theory Acceptance Use of Technology (UTAUT) model is implemented in formulating the hypothesis and in quantitative analysis (Figure 1). UTAUT is a model of the acceptance and use of the latest integrated technology developed by V. Venkatesh, M. G. Morris, G. B. Davis and F. D. Davis (2003). Several economic experts, such as C. M. Chao (2019) and R. A. Ericska, L. A. Maureen Nelloh and S. Pratama (2022) agree upon the fact that UTAUT is the most fitting model to the understanding of research in technological and economic phenomena research. Furthermore, UTAUT combines eight related models, including Theory Reasoned Action (TRA), the Technology Acceptance Model (TAM), the Motivational Model (MM), the Theory of Planned Behavior (TPB), Combined TAM and TPB (C-TAM-TPB), the Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT), and Social Cognitive Theory (SCT) in order to explain the acceptance and use of technology based on society or user behavior (Venkatesh *et al*, 2003).

A previous study carried out in China used the UTAUT model to investigate customer behavior when making contactless payments included the following variables: perceived ease of use (PEOU), perceived usefulness (PU), service security (SS), perceived value (PV), and post-adoption behavior (PAB). The result confirmed the fact that the perceived ease of use, perceived usefulness, and service security were the vital antecedents of the perceived value of and user satisfaction when making contactless payments (Zhong & Moon, 2022).

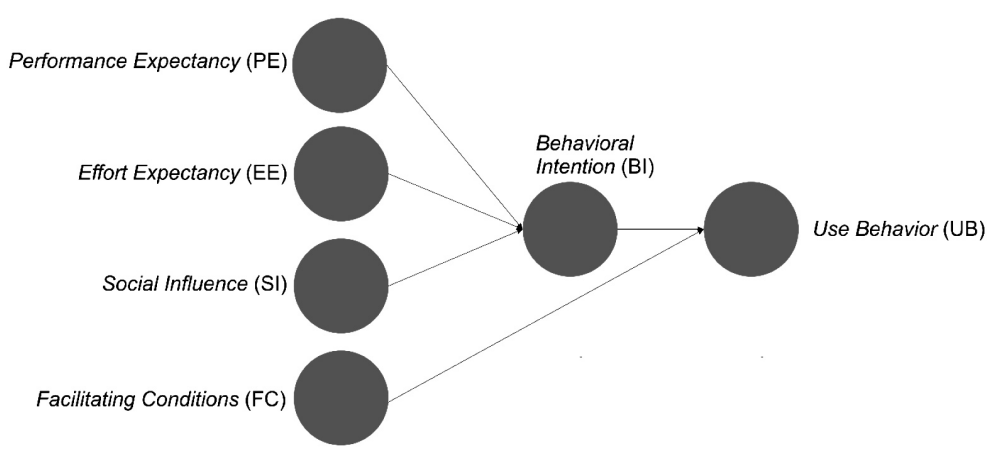

Figure 1 The UTAUT conceptual model

Source: Authors

In the study for Nigeria, Z. U. Mamudu and G. O. Gayovwi (2019) revealed that the positive relationship between ATM, Web/Internet Transfers Payment Value (WEBP) and National Electronic Funds Transfer Value (NEFT) was a result of the e-transaction usage through technology acceptance and the diffusion of the innovation of the cashless payment policy. The results also suggested that Cheques Cleared Value (CHEV), the Point-of-Sale Value (POSV) and Mobile Payment Value (MOBP) had an inverse and insignificant impact on the Gross Domestic Product in Nigeria.

The impact of performance expectancy (PE) on the behavioral intention (BI)

PE is a person's desire to use information technology in order to achieve something. V. Venkatesh *et al*, (2003) define the behavioral intention as a measure of a person's will to behave in a certain way. J. Erjavec and A. Manfreda (2022) state that society is more likely to accept and use digital technology if it is perceived as beneficial and if it offers certain advantages. Testing the PE effect on BI is done so as to determine an individual's feeling about PE concerning ERPT in the cashless payment of taxes and levies in North Sumatra. The hypothesis is formulated as follows:

H1: PE has a positive and significant impact on behavioral intention (BI).

The impact of effort expectancy (EE) on the behavioral intention (BI)

EE is the level of the ease of use associated with the use of the system. It is how easily users can use and learn a new technology or the level of the ease of the system use by the respondents (Venkatesh *et al*, 2003). The EE impact on BI research test variable is used in order to determine how easily users may utilize ERPT to pay for taxes and levies in North Sumatra, taking into consideration the fact that the use of the new technology is becoming a challenge for the elder (Erjavec & Manfreda, 2022). The hypothesis reads as follows:

H2: EE has a positive and significant impact on behavioral intention (BI).

The impact of the social influence (SI) on the behavioral intention (BI)

SI is a variable used so as to see how far an individual believes of the reviews made by the other people who have already used a new system or a new technology as an important consideration prior to trying to use the system themselves (Venkatesh *et al*, 2003). The more positive such reviews on the payment of taxes and levies in North Sumatra are, the more convinced an individual is in their intention to try to do the same thing (Erjavec & Manfreda, 2022). The hypothesis is set as follows:

H3: SI has a positive and significant impact on the behavioral intention (BI).

The impact of the facilitating condition (FC) on the behavioral intention (BI) and user behavior (UB)

FC is a variable used so as to see how far an individual believes the organization and technical infrastructure can support a particular system (Venkatesh *et al*, 2003). The compatibility of the conditions between the digital system supporting facilities and the perception of the public has positive impacts on the people's behavior and desire to use a digital system (Erjavec & Manfreda, 2022). FC was tested through BI and UB in order to determine the compatibility of FC in the ERPT system based on the frequency of payments and the people's desire to continue to use cashless payments to pay for taxes and levies in North Sumatra Province. The proposed hypotheses read as follows:

H4: FC has a positive and significant impact on the behavioral intention (BI).

H5: FC has a positive and significant impact on use behavior (UB).

The impact of the behavioral intention (BI) on user behavior (UB)

BI testing on UB is essential to identify whether the people of North Sumatra Province are interested in the cashless payment of taxes and levies based on the frequency of cashless payments made by the respondents. The more the respondents use the cashless system to pay for taxes and levies, the more interested people are in this system. The hypothesis is proposed to read as follows:

H6: BI has a positive and significant impact on user behavior (UB).

METHODOLOGY AND DATA

This study was carried out quantitatively and it was conducted in nine cities/districts with the assistance of Bank Indonesia, North Sumatra Province, which had already implemented the ERPT policy. The study was being conducted from January to December 2021. The primary data used in the study were collected through a survey in the form of an online questionnaire based on the motivation, perception, and consumer attitudes, i.e. "MAPID" perception, in the UTAUT model. The respondents taking part in this study were chosen using the purposive sampling method so as to determine the number of the samples. This method aims to take samples purposively following the sample requirements (Sugiyono, 2020). This study required a sample of people in the research area (namely the nine cities/regencies that had implemented ERPT in North Sumatra Province) or of those who had paid taxes and levies in the research area.

The data were analyzed using the Structural Equation Model-Partial Least Square (SEM-PLS) model. In addition, the questionnaire in this study also used a Likert scale from 1 (strongly disagree) to 5 (strongly agree). The questions in the questionnaire refer to the previous research related to UTAUT, namely performance expectancy, effort expectancy, the social influence, the facilitating condition, the behavioral intention, and user behavior (Venkatesh *et al*, 2003). Apart from the foregoing, there are also the demographic questions asked in order to obtain more information related to the respondents' gender, age, education, occupation, income, and place of origin.

Table 1 shows the demographic structure of the respondents included in the questionnaire in this research study. The respondents are mainly millennials of 26 to 35 years of age (39.66%) and 36 to 45 years of age (27.16%), especially men (56.82%) from the Pakpak Bharat Regency (17.03%). Moreover, the background education of the largest number of the respondents who had paid cashless taxes and levies implies a high-school diploma (44.54%) and entrepreneurs (42.55%) with an average income mostly ranging from 3 to 5 million rupiahs (43.75%).

RESEARCH RESULTS

This study analyzes the data through the validation and reliability process using outer loading analysis (item loading), average variance extracted (AVE), composite reliability, and discriminant validity (Maureen Nelloh, Santoso & Slamet, 2019).

First, outer loading analysis is applied in the study to each indicator, an indicator having good reliability if the outer loading value is greater than 0.7 (Ericska *et al*, 2022). Based on the results, the test items FC6, SI6, and SI7 have a value lesser than 0.7, namely 0.589, 0.678, and 0.683, respectively. Modifications were made by removing these three items so that data research reliability could be accepted at this stage.

Second, an internal consistency test based on the composite reliability value was done. The research indicator is reliable when the composite reliability value is greater than 0.7 (Amoah & Jibril, 2021). Based on Table 2, the composite reliability value of each indicator is greater than 0.7, which shows that the research indicators have good internal consistency.

Third, a convergent validity test is applied in the study so as to evaluate the value of the average variance extracted (AVE). An indicator is valid when

Table 1 The demographic structure of the respondents

Demographic Variable		Frequency	Percent (%)
Gender	Male	279	56.82
	Female	212	43.18
Age	<25 years old	98	21.12
	26-35 years old	184	39.66
	36-45 years old	126	27.16
	46-55 years old	39	8.41
	55-65 years old	17	3.66
Education	Middle School (SMP)	12	2.57
	High School (SMA)	208	44.54
	Diploma	36	7.71
	Undergraduate	192	41.11
	Post-graduate	19	4.07
Occupation	Entrepreneur	197	42.55
	Private Employee	173	37.37
	Civil Servant	63	13.61
	Military/Police	6	1.30
	Unemployed	24	5.18
Income	< 3 million rupiahs	159	34.27
	3-5 million rupiahs	203	43.75
	5-10 million rupiahs	83	17.89
	>10 million rupiahs	19	4.09
Place of Origin	Pakpak Bharat Regency	79	17.03
	Deli Serdang Regency	55	11.85
	Langkat Regency	52	11.21
	Tebing Tinggi City	48	10.34
	Karo Regency	50	10.78
	Medan City	47	10.13
	Binjai City	47	10.13
	Serdang Bedagai Regency	31	6.68
	Dairi Regency	24	5.17

Source: Authors

its AVE value is greater than 0.5 (Erjavec & Manfreda, 2022). Table 2 shows that all the research indicators of the AVE value are greater than 0.5, thus indicating that all the indicators have convergent validity.

The last step was conducting a discriminant validity test using the Fornell-Larcker criterion (Amoah & Jibril, 2021; Erjavec & Manfreda, 2022). Based on the Fornell-Larcker criterion test results, the facilitating condition and performance expectancy indicators demonstrate a higher correlation value than the other indicators, being 0.836 and 0.903, respectively. Hence, the model modification was performed issuing the indicators with the smallest outer loading results, namely FC1 and PE1, so that the research indicators do have discriminant validity. Overall, the results of the model test can be seen in Table 2.

Table 3 shows the results of the hypothesis testing. The results are obtained by comparing the t-statistic

Table 2 The model test results

Construct	Item	Item Loading	Composite Reliability	AVE	Fornell-Larcker
Behavioral intention	BI1	0.880	0.8780	0.7080	0.841
	BI2	0.737			
	BI3	0.898			
Effort expectancy	EE1	0.913	0.9620	0.8090	0.899
	EE2	0.888			
	EE3	0.928			
	EE4	0.935			
	EE5	0.886			
	EE6	0.843			
Facilitating conditions	FC2	0.881	0.9450	0.6830	0.841
	FC3	0.820			
	FC4	0.881			
	FC5	0.850			
	FC7	0.828			
	FC8	0.771			
	FC9	0.854			
Performance expectancy	PE2	0.896	0.9710	0.8060	0.906
	PE3	0.902			
	PE4	0.885			
	PE5	0.900			
	PE6	0.912			
	PE7	0.929			
	PE8	0.916			
Social influence	SI1	0.792	0.9380	0.7520	0.867
	SI2	0.914			
	SI3	0.893			
	SI4	0.916			
	SI5	0.812			
User behavior	UB1	0.834	0.9130	0.7770	0.882
	UB2	0.916			
	UB3	0.892			

Source: Authors

value with the critical values. If a t-statistic is greater than the critical value, the hypothesis can be accepted, and *vice versa*. Apart from comparing t-statistics with a t-value, hypothesis testing can also be done by comparing a p-value and the 5% significance level. If the p-value is greater than 5% or 0.05, then the hypothesis is rejected, and *vice versa* (Amoah & Jibril, 2021; Ericska *et al*, 2022).

Based on Table 3, it is only Hypothesis 2 that is rejected. In other words, increasing the ease of noncash payments does not necessarily encourage the people of North Sumatra Province to pay taxes and levies using cashless payments. This result is contradictory with the UTAUT model developed by (Venkatesh *et al*, 2003), which states that effort expectancy has a positive and significant effect on the behavioral intention. However, this result is in line with B. Ndekwa, A. J. Ochumbo, A. G. Ndekwa and K. E. John (2018). B. Ndekwa *et al* (2018) found that users' perceptions of the ease of use of the open-source software did not play an important role in the behavioral intentions for the actual use.

Table 3 The statistical test results

Hypothesis		Original Sample	Standard Deviation	t-Statistic	p-value	Decision
H1	PE → BI	0.2200	0.0830	2.6360	0.0090	Supported
H2	EE → BI	-0.1310	0.1130	1.1520	0.2500	Not supported
H3	SI → BI	0.1400	0.0440	3.1590	0.0020	Supported
H4	FC → BI	0.7080	0.0700	10.0450	0.0000	Supported
H5	FC → UB	0.5430	0.1020	5.3440	0.0000	Supported
H6	BI → UB	0.3460	0.1080	3.2150	0.0010	Supported

Source: Authors

DISCUSSION

Based on the results of the hypothesis testing done in this study, the test results regarding the facilitating condition variable (the hypotheses 4 and 5) are indicative of the fact that the infrastructure has the biggest positive impact on the behavioral intention and user behavior. Furthermore, the supporting infrastructure has the biggest influence on the consumer behavior of taxpayers and levies through the cashless option, which is in line with the other studies (Akinnuwesi, Uzoka, Fashoto, Mbunge, Odumabo, Amusa, Okpeku & Owolabi, 2022; Erjavec & Manfreda, 2022) stating that the supporting infrastructure for technology and digitalization has the major role in the acceptance of new technologies in society.

Based on the research results it is evident that the largest number of the people who pay taxes and levies through the cashless system come from certain groups with the education level of at least a high-school diploma or an equivalent to undergraduate studies. Therefore, it is necessary that the digital environment and infrastructure for paying taxes and levies using the cashless system should be equalized by the local governments. This activity is also accordant with Indonesia's smart governance role to create the digital environment at the regional level that includes digital financial transactions, the development of technology, the information and communication (ICT) infrastructure, digitization, data transparency and government systems, as well as the development of transportation and digital education in Indonesia (Mutiara *et al*, 2018; Yudono *et al*, 2019).

As far as the results of the hypothesis 1 testing are concerned, a conclusion can be drawn that the community believes that ERPT in North Sumatra Province will provide relative benefits for users (the community and the local government) through the fulfilment of the performance expectations, namely through facilitating noncash transactions for the local government and the community spending, as well as the other benefits of the use of cashless payment systems such as a discount, a gift, and many more. Studies conducted by the African economic and psychological/behavioral schools of thoughts are commonly used to support tax performance (Olaniyi & Akinola, 2020). Thereby, users will be more confident to use the cashless payment system which they feel is easier, more effective, more efficient, faster, and safer to use than paying in cash. This positive experience will directly increase people's confidence to do the same thing repeatedly, simultaneously influencing others as well (Akinnuwesi *et al*, 2022).

In contrast to the results of the hypotheses 4 and 1 testing, the results of testing the hypothesis 2 actually reveal a discrepancy against the theory stating the effort expectancy of the users' perceptions of the level of the ease of use of technology. According to the results of the hypothesis 2, effort expectancy has a negative and insignificant impact on the behavioral intention, which indicates that increasing the ease of noncash payments does not necessarily encourage

the people of North Sumatra Province to pay for their taxes and regional levies making cashless payments. At present, the public perception of the cashless payment system of taxes and levies in North Sumatra Province is still low and many respondents perceive that paying taxes and levies in cash is still easier than making cashless payments.

The results of the hypothesis 3 testing show that the higher the level of the trust of individuals and/or groups of people (i.e. friends, family, colleagues, and society) in using a particular system, the greater the likelihood that they will recommend the system to others. This result is in line with V. Venkatesh *et al* (2003) who showed that, if others believed in the system, then it would influence other people to use it as well. Based on the survey results, the largest number of the people of North Sumatra perceive the use of cashless payment systems as the lifestyle of modern society, which then affects others to use the system, too. In contrast to that, the respondents also consider the cities/regencies other than the nine fostered districts/cities as underdeveloped areas for various reasons, such as insufficient technological facilities and the insufficient infrastructure to support cashless payments. L. A. Maureen Nelloh *et al* (2019) stated that that kind of the community view would exert a negative influence on and broaden regional economic inequality in the long run. Smart governance plays an important role in eliminating this perspective through the development of technology-based education (Bakici *et al*, 2013).

While previous study focused on the cashless payment system and its influence on the economy, this research study focuses on the impact of electronification on the government payment system. Overall, the study results show that the acceptance of the implementation of the cashless payment of taxes and levies in the North Sumatra Province as one of the regional smart governance policies in Indonesia would be more easily accepted if the public were aware of the positive impact of these cashless transactions and if it were used highly frequently and more intensely. Behaviorally speaking, the cashless payment system that is easier to use, more effective and more efficient than the cash payment system has the potential to provide support to tax performance and users will also be more confident to utilize the cashless payment system if others believe in that system (Venkatesh *et al*, 2003; Olaniyi & Akinola, 2020; Akinnuwesi *et al*, 2022). If many users have a good experience with making cashless transactions, they will anticipate making cashless payments for taxes and levies in the long run and they will try to motivate others to do the same as well. Increasing the number of the people who take advantage of digital innovation by moving from cash payments to cashless payments is the one indicator of governance success in achieving these goals (Ndekwa *et al*, 2018; Yudono *et al*, 2019).

CONCLUSION

In this study, the UTAUT model is implemented in order to determine the public acceptance of the implementation of the smart governance policies on the cashless payment of taxes and levies in North Sumatra Province. The conclusions are based upon the six hypotheses proposed in this study reading that performance expectancy, the social influence, and the facilitating condition have a positive and significant impact on the behavioral use of noncash payment transactions of taxes and levies in North Sumatra Province. On the other hand, effort expectancy has no significant impact on the cashless transactions of tax and levy payments in the North Sumatra Province, which is because the respondents' perceptions of the cashless payment system for taxes and levies in North Sumatra Province are still negative.

Overall, the results of the hypotheses testing are positive and significant to be implemented as the policy development related to ERPT by smart governance. However, because effort expectancy is negative and insignificant with respect to the acceptance of cashless payments of taxes and levies, further research should reaffirm this relationship by expanding the research variables (e.g. using the UTAUT-2 model) or increasing the number of the respondents to be included in the research study.

The problems the authorities were faced with when the ERPT implementation in North Sumatra Province is concerned were the user's interest, the banking infrastructure, HR competence and regional government commitment, and the IT infrastructure. There is still a lack of information about and education in ERPT, particularly so for the payment of taxes and levies in a noncash regime. The public's trust in the capacity of the banking and IT infrastructures to support transactions for the cashless payment of taxes and levies is still lacking, and the imbalance in the quality of the network in each region is a limiting factor to the implementation of ERPT in North Sumatra Province.

In order to increase the public acceptance of noncash transactions, the Government needs to increase promotion, such as education in and socialization with respect to the payment of taxes and levies through digital channels by making educational videos or publications through social media. Education and technical guidance to improve the competence of the local government's human resources is needed so as to provide smoothness in the development of ERPT. In addition to said, the equitable availability of electricity and telecommunications networks and IT devices in all districts/cities, especially in rural/remote areas, improving the server quality and security using blockchain technology, developing a single database and the regional government financial dashboard and local tax applications play an important role in encouraging digitization in North Sumatra Province.

The scope of this study is limited to North Sumatra Province as one of Indonesia's urban areas managed by means of smart governance. However, this research accommodates at least 50 samples in each district, so the respondent can capture the implementation of cashless society and the electronification payment system in this area. This paper suggests that future research could include a larger number of populations, such as island populations or Indonesian, in order to capture electronification development and the government payment system to make a policy suitable for this purpose.

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