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# Macroeconomic determinants of enterprise births in European countries: The moderating role of human capital in the unemployment structure

**JEL Classification:** *J64; M13*

**Keywords:** *enterprise births; unemployment; long-term unemployment; human capital*

**Abstract**

**Research background:** While micro-level studies evidence that unemployment increases the probability of being self-employed, the findings at the macro-scale are ambiguous. At the macroscale, the unemployment push mechanism is further conditioned by cyclical fluctuations and industry-specific characteristics. Most studies, however, have neglected the heterogeneity of the group of unemployed, which could also be behind the disparate results.
**Purpose of the article:** In filling this gap, the study aims to examine the links between the unemployment rate and enterprise births, while considering the unemployment structure in terms of the human capital of the unemployed and the unemployment duration.
**Methods:** The issue is examined using the example of 20 European countries in the period 2004–2020. The fixed- and random-effects panel models were applied. The sectoral diversity of entrepreneurial activity (manufacturing, wholesaling and retailing, professional and scientific activities, ICT), and the size class of the newly established enterprises (with/without employees) are also considered.

**Findings & value added:** The study reveals that the share of long-term unemployment and the skill structure of the unemployed have an impact on new firm formation, which varies with the knowledge intensity of the start-ups and their size. A higher share of highly qualified unemployed increases the start-up rates, particularly in knowledge-intensive services and manufacturing. A higher share of long-term unemployed has a negative impact on enterprise births, specifically in new businesses with employees. The findings are important for designing effective instruments to address unemployment by entrepreneurship within active labour market policy.

## Introduction

The drivers of entrepreneurial activity have been at the centre of attention of researchers and policy makers for many years. In current debates, the search for a deeper understanding of the factors that influence not only the dynamic, but also the quality of emerging enterprises plays an important role (Bilan & Apostoaie, 2023; Audretsch *et al.*, 2024). In the context of the ongoing process of technological transformation, enterprises with high growth potential and innovativeness are particularly considered beneficial due to their contribution to job creation and economic growth (Ahn & Winters, 2023). Considering motives for setting up a new business (opportunity vs. necessity entrepreneurs) is another interesting dimension of the recent research on the entrepreneurial quality. Opportunity entrepreneurs are perceived as more prone to establish growth-orientated businesses and create new jobs than necessity entrepreneurs (Fossen, 2021; Audretsch *et al.*, 2022).

An effective framework for analysing individual decisions to enter self-employment is labour force characteristics: unemployment and human capital. Both are recognised as relevant factors that mediate the effect of entrepreneurship on economic growth (Rodrigues & Teixeira, 2020). Higher level of education increases the probability of starting a business in knowledge-intensive, high growth industries and is also positively correlated with opportunity entrepreneurship (Ahn &Winters, 2023). On the contrary, unemployment is perceived as a regressive factor, pushing people to self-employment and a driver of necessity entrepreneurship (Fairlie & Fossen, 2020).

Despite these general findings, there is no straightforward relationship between human capital, unemployment, and entrepreneurship. In the case of human capital, the role of formal education is emphasised. The impact of educational attainment on quantity and quality of newly established enter-

prises depends not only on individual characteristics of founders, but also on their previous occupational status (Bilan & Apostoaie, 2023), their market-specific knowledge (Epure *et al.,* 2023), the type of industry (Ahn & Winters, 2023), quality of the education system (Habibov *et al.,* 2017) or institutional environment (Audretsch *et al.*, 2022). These studies are usually of a microeconomic nature.

In the case of unemployment, the unemployment push-effect is explored. It is evidenced that the probability of being self-employed is higher among the unemployed than employed individuals (da Fonseca, 2022). In contrast to microeconomic studies, the findings regarding the unemployment push effect at the macro level are still inconclusive. At the macroscale, the unemployment push mechanism is conditioned not only by individual characteristics of entrepreneurs but also by cyclical economic fluctuations (Konon *et al.*, 2018; Fossen, 2021), industry-specific entry barriers (Wosiek *et al.*, 2022) or entrepreneurship policy, also within active labour market policy (ALMP) (Bilan & Apostoaie, 2023). However, so far, most studies have treated unemployment as a homogenous economic phenomenon. In fact, unemployed individuals differ in terms of their entrepreneurial skills and their ability to become self-employed (Audretsch *et al.*, 2015), which may also be a causative factor in the disparate results.

On the macroscale, the effects of human capital and unemployment on entrepreneurship are usually considered separately, although these factors are interrelated. Formal education could be a moderator in the relationship between unemployment and the creation of new businesses. This is a general conclusion of microlevel studies (Fossen, 2021; Dencker *et al.,* 2021). At the macro level, the share of people (unemployed) with tertiary education was found to be positively associated with nascent entrepreneurship (Bilan & Apostoaie, 2023) and the business entry rate in knowledge-intensive industries (Audretsch *et al.*, 2015; Horta *et al.,* 2016). In an international context, Rodrigues and Teixeira (2020) confirm the mediating role of human capital on the effect of necessity entrepreneurship on economic growth in 79 countries. However, they do not explore the channels through which human capital may influence necessity entrepreneurs.

The relationship between unemployment and the entrepreneurial dynamics is a current and important issue. Due to the complex nature of these relationships, there are still areas that have not been sufficiently explored, such as the context of the unemployed heterogeneity. In filling this gap, the study aims to investigate the links between the unemployment rate and

new firm formation, while considering the unemployment structure in terms of the human capital of those unemployed and their duration of unemployment. Moreover, not only is the sectoral diversity of enterprises taken into account (manufacturing, wholesale and retail trade, professional and scientific activities, ICT), but also the scale of the newly established firms (with/without employees), which provides further insight into the research subject. The links between unemployment, its structure, and enterprise births are examined on the example of 20 European countries. Eurostat and World Bank data for 2004–2020 are used. The empirical approach applies panel fixed- and random-effects modelling.

This paper contributes to the literature of entrepreneurship determinants by exploring the understudied feature of the macroeconomic unemployment push effect related to the quality of human capital of the unemployed. This research not only validates the impact of unemployment rates on the number of enterprises created, but also tackles the quality of new establishments. The research investigates two channels through which human capital can influence the quality of enterprises created by the unemployed: the sectoral structure of new businesses (a proxy for knowledge output) and the scale of the newly born enterprises (a proxy for social impact and new jobs creation). Furthermore, the study addresses a call for a more nuanced understanding of necessity entrepreneurs (Nikiforou *et al.*, 2019; Dencker *et al.*, 2021) by considering the heterogeneity of the unemployed (including their educational attainment and unemployment duration).

Understanding how different types of unemployment impact entrepreneurial activity may be important for ALMP. The composition of instruments addressed to the unemployed is important not only for the improvement of the employability of individuals (the core perspective for assessing ALMP), but also for stimulating entrepreneurial activity (an overlooked 'side effect' of this policy) (Bilan & Apostoaie, 2023). Although the main idea of start-up subsidies for the unemployed is not to create high-growth industries, but to increase unemployment exit rates (Dvouletý, 2022), it is possible to leverage the ALMP effect in terms of not only activating unemployed individuals, but also quality on newly formed enterprises. As different ALMP programmes may target specific types of the unemployed, this research may be useful for redesigning instruments to address unemployment through entrepreneurship-supporting programmes. This is

in line with the current interest in how policies may address specific goals more effectively (Audretsch *et al.*, 2024).

The paper is structured as follows. The next part reviews the previous research on the links between unemployment and entrepreneurship, which is the basis for hypothesis development. The following section describes the research method. The next parts present and discuss the research results. Finally, the main findings are presented.

## Literature review

### *Unemployment push effect in the macro scale*

The theory of occupational choice is a commonly used reference concept in studies on the links between unemployment and the creation of new businesses. In this framework, entrepreneurship is perceived as a choice between being unemployed, employed, or owning and managing a business as a solo entrepreneur (quasi-entrepreneur) or entrepreneur with employees (proper entrepreneur) (Bennett & Rablen, 2015). The choice is driven by a cost-benefit analysis, in which a number of variables are considered: the number and quality of job offers, unemployment benefits, average wages, expected entrepreneurial profits, business entry costs, risk of failure, etc. (Gaweł, 2022; Epure *et al.*, 2023; Ahn & Winters, 2023).

Among the factors determining the occupational choice is the situation on the labour market. Higher rates of unemployment may lower the opportunity cost of starting a business and push people into self-employment (Gaweł, 2022; Fossen, 2021). Micro-level studies have clearly evidenced that unemployed individuals are more likely to start a new business than employed individuals (Niefert, 2010; da Fonseca, 2022; Fossen, 2021). The transition from unemployment status to self-employment is deemed as closely related to necessity entrepreneurship (Nikiforou *et al.*, 2019).

From the macroeconomic perspective, a positive correlation between the number of newly established enterprises and unemployment rate is perceived as a proxy for the unemployment-push effect and necessity entrepreneurship. At the macroscale, however, the empirical findings on the role of the unemployment rate in starting a business are mixed, in particular when the overall number of the enterprise births is analysed.

An example is the ambiguous research results for the Czech Republic. Dvoulteý (2017) supports a positive relationship between the unemployment rate and annual growth in the total number of registered businesses, while Hájek, *et al.* (2015) indicate that such an effect is not significant in this country. Numerous studies have demonstrated that the reasons behind the mixed results are:

- cyclical fluctuations: unemployment push-effect manifests strongly during a recession (Konon *et al.*, 2018; Fossen, 2021),
- structural problems of lagged economies that generally hamper entrepreneurial activity (Calá, 2018; O'Leary, 2022),
- heterogeneity of businesses: the unemployment push-effect is mostly manifested in the industries with low capital and knowledge requirements (Konon *et al.*, 2018; Caree & Dejardin, 2020; Wosiek *et al.*, 2022).

Rarely do studies control the scale of newly established enterprises or the heterogeneity of the unemployed. With regard to the firm size, small-scale industries due to lower entry costs are assumed to be well suited for former unemployed entrepreneurs. Dvoulteý (2022) and da Fonseca (2022) show that most of the unemployed enter self-employment as solo entrepreneurs and tend to hire fewer workers than companies created by employed individuals. In contrast, Konon *et al.* (2018) indicate that in German regions large-scale industries are mainly influenced by changes in unemployment. It was linked to the easier availability of workers. All these studies have treated the unemployed as a homogeneous group.

Addressing the heterogeneity of the unemployed, Fossen (2021) indicates that the educational attainment of the unemployed increased the probability of incorporated self-employment (perceived as a proxy of opportunity entrepreneurship). However, this study is based on individual-level data for the U.S. and limits heterogeneity of newly formed business to its legal status.

On the macro-level, Audretsch *et al.* (2015) show that in German regions in 1998–2005 a high share of those unemployed with a university degree positively affected the level of new firm formation in knowledge-intensive sectors, while a higher share of long-term unemployed decreased new firm formation, especially in medium- and low-knowledge sectors. Horta *et al.* (2016) indicate that the unemployment rate negatively affected the formation of knowledge-intensive firms in Italy in 1999–2013. They show, however, that a higher share of skilled unemployed positively impacted the foundation of academic spin-offs. All studies are single-country analy-

sis and neglect the scale of newly established companies, which is also an important feature of business demography. Rodrigues and Teixeira (2020) acknowledge the international context and indicate that higher levels of human capital may enhance the effect of necessity entrepreneurship on economic growth in 79 OECD and non-OECD countries in 1990–2016. However, they do not provide a comprehensive framework for analysis of the relationship between human capital, unemployment, and business creation.

Human capital matters in the creation of new businesses. It might be an important moderator in the relationship between unemployment and business dynamics, not only in terms of quantity, but also quality of newly established enterprises (intensity of knowledge creation, ability to create new jobs). This issue requires further investigation, and there is still a gap in the literature in this area. Exploring these relationships should lead to better recognising the nature of the relationship between unemployment and the entrepreneurial activity.

*The role of human capital in new firm formation*

Human capital, unlike unemployment, can increase the opportunity cost of starting a business and lower the incentive to enter self-employment. Educated people have a better situation in the labour market and a better perspective for wage employment (Gaweł, 2022; Rodrigues & Teixeira, 2020). They also show greater risk awareness and higher preference for free time that can inhibit the entrepreneurial spirit in this group (Habibov *et al.*, 2017).

On the other hand, individuals with higher levels of human capital are more likely to be opportunity entrepreneurs (Ahn & Winters, 2023). They have not only higher career ambitions, but also higher potential to recognise self-employment opportunities than individuals with lower educational attainment (Epure *et al.*, 2023). Thus, when faced with unemployment status, highly skilled people are more likely to become self-employed than low-skilled people (Niefert, 2010). The effect of formal education on overall self-employment, however, is conditioned by the quality of education system and its orientation towards shaping entrepreneurial skills (Habibov *et al.*, 2017).

The quality of newly formed enterprises also might be linked to human capital of founders. The unemployed usually start a business in industries

consistent with their previous education and market experience (Dencker *et al.*, 2021). Higher educational attainment confers high-level knowledge and specific skills required for starting a business in knowledge-intensive industries (Ahn & Winters, 2023). Furthermore, formal education promotes the opportunity entrepreneurship (Fossen, 2021). The growth and profit aspirations of the founders is also reflected in the scale of new businesses. Entrepreneurs with higher growth aspirations, recognising profit opportunities, are more likely to hire workers, and contribute to further job creation (Laffineur *et al.*, 2017; Bilan & Apostoaie, 2023; Epure *et al.*, 2023).

Therefore, the research hypotheses assume:

H1: *A higher share of highly qualified unemployed positively affects the enterprise birth rate.*

H2: *The effect varies with the scale of new businesses: entrepreneurs with employees are relatively more sensitive to the impact of the skill structure of the unemployed.*

*The effect of the unemployment duration on business entries*

This study assumes that unemployment status may have different effects on entry into self-employment at different stages of unemployment spell. First, it is because human capital and unemployment are negatively correlated. Longer unemployment duration is associated with lower level of human capital (da Fonseca, 2022). Empirical studies verifying the effectiveness of entrepreneurship-supporting programmes within ALMP indicate that their beneficiaries usually are not only more highly qualified than other unemployed persons, but are also unemployed for a shorter period of time (Srhoj & Zilic, 2020).

Second, a longer duration of unemployment status leads to several negative consequences, such as the depreciation of human and social capital, worsening of physical and mental health, and declining income (Nikiforou *et al.*, 2019). The longer the unemployment duration, the lower the probability of starting new business, because of lower availability of capital and other resources needed to start own business (Bilan & Apostoaie, 2023).

Third, the longer a person stays unemployed, the higher is the pressure to leave unemployment (financial pressures, social and institutional pressures). Thus, long-term unemployed are highly exposed to be necessity

entrepreneurs. Nikiforou *et al.* (2019) demonstrate that the behaviour of short-term unemployed is similar to that of opportunity entrepreneurs, whereas the long-term unemployed are likely to behave as necessity entrepreneurs.

On average, unemployed persons more often encounter financial constraints when starting a business than other business founders due to a lower level of wealth. Their start-ups tend to be found in low-scale industries with low financial and knowledge requirements (da Fonseca, 2022; Fossen, 2021). They usually have fewer employees and mostly take the form of solo entrepreneurs (Laffineur *et al*., 2017; Dvoulteý, 2022). Necessity entrepreneurs usually have lower aspiration in terms of job creation. Due to the lower quality of human capital, it would be more difficult for them to organise firm operations on a larger scale (Bilan & Apostoaie, 2023).

Therefore, the following research hypotheses were formulated:

H3: *A higher share of long-term unemployed negatively affects the enterprise birth rate.*

H4: *The effect varies with the scale of new businesses: the birth rate of enterprises with employees is relatively more sensitive to the impact of the share of long-term unemployed.*

## Research method

This study investigates the effects of unemployment rates on new enterprise formation while considering the unemployment structure, the scale of the newly born enterprises, and their sectoral diversity in European countries. The research approach also considers other macro-level determinants that impact the relationship between unemployment and entrepreneurship.

Business Demography Database in Eurostat provides comparable data on European enterprises. Due to the availability of data, the study spans 2004–2020 (the longest possible period of analysis) and includes 20 European countries (the availability of full data set): Austria, Bulgaria, the Czech Republic, Finland, Germany, Hungary, Estonia, France, Italy, Latvia, Luxemburg, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden. The final research sample covers important EU members (19 out of 27 countries), all countries belong to The European

Economic Area. This allows for general conclusions to be drawn regarding these countries. The research period covers different phases of the economic cycle (e.g., the 2007+ financial crisis, the first year of the COVID-19 pandemic), which creates appropriate environment for exploring the relationship between the unemployment rate and the business births.

As a proxy for the business entry rate, the number of enterprise births per 1,000 people in the labour force (15–64 years) was adopted ($Y_i$). This data set reflects all new business creations in European countries included in the countries' business registers.[1] To capture the heterogeneity of entrepreneurship, the enterprise births were analysed separately by:

- the type of business sector: (manufacturing,[2] low knowledge services: wholesale and retail trade; and knowledge-intensive services: professional and scientific activities; ICT),
- the size class: all new firms ($Y_1$), without employees ($Y_0$), with employees ($Y_2$).

Regarding the unemployment, the following variables (LFS data) were acknowledged:

*U* – unemployment rate: the ratio of the number of unemployed to the size of the labour force (aged 15–64 years);

*Uh* – the share of unemployed with tertiary education (ISCED levels 5–8) in the total unemployment;

*Ul* – the share of long-term unemployed (12 months or more) in the total unemployment.

To capture more precisely the effect of unemployment and its structure on new business formation, the following macrolevel determinants of business births were also included in the analysis:

$X_1$ – GNI *per capita*, PPP (constant 2017 international USD) as a proxy of the level of economic development (Nikolaev *et al.*, 2018);

$X_2$ – GDP growth (annual %) as a proxy of economic fluctuations (Konon *et al.*, 2018);

[1] Enterprises restarting activity within 2 years, changing legal form, or established by taking over previously created enterprises (*Eurostat-OECD Manual…*, 2008, pp. 33–34) are excluded from the statistics. The study does not distinguish between proper entrepreneurial activity and 'false' self-employed that depend economically on only one client (e.g. former employer) (Carrasco & Hernanz, 2022).

[2] Unfortunately, there are no data in Eurostat enabling the division of newly established manufacturing enterprises based on their knowledge content.

$X_3$ – the Starting a Business Index (sub-index of the World Bank Ease of Doing Business Index) as a proxy of the institutional environment (Laffineur *et al.*, 2017);
$X_4$ – R&D expenditure (% of GDP) as a proxy of technological progress (Audretsch *et al.*, 2015);
$X_5$ – national expenditure within ALMP on start-up incentives (% GDP) as a proxy of government incentive to promote entrepreneurship among the unemployed (Laffineur *et al.*, 2017).

The following regression equation was applied to verify the research hypotheses:

$$Y_{i,t}^{s,c} = \alpha_0 + \alpha_1 U_{i,t-1} + \alpha_2 Uh_{i,t-1} + \alpha_3 Ul_{i,t-1} + \sum_{n=1}^{5} \beta_n X_{n,i,t-1} + \mu_i + \varepsilon_{i,t} \quad (1)$$

where:

| | |
|---|---|
| $Y$ | enterprise birth rate in country $i$ in year $t$ in sector $s$ and size class $c$; |
| $U$ | unemployment rate; |
| $Uh$ | share of unemployed with tertiary education; |
| $Ul$ | share of long-term unemployed; |
| $X$ | set of control variables; |
| $\alpha_0, \alpha_i, \beta_i$ | regression coefficients, |
| $\mu_i$ | country fixed effects (fixed-effect panel model), |
| $\varepsilon_{j,t}$ | error term of the specification. |

The results of White's test for non-linearity ($p$<0.05) indicate that a relationship is non-linear and that using log-transformed variables is more appropriate. It has the additional advantage of interpreting the regression coefficients in terms of elasticity. All variables in the regression were used as 4-year averages (2004–2007; 2008–2011; 2012–2015; 2016–2020), based on the assumption that the effects of the unemployment structure on the enterprise births manifest over a longer period. This is also in line with the estimation approach applied by Audretsch *et al.* (2015).

Furthermore, F-test results ($p$>0.05) indicate that no time fixed effects are needed, and the results of the Pasaran CD test ($p$>0.05) suggest that there is no cross-sectional dependence. In addition, the correlation coefficients between the independent variables do not exceed 0.58 (Tab. 2), and the VIF values are in the range [1.40; 2.58]. It indicates that multicollinearity does not alter the estimation results. To address the problem of heteroscedasticity, robust standard errors were used.

The Hausman test was performed to choose between the random- or fixed-effects model. The results of this test were dependent on the industry and scale of new enterprises. Therefore, to maintain comparability, both estimation methods were used. The fixed-effects approach emphasises that the individual characteristics of countries affect the enterprise births, whereas the random-effects approach assumes that characteristics of individual countries have no effect on the regressors (Dańska-Borsiak, 2011). In the Hausman test, a $p$-value>0.05 indicates that the random effects model is preferred.

The main limitation of the presented research approach is that fixed- and random-effects models do not fully solve the possible problem of endogeneity arising from the reversed causality between entrepreneurship and some of the macro variables (unemployment, GDP growth rate). To reduce the potential endogeneity problem, all predictors were lagged by one period of time (4 years) (Laffineur *et al.*, 2017). Thus, it could be assumed that proposed analyses are able to capture the effects of unemployment and its structure on enterprise births.

## Results

In 2004–2020, in the sample of 20 European countries, on average, 9.00 new firms (per 1,000 people aged 15–64 years) were established yearly (Tab. 1). Most (73%) were solo entrepreneurs. New companies were established mainly in services, both in low-knowledge services, such as wholesale and retail trade (25%), and in knowledge-intensive services (KIS), such as professional and scientific activities (18%). Moreover, KIS included those in which solo entrepreneurs appeared more often (ca. 78% of enterprise births).

The enterprise birth rates also fluctuated over time. These changes were positively related to the unemployment rate and negatively to the GDP growth rate (except for new firms of proper entrepreneurs) (Tab. 2). The positive correlations with the unemployment rate suggest the appearance of an unemployment push effect in the sample of European countries, especially for solo entrepreneurs.

The estimation results (est. 1a–5a) suggest the occurrence of the unemployment push effect in European countries in all types of new firms, regardless of their sectoral specialisation (Tab. 3). However, including varia-

bles representing the structure of unemployment alters the results (est. 1b–5b). For the KIS, it drives the positive effect of the unemployment rate on enterprise births to insignificance (est. 4b, 5b). In addition, it can be noticed that a higher share of long-term unemployed, *ceteris paribus,* decreased the enterprise birth rate in manufacturing, and wholesale and retail trade (est. 2b, 3b). Such an effect was not observed in KIS (est. 4b, 5b). It these sectors, especially in ICT services (est. 5b), the higher share of unemployed with a university degree, *ceteris paribus,* positively affected the enterprise birth rate. Altogether, including the unemployment structure increases the explanatory power of the models except for all newly born firms (est. 1b) and professional and scientific activities (est. 4b) ($p$>0.10 for the F-test). The initial equations (1a–5a) account for 37% (1a) to 67% (5a) of the total variance within countries. Their explanatory power increased (to 43.2%–72.7%) after including the *Uh* and *Ul* variables.

The impact of unemployment varies not only by sector but also by the size class of the newly born enterprises. For solo entrepreneurs (Tab. 4) the unemployment rate, *ceteris paribus,* positively affected the subsequent firm birth rate in manufacturing, and wholesale and retail trade (est. 2c, 3d). The unemployment push effect was not statistically significant in the group of all solo entrepreneurs (est. 1d) and in KIS (est. 4c–5d). Regarding the unemployment structure, the positive effect of a higher share of skilled unemployed on the enterprise birth rate is observed in all types of business activities except for trade (est. 3c, 3d). Among solo entrepreneurs, the duration of unemployment did not impact the number of newly born companies, regardless of their type of activity.

Similarly, among proper entrepreneurs (Tab. 5), the unemployment push effect was observed in manufacturing, and wholesaling and retailing (est. 2e, 3g) but not in KIS (est. 4e–5f) and in the group of all newly established enterprises with employees (est. 1e, 1f). In all types of business activities, a higher share of long-term unemployed, *ceteris paribus*, negatively affected the birth rate of enterprises with employees (est. 1e–5f). The birth rate of firms by proper entrepreneurs, however, seems to be ambivalent to the skill structure of the unemployed.

The findings confirm that a higher share of unemployed with tertiary education fostered the firm birth rate, which is manifested by positive values of all statistically significant regression coefficients for the *Uh* variable in all sectors (except trade). This observation supports the first hypothesis. When considering the size-class of new businesses, the effects remain visi-

ble only for the creation of businesses with higher knowledge requirements, such as ICT services, professional and scientific activities and in the group of solo entrepreneurs. The educational attainment of the unemployed had no statistically significant impact for the establishment of enterprises with employees. It contradicts the second hypothesis. The positive effect of the educational structure of unemployment seems to be more sector- than size-class-dependent.

The unemployment duration also impacts business entries. A higher share of long-term unemployed damped the process of new firm formation which is in line with hypothesis 3. This conclusion is supported by negative values of all statistically significant regression coefficients for the *Ul* variable. The negative impact of the unemployment duration manifests primarily for proper entrepreneurs, struggling with greater capital and organisational challenges. Such an effect was statistically insignificant in the group of solo entrepreneurs. Thus, the negative impact of long-term unemployment was related to the size of newly born enterprises, as hypothesis 4 assumed.

## Discussion

The estimation results are consistent with previous findings on the unemployment push effect addressing the sectoral diversity of newly formed businesses. The unemployment push effect manifests in easy-to-enter services, such as wholesale and retail trade (Carree & Dejardin, 2020; Wosiek *et al.*, 2022), regardless of the size of the new establishments.

Additionally, the findings enable us to explain the lack of unemployment-push effect in knowledge-intensive services. This could be attributed to the impact of the skill structure of the unemployed (Audretsch *et al.*, 2015). It was only for KIS that the positive effect of the unemployment rate became statistically insignificant when augmenting the basic specification with the unemployment structure variables. Unemployed individuals with higher human capital tend to make use of their specific knowledge when entering self-employment (Nikiforou *et al.*, 2019; Dencker *et al.*, 2021). This could also explain why a higher share of skilled unemployed was not conducive to new firm formation in low-knowledge services.

Another observation is that the diversification of activities (due to knowledge loading) within the sector may bring mixed result. This is the

case of manufacturing for which it is difficult to refer to the knowledge intensity due to a lack of data. In this sector apart from the unemployment-push mechanism, a positive impact of the human capital of the unemployed on enterprise births was also visible. The results therefore strengthen the rationale for taking into account a more detailed industry context in research on the relationship between unemployment and entrepreneurship (Wosiek, 2021).

Surprisingly, the educational structure of the unemployment played a more important role for new establishments among solo- than proper entrepreneurs. It could suggest that when starting a business on a larger scale (with employees), financial conditions are a greater impediment than knowledge requirements. The unemployed are more financially constrained than other business founders, and necessity entrepreneurs are even more dependent on external financial support (Bilan & Apostoaie, 2023). This is related to the observation that a higher share of long-term unemployed exerts a damping influence on the enterprise birth rate, in particular for new companies with employees, regardless of their sectoral affiliation (Tab. 5). These results raise a question of the intensity of public support provided to the unemployed to start a business. It is usually a one-time start-up subsidy. The availability of additional support in the first or even second year of the company's activity could encourage the unemployed to start a business on a larger scale. The positive correlation between the size of the start-up subsidy and the firm employment was shown by Dvoulteý (2022).

Higher educational attainment of the unemployed not only increases the number of solo entrepreneurs, but also facilitates structural changes among the self-employed. It triggers reallocation of production factors toward knowledge-intensive services. This is in line with human capital research in entrepreneurship (Ahn & Winters, 2023). Additionally, the findings suggest that start-up subsidies for the unemployed instead of supporting low-productivity firms (da Fonseca, 2022; Dvoulteý, 2022) may also induce a reallocation of resources to more productive sectors. The condition for creating 'added value' within ALMP is a more careful selection of potential beneficiaries of ALMP activities.

The negative effect of the unemployment duration could also be triggered by a lower level of human capital of the long-term unemployed. The probability of long-term unemployment significantly increases with low educational attainment (Fossen, 2021). It is plausible that the share of long-

term unemployed captures similar effects as the share of low-educated unemployed (Audretsch *et al.*, 2015). Therefore, the long-term unemployed are likely to feel less confident in overcoming the challenges of entrepreneurship, which is more evident in the case of its more complex form (with employees).

Finally, the study suggests that the size of the newly established company could be used as an additional category in the distinction between opportunity and necessity entrepreneurs next to the legal status of the company (Fossen, 2021) or unemployment duration (Nikiforou *et al.*, 2019). As concerns the control variables, the findings imply a greater presence of opportunity entrepreneurs in the group of proper entrepreneurs than among the solo entrepreneurs. The formation of new companies hiring employees was fostered by pull factors, such as a higher GDP growth rate, higher levels of development, and more favourable institutional conditions. For solo entrepreneurs, the business entry rate was negatively correlated with the GDP growth rate and positively with the unemployment rate. This suggests a higher propensity of individuals to opt for solo entrepreneurship out of necessity motives.

## Conclusions

The main focus of this study was to explore the moderating role of human capital in the relationship between the unemployment rate and the creation of new businesses. Not only the occurrence of unemployment push effect (impact on the number of enterprise births) was verified, but also the quality of newly created businesses was acknowledged. In order to capture such an effect, the research approach considered not only sectoral diversity of new companies, but also their size and the heterogeneity of the unemployed.

The study reveals the channels through which human capital influences the quality of enterprises created by unemployed individuals. Higher educational attainment of the unemployed stimulates structural changes in the group of self-employed. It increases the enterprise births in knowledge-intensive services. Thus, the quality of human capital matters for the knowledge and innovation output of businesses started by the unemployed.

The quality of human capital affects the scale of newly born enterprises as well. A higher share of low-educated unemployed (long-term unemployed) decreases the birth rate of proper entrepreneurs (with employees). Thus, the quality of human capital also matters for social impact and new jobs creation by former unemployed entrepreneurs.

Altogether, the study contributes to better recognising the nature of the relationship between unemployment and the establishment of new businesses in terms of its quantity and quality. It also adds value to the strand of research on necessity entrepreneurs.

The findings are important for designing effective instruments to address unemployment by entrepreneurship, in particular within ALMP. It suggests that the educational attainment of unemployed individuals should be taken into account more when designing ALMP instruments. The better-qualified unemployed should be the main target group for entrepreneurship-supporting training, grants, etc. This change could positively impact the quality of new businesses in terms of their knowledge loading and, as a result, foster flows from the less to the more productive sectors. Furthermore, it is reasonable to offer support to the unemployed in the early stages of unemployment. Such support offered early increases the probability of the recipients setting up enterprises with employees, which, in turn, may positively affect the labour market. The longer the duration of unemployment, the lower the effects of entrepreneurship-supporting instruments.

Despite the valuable insights, this research has limitations. Regarding the data set, the availability of time series for other European countries, as well as the selection of 'false' self-employed from solo-entrepreneurs would increase the informativeness of the research. Furthermore, this research does not fully acknowledge the reverse causality between unemployment and entrepreneurship, which can result in less precise estimates of the size of the unemployment effect on firms' birth rates. Therefore, further research could apply another estimation technique (e.g. instrumental variable) to reinforce the robustness of the results. It would also be interesting to consider possible spatial effects, include other control variables (e.g., migration flows, sectoral diversity of the economy), or perform the analysis at the regional level in the EU countries.

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# Annex

**Table 1.** Descriptive statistics

| Variable | Mean | Std dev. | Min | Max |
|---|---|---|---|---|
| | | *Total start-ups:* | | |
| $Y_1$ | 9.00 | 3.45 | 2.61 | 22.33 |
| $Y_0$ | 6.65 | 3.32 | 1.06 | 20.55 |
| $Y_2$ | 2.35 | 1.28 | 0.45 | 9.61 |
| | | *Manufacturing* | | |
| $Y_1$ | 0.67 | 0.53 | 0.06 | 3.43 |
| $Y_0$ | 0.49 | 0.49 | 0.03 | 3.25 |
| $Y_2$ | 0.18 | 0.12 | 0.03 | 0.69 |
| | | *Wholesale and retail trade* | | |
| $Y_1$ | 2.17 | 0.89 | 0.64 | 4.86 |
| $Y_0$ | 1.57 | 0.76 | 0.17 | 4.40 |
| $Y_2$ | 0.60 | 0.38 | 0.09 | 1.90 |
| | | *Professional, scient. activities* | | |
| $Y_1$ | 1.60 | 0.67 | 0.31 | 3.73 |
| $Y_0$ | 1.28 | 0.67 | 0.09 | 3.65 |
| $Y_2$ | 0.33 | 0.27 | 0.04 | 2.05 |
| | | *ICT services* | | |
| $Y_1$ | 0.45 | 0.23 | 0.10 | 1.63 |
| $Y_0$ | 0.33 | 0.19 | 0.02 | 1.16 |
| $Y_2$ | 0.11 | 0.10 | 0.01 | 0.76 |
| | | *Unemployment* | | |
| U | 8.14 | 3.94 | 2.10 | 26.20 |
| Uh | 16.33 | 6.39 | 3.34 | 34.34 |
| Ul | 39.65 | 13.76 | 12.70 | 76.30 |
| | | *Control variables* | | |
| $X_1$ | 39 503 | 15 987 | 13 856 | 93 174 |
| $X_2$ | 1.83 | 3.64 | -14.63 | 11.97 |
| $X_3$ | 84.74 | 8.76 | 51.47 | 95.36 |
| $X_4$ | 1.63 | 0.87 | 0.38 | 3.73 |
| $X_5$ | 0.02 | 0.03 | 0.00 | 0.15 |

Source: own calculation based on Business Demography Statistics (https://ec.europa.eu/eurostat/web/structural-business-statistics/database); LFS (https://ec.europa.eu/eurostat/web/lfs/database); World Development Indicators (https://databank.worldbank.org/source/world-development-indicators).

**Table 2.** Correlation analysis (all start-ups)

| Variable | $Y_1$ | $Y_0$ | $Y_2$ | U | Uh | Ul | $X_1$ | $X_2$ | $X_3$ | $X_4$ | $X_5$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $Y_1$ | 1.0 | | | | | | | | | | |
| $Y_0$ | 0.93*** | 1.0 | | | | | | | | | |
| $Y_2$ | 0.28*** | -0.10* | 1.0 | | | | | | | | |
| U | 0.13** | 0.09* | 0.12** | 1.0 | | | | | | | |
| Uh | -0.01 | 0.03 | -0.09* | -0.10* | 1.0 | | | | | | |
| Ul | 0.24*** | 0.19*** | 0.15*** | 0.43*** | -0.53*** | 1.0 | | | | | |
| $X_1$ | -0.25*** | -0.16*** | -0.25*** | -0.40*** | 0.58*** | -0.59*** | 1.0 | | | | |
| $X_2$ | -0.03 | -0.11* | 0.19*** | -0.11** | -0.18*** | 0.28*** | -0.12** | 1.0 | | | |
| $X_3$ | 0.01 | -0.01 | 0.06 | -0.18*** | 0.49*** | -0.32*** | 0.29*** | -0.23*** | 1.0 | | |
| $X_4$ | -0.27*** | -0.14** | -0.37*** | -0.26*** | 0.37*** | -0.55*** | 0.54*** | -0.20*** | 0.34*** | 1.0 | |
| $X_5$ | -0.05 | -0.01 | -0.13** | 0.53*** | 0.02 | 0.13** | -0.10* | -0.07 | -0.27*** | 0.01 | 1.0 |

Note: *, **, *** - statistical significance: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

**Table 3.** Determinants of enterprise births ($Y_1$) – estimation results

| Variable | All | | Manuf. | | Trade | | Profes. services | | ICT | |
|---|---|---|---|---|---|---|---|---|---|---|
| Est. | 1a | 1b | 2a | 2b | 3a | 3b | 4a | 4b | 5a | 5b |
| Est. method | FE | FE | FE | FE | FE | FE | RE | RE | FE | FE |
| U | **0.30*** ** | **0.42*** ** | **0.29** ** | **0.49*** ** | **0.24*** ** | **0.53** ** | **0.18** ** | 0.191 | **0.305** ** | 0.383 |
| | **(0.07)** | **(0.15)** | **(0.12)** | **(0.12)** | **(0.08)** | **(0.20)** | **(0.08)** | (0.162) | **(0.137)** | (0.248) |
| $X_1$ | **1.04** ** | **1.05** ** | **1.16** ** | **1.19*** ** | 0.49 | 0.77 | 0.22 | 0.21 | **1.75** ** | **1.63** ** |
| | **(0.41)** | **(0.38)** | **(0.48)** | **(0.41)** | (0.47) | (0.49) | (0.27) | (0.26) | **(0.83)** | **(0.70)** |
| $X_2$ | 0.01 | 0.013 | 0.005 | **0.016*** | -0.004 | 0.009 | 0.001 | 0.003 | -0.004 | 0.002 |
| | (0.01) | (0.01) | (0.01) | **(0.01)** | (0.008) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| $X_3$ | 0.05 | -0.08 | -0.26 | -0.41 | -0.38 | -0.14 | **0.896*** ** | **0.73** ** | 0.43 | 0.11 |
| | (0.22) | (0.27) | (0.25) | (0.31) | (0.23) | (0.27) | **(0.29)** | **(0.38)** | (0.31) | (0.45) |
| $X_4$ | -0.09 | -0.20 | 0.12 | -0.05 | **-0.43** ** | **-0.39*** | 0.03 | -0.04 | 0.35 | 0.13 |
| | (0.17) | (0.14) | (0.19) | (0.18) | **(0.19)** | **(0.20)** | (0.18) | (0.18) | (0.33) | (0.25) |
| $X_5$ | 0.01 | 0.02 | 0.057 | **0.06** ** | 0.05 | 0.003 | 0.02 | 0.03 | -0.02 | 0.02 |
| | (0.02) | (0.02) | (0.034) | **(0.03)** | (0.03) | (0.03) | (0.03) | (0.03) | (0.03) | (0.04) |
| Uh | | 0.21 | | 0.28 | | -0.22 | | 0.18 | | **0.46*** |
| | | (0.14) | | (0.17) | | (0.14) | | (0.16) | | **(0.23)** |
| Ul | | -0.16 | | **-0.28*** | | **-0.53** ** | | 0.01 | | -0.04 |
| | | (0.18) | | **(0.16)** | | **(0.25)** | | (0.20) | | (0.32) |
| Constant | -9.5** | -9.1** | -11.9** | -11.6** | -2.9 | -5.2 | -6.2** | -5.8* | -21.8** | -20.2** |
| | (4.37) | (4.03) | (4.89) | (4.38) | (4.59) | (4.83) | (3.02) | (3.10) | (8.57) | (7.33) |
| $R^2$ within | 0.367 | 0.432 | 0.416 | 0.510 | 0.389 | 0.539 | 0.476 | 0.514 | 0.674 | 0.727 |
| $R^2$ between | 0.054 | 0.029 | 0.307 | 0.314 | 0.164 | 0.012 | 0.062 | 0.048 | 0.004 | 0.0003 |
| $R^2$ overall | 0.068 | 0.039 | 0.294 | 0.297 | 0.182 | 0.007 | 0.099 | 0.079 | 0.0004 | 0.0007 |
| | | | | | *Post-hoc tests (p-value)* | | | | | |
| F model | 0.002 | 0.0002 | 0.047 | 0.001 | 0.0002 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 |
| Doornik-Hansen | 0.77 | 0.19 | 0.997 | 0.87 | 0.17 | 0.57 | 0.42 | 0.67 | 0.29 | 0.43 |
| F unemp. variab. | | 0.22 | | 0.086 | | 0.02 | | 0.37 | | 0.08 |
| Hausman | 0.04 | 0.08 | 0.00002 | 0.00002 | 0.047 | 0.014 | 0.82 | 0.80 | 0.0001 | 0.0001 |

Note: *, **, *** - statistical significance: * $p < 0.1$; ** $p < 0.05$; ***$p < 0.01$; robust standard errors in parentheses. In bold – statistically significant variables. FE – fixed effects model, RE – random effects model.

**Table 4.** Determinants of enterprise births ($Y_0$) – estimation results

| Variable | All | | Manuf. | | Trade | | Profes. services | | ICT | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Est. method** | **FE** | **RE** | **FE** | **RE** | **FE** | **RE** | **FE** | **RE** | **FE** | **RE** |
| **Est. No.** | **1c** | **1d** | **2c** | **2d** | **3c** | **3d** | **4c** | **4d** | **5c** | **5d** |
| U | 0.47** | 0.21 | **0.55*** ** | 0.20 | 0.58*** | **0.32** ** | 0.27 | 0.06 | 0.26 | -0.11 |
| | (0.17) | (0.17) | **(0.15)** | (0.19) | (0.19) | **(0.15)** | (0.20) | (0.18) | (0.28) | (0.23) |
| $X_1$ | 1.40*** | 0.41 | **1.54** * | 0.25 | 1.35** | 0.19 | 1.10** | 0.33 | **2.25*** ** | -0.03 |
| | (0.49) | (0.34) | **(0.62)** | (0.67) | (0.57) | (0.26) | (0.52) | (0.27) | **(0.73)** | (0.31) |
| $X_2$ | -0.008 | **-0.02** ** | -0.004 | -0.02 | -0.02 | **-0.03** * | -0.01 | **-0.03** ** | **-0.03** * | -0.05*** |
| | (0.001) | **(0.01)** | (0.01) | (0.01) | (0.01) | **(0.01)** | (0.008) | **(0.01)** | **(0.01)** | (0.02) |
| $X_3$ | -0.98** | **-0.72*** | **-1.04** * | -0.66** | -1.21*** | **-1.02*** ** | -0.59 | -0.27 | **-1.27** * | -0.13 |
| | (0.45) | **(0.40)** | **(0.39)** | (0.33) | (0.34) | **(0.36)** | (0.57) | (0.47) | **(0.57)** | (0.55) |
| $X_4$ | -0.24 | -0.16 | -0.13 | -0.07 | -0.35 | -0.26 | 0.02 | 0.07 | 0.27 | 0.12 |
| | (0.20) | (0.22) | (0.25) | (0.29) | (0.26) | (0.19) | (0.22) | (0.20) | (0.28) | (0.24) |
| $X_5$ | 0.02 | 0.01 | 0.06 | 0.06 | 0.002 | -0.003 | 0.03 | 0.02 | 0.03 | -0.02 |
| | (0.04) | (0.03) | (0.04) | (0.04) | (0.04) | (0.04) | (0.05) | (0.04) | (0.051) | (0.06) |
| Uh | 0.44** | **0.40*** ** | **0.46** * | 0.42** | -0.07 | -0.03 | 0.49* | **0.41*** | **0.68** * | 0.69*** |
| | (0.19) | **(0.14)** | **(0.20)** | (0.19) | (0.15) | (0.16) | (0.25) | **(0.16)** | **(0.27)** | (0.24) |
| Ul | 0.04 | 0.26 | -0.09 | 0.22 | -0.28 | -0.06 | 0.19 | 0.36 | 0.41 | 0.46 |
| | (0.24) | (0.23) | (0.23) | (0.33) | (0.26) | (0.22) | (0.27) | (0.24) | (0.39) | (0.29) |
| Constant | -10.6** | -10.6** | -14.2** | -2.7 | -8.3 | 2.6 | -11.08* | -4.5 | -22.8*** | -3.56 |
| | (5.04) | (5.04) | (6.17) | 6.192 | (5.39) | (3.79) | (60.4) | (4.06) | (8.13) | (4.92) |
| $R^2$ within | 0.547 | 0.481 | 0.573 | 0.478 | 0.555 | 0.480 | 0.573 | 0.546 | 0.762 | 0.685 |
| $R^2$ between | 0.000 | 0.055 | 0.167 | 0.003 | 0.041 | 0.328 | 0.114 | 0.134 | 0.0042 | 0.016 |
| $R^2$ overall | 0.000 | 0.072 | 0.139 | 0.005 | 0.015 | 0.339 | 0.107 | 0.154 | 0.015 | 0.127 |
| *Post-hoc tests (p-value)* | | | | | | | | | | |
| F model | 0.005 | 0.0004 | 0.002 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 |
| Doornik-Hansen | 0.69 | 0.55 | 0.92 | 0.13 | 0.34 | 0.91 | 0.06 | 0.95 | 0.18 | 0.19 |
| F unemp. var. | 0.04 | 0.01 | 0.04 | 0.045 | 0.57 | 0.94 | 0.56 | 0.02 | 0.01 | 0.003 |
| Hausman | 0.23 (RE) | | 0.004 (FE) | | 0.16 (RE) | | 0.79 (RE) | | 0.0005 (FE) | |

Notes: *, **, *** - statistical significance: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; robust standard errors in parentheses. In bold – statistically significant variables.

**Table 5.** Determinants of enterprise births ($Y_2$) – estimation results

| Variable | All | | Manuf. | | Trade | | | Profes. services | | ICT | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Est. method | FE | RE | FE | RE | FE | RE | OLS | FE | RE | FE | RE |
| Est. No. | 1e | 1f | 2e | 2f | 3e | 3f | 3g | 4e | 4f | 5e | 5f |
| U | 0.03 | 0.23 | **0.47**** | -0.06 | 0.43 | 0.33 | **0.46**** | 0.47 | 0.28 | 0.47 | 0.31 |
| | (0.28) | (0.22) | **(0.22)** | (0.25) | (0.30) | (0.23) | **(0.19)** | (0.32) | (0.34) | (0.34) | (0.32) |
| $X_1$ | 1.20* | 0.18 | **1.45***** | -0.67** | 0.42 | -0.12 | -0.43 | 1.15 | 0.07 | 1.57 | 0.25 |
| | (0.69) | (0.36) | **(0.51)** | (0.28) | (0.65) | (0.32) | (0.32) | (0.91) | (0.55) | (0.99) | (0.53) |
| $X_2$ | 0.04 | **0.04***** | **0.05***** | 0.02 | 0.05*** | 0.04** | 0.02 | 0.06*** | **0.05**** | 0.05** | **0.04**** |
| | (0.02) | **(0.01)** | **(0.01)** | (0.01) | (0.02) | (0.01) | (0.02) | (0.02) | **(0.02)** | (0.02) | **(0.02)** |
| $X_3$ | 2.18*** | **2.01***** | **1.03**** | 1.66*** | 2.18*** | 1.66*** | 0.16 | 3.51*** | **3.29**** | 3.19*** | **3.42***** |
| | (0.05) | **(0.59)** | **(0.44)** | (0.54) | (0.56) | (0.54) | (0.66) | (0.85) | **(0.98)** | (0.96) | **(0.87)** |
| $X_4$ | -0.69** | -0.54 | -0.22 | -0.28 | -0.85*** | -0.69*** | **-0.36**** | -1.13*** | -0.64* | -0.87* | -0.66* |
| | (0.28) | (0.20) | (0.26) | (0.23) | (0.28) | (0.21) | **(0.15)** | (0.37) | (0.35) | (0.48) | (0.36) |
| $X_5$ | 0.04 | 0.02 | 0.07 | 0.06 | 0.03 | 0.01 | -0.13** | 0.10 | 0.05 | 0.09 | 0.07 |
| | (0.07) | (0.04) | (0.05) | (0.05) | (0.06) | (0.04) | (0.06) | (0.10) | (0.07) | (0.12) | (0.08) |
| Uh | -0.45* | -0.27 | -0.27 | -0.20 | -0.57** | -0.36 | 0.03 | -0.39 | -0.40 | -0.15 | -0.09 |
| | (0.20) | (0.19) | (0.17) | (0.04) | (0.22) | (0.23) | (0.19) | (0.27) | (0.34) | (0.28) | (0.32) |
| Ul | -0.58 | **-0.49**** | **-0.68***** | -0.17 | -0.89** | -0.67*** | **-0.35*** | -1.00** | **-0.93**** | -0.60 | **-0.65**** |
| | (0.34) | **(0.23)** | **(0.21)** | (0.14) | (0.38) | (0.25) | **(0.20)** | (0.41) | **(0.42)** | (0.47) | **(0.33)** |
| Constant | -18.5** | -7.7 | -19.0*** | -0.6 | -10.5 | -3.8 | 2.9 | -24.5** | -12.4* | -30.7*** | -17.8** |
| | (6.74) | (4.71) | (5.42) | (4.61) | (6.751) | (4.29) | (4.35) | (9.73) | (7.09) | (9.71) | (7.42) |
| $R^2$ within | 0.418 | 0.377 | 0.456 | 0.182 | 0.570 | 0.543 | | 0.441 | 0.413 | 0.400 | 0.370 |
| $R^2$ between | 0.0001 | 0.194 | 0.612 | 0.643 | 0.287 | 0.489 | | 0.037 | 0.157 | 0.022 | 0.225 |
| $R^2$ overall | 0.035 | 0.238 | 0.511 | 0.619 | 0.319 | 0.518 | 0.566 | 0.060 | 0.208 | 0.031 | 0.255 |
| *Post-hoc tests (p-value)* | | | | | | | | | | | |
| F model | 0.013 | 0.006 | 0.001 | 0.000 | 0.008 | 0.000 | 0.0001 | 0.026 | 0.004 | 0.032 | 0.004 |
| Doornik-Hansen | 0.09 | 0.82 | 0.99 | 0.48 | 0.0001 | 0.49 | 0.83 | 0.36 | 0.96 | 0.49 | 0.82 |
| F unemp. var. | 0.085 | 0.099 | 0.045 | 0.46 | 0.007 | 0.01 | 0.07 | 0.15 | 0.04 | 0.60 | 0.33 |
| Hausman | 0.20 (RE) | | 0.0001 (FE) | | | 0.005 (FE) | | 0.23 (RE) | | 0.62 (RE) | |

Note: *, **, *** - statistical significance: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; robust standard errors in parentheses. In bold – statistically significant variables.