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Informality and Inclusion: Assessing the effects of the Shadow Economy and informal labour in Europe

Adriana AnaMaria Davidescu
Bucharest University of Economic Studies, Bucharest, Romania
eduard.manta@csie.ase.ro

Eduard Mihai MANTA
Bucharest University of Economic Studies, Bucharest, Romania
eduard.manta@csie.ase.ro

Cristina Maria GEAMBASU
Bucharest University of Economic Studies, Bucharest, Romania
geambasumaria14@stud.ase.ro

Ioana BIRLAN
Bucharest University of Economic Studies, Bucharest, Romania
birlanioana19@stud.ase.ro

Abstract. *The informal economy, often characterized by unregulated and untaxed economic activities, has significant yet understudied implications for sustainable development and inclusivity. This paper explores the influence of the size of the shadow economy and undeclared work patterns (envelope wage, without a formal contract and bogus self-employed) on the Leave No One Behind Index and the Sustainable Development Index developed by the United Nations across European countries from 2000 to 2021. Employing panel data regression models, the research investigates the differential impacts of informality on these indices, revealing a negative correlation with the informal economy and a positive association with various forms of undeclared work. The analysis, comprising 18 models segmented by region – Central and Eastern Europe, Western Europe, and Europe – demonstrates that the adverse effects of the informal economy are more pronounced, whereas the positive contributions of undeclared work patterns are subtler, yet significant. The study's findings suggest a complex interaction between informal economic activities and sustainable development goals, challenging the conventional perspective on informality and its role in inclusive development. The results indicate that while the shadow economy may hinder broad development efforts, informal labor arrangements support vulnerable populations, underscoring the need for nuanced policy interventions that recognize the multifaceted nature of work and its impacts on development.*

Keywords: informality, sustainable development, leave no one behind, informal workers, panel data.

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Introduction

In the evolving discourse on sustainable development and inclusive growth, the shadow economy and undeclared work patterns have emerged as pivotal yet understudied factors influencing national development trajectories. The informal sector, characterized by its evasion of official regulation and taxation, encompasses various economic activities, from envelope wages and work without formal contracts to bogus self-employment arrangements. These occurrences challenge standard economic analytical frameworks of economic analysis, but also pose significant implications for fulfilling the United Nations' Sustainable Development Goals (SDGs). This research seeks to fill a gap in the existing literature by investigating the impact of the extent of the shadow economy and various types of undeclared work on the Leave No One Behind Index and the SDG Index in European nations from 2000 to 2021.

The significance of understanding the informal economy's role in sustainable development cannot be overstated. As countries strive towards the ambitious targets set forth by the United Nations, it becomes increasingly clear that traditional metrics and development strategies may not fully capture the complexities of modern economies. In particular, the shadow economy and undeclared work patterns represent a dual-edged sword in development. On the one hand, they can undermine state revenues and formal employment, impeding broad development efforts. On the other hand, they provide critical income sources and employment opportunities for vulnerable populations, often serving as a social safety net that formal systems fail to reach.

The extensive understanding of the shadow economy and undeclared employment patterns emphasizes the importance of strategic marketing tactics that consider consumers' distinct behaviours and needs in informal markets. Businesses may create focused digital advertising campaigns and new product designs for these customers based on insights into their tastes and financial limits. Furthermore, the benefits of certain undeclared work patterns indicate the chance for operations management to incorporate flexible labour practices that benefit vulnerable groups, increasing corporate social responsibility activities. The study's findings on the socioeconomic implications of informality can also be used to drive financial strategies, such as microfinance solutions suited to informal workers, as well as to guide the creation of information systems that promote market efficiency and inclusivity.

By using panel data regression models, this research endeavors to disentangle the complex effects of informality on the Leave No One Behind Index and SDG Index. This study intends to discover regional variations in the consequences of the shadow economy and undeclared labour by analyzing data from a range of European countries divided into three regions: Central and Eastern Europe, Western Europe, and the broader European environment. The discovered differential implications not only emphasize the negative correlation between the shadow economy and sustainable development indices but also reveal the beneficial associations between various forms of undeclared work and these metrics.

The adverse effects of the shadow economy, more pronounced in our findings, underscore the challenges it poses to inclusive development. Conversely, undeclared work patterns' subtle, yet significant positive contributions suggest a complex interaction between informal economic activities and sustainable development goals. This paper challenges the conventional perspective on informality, advocating for a more nuanced understanding of its

role in the broader development agenda. The insights gleaned from our analysis underscore the need for policy interventions that are attuned to the multifaceted nature of work and its impacts on development. By recognizing the essential support informal labor arrangements provide vulnerable populations, this study contributes to the ongoing dialogue on crafting inclusive development strategies that truly leave no one behind.

This paper aims to provide answers to the following research questions: RQ1. How does the size of the shadow economy within European countries affect their performance on the Leave No One Behind Index and the SDG Index between 2000 and 2021? RQ2. What are the differential impacts of various undeclared work patterns (envelope wages, work without a formal contract, and bogus self-employment) on European regions' Leave No One Behind Index and the SDG Index? RQ3. How do regional disparities within Europe (Central and Eastern Europe, Western Europe, and the broader European context) influence the relationship between the shadow economy, undeclared work patterns, and sustainable development indices? RQ4. What policy interventions can be derived from the study's findings to address the multifaceted nature of work and its impacts on sustainable development, especially in light of the shadow economy and undeclared work patterns?

This paper has been structured into four sections: the second part defines the theoretical foundation and establishes the assumptions under consideration; the third section explains the study's approach, sources of data, and implied methodology; section 4 presents the findings; and the final section focuses on the paper's discussions, policy implications, and conclusions.

Literature review

Within the framework of the 2030 agenda, the principle of inclusivity is paramount, serving as the foundational element that permeates the entirety of the Agenda. As the global community embarks on this significant collective endeavor, a commitment is made to ensure that no individual or group is overlooked. Acknowledging the intrinsic worth of every human being, it is the collective aspiration that the objectives and benchmarks established will be achieved universally across all nations and societal segments. Priority will be given to extending support to those who are most marginalized, with a strategic focus on ensuring that the benefits of progress reach the most disadvantaged first (UN, 2015; Niculescu et al., 2022; Rădoi et al., 2023). The enhanced focus on "Leaving No One Behind" (LNOB) is recognized as a pivotal advancement over the 2015 agenda and its associated Millennium Development Goals (MDGs). The newly established Agenda not only builds upon the foundation laid by the MDGs, but also endeavors to address and fulfil the unachieved objectives, with a particular emphasis on reaching the most vulnerable populations. It is indeed noteworthy that the Sustainable Development Goals (SDGs) have accorded a higher level of priority to the principle of LNOB compared to the MDGs by integrating it as a fundamental, cross-cutting issue throughout the goals. Beyond mere rhetorical commitment, integrating LNOB within the SDGs is substantiated in two significant ways, ensuring a more robust framework for inclusivity and equitable progress.

The core focus of the SDGs primarily revolves around the welfare of individuals, with a significant emphasis on ensuring that no one is left behind. Simultaneously, certain SDGs are dedicated to addressing countries' specific challenges, especially Least Developed Countries (LDCs). Goal 10 distinctively highlights both dimensions, underscoring their considerable importance. While studies indicate a decline in relative inequality between nations, particularly when population size is considered, over recent decades – evidenced by

research conducted by Bourguignon (2015) and further explored by Klasen et al. (2016) – the disparity remains pronounced. The economic divide between the poorest and the wealthiest nations has also persisted but also widened. Furthermore, inequality within nations has increased across many regions since the 1980s, now representing a larger fraction of global inequality, as detailed in the research by Klasen (2016). This context prompts a critical debate: The pursuit of development convergence among countries and the reduction of internal inequalities could embody the principle of leaving no one behind. However, this introduces a vital question regarding prioritization: Should the focus be placed more on aiding underdeveloped countries or the individuals within these nations? It is imperative to clearly delineate this focus clearly to guide targeted and effective policy interventions.

Indeed, a third perspective exists that centers on assessing the conditions of the world's most impoverished people, regardless of where they live. This approach typically uses a universal metric to identify those in the most dire situations, such as income per capita, poverty thresholds (for example, the $1.90 per day poverty line), or multifaceted poverty indices such as the United Nations Development Programme's global Multidimensional Poverty Index (MPI) (UNDP, 2014). This global perspective on meeting the needs of the most vulnerable is closely related to cosmopolitan conceptions of social justice, which advocate for prioritizing human welfare beyond national borders and societal differences.

The distinction between analysis and description, on the one hand, and implementation of policies, on the other, is critical. When it comes to describing and analyzing, it is useful to focus on the world's poorest people without regard for national borders. These highly disadvantaged people live not only in nations, but also in many middle- and high-income countries. For example, it has been established that a sizable proportion of the world's extremely impoverished people live in middle-income countries (Sumner, 2012). As a result, it is appropriate for the SDGs to include metrics that track suffering using a consistent metric across multiple countries.

When the discussion shifts to policies, the importance of national borders becomes evident. Policymaking occurs predominantly occurs at the national level, and, while international efforts – through mechanisms like aid, trade, or various policies – can impact inequality within countries, their influence is typically filtered through the domestic policies of each nation (Klasen et al. 2018). Nonetheless, global governance frameworks, as well as international assistance, finance, commerce, and technology systems, have a substantial impact on the possibilities and limits that impoverished countries, especially LDCs, confront. Such external influences can indirectly affect poverty levels within these countries, highlighting the complex interplay between national policy environments and international support structures to address the needs of the most disadvantaged populations.

In the context of focusing on LNOB within countries, it is crucial to differentiate between concerns for LNOB among individuals, known as vertical inequality, and among groups, referred to as horizontal inequality. The United Nations documents explicitly acknowledge the significance of both forms of inequality. However, they emphasize that inequalities among groups warrant special attention due to their often stemming from deeply entrenched discrimination – either in legislation or social customs – against marginalized groups. Furthermore, there is substantial evidence suggesting that horizontal inequality can lead to conflict and social unrest in many societies (Klasen, 2008). This distinction underlines

the need for policies that not only address individual disparities but also specifically target the systemic inequalities affecting entire groups within societies.

When advocating for LNOB, it is critical to distinguish between intrinsic and instrumental motivations. Intrinsic reasons stem from rights-based strategies to growth and development, which have emphasized the importance of social and economic freedoms such as having access to schooling, medical care, and an adequate standard of life. Individuals who are left behind are effectively denied their fundamental rights. This viewpoint is endorsed by justice theorists (Rawls, 1971; Sen, 1999; Roemer, 1998), who believe that it is intrinsically unfair for some people to be left behind, lacking equitable access to fundamental capacities (Sen, 1999), main commodities (Rawls, 1971), or possibilities. Furthermore, even theorists who do not have a global cosmopolitan conception of justice (Nagel, 2005) or are driven by religious ethics (Mack et al., 2009) emphasize the global necessity to prioritize the poorest. These arguments highlight a moral and ethical foundation for the LNOB principle, asserting that ensuring equitable access to essential services and opportunities is not only a matter of justice but also a fundamental human right.

Samman et al. (2019) underline the essence of the LNOB principle within this Agenda, stressing the critical need to overcome social and economic divides and to guarantee the inclusion of marginalized and discriminated groups, especially informal workers. The condition of informality, marked by a lack of social security, insufficient workplace rights, and frequently harsh working conditions, impacts hundreds of millions of people worldwide. This state not only diminishes individual productivity but also hampers businesses' access to finance, highlighting the imperative to tackle this challenge.

The International Labour Organization (ILO, 2018) offers a fundamental viewpoint on informality, highlighting its widespread presence across various economies and the critical need for the inclusion of informal workers within sustainable development initiatives, as detailed in their report "Women and Men in the Informal Economy: A Statistical Picture". This statistical exploration provides a foundation for grasping the extent and ramifications of informality, bringing attention to its significance in relation to gender disparities and employment patterns. Furthering this discourse, Chen (2005) delves into the heterogeneous nature of informal employment, which encompasses a spectrum from self-employed street vendors to wage earners in unregistered businesses. This variety emphasizes the intricate challenge of incorporating the informal sector into frameworks for sustainable development.

Subsequent research, such as the studies by Meagher (2013), Guha-Khasnobis et al. (2006) and Miron et al. (2023), has started to close the previously identified gap, advocating for the inclusion of informal economies within sustainable development plans to ensure that no individual is overlooked. This perspective has gained traction in recent academic discourse, with an increasing acknowledgement of the need to address informality within the SDGs framework. The United Nations' 2030 Agenda for Sustainable Development explicitly calls for the universal observance of human rights, extending these rights to those engaged in informal employment (UN, 2015). Further contributions from researchers such as Samman et al. (2019) and Carre and Heintz (2009) underline the necessity of incorporating informal workers into national economic systems and social safety nets, highlighting their essential contribution to poverty alleviation (SDG 1) and the promotion of decent work and economic growth (SDG 8).

The informal economy presents a complex paradox. On the one hand, it is distinguished by its entrepreneurship, flexibility, and resilience, often surpassing the formal

economy in terms of innovation, resource efficiency, and robustness (Schneider & Enste, 2002; Gurtoo & Williams, 2009; Williams & Nadin, 2010; Dima et al., 2022; Călinescu, 2023). This sector fuels economic growth by creating new markets, enhancing entrepreneurship, and expanding financial access while also acting as a social safety net by providing employment for those who are jobless, thus helping to alleviate poverty and reduce inequality (Asea, 2005; Galli & Kucera, 2003; Chen, 2019). It offers a cushion against unemployment, facilitating job opportunities for the unemployed (Galli and Kucera, 2003; Nicolescu and Dima, 2010), and contributes to lessening poverty and inequality (Chen, 2019).

On the other hand, the underground economy is distinguished by low salaries, detrimental workplace conditions, and the absence of benefits related to social security (Farzanegan & Hassan, 2017). It competes with the formal economy for resources, depleting state funds, distorting official statistics, and encouraging unfair competition with formal firms (Schneider & Enste, 2002; Gerxhani, 2004; La Porta & Schleifer, 2014; Dell'Anno, 2016; Dell'Anno et al., 2020). Based on the standpoint of the environment, it causes increasing pollution and difficulties in managing the rise of the export market (Biswass et al., 2003; Bacchetta et al., 2012).

Despite these drawbacks, the informal sector continues to be a vital source of goods, services, and income for low-income communities and plays a crucial role in the economies of developing countries (Rupani, 2014; Ruzek, 2015; Dell'Anno, 2022).

Methodology

The study employs panel data from 2000 to 2021 to analyze the influence of the informal economy (the size of the shadow economy as a per cent of GDP estimated by Medina and Schneider in 2018) and three forms of undeclared work patterns as proxies for informal workers (envelope wage, employment without a formal contract, and bogus self-employment) on the Leave-No-One-Behind index (LNOB) across European countries. The undeclared work patterns are widely documented in the literature (Williams et al., 2011; Williams, C. C., & Öz-Yalaman, 2021). The data are sourced from the Sustainable Development Goals (SDG) Index and Dashboards, an authoritative repository that assesses national performances in relation to the SDGs. Given its extensive coverage and the transparency of its methodological framework, this database is particularly suited for conducting a statistically robust analysis. The research focuses on elucidating the effects of informal economic activities on sustainability, providing valuable insights into how these practices influence the progress towards achieving sustainable development objectives.

Each independent variable serves as a proxy for different informal economic practices that, while contributing to economic output, may pose challenges to the realization of sustainable development goals, particularly those aimed at social equity and inclusion. The study aims to quantify the impact of informality on the LNOB index, thereby offering a nuanced understanding of the informal economy's role within the broader European socioeconomic landscape.

The dataset encompasses a diverse range of European countries, providing a broad perspective on the socioeconomic landscape of the continent. The analysis includes data from a total of 32 countries, ensuring a comprehensive evaluation across different regions with varying levels of economic development, regulatory frameworks, and social policies.

- Western Europe includes the following countries: Belgium, Denmark, Finland, France, Ireland, Germany, Greece, Iceland, Italy, Austria, Luxembourg, Malta, Netherlands, Portugal, Spain, Sweden, Switzerland, the United Kingdom, Cyprus and Norway.
- Eastern and Central Europe that includes: the Czech Republic, Hungary, Romania, Croatia, the Slovak Republic, Bulgaria, Estonia, Latvia, Lithuania, Serbia, North Macedonia, Turkey and Poland.

The country selection represents a cross-section of the European Union member states, candidate countries, and other European nations, providing a rich dataset to explore the interplay between informal economic activities and sustainable development. The inclusion of countries outside the EU, such as Norway and Switzerland, allows for a broader understanding of the European context, as these nations often share economic and social ties with EU member states.

According to Table 1, the SDG index shows a mean score of 76.50, indicating a relatively high level of achievement, with most countries clustering around the median of 76.67 and a narrow spread, as suggested by the standard deviation of 4.40. The index ranges from a minimum of 65.74 to a maximum of 86.56, denoting some variability among the countries' performances. LNOB has a mean value of 68.53 and a median of 69.79, with a more extensive spread between the maximum and minimum values, as evidenced by a larger standard deviation of 11.09. This suggests a greater disparity in the inclusiveness of progress among different countries. The 'Shadow Economy', with an average of 18.41% of GDP, suggests a significant variance from 6.39% to 34.66%, indicating that while some countries have a minimal shadow economy, others face a substantial challenge with undeclared economic activities. 'Envelope Wages' have an average of 3.66% and a median of 3.29%, pointing to a relatively low but non-negligible level of wage underreporting. 'Without a formal Contract' has an average of 3.30%, with unusually high skewness and kurtosis, indicating a highly skewed distribution with a substantial peak and a vast range from 0.15% to 29.86%, signifying that informal employment practices vary greatly across countries. Lastly, the 'Bogus self-employed' variable averages 4.47%, with a slightly positive skewness, reflecting that most countries have a lower incidence of this practice, but a few have notably higher rates. The Jarque-Bera test indicates non-normality in the distributions of most variables, with the probability close to zero, except for the SDG index, where the normality assumption cannot be rejected at the usual significance levels. With a total of 748 observations, these statistics offer a robust overview of the underlying patterns in the data.

Table 1. Descriptive Statistics

	Mean	**Median**	**Max.**	**Min.**	**Std. Dev.**	**Skewness**	**Kurtosis**	**Jarque - Bera**	**Prob.**	**Obs.**
SDG	76.50	76.67	86.56	65.74	4.40	-0.11	-0.26	3.81	0.149	748
LNOB	68.53	69.79	87.71	37.77	11.09	-0.61	-0.09	46.40	0.000	748
Shadow Economy	18.41	18.49	34.66	6.39	7.38	0.24	-1.05	41.73	0.000	748
Envelope Wage	3.66	3.29	11.09	0.24	2.46	0.45	-0.77	44.22	0.000	748
Without a formal Contract	3.30	1.92	29.86	0.15	4.15	3.43	14.06	7634.94	0.000	748
Bogus self employed	4.47	4.55	14.11	0.20	2.70	0.32	-0.26	14.73	0.001	748

Source: Authors' own research.

Panel data models, with their dual dimensions of cross-sectional (country-specific) and time-series (annual) data, offer a nuanced lens through which to observe the dynamic interplay between informal economic activities and social inclusion metrics. The panel structure facilitates a richer analysis compared to cross-sectional or time-series data alone, enabling control for both observable and unobservable heterogeneity across countries and over time.

The Leave No One Behind (LNOB) equation was developed to take into account the various effects of informal economic activity on social and economic inclusion. Based on the wide research on informality and its various implications, the model incorporates crucial variables that represent various aspects of undeclared work: the 'shadow economy', 'envelope wages', 'employment without formal contracts', and 'bogus self-employment'. These variables were chosen based on their importance in previous studies, such as those of Williams et al. (2011), highlighting the major role of informal labor patterns in affecting economic outcomes.

The inclusion of the shadow economy as a fundamental component is consistent with Medina and Schneider's (2018) findings, which show its ubiquitous influence across diverse economies. The LNOB equation uses panel data regression models to analyze both cross-sectional and time-series variations, accounting for the dynamic character of informal economic activities and their changing impact over time.

$$LNOB_{it} = \alpha + \beta_1 ShadowEconomy_{it} + \beta_2 EnvelopeWage_{it} + \beta_3 BogusSelfEmployed_{it} + \beta_4 WithoutFormalContract_{it} + \mu_i + \gamma_t + \varepsilon_{it}$$

Where $LNOB_{it}$ denotes LNOB for country i in year t, α is the constant term, β_1 through β_4 represent the coefficients of the factors under study, μ_i captures the unobserved country-specific effects, γ_t accounts for time-specific effects, and ε_{it} is the error term.

To accommodate the panel data's longitudinal aspect, the model incorporates annual fixed effects, represented by γ_t, to capture temporal changes that might affect all countries uniformly in any given year, such as global economic trends or international policy shifts. This specification allows for the detection of time-specific influences on the relationship between the informal economy and social inclusion.

The fixed effects (FE) regression model is adeptly chosen for its proficiency in controlling unobserved heterogeneity across countries, a critical feature that allows the study to isolate the unique impact of the examined socioeconomic factor.

Firstly, a detailed analysis of each socioeconomic variable was performed that included annual fixed effects, allowing an exploration of how the relationship between the independent variables and LNOB evolved in response to macroeconomic trends, policy interventions, or significant events such as the financial crisis and the COVID-19 pandemic.

A strength of this analysis is its consideration of country-specific variations, as shown in Figure 1, underscored by the individual adjustment of models for each country. This approach not only enhances the precision of the findings, but also provides insights into the heterogeneity of impacts across different European socio-political landscapes. The positive and negative coefficients obtained for various factors across countries underscore the complex and varied nature of these relationships, reflecting the nuanced interplay between informal economic activities and social inclusion efforts.

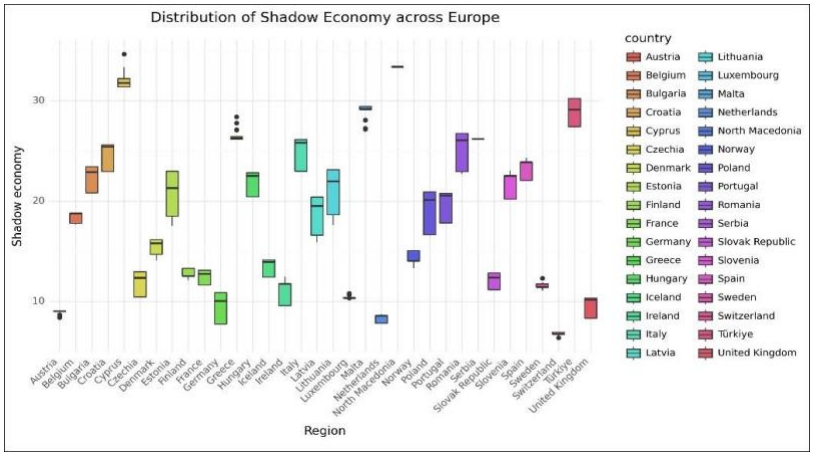

Figure 1. Distribution of Shadow Economy across Europe

Source: Author's own creation.

This study further refines its analytical approach to comprehensively explore the intricate relationship between informal economic practices and LNOB in European countries. Annex 1 illustrates the temporal evolution of the shadow economy percentages over two decades, revealing significant fluctuations in the years following the financial crisis, particularly between 2010 and 2015. These fluctuations are paralleled in Annexes 2, 3, and 4, which display the trends for 'Envelope Wage', 'Without a Formal Contract', and 'Bogus Self Employed' percentages, respectively. The convergence of trends in these figures suggests that the financial crisis and the pandemic may have driven changes in various forms of informal employment. Such temporal heterogeneity, characterized by multiple observations per country, necessitates the use of panel data methods to account for these dynamic changes over time.

By employing Ordinary Least Squares (OLS) regression and transitioning to Fixed Effects and Random Effects models, the study captures within-country correlation and between-country heterogeneity. This comprehensive approach enables a nuanced comparison of informal economic indicators, enhancing our understanding of their collective impact on LNOB in European countries.

Subsequently, a series of regression models (M1 to M15) are designed to understand the individual and collective impacts of the shadow economy, envelope wage, employment without a formal contract, and bogus self-employment in LNOB. In particular, the analysis is stratified to discern regional nuances, with tailored models for Eastern and Central European (ECE) countries and Western European countries (WE). Following this, an analogous set of regression models (M1' to M15') was conducted, replacing LNOB with the SDG Index as the dependent variable. This approach was adopted to investigate how informal economic activities influence countries' overall performance across the spectrum of Sustainable Development Goals (SDGs). By examining the impact of the SDG Index, we gain insight into the broader implications of informal economic practices on sustainable development outcomes beyond the specific domain of social inclusion targeted by the LNOB metric.

This strategic partition acknowledges the diverse economic landscapes and policy contexts within Europe, offering a nuanced understanding of how informal economic dynamics intersect with societal inclusivity across different regions. Moreover, to fortify the robustness of the findings amidst cross-sectional dependencies and heteroskedasticity, standard errors are adjusted using the Newey-West method. The Newey-West method

addresses these challenges by estimating robust standard errors that are consistent in the presence of heteroskedasticity and autocorrelation. Instead of assuming that errors are independent and identically distributed, which is often not the case in panel data, this method allows for the estimation of standard errors that adjust for the potential correlation and heteroskedasticity in the data. The key idea behind the Newey-West method is to compute standard errors that are "robust" to these issues by incorporating information from the lagged values of the residuals. This is achieved by weighing the observations based on their distance from each other in time or space, with closer observations receiving higher weights and more distant observations receiving lower weights.

By integrating these methodological refinements, the study endeavors to provide empirically grounded insights into the multifaceted interplay between informal economic activities and sustainable development objectives, thereby informing evidence-based policy formulation and implementation strategies aimed at fostering greater social equity and inclusion.

Results and discussions

Country-specific annual fixed effects

A panel data analysis was conducted to explore the impact of various socioeconomic factors (shadow economy, envelope wage, employment without a formal contract and bogus self-employment) on the "Leave No One Behind" variable in European countries from 2000 to 2021. Each of these factors can impact various aspects of social and economic life, including labor market conditions, income equality, social protection, and the overall economic health of a nation (Cotfas et al., 2023). By examining these factors, the aim is to shed light on how different dimensions of socioeconomic environments influence efforts to ensure that no one is left behind in terms of social and economic development. A fixed effects regression model was employed, and the analysis was conducted separately for each country. This approach allows us to control for unobserved variations specific to each country, focusing on the internal influence of the factors analyzed factors. The model was adjusted for each country individually, taking into account annual fixed effects to capture temporal changes.

The results of the regression models, as shown in Annex 5, illustrate how each independent factor influences the dependent variable in the specific context of each European country analyzed. The coefficients obtained for each independent variable indicate the direction and magnitude of their impact on the dependent variable.

The coefficients for each year were included to identify potential time-specific changes in the impact of the analyzed factors. These annual coefficients highlight how the influence of factors varies from one year to another. The results highlight significant variations in how different factors affect the level of adherence to LNOB principles across various European countries. These variations reflect the diversity of socioeconomic and political contexts in Europe.

For all countries except for Iceland, Romania, Poland, Türkiye, Czech Republic, United Kingdom, Lithuania, Latvia, and Bulgaria, the shadow economy has a positive coefficient, suggesting a positive association with LNOB. This implies that in these countries, informal economic activities may provide essential income for segments of the population not covered by the formal economy. Only one country has a negative coefficient (-4.9) for 'envelope wage' – the Netherlands. Thus, it implies that an increase in the practice of envelope wages (part of the wages being paid under the table) is associated with a decrease in the LNOB indicator in

the Netherlands. This indicates that the prevalence of envelope wage practices negatively impacts social or economic inclusion in the Netherlands. Envelope wages often bypass formal channels, meaning that workers may not have access to social protections such as health insurance, unemployment benefits, or pension contributions. In a country like the Netherlands, with a well-developed social security system, the negative impact of envelope wages might be more pronounced as it could lead to a significant loss of social benefits for workers.

The negative coefficient (-5.5) for 'without a formal contract' in Latvia, as revealed in the regression analysis, stands out, especially since it contrasts with positive coefficients in other countries. The negative coefficient indicates that an increase in employment without formal contracts is associated with a decrease in the LNOB indicator. This implies that informal employment in Latvia may have more adverse effects on social and economic inclusion compared to other countries. Informal employment typically lacks formal labor protections, benefits, and social security contributions. In Latvia, this lack of protection and benefits might be particularly detrimental to achieving inclusive social and economic outcomes.

The only countries with a negative coefficient for bogus self-employed are the Slovak Republic, Lithuania, Latvia, Belgium, Italy, Estonia, Luxembourg, and Cyprus. A negative coefficient implies that an increase in bogus self-employment is associated with a decrease in the "Leave No One Behind" indicator in these countries. Bogus self-employment typically involves individuals being classified as self-employed for legal purposes, but in reality, they work in conditions akin to traditional employees, often without the corresponding benefits and protections. In countries with negative coefficients, the prevalence of bogus self-employment might be particularly harmful due to the lack of social protections such as healthcare, pension contributions, and employment rights. This lack of protection can adversely affect social inclusion and economic stability for these workers.

The fact that only certain countries show this negative relationship indicates that the impact of these different variables is not uniform across Europe. It suggests that country-specific factors, such as the structure of the labor market, the enforcement of labor laws, and the overall economic context, significantly influence this relationship.

The coefficients for each year capture the changing impact of socioeconomic factors over time. In the years following 2008, many countries exhibit significant changes in coefficients. For instance, in the Slovak Republic, Latvia, and Lithuania, there is a notable increase in coefficients post-2008, indicating a potential impact of the financial crisis on socioeconomic factors related to LNOB. However, in countries like Germany and Slovenia, we observe a decrease in coefficients after 2008, suggesting a different kind of impact, possibly due to economic contraction and its social consequences. The pandemic's impact is reflected in the coefficients for the years 2020 and 2021. For many countries, there have been noticeable changes during these years. For example, in the Slovak Republic, Estonia, and the Netherlands, the coefficients for 2020 and 2021 show significant differences compared to previous years, reflecting the economic and social disruptions caused by the pandemic.

The impact of the socioeconomic factors on Leave-No-One-Behind and SDG index

Initially, Ordinary Least Squares (OLS) regression was employed to analyze the data. However, considering the panel structure of the dataset – comprising multiple observations per country across different years –the potential for within-country correlation and between-

country heterogeneity was recognized. To address this, the focus was shifted to panel data methods, specifically Fixed Effects and Random Effects models.

The Hausman test was used to discern the most appropriate model between fixed effects and random effects. This statistical test is crucial for panel data analysis, as it helps to determine whether the unique characteristics of each country (which are not captured in the model) correlate with the independent variables. The Hausman test results were pivotal in our analysis. With a p-value smaller than 0.05, the test indicated a significant difference in coefficients between the Fixed Effects and Random Effects models. Consequently, based on the Hausman test's recommendation and its implication that the Fixed Effects model would yield more consistent and reliable results, the Fixed Effects model was opted for.

In the Fixed Effects regression analysis, as detailed in Table 2, each independent variable was tested separately against the dependent variable LNOB to isolate and understand its individual impact. The initial model denoted as M1, focused on assessing the influence of the

shadow economy. Subsequent models introduced other independent variables: 'envelope wage' (M2), 'bogus self-employment' (M3), and 'without a formal contract' (M4).

Building upon these foundational models, a comprehensive analysis was conducted in M5, incorporating all aforementioned economic factors simultaneously to provide an understanding of their combined impact on LNOB.

Subsequent iterations of this comprehensive model (M6 to M10) were tailored to ECE, followed by a dedicated exploration for WE (M11 to M15). This separation recognized the potential for regional heterogeneity in the relationship between economic factors and societal inclusivity. By conducting fixed effects estimation separately for ECE and WE, we could better capture and control for any unique characteristics or dynamics specific to each region that may influence the observed relationships. This approach enhances the accuracy and reliability of the estimated effects, providing valuable insights into the distinct pathways through which economic factors contribute to societal inclusivity within Eastern and Central European versus Western contexts—reflecting the diverse economic landscapes and policy contexts within the region.

On the contrary, Table 3 mirrors the structure of Table 2, with models M1 to M15, but shifts the focus to the SDG Index as the dependent variable. The bifurcation into models M6 to M10 for ECE and M11 to M15 for WE remains.

The Breusch-Pagan LM test, designed to detect cross-sectional dependencies in panel data models, yielded results that suggest a significant level of interdependence among the countries in the study. This finding was corroborated by the Pesaran CD test, which is known for its applicability to panels with large cross-sections and its ability to accommodate both balanced and unbalanced panels. The Pesaran CD test further confirmed the presence of cross-sectional dependencies, indicating that ignoring these interconnections could lead to biased and inconsistent estimations.

In order to ensure robustness in the findings, especially in the presence of cross-sectional dependence, heteroskedasticity, or autocorrelation, the standard errors were adjusted using the Newey-West method, a widely recognized approach to address these issues in panel data analysis. This method accounts for autocorrelation and heteroskedasticity by incorporating robust covariance matrices that are adjusted for the lagged values of the residuals.

By applying the Newey-West correction, the analysis provides consistent estimates of the standard errors in the presence of autocorrelation and heteroskedasticity, thereby enhancing the reliability and validity of the estimated coefficients. This approach ensures that the reported statistical significance is robust and not biased by the potential issues of autocorrelation and heteroskedasticity commonly encountered in panel datasets.

Table 2. Fixed effects regression outcomes for LNOB attainment

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15
Shadow Economy	-1.36 ***				-1.16 ***	-1.40 ***				-1.03 ***	-1.27 ***				-0.97 ***
Envelope Wage		1.15 ***			0.88 ***		2.24 ***			1.33 ***		-1.20 ***			-0.16
Bogus Employment			0.36 ***		-0.14 *			0.93 ***		-0.30 *			-0.26 **		-0.26 ***
Without a formal contract				0.49 ***	0.40 ***				3.21 ***	1.64 ***				0.42 ***	0.36 ***
SST	5082	5082	5082	5082	5082	3198.7	3198.7	3198.7	3198.7	3198.7	1883.3	1883.3	1883.3	1883.3	1883.3
SSR	3503	4792.4	4921.4	4384.1	2990.2	2060.8	2445.4	2645.2	2543.6	1755.5	1439	1781.8	1842.3	1359.5	1046.7
R squared	0.31	0.05	0.03	0.13	0.41	0.35	0.23	0.17	0.20	0.45	0.23	0.05	0.02	0.27	0.44
Adj R squared	0.27	0.01	-0.01	0.09	0.38	0.32	0.19	0.13	0.16	0.41	0.19	0.01	-0.02	0.24	0.41
F-statistic	302.4	40.5	21.8	106.8	116.8	138.5	77.3	52.5	64.6	50.9	129.3	23.8	9.32	161.4	83.1
Prob F-statistic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
Cross-sectional dependency															
Breusch-Pagan LM	3186 ***	5054.9 ***	5349.7 ***	4186.5 ***	2291.5 ***	453.78 ***	428.86 ***	442.59 ***	660.21 ***	278.66 ***	1286.4 ***	1872.8 ***	2066.5 ***	1327.3 ***	811.61 ***
Pesaran CD	37.34 ***	64.47 ***	62.30 ***	49.99 ***	22.93 ***	17.02 ***	16.55 ***	17.1 ***	19.41 ***	10.08 ***	23.07 ***	39.39 ***	41.63 ***	25.85 ***	13.95 ***
Serial Correlation															
Breusch Godfrey/Wooldridge (Chi Square)	363.4 ***	391.8 ***	389.9 ***	399.0 ***	361.6 ***	139.7 ***	142.4 ***	144.1 ***	145.2 ***	137.7 ***	224.7 ***	238.8 ***	241.2 ***	227.9 ***	203.2 ***
Breusch Godfrey/Wooldridge (F)	749.1 ***	880.9 ***	871.7 ***	918.5 ***	738.5 ***	294.4 ***	306.9 ***	314.9 ***	320.5 ***	282.4 ***	457.1 ***	520.1 ***	531.4 ***	470.7 ***	373.4 ***
Heteroscedasticity															
Breusch-Pagan	5880.1 ***	3949.7 ***	6359.2 ***	6331.2 ***	4570.6 ***	1405 ***	961.53 ***	1316.6 ***	1676.4 ***	1191.3 ***	3736.7 ***	3664.7 ***	3429.5 ***	3193.5 ***	3081.8 ***
Normality															
Jarque Bera	212.1 ***	143.0 ***	169.3 ***	189.2 ***	359.2 ***	62.37 ***	51.76 ***	67.73 ***	26.78 ***	129.0 ***	13.94 ***	52.89 ***	51.68 ***	13.62 ***	3.681

Source: Authors' own research

Table 3. Fixed effects regression outcomes for SDG Index

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15
Shadow Economy	-1.22 ***				-1.08 ***	-1.24 ***				-1.0 ***	-1.16 ***				-0.95 ***
Envelope Wage		0.85 ***			0.50 ***		1.64 ***			0.63 **		-0.83 ***			-0.004
Bogus Employment			0.32 ***		-0.06			0.75 ***		0.02			-0.15 *		-0.15 *

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15
Without a formal contract				0.37***	0.28***				2.08***	0.29				0.33***	0.27***
SST	3168.6	3168.6	3168.6	3168.6	3168.6	1716.3	1716.3	1716.3	1716.3	1716.3	1452.3	1452.3	1452.3	1452.3	1452.3
SSR	1896.4	3007.5	3041.1	2758.1	1653.5	818.37	1311.6	1350.3	1440.7	747.33	1076.9	1403.5	1438.1	1128.2	866.59
R squared	0.40	0.05	0.04	0.12	0.47	0.52	0.23	0.21	0.16	0.56	0.25	0.03	0.01	0.22	0.40
Adj R squared	0.37	0.01	-0.01	0.08	0.45	0.50	0.19	0.17	0.12	0.53	0.22	-0.01	-0.03	0.18	0.37
F-statistic	450.1	35.9	28.1	99.8	153	275.4	77.4	68	48	80.3	146	14.5	4.1478	120.3	70.2
Prob F-statistic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00
Cross-sectional dependency															
Breusch-Pagan LM	4860.7***	9121.9***	9211.3***	8342***	4183.1***	537.03***	867.06***	897.94***	936.53***	513.03***	2345.4***	3580.5***	3714.7***	3013.3***	1958.5***
Pesaran CD	60.0***	95.2***	95.7***	85.8***	53.6***	18.6***	28.6***	29.19***	28.7***	17.3***	45.4***	59.6***	60.8***	50.7***	39.8***
Serial Correlation															
Breusch Godfrey/Wooldridge (Chi Square)	377.78***	409.93***	408.18***	425.34***	387.79***	147.56***	155.44***	159.33***	164.77***	151.36***	239.21***	254.3***	255.63***	258.14***	239.68***
Breusch Godfrey/Wooldridge (F)	812.93***	978.55***	968.62***	1071.5***	857.23***	332.02***	375.17***	398.83***	435.05***	348.03***	521.79***	599.8***	607.26***	621.72***	520.49***
Heteroscedasticity															
Breusch-Pagan	2877.9***	2980.4***	4108.8***	3549.1***	2878.6***	337.39***	526.85***	515.54***	584.67***	529.06***	2446.5***	2781.1***	2768***	1957.1***	2212***
Normality															
Jarque Bera	6.7.	11.2*	9.1*	6.4.	8.1.	3.8	7.2.	4.3	8.1.	5.4	2.6	5.3	7.1.	9.9*	5.2

Source: Authors' own research

The impact of the shadow economy on Leave-No-One-Behind and SDG index

Analyzing the influence of the underground economy on SDG achievement and LNOB throughout Europe reveals important insights into the complex interaction between informal economic activities and inclusive development. As demonstrated in Table 3, in Model M1 using the SDG Index as the dependent variable, the shadow economy has a significant negative influence (-1.22) on SDG accomplishment. The R-squared value of 0.40 implies that changes in the size of the shadow economy account for approximately 40.2% of the variance in the SDG Index.

When focusing on LNOB, as shown in Table 2, as the dependent variable, Model M1 reveals a similar negative association between the shadow economy and LNOB attainment (-1.36), albeit with a slightly lower R-squared value of 0.31. This suggests that approximately 31.2% of the variation in LNOB attainment can be explained by variations in the shadow economy size.

Turning our focus to Eastern and Central European (ECE) countries, the analysis provides insights specific to this regional context. In Model M6, where only the shadow economy is considered as an independent variable with LNOB as the dependent variable, a significant negative coefficient (-1.40) indicates a detrimental effect of the shadow economy on LNOB attainment. The corresponding R-squared value of 0.356 suggests that approximately 35.6% of the variation in LNOB attainment can be explained by variations in the shadow economy size.

Turning to SDG index as the dependent variable, Model M6 demonstrates a similar negative association between the shadow economy and SDG attainment, with a coefficient of -1.24 and an R-squared value of 0.52. This indicates that approximately 52.3% of the variance in SDG attainment among ECE countries can be explained by variations in the shadow economy size.

Analyzing Western countries sheds more light on the connection between the underground economy and sustainable development outcomes. The coefficient in Model

M11, which considers the shadow economy solely as an independent variable and Leave No One Behind (LNOB) attainment as the dependent variable, is -1.27, demonstrating a considerable negative impact. The model's R-squared value of 0.23 shows that around 23.6% of the variation in LNOB attainment may be explained by changes in the size of Western nations' shadow economies.

Turning to the Sustainable Development Goals (SDG) Index as the dependent variable, Model M11 demonstrates a similar negative association between the shadow economy and SDG attainment, with a coefficient of -1.16 and an R-squared value of 0.25. This suggests that approximately 25.8% of the variance in SDG attainment among Western countries can be explained by variations in the shadow economy size.

The impact of envelope wage on Leave-No-One-Behind and SDG index

The envelope wage practice, where employees are compensated partially or wholly off the books, often reflects broader challenges in formal employment and tax systems. Its impact on Sustainable Development Goals (SDG) attainment and the Leave No One Behind (LNOB) principle across Europe offers valuable insights into the relationship between non-transparent economic activities and inclusive growth.

Both the Breusch-Pagan LM test and the Pesaran CD test indicated significant cross-sectional dependence in the panel data, a finding that underscores the interconnectedness of European countries in their SDG achievements. The Breusch-Godfrey/Wooldridge test for serial correlation, alongside the Breusch-Pagan test for heteroskedasticity, further highlighted the presence of autocorrelation and heteroskedasticity within the panel data, necessitating robust standard error estimates.

Focusing on the SDG Index as the dependent variable, envelope wages show varied effects in different European contexts. For the broader European context (ECE and West Europe), Model M2 indicates a positive association with a coefficient of 0.858. This suggests that envelope wages are linked to an improvement in the SDG Index, contrary to the negative impact of the shadow economy. The R-squared value for this model is 0.05, which means that envelope wages account for approximately 5.1% of the variance in the SDG Index in Europe.

In Eastern and Central European (ECE) countries, Model M7 shows a more pronounced positive impact of envelope wages on the SDG Index with a coefficient of 1.64, which is statistically significant. This model's R-squared value is 0.23, indicating that envelope wages explain about 23.6% of the variance in SDG attainment.

Conversely, in Western countries, the effect of envelope wages is negative (Model M12), with a coefficient of -0.83. The R-squared value here is relatively low at 0.03, suggesting that envelope wages explain only 3.4% of the variation in the SDG Index among Western nations.

As for the LNOB initiative, envelope wages again show divergent impacts. In the broader European context, Model M2 exhibits a strong positive coefficient of 1.15, with an R-squared value of 0.05, indicating that about 5.7% of the variation in LNOB attainment can be explained by envelope wages.

In the ECE region, the positive impact of envelope wages is even more significant, with a coefficient of 2.24 in Model M7 and an R-squared value of 0.23, suggesting that envelope wages account for 23.6% of the variance in LNOB attainment.

In Western countries, Model M12 reveals a starkly different picture: envelope wages negatively affect LNOB attainment with a coefficient of -1.20. The R-squared value in this

model is 0.05, which means that envelope wages explain 5.4% of the variation in LNOB attainment in these countries.

The positive associations in the ECE context might reflect the role of informal compensation in economies where formal work is less accessible or rigid. In contrast, the negative impact in Western Europe could suggest that envelope wages are symptomatic of larger systemic issues that undermine inclusive and sustainable development.

These findings suggest a need for nuanced policy approaches. In regions where envelope wages contribute positively to SDG and LNOB goals, policies could focus on formalizing these income sources without disrupting the livelihoods they support. Conversely, in contexts where envelope wages have a detrimental effect, efforts could be directed towards strengthening labor market regulation and social protection systems.

The impact of employment without a formal contract on Leave-No-One-Behind and SDG index

The absence of formal contracts in employment relationships is a critical factor that can either hinder or inadvertently support the attainment of SDG and the LNOB initiative. Several diagnostic tests were conducted to ensure the robustness of these findings.

Across Europe, employment without formal contracts appears to have a varying impact on SDG attainment. In Model M4, the presence of workers without contracts is significantly associated with the SDG Index, with a coefficient of 0.377. The R-squared value is 0.130, suggesting that such employment conditions explain 13.0% of the SDG Index variance.

In ECE, Model M9 reports a substantial positive coefficient of 2.085 for employment without formal contracts. This indicates a strong association with SDG attainment in the region, with an R-squared value of 0.161. This might suggest that in the ECE region, informal employment can provide critical access to work, even if not ideally structured.

For Western countries, Model M14 shows a coefficient of 0.339 for employment without formal contracts, indicating a positive relationship with SDG attainment. The corresponding R-squared value of 0.223 suggests that such employment explains 22.3% of the variance in the SDG Index, highlighting the significant role of informal labor market structures even in developed economies.

Regarding the LNOB initiative, Model M4 for the context of the broader European region reveals a coefficient of 0.491 for employment without formal contracts. The R-squared value of

0.137 indicates that this type of employment accounts for 13.7% of the variation in LNOB attainment, which could indicate that informal work arrangements provide a critical income source for some individuals.

In the ECE region, employment without formal contracts shows an even more pronounced positive impact on LNOB attainment with a coefficient of 3.215 in Model M9. The R-squared value of 0.205 suggests that 20.5% of the variation in LNOB attainment is explained by this factor, signaling the importance of such employment in these economies.

Conversely, in Western Europe, Model M14 presents a coefficient of 0.430 for employment without formal contracts. With an R-squared value of 0.278, it appears that nearly 27.8% of the variation in LNOB attainment is accounted for by this employment type. This substantial impact indicates that even in regions with robust social systems, the lack of formal contracts can significantly influence inclusivity and equality goals.

The impact of bogus self-employment on Leave-No-One-Behind and SDG index

Bogus employment, where workers are falsely classified as self-employed or as independent contractors, undermining their employment rights, has significant implications for achieving the SDG and the LNOB initiative.

In the broadest context, combining Eastern, Central, and Western Europe, Model M3 demonstrates a positive relationship between bogus employment and the SDG Index, with a coefficient of 0.324. The R-squared value of 0.040 suggests that bogus employment practices explain only about 4.0% of the variation in the SDG Index.

The ECE countries show a different pattern in Model M8. Bogus employment has a positive coefficient of 0.757, indicating a significant association with SDG attainment. The R-squared value of 0.213 indicates that these practices account for 21.3% of the variance in the SDG Index, suggesting a more substantial influence within this region.

For Western countries, the data presented in Model M13 suggests a weak but positive relationship between bogus employment and SDG attainment, with a coefficient of 0.158.

However, with an R-squared value of 0.010, this implies that bogus employment explains just 1.0% of the variation in the SDG Index, signaling a marginal impact in these economies.

When evaluating the impact on LNOB, Model M3 for the broader European region shows a coefficient of 0.364 for bogus employment. The R-squared value in this model is 0.032, which means that bogus employment practices explain 3.2% of the variation in LNOB attainment.

In the ECE countries, Model M8 reveals a stronger positive coefficient of 0.931 for bogus employment, with an R-squared value of 0.173. This suggests that bogus employment practices account for 17.3% of the variation in LNOB attainment in these countries, which may indicate that in regions with less developed formal labor markets, such practices could potentially provide a form of employment that contributes to inclusivity.

Conversely, in Western European nations, Model M13 shows a negative association with a coefficient of -0.268 for bogus employment, and the R-squared value is 0.022. This indicates that bogus employment explains about 2.2% of the variation in LNOB attainment. This negative impact reflects the potential for such employment practices to undermine social protection systems and equitable growth in more developed economies.

The varied impact of bogus employment on SDG and LNOB outcomes suggests that the context within which such employment occurs is critical.

Comparative analysis of the impact of informality on SDG and LNOB

In Model M5, the combined effect of all four variables on the SDG Index shows that the shadow economy has a significant negative coefficient of -1.087, envelope wages contribute positively with a coefficient of 0.500, bogus employment has a slightly negative impact with a coefficient of -0.061, and employment without formal contracts shows a positive influence with a coefficient of 0.287. The R-squared value of 0.478 indicates that these factors together account for 47.8% of the variance in SDG attainment across Europe.

For the LNOB initiative, the results are somewhat similar: the shadow economy has a negative coefficient of -1.165, envelope wages show a positive effect with a coefficient of 0.888, bogus employment has a slightly negative impact at -0.143, and employment without formal contracts yields a positive coefficient of 0.407. The R-squared value here is 0.412,

which means that these variables explain 41.2% of the variance in LNOB attainment in the broader European context.

Model M10 for ECE countries reveals that the shadow economy's negative effect is less pronounced with a coefficient of -1.035, envelope wages still show a significant positive impact with a coefficient of 1.338, bogus employment has a substantial positive coefficient of 0.931, and employment without formal contracts is highly positive with a coefficient of 3.215. The R- R-squared value increases to 0.451, suggesting that 45.1% of the variation in LNOB attainment can be attributed to these factors in the ECE region.

Regarding SDG attainment, the shadow economy has a negative coefficient of -1.056, envelope wages have a positive influence with a coefficient of 0.634, bogus employment has a positive coefficient of 0.757, and employment without formal contracts has the most substantial positive impact with a coefficient of 2.085. The R-squared value here is 0.565, indicating that these variables account for 56.5% of the variance in SDG attainment in ECE countries.

In Western European countries, Model M15 shows that the shadow economy has a negative coefficient of -0.958, envelope wages have a minimal positive effect with a coefficient of -0.005, bogus employment is slightly negative with a coefficient of -0.155, and employment without formal contracts shows a positive impact with a coefficient of 0.275. The R-squared value is 0.403, indicating that these factors together explain 40.3% of the variance in SDG attainment in Western Europe.

For LNOB attainment, the shadow economy's negative impact is -0.976; envelope wages show a negligible effect with a coefficient of -0.165, bogus employment is negative with a coefficient of -0.261, and employment without formal contracts has a positive coefficient of

0.362. With an R-squared value of 0.444, these variables collectively account for 44.4% of the variance in LNOB attainment in Western European countries.

When comparing across Models M5, M10, and M15, several patterns emerge:

'Shadow economy' consistently shows a negative impact on both SDG and LNOB attainment across all regions, highlighting the potential detrimental effects of unregulated economic activities on sustainable development.

'Envelope wages' varies, with positive contributions in the ECE regions but negligible or slightly negative effects in Western Europe. This may reflect regional differences in the way that envelope wages interact with formal labor markets.

'Bogus self-employment' differs, positively associated in ECE countries, and negative in Western Europe. This suggests that the implications of bogus employment for development goals may depend on the specific economic and regulatory environment.

'Employment without formal contracts' tends to have a positive effect on both SDG and LNOB attainment across all models, implying that informal employment can play a role in supporting individuals' livelihoods where formal work is not available or accessible.

The increased R-squared values from individual factors models to M5, M10, and M15 (combined factors) indicate that considering all four informal employment variables together provides a more comprehensive explanation for the variations in SDG and LNOB outcomes across Europe.

Policy Recommendations for Different EU Regions

According to the research findings, the effects of the shadow economy and undeclared labor patterns range significantly across European areas. Tailored policy measures are required to address these specific geographical dynamics successfully. The following recommendations are offered for Central and Eastern Europe, Western Europe, and Europe in general:

- **Central and Eastern Europe (CEE)**

Policies should be adopted in order to encourage businesses to go from informal to formal operations by offering tax benefits, simpler registration processes, and access to government funding for small and medium-sized enterprises (SMEs) that formalize their workforce. Social protection systems should be enhanced to include informal workers by implementing adaptable social security plans that are suited to their needs, offering a safety net, and encouraging formal employment. Investing in education and vocational training programs could help informal sector workers improve their skills and become more competitive in the formal job market. Additionally, strengthen labor law enforcement should be strengthened to prevent phoney self-employment and ensure equitable treatment and protection for all workers (Chivu et al., 2022).

- **Western Europe**

To combat the different forms of undeclared work, tighten rules and strengthen enforcement of current labor laws by increasing fines for noncompliance, and performing regular audits should be applied. Integration programs should be developed in order to help informal workers shift into the formal economy by providing services such as job matching, career counselling, and support in securing formal contracts. Social dialogue should be promoted among governments, employers, and trade unions to address the challenges presented by the informal sector and to develop consensus-driven solutions. Awareness programs should be launched for both companies and employees to educate them about the advantages of formal employment and the risks associated with undeclared work.

- **Europe as a Whole**

Developing coordinated policies across the EU to address the shadow economy by maintaining consistency in rules and enforcement procedures is critical to preventing the cross-border displacement of informal enterprises. Furthermore, improving data collecting and monitoring systems is critical for precisely estimating the size and influence of the informal economy, resulting in more effective policymaking and easier progress tracking over time. Promoting financial inclusion programs that provide informal workers with access to banking services, credit, and insurance can help them transition to the formal economy. Furthermore, establishing cross-border cooperation is required to address the transnational features of the informal sector, including sharing best practices, coordinating enforcement operations, and supporting cooperative initiatives to combat informal labor.

Conclusion

This paper objective was to explore the influence of the size of the shadow economy and undeclared work patterns (envelope wage, without a formal contract and bogus self-employed) on the Leave No One Behind Index and the SDG Index developed by United Nations across European countries from 2000 to 2021.

For many of the European countries studied, the shadow economy correlates positively with the "Leave No One Behind" measure. This shows that informal economic activity can provide critical revenue for sectors of the population not served by the formal

economy. This research suggests that informal economic activity can help with social and economic inclusion in some cases.

Our findings show that the shadow economy has a negative influence on both the LNOB and SDG indices across Europe, emphasizing the need for strict measures to reduce informal economic activities. This is consistent with the findings of Schneider and Enste (2002) and Medina and Schneider (2018), who both report detrimental repercussions of the shadow economy for economic performance and social development.

In contrast, the study discovered that certain types of undeclared work, such as envelope wages and employment without formal contracts, can have complex effects, sometimes favourably contributing to inclusivity and support for vulnerable communities. These findings are consistent with the work of Chen (2005) and Dell'Anno (2022), who claim that informal labour can provide important income and employment options, especially in areas where official employment is rare or inaccessible.

In the Netherlands, an increase in envelope earnings correlates with a decline in the "Leave No One Behind" indicator. This suggests that the prevalence of envelope wage practices has a detrimental influence on social or economic participation, possibly because workers lack access to social safeguards such as health insurance, unemployment benefits, and pension contributions.

In Latvia, employment without formal contracts has a negative correlation with the "Leave No One Behind" indicator. This shows that informal work in Latvia may have a greater negative impact on social and economic inclusion than in other countries, most likely due to a lack of official labor rights, benefits, and social security contributions.

Several countries, notably the Slovak Republic, Lithuania, Latvia, Belgium, Italy, Estonia, Luxembourg, and Cyprus, show a negative correlation between fraudulent self-employment and the "Leave No One Behind" indicator. This suggests that an increase in false self-employment is linked to a loss in social and economic inclusion, most likely because these workers lack social protections such as healthcare, pension contributions, and job rights.

The impact of these socioeconomic elements differs between European nations, indicating the importance of country-specific issues such as labor market structure, labor law enforcement, and the broader economic climate. Furthermore, the coefficients show substantial variations over time, with major shifts identified following events such as the 2008 financial crisis and the COVID-19 epidemic, demonstrating the dynamic nature of socioeconomic factors driving social and economic inclusion initiatives.

Using a Fixed Effects model, the study ran a series of regression analyses (from M1 to M15) to determine the individual and combined impact of various socioeconomic characteristics on the "Leave No One Behind" indicator. This method enables a more robust and nuanced understanding of how each component contributes to societal inclusion, while also providing insights into their combined effects.

The initial model denoted as M1 focused on assessing the influence of the shadow economy. Subsequent models had independent variables: envelope wage (M2), bogus self-employment (M3), and without a formal contract (M4). Subsequent iterations of this comprehensive model (M6 to M10) were tailored to ECE, followed by a dedicated exploration for WE (M11 to M15).

The models analyzed through the study have yielded several findings:

Shadow economy - In the larger European context, the shadow economy has a negative impact on both SDG attainment and LNOB, with significant negative coefficients. Similarly, when looking at Eastern and Central European (ECE) countries, the shadow economy has a negative relationship with both the SDG achievement and the LNOB, emphasizing its detrimental influence on inclusive development in this region. In contrast, in Western countries, the shadow economy has a negative influence on SDG attainment and LNOB, demonstrating that its negative consequences are ubiquitous across Europe.

Envelope wage - In the broader European context, envelope wages are positively associated with SDG attainment, implying that they may help to improve SDG outcomes. However, in Eastern and Central European (ECE) nations, envelope wages have a more obvious beneficial influence on SDG achievement, emphasizing their potential importance in pushing progress toward sustainable development objectives in this region. In contrast, envelope wages have a negative influence on SDG achievement in Western countries, implying that they may impede progress toward sustainable development in these countries. Similarly, the effect of envelope wages on LNOB attainment differs by context, with favorable associations identified in the larger European context for ECE nations but a negative influence observed in Western countries. The findings underscore the importance of nuanced policy approaches that consider the diverse implications of informal economic activities in European regions. In areas where envelope wages contribute favorably to the SDG and LNOB goals, policymakers could focus on formalizing these revenue sources while preserving the livelihoods they support. In contrast, if envelope wages have a negative influence on inclusive and sustainable development, efforts might be put into enhancing labor market regulation and social protection programs.

Employment without a formal contract - Across Europe, the prevalence of workers without formal contracts is strongly associated with higher SDG achievement. This favorable link exists in both Eastern and Central European (ECE) and Western countries, albeit to differing degrees. In ECE countries, the positive impact is stronger, indicating that informal employment without formal contracts can play an important role in giving access to work in economies whose formal labor structures are less accessible or restrictive. Even in Western countries with more established social systems, the lack of formal contracts has a substantial impact on SDG achievement, emphasizing the relevance of informal labor market mechanisms. Employment without formal contracts likewise has a favorable correlation with LNOB accomplishment throughout Europe. This shows that informal employment agreements without formal contracts are a crucial source of income for some people, helping to achieve inclusion goals. The impact is greater in the ECE nations, demonstrating the importance of such employment in their economies. Even in Western Europe, where social institutions are strong, the absence of legal contracts has a substantial impact on inclusion and equality objectives.

Bogus self-employment - In the broader context of Eastern, Central, and Western Europe, bogus employment practices have a positive correlation with SDG attainment. However, the magnitude of the influence is quite minor. The positive impact of fake employment on SDG attainment is stronger in the ECE countries, indicating a greater influence in this region. In Western countries, the association between bogus employment and SDG achievement is minimal, implying a minor impact in these economies. The effect of bogus employment on LNOB attainment varies by area. There is a positive connection between the larger European context and ECE nations, indicating that such activities may

contribute to inclusion in places with less developed formal labor markets. In contrast, in Western European countries, bogus employment is associated with lower LNOB attainment, indicating that such employment practices have the potential to undermine social protection systems and fair growth in more developed economies. The varying effects of bogus work on the SDG and LNOB results highlight the importance of the circumstances in which such employment occurs. Economic, social, and institutional considerations all influence the outcomes of various employment practices. This understanding is critical for developing tailored policies supporting sustainable and inclusive development in Europe's regions.

As a comparative analysis, the shadow economy consistently negatively influences both SDG and LNOB achievement across all regions, demonstrating the potential negative implications of uncontrolled economic activities on sustainable development. Envelope wages vary, with positive contributions in ECE regions and negligible or slightly negative effects in Western Europe, owing to regional differences in how envelope wages interact with formal labor markets. Bogus self-employment differs, with favorable associations in ECE nations and negative associations in Western Europe, implying that ramifications may vary depending on unique economic and legal circumstances. Employment without formal contracts had a beneficial influence on both SDG and LNOB attainment across all models, showing that informal employment can improve livelihoods where formal labor is not available or accessible. Combined factors offer a more comprehensive explanation for variances in SDG and LNOB outcomes within Europe. Regional differences highlight the importance of targeted policy measures to address the impact of informal employment on long-term development and inclusion.

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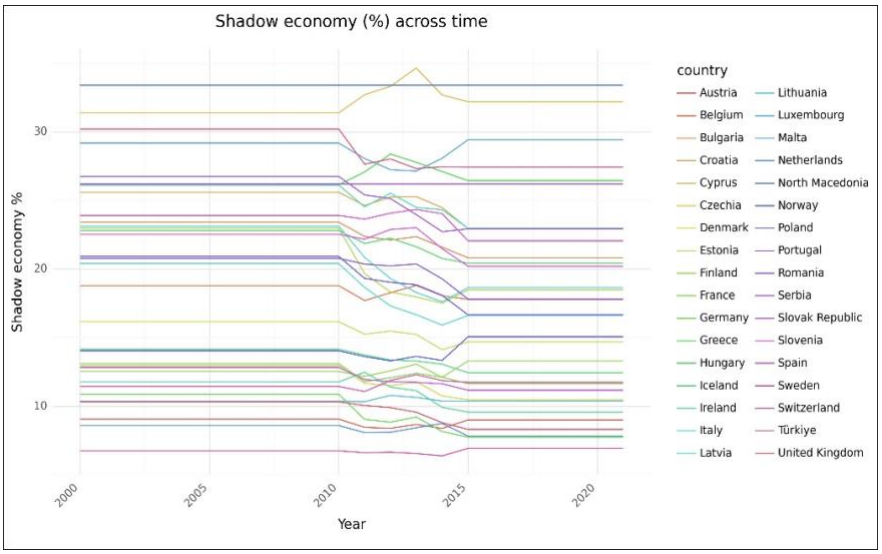
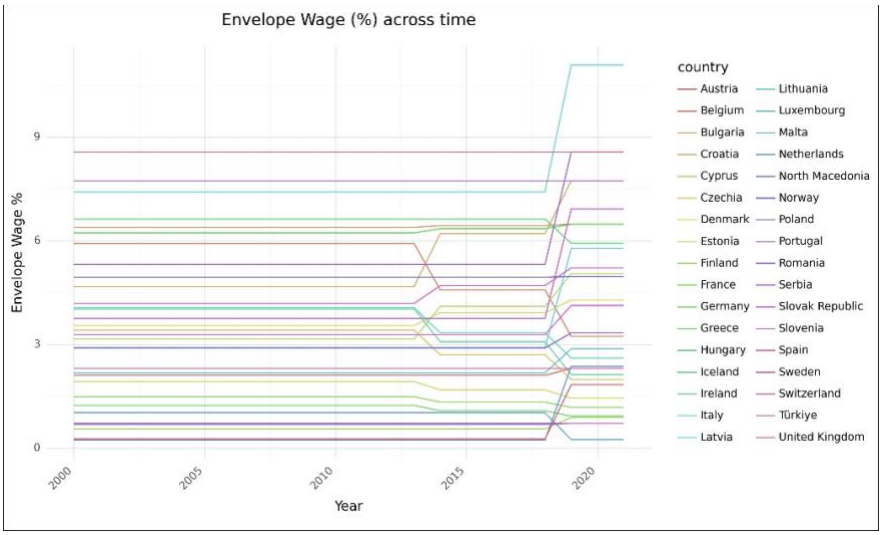
Annex 1. Variation in shadow economy across time



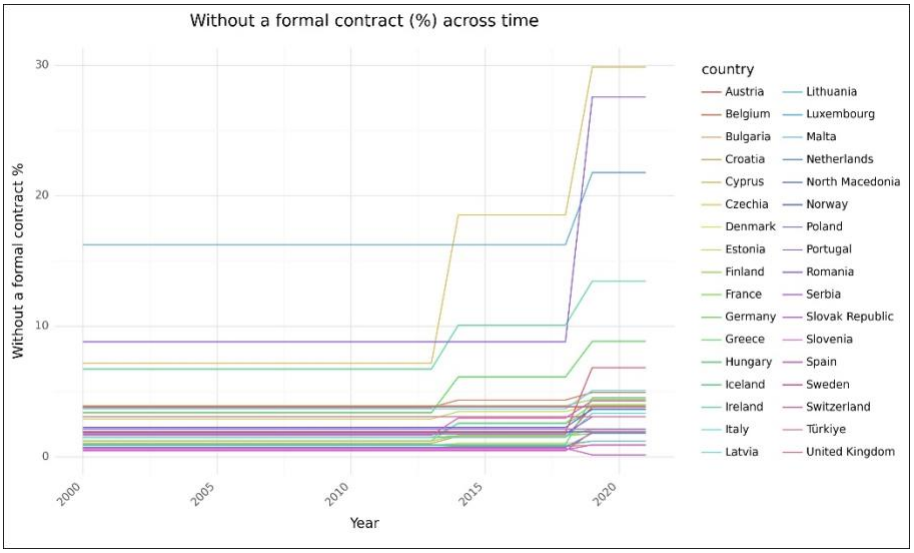
Source: Generated by authors.

Annex 2. Variation in envelope wage across time



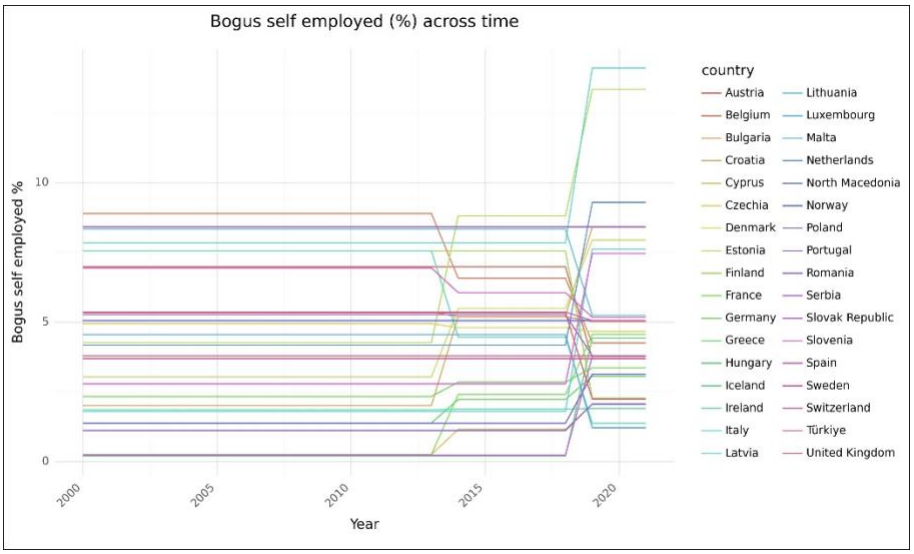
Source: Generated by authors.

Annex 3. Variation in without a formal contract across time



Source: Generated by authors.

Annex 4. Variation in bogus self-employed across time



Source: Generated by authors.

Annex 5. Fixed effects regression

	Intercept	C(year)[T.2001]	C(year)[T.2002]	C(year)[T.2003]	C(year)[T.2004]	C(year)[T.2005]	C(year)[T.2006]	C(year)[T.2007]	C(year)[T.2008]	C(year)[T.2009]	C(year)[T.2010]	C(year)[T.2011]	C(year)[T.2012]	C(year)[T.2013]	C(year)[T.2014]	C(year)[T.2015]	C(year)[T.2016]	C(year)[T.2017]	C(year)[T.2018]	C(year)[T.2019]	C(year)[T.2020]	C(year)[T.2021]	shadow_economy	envelope_wage	Without_a_formal_contract	Bogus_self_employed
Slovak Republic	5.5242 3	3.1	2.98	3.42	3.3	2.37	4.96	7.36	7.23	7.3	8.37	6.9375 91	5.6945 67	6.2773 57	6.2958 06	6.4338 65	6.8338 65	7.7638 65	7.8938 65	-2.4565 6	-0.0165 6	-0.0365 6	0.7131 72	12.840 47	4.8455 97	-7.6137 5
Latvia	5.2521 55	3.69E-14	2.90E-14	0.09	-1.24	-0.7	-0.12	0.08	0.95	1.62	2.27	2.0402 14	2.7383 12	3.4589 65	3.5441 16	4.5362 14	6.1062 14	5.9662 14	8.1062 14	-1.6269 5	-2.4669 5	-3.0969 5	-0.0458 5	12.580 55	-5.4773 7	-3.9097 8
Lithuania	4.6019 75	-0.02	0.67	0.76	1.44	0.07	1.32	2.92	3.46	3.33	3.69	5.5774 19	5.3136 41	2.2999 7	2.3275 23	1.8644 65	2.6244 65	3.2544 65	5.7044 65	-1.7408	-0.5308	-0.0308	-0.3271 3	6.7838 2	13.734 91	-5.1625 1
Germany	4.5447 44	-0.06	-0.03	-0.16	-1.87E-15	-0.05	-0.13	-0.78	-1.15	-1.37	-0.75	3.4074 64	4.5788 26	4.3813 06	1.4284 84	2.6513 45	3.4913 45	3.8113 45	2.9113 45	-2.0736 3	-2.2136 3	-2.1036 3	2.5068 11	5.4011 08	6.9227 09	11.367 98
Estonia	4.4649 17	0.33	0.65	0.84	0.19	1.33	0.98	1.25	2.85	2.3	3.29	6.0518 53	6.5929 87	6.6156 33	-0.4875 1	1.7120 34	2.1120 34	3.6120 34	5.3520 34	-2.9994 7	-2.3094 7	-2.9994 7	1.1963 41	10.030 35	3.4803 61	-0.5965 1
Netherlands	4.3948 21	3.57E-14	0.03	-0.09	-0.21	-0.43	-0.06	1.61	2.33	2.52	2.48	5.9456 24	6.0697 17	4.7272 55	0.6706 99	8.5124 12	8.3224 12	8.9524 12	8.6324 12	-1.1406 5	-1.0106 5	-0.6606 5	6.7953 41	-4.9346 8	0.1432 03	3.9292 64
Portugal	4.2974 35	0.07	-0.1	-0.08	-0.12	0.91	1.17	0.93	0.55	2.55	2.92	2.3633 03	1.7881 35	0.9237 01	1.5703 69	5.1919 31	6.1619 31	8.6819 31	10.141 93	-1.2583 2	-0.4183 2	-0.3283 2	0.9602 46	11.580 38	0.2673 45	2.8654 38
Iceland	3.4591 29	-8.81E-14	-4.85E-14	-6.53E-14	-0.46	-0.65	-0.75	-0.05	-0.91	3	3.56	2.7122 73	2.6656 51	4.5943 63	4.8299 48	2.7585 42	3.9085 42	2.5085 42	2.9185 42	2.8685 42	3.0585 42	4.5585 42	-2.0184	2.4905 73	6.6415 27	17.468 6
Poland	3.2344 32	1.73E-14	-0.01	0.17	0.45	-0.49	0.72	1.77	3.58	4.96	5.9	3.3756 22	3.0662 66	2.7311 48	2.2214 79	1.3222 18	2.9122 18	4.1922 18	4.5522 18	-2.0740 4	-0.5640 4	0.4859 59	-1.5839 9	15.967 4	4.2214 57	0.6434 34
France	2.9629 73	0.22	0.55	0.61	0.3	1.12	0.27	0.49	1.3	1.68	0.14	6.5985 6	7.4386 29	6.9653 79	0.8269 55	2.8612 81	3.4112 81	5.4412 81	6.1212 81	-2.2715 1	-3.5715 1	-3.3015 1	4.2219 7	4.3570 17	4.1535 9	1.5445 39
United Kingdom	2.2170 15	-0.12	0.03	0.65	0.61	0.23	0.02	0.24	0.19	0.43	1.26	1.6260 98	1.3839 3	2.0456 84	1.3013 68	1.7909 53	2.6609 53	2.6309 53	1.7509 53	-0.4207	0.2493 02	0.6393 02	-0.3477 8	1.3332 07	6.4888 05	10.370 86
Slovenia	2.1965 12	-0.12	0.08	-0.11	0.33	-1.37	-2.13	-1.39	-2.61	-2.76	-2.82	-2.3044 8	-2.7220 3	-3.0573 6	1.2661 03	4.2923 99	4.9523 99	4.8123 99	6.1523 99	-0.6507 3	-0.2507 3	-0.3207 3	2.3486 69	6.1998 88	0.7680 95	0.3864 76
Italy	1.8207 06	-0.03	0.17	0.31	1.33	2.28	2.89	3.65	3.69	3.81	3.42	4.3564 84	3.0728 24	6.1083 87	-0.3973 7	1.1883 64	2.3983 64	3.6183 64	5.5483 64	-1.5474 8	-0.9874 8	-1.2474 8	1.1480 41	3.9783 91	7.6779 29	-0.7804 1
Czechia	1.7164 17	-0.05	8.09E-15	-0.04	-0.16	0.55	-0.28	1.34	1.43	2.34	4.13	3.2290 3	2.9933 13	1.7891 9	-1.8825 2	-0.8284	-0.2584	1.8816 02	2.7616 02	0.2859 36	0.7659 36	1.8359 36	-0.3650 9	8.8495 97	2.7023 67	7.4361 72
Romania	1.7151 76	0.13	-0.38	-0.1	-0.7	0.67	0.53	0.42	3.26	5.71	6.43	4.0461 23	2.8213 48	0.9606 55	-2.2257 2	-0.0986 7	2.2713 27	4.3913 27	5.7913 27	-0.1966 8	-0.0866 8	-0.5666 8	-1.7954 6	6.3621 15	1.9308 13	10.271 38

Austria	1.3537	0.23	0.04	-0.15	0.01	0.41	-0.05	0.18	-1.58	-1.61	-0.24	2.4943	3.3120	2.5113	4.3202	2.1594	2.2494	2.8394	4.5694	0.7038	0.7738	0.3938	3.8239	3.2306	6.4387	3.2918
Denmark	1.3472	0.03	0.21	0.33	0.06	-0.38	-4.17E-14	-0.01	1.18	0.41	0.44	3.1723	3.0928	4.0786	3.4102	1.6453	2.3653	2.2753	1.2353	-2.4084	-1.8284	-1.7884	3.3857	2.8689	3.2802	1.3341
Sweden	1.1501	0.05	-0.22	-0.18	0.39	1.56	-0.37	0.45	-0.69	-0.12	-0.99	-0.079	-3.1101	-4.7647	-3.3673	-2.4918	-1.6918	-1.4618	-1.1818	-0.1521	0.1478	0.1217	4.2729	0.7972	0.7093	6.1264
Switzerland	1.0068	1.1	1.32	1.43	1.46	1.72	1.36	0.71	1.4	2.25	2.2	4.2423	4.7488	5.6776	6.5876	3.0741	2.7641	2.6941	2.5841	2.2641	2.6841	2.9541	5.5858	2.3258	3.8768	3.7153
Norway	0.9777	0.04	0.04	1.55	1.77	2.11	1.08	1.76	3.09	3.38	3.7	5.9675	7.7044	5.4301	7.2225	0.5931	0.7831	0.9031	0.5531	0.6231	0.4031	1.4431	3.7321	0.7049	1.8771	4.9374
Bulgaria	0.9223 5	-0.4	-1.75E-14	-0.13	0.66	-0.14	0.31	-0.83	0.08	2.51	2.62	1.9891 39	2.1681 37	1.4438 8	1.3630 94	0.8206 06	-1.4793 9	-0.5693 9	0.7106 06	1.8623 07	1.3523 07	2.3207	-0.2629 7	6.4882	1.7872 08	2.9175 03
Hungary	0.9097 57	-0.05	0.02	0.31	-0.04	-0.63	0.61	2.21	2.38	3.32	2.73	-1.3259 8	-2.9206 8	-2.4577	-1.0346 3	0.9136 89	1.9236 89	3.1736 89	5.3936 89	-0.9702	-0.0602	1.2498 01	0.9094 93	5.8781 05	1.1664 39	1.1078 37
Turkiye	0.8735 36	-4.80E-14	4.68E-14	2.62E-14	4.18E-14	3.09E-14	0.02	-0.07	-0.27	0.62	1	-1.9781 1	-0.4072 2	-0.2741 3	1.0156 28	-0.516	-0.0076 6	0.0003	2.4103	2.3340	3.8317	4.4017	-1.5812 9	7.4862	2.6817	3.3107 03
Ireland	0.8533 27	0.01	0.31	0.48	0.34	1.21	0.25	0.23	1.89	1.42	1.33	-0.6677 5	1.5796 4	2.7736 03	-1.2127	0.0280 16	1.1880 16	1.7480 16	2.7880 16	-2.1713 5	-1.3013 5	0.8145	2.6306 3	4.1692 4	3.1474 48	1.5594 36
Finland	0.7824 19	-0.09	-0.01	0.09	0.76	1.83	0.65	0.14	1.09	0.83	1.2	3.4831 37	1.8638 38	-0.7465 5	4.6617 65	-1.1736 7	-0.7836 7	-0.5536 7	-0.1236 7	0.5043	0.4213 43	0.4213 43	5.1232 5	0.7859 84	3.5651 91	0.3419 85
Belgium	0.7430 37	0.06	-0.24	-0.66	0.77	-0.2	0.13	0.41	0.94	1.06	0.64	3.9449 63	3.5118 17	1.7457 34	0.6829 1	1.7457 19	1.1438 19	1.4119 19	1.1938 19	-0.9993	-0.0989 3	-0.2989 3	3.4265 71	0.0912 35	4.6512 67	-0.8522 4
Greece	0.7354 27	0.21	0.07	0.37	0.94	0.53	0.98	2.82	1.87	1.37	2.61	-0.3247	-3.2994 8	-3.2432 8	-4.2043 5	-4.0368 3	-4.3868 3	-2.6268 3	-0.2468 3	1.0843 1	2.6243 1	3.6243 1	1.0265 55	4.4772 34	0.1997 99	0.3128 08
Luxembourg	0.6377 08	0.73	0.7	0.16	0.34	-0.1	-1.11	0.67	1.02	0.68	0.19	1.0665 57	-0.7773 1	0.4254 71	2.5889 62	3.6644 81	2.8244 81	3.3744 81	1.7144 81	-0.9033 2	1.1336 82	1.4136 82	6.5518 89	2.6735	1.1807 61	-0.3767 3
Croatia	0.5423 8	-3.54E-14	6.30E-14	0.31	-0.22	0.46	0.55	0.15	0.41	1.15	1.96	3.1420 56	1.9771 87	2.5173 52	-1.8156 8	1.5217 42	0.7817 42	0.8417 42	2.2642	-2.8446 7	-0.6546 7	1.1629	1.9917 25	2.4209 23	0.5164 43	0.8388 01
Spain	0.4467 48	0.31	0.3	0.31	0.76	0.46	0.38	0.77	1.02	0.12	0.03	0.6993 87	1.3661 7	0.5394 99	-3.6601 9	-0.0779 3	-0.3979 3	1.4264 68	2.7920 68	0.0844 74	0.0865 74	0.0865 74	1.7284 12	2.8285 02	3.1983 63	1.4565 14
Cyprus	0.3513 33	-0.47	0.28	0.05	-0.74	-1.15	0.54	0.96	2.38	2.68	2.7	1.4376 48	-0.3931 4	-3.0276 4	-2.0212 9	-1.1279 4	1.4458	0.7920 58	1.9320 58	-1.2727 3	-0.2135 3	0.8864	1.6078 42	1.3333 13	0.3765 02	-0.0820 4
Malta	0.3347 31	0.71	0.82	1.04	1.15	1.35	3.75	2.36	3.05	1.68	2.77	2.0874 72	1.7233 59	2.3126 05	2.2236 23	2.3338 11	2.9238 11	3.3338 11	5.6738 11	-0.7148 7	0.0051 35	0.0023 35	0.1924 53	0.7149 58	2.8115 11	3.1081 78
Serbia	0.0581 44	2.87E-14	2.66E-14	2.51E-14	2.49E-14	2.55E-14	1.93E-14	1.99E-14	0.18	0.47	0.31	-0.04	0.44	1.66	0.26	3.83	3.51	5.64	9.33	11.57	14.84	14.5	1.5233 73	0.4500 35	0.1238 47	0.4889 91
North Macedonia	0.0368 13	3.52E-14	4.56E-14	5.37E-14	5.78E-14	4.27E-14	3.69E-14	-0.59	-0.52	0.33	1.32	2.94	2.87	3.91	5.33	6.02	6.64	8.16	9.22	9.78	10.89	11.55	1.2295 53	0.2849 32	0.0784 12	0.3095 97

	Intercept	C(year) [T.2001]	C(year) [T.2002]	C(year) [T.2003]	C(year) [T.2004]	C(year) [T.2005]	C(year) [T.2006]	C(year) [T.2007]	C(year) [T.2008]	C(year) [T.2009]	C(year)[T.2010]	C(year)[T.2011]	C(year)[T.2012]	C(year) [T.2013]	C(year) [T.2014]	C(year) [T.2015]	C(year) [T.2016]	C(year) [T.2017]	C(year) [T.2018]	C(year) [T.2019]	C(year) [T.2020]	C(year) [T.2021]	Shadow economy	Envelope wage	Without a formal contract	Bogus self employed
Slovak Republic	5.524423	3.1	2.98	3.42	3.3	2.37	4.96	7.36	7.23	7.3	8.37	6.937591	5.694567	6.277357	6.295806	6.433865	6.838865	7.763865	7.893865	-2.456556	-0.01656	-0.03656	0.713172	12.84947	4.845597	-7.61375
Latvia	5.3521355	3.69E-14	2.98E-14	0.09	-1.24	-0.7	-0.12	0.08	0.95	1.62	2.27	2.040214	2.708312	3.458965	3.544116	4.536214	6.106214	5.946214	8.106214	-1.63695	-3.09695	-3.09695	-0.04585	12.58055	-5.47737	-3.90978
Lithuania	4.6019975	-0.02	0.67	0.76	1.44	0.07	1.32	2.92	3.46	3.33	3.69	3.577419	5.313641	2.29997	2.327523	1.864465	2.624465	3.254465	5.704465	-1.7408	-0.5308	-0.0308	-0.33713	6.78382	13.73491	-5.16351
Germany	4.544744	-0.06	-0.03	-0.16	-1.87E-15	-0.05	-0.13	-0.78	-1.15	-1.37	-0.75	3.407464	4.578826	4.381306	1.428484	2.651345	3.491345	3.811345	2.911345	-2.07363	-2.21363	-2.11063	2.606811	5.401108	6.923709	11.36798
Estonia	4.4649917	0.33	0.65	0.84	0.19	1.33	0.98	1.25	2.85	2.3	3.29	6.051863	6.992987	6.615633	-0.48751	1.712034	2.112034	3.612034	5.352034	-2.99947	-2.80947	-2.99947	1.196341	10.03035	3.480361	-0.59651
Netherlands	4.3948211	3.57E-14	0.03	-0.09	-0.21	-0.43	-0.06	1.61	2.33	2.52	2.48	5.945624	6.069717	4.727255	0.676699	8.512412	8.322412	8.952412	8.632412	-1.14065	-1.01065	-0.66065	6.795341	-4.93468	0.143203	3.929264
Portugal	4.3971435	0.07	-0.1	-0.08	-0.12	0.91	1.17	0.93	0.55	2.55	2.92	3.363303	1.788135	0.923701	1.570369	5.191931	6.161931	8.681931	10.14193	-1.25832	-0.41832	-0.32832	0.960246	1.158038	0.267345	2.866438
Iceland	3.4591129	-8.81E-14	-4.85E-14	-4.53E-14	-0.46	-0.65	-0.75	-0.05	-0.91	3	3.66	2.712373	2.665651	4.594363	4.829948	2.758542	3.908542	2.508542	2.918542	2.868542	3.068542	4.558542	-2.0184	2.490573	6.641527	17.4686
Poland	3.2344432	1.73E-14	-0.01	0.17	0.45	-0.49	0.72	1.77	3.58	4.96	5.9	3.375622	3.066266	2.731148	2.221479	1.322218	2.912218	4.192218	4.552218	-2.07404	-0.56404	-0.48959	-1.58399	15.9674	4.221457	0.643434
France	2.9629373	0.22	0.55	0.61	0.3	1.12	0.37	0.49	1.3	1.68	0.14	6.59866	7.438629	6.965379	0.826955	2.861281	3.411281	5.441281	6.121281	-2.27151	-3.57151	-3.30151	4.221197	4.357017	4.15359	1.544639
United Kingdom	2.2170115	-0.12	0.03	0.65	0.61	0.23	0.02	0.24	0.19	0.43	1.26	1.626098	1.38393	2.045684	1.301368	1.790953	2.660953	2.630953	1.750953	-0.4207	0.249302	0.699302	-0.34778	1.333207	6.488805	10.37086
Slovenia	2.1965612	-0.12	0.08	-0.11	0.33	-1.37	-2.13	-1.39	-2.61	-2.76	-2.82	-2.30448	-2.72303	-3.05736	1.266103	4.292599	4.952599	4.812599	6.152599	-0.65073	-0.25073	-0.32073	2.348669	6.199888	0.768095	0.386476
Italy	1.8230706	-0.03	0.17	0.31	1.33	2.28	2.89	3.65	3.69	3.81	3.42	4.356484	3.072824	6.108287	-0.39737	1.188364	2.398364	3.618364	5.488364	-1.54748	-0.98748	-1.24748	1.438041	3.978391	7.677929	-0.78041
Czechia	1.716417	-0.05	8.09E-15	-0.04	-0.16	0.55	-0.28	1.34	1.43	2.24	4.13	3.22903	2.993313	1.78919	-1.88252	-0.8284	-0.3584	1.881602	2.761602	0.285936	0.765936	1.835936	-0.36599	8.849597	2.703367	7.436172
Romania	1.7151776	0.13	-0.38	-0.1	-0.7	0.67	0.53	0.42	3.26	5.71	6.43	4.046123	2.821848	0.960655	-2.23572	-0.09867	2.271327	4.391327	5.791327	-0.19668	-0.08668	-0.56668	-1.79546	6.362115	1.930813	10.27138
Austria	1.3537707	0.23	0.04	-0.15	0.01	0.41	-0.05	0.18	-1.58	-1.61	-0.24	2.494349	3.312023	2.511327	4.320262	2.159435	2.249435	2.889435	4.569435	0.703807	0.773807	0.393807	3.823914	3.230606	6.438756	3.291898
Denmark	1.1347282	0.03	0.21	0.33	0.06	-0.38	-4.17E-14	-0.01	1.18	0.41	0.44	3.172318	3.093856	4.078632	3.410287	1.645319	2.365319	2.725319	1.235319	-1.42849	-1.78849	-1.82849	3.815734	2.868907	3.280263	1.334175
Sweden	1.1501139	0.05	-0.22	-0.18	0.39	1.56	-0.37	0.45	-0.69	-0.12	-0.99	-0.079	-3.11011	-4.76476	-3.36738	-2.49189	-1.69189	-1.46189	-1.18189	-0.15218	0.147817	0.127817	4.272973	0.797299	0.709301	6.126475
Switzerland	1.0068881	1.1	1.32	1.43	1.46	1.72	1.36	0.71	1.4	2.25	2.2	4.242343	4.748817	5.677633	6.587621	3.07413	2.76413	2.69413	2.58413	2.56413	2.68413	2.95413	5.588166	2.325896	3.876493	3.715392
Norway	0.9777707	0.04	0.04	1.55	1.77	2.11	1.08	1.76	3.09	3.38	3.7	5.96752	7.704499	5.430198	7.232533	0.5931166	0.7831166	0.9031166	0.5531166	0.6231166	0.4031166	1.4431166	3.73219	0.703949	1.877197	4.937419
Bulgaria	0.912235	-0.4	-1.75E-14	-0.13	0.66	-0.14	0.31	-0.83	0.08	2.61	2.62	1.909139	2.168137	1.44388	1.363094	0.8256066	-1.47939	-0.56939	0.7106066	1.8623307	1.3523307	2.3223307	-0.26397	6.489782	1.787208	2.917503
Hungary	0.9099757	-0.05	0.02	0.31	-0.04	-0.63	0.61	2.21	2.38	3.32	2.73	-1.12598	-2.92068	-2.4677	-1.03463	0.9136689	1.9236689	3.1736689	5.3936689	-0.9702	-0.0602	1.2490801	0.909493	5.878105	1.640639	1.107837
Türkiye	0.8783586	-4.80E-14	4.68E-14	2.62E-14	4.18E-14	3.09E-14	0.02	-0.07	-0.27	0.62	1	-1.97811	-0.40722	-0.37413	1.015628	-0.516	-0.766	0.004003	2.414003	2.334003	3.834003	4.174003	-1.58129	7.486307	3.681757	3.310703
Ireland	0.8533327	0.01	0.31	0.48	0.34	1.31	0.35	0.33	1.89	1.42	1.33	-0.66775	1.57964	3.778603	-1.3127	0.0228016	1.1880016	1.7480016	2.3780016	-2.17135	-1.80135	-0.81645	2.63063	4.16924	3.147448	1.559436
Finland	0.7824419	-0.09	-0.01	0.09	0.76	1.83	0.65	0.14	1.09	0.83	1.2	3.483137	1.863838	-0.74655	4.661765	-1.17367	-0.78367	-0.55367	-0.12367	0.501343	0.131343	0.4213343	5.13325	0.788984	3.565191	0.341985
Belgium	0.7443037	0.06	-0.24	-0.66	0.77	-0.2	0.13	0.41	0.84	1.06	0.64	3.944963	3.511817	1.746734	0.68291	1.5738119	1.1438119	1.1438119	1.1938119	-0.99893	-0.09893	-0.29893	3.426571	0.091235	4.657067	-0.85224
Greece	0.7354527	0.21	0.07	0.37	0.94	0.53	0.98	2.82	1.87	1.37	2.61	-0.3247	-3.29948	-3.24328	-4.20435	-4.03683	-4.38683	-2.42683	-0.24683	1.08431	2.62431	3.62431	1.026555	4.477234	0.199799	0.312808
Luxembourg	0.6377708	0.73	0.7	0.16	0.34	-0.1	-1.11	0.67	1.02	0.68	0.19	1.066557	-0.77731	0.435471	2.588962	3.6644481	2.8254481	3.774481	1.714481	-0.90632	1.1336682	1.4136682	6.651889	2.678935	1.180761	-0.37673
Croatia	0.64288	-3.54E-14	6.38E-14	0.31	-0.22	0.46	0.55	0.15	0.41	1.15	1.96	3.1403566	1.977187	2.517852	-1.81568	1.521742	0.781742	0.841742	2.361742	-2.84467	-0.65467	-0.65467	1.665329	1.991725	3.420923	0.516449	0.838801
Spain	0.6446748	0.31	0.3	0.31	0.76	0.46	0.38	0.77	1.02	0.12	0.03	0.699387	1.36617	0.539499	-3.66019	-0.07793	-0.39793	1.6420268	2.7920268	0.4446574	0.2446574	0.0866574	1.728412	3.828502	3.198363	1.456514
Cyprus	0.3511833	-0.47	0.28	0.05	-0.74	-1.15	0.54	0.96	2.38	2.68	2.7	1.437648	-0.39314	-3.02764	-2.03579	-1.13794	1.4420268	0.7920268	1.9320268	-1.27353	-0.21353	0.8864648	1.6078842	1.336513	0.377702	-0.08204
Malta	0.3344731	0.71	0.82	1.04	1.15	1.35	3.75	2.36	3.05	1.68	2.77	2.087472	1.723359	2.312605	2.233623	2.333811	2.923811	3.333811	5.673811	-0.71407	0.0061195	0.2351195	0.192463	0.714958	2.811511	3.108178
Serbia	0.0581144	2.87E-14	2.66E-14	2.51E-14	2.49E-14	2.55E-14	1.93E-14	1.59E-14	0.18	0.47	0.31	-0.04	0.44	1.66	0.26	3.83	3.51	5.64	9.33	11.57	14.84	14.5	1.523373	0.450035	0.123847	0.488991
North Macedonia	0.0368813	3.52E-14	4.56E-14	5.37E-14	5.78E-14	4.27E-14	3.69E-14	-0.59	-0.52	0.33	1.32	2.94	2.87	3.91	5.33	6.02	6.64	8.16	9.22	9.78	10.89	11.55	1.229553	0.284932	0.078412	0.309597

Source: Authors' own research.