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11 January 2024

Online at <https://mpra.ub.uni-muenchen.de/121311/>
MPRA Paper No. 121311, posted 02 Jul 2024 06:14 UTC

An empirical analysis on the impact of labour market regulations on uninsured employment in Greece

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Abstract. The impact of labour market regulations on uninsured employment in Greece between 2014 and 2019 is a crucial exploration in response to the pervasive challenge of undeclared work. With the rise of globalization and evolving labour dynamics, understanding and addressing the complexities of uninsured employment by analysing data from the Greek Ministry of Labour and Social Affairs was the main purpose of this study. Employing a comprehensive examination of key indicators, the study sought to evaluate the effectiveness of these measures in curbing undeclared work. This paper meticulously analysed the pivotal strategies implemented by the Ministry of Labour and Social Affairs during the specified period using statistical analysis, focusing on high fines, reduced non-salary costs, the ERGANI information system, and a modernized fines framework. Statistical graphs were utilized to examine trends, providing a solid foundation for evaluating the impact of the implemented strategies. Additionally, qualitative assessments were employed to offer a nuanced understanding of the contextual factors influencing the outcomes. The findings reveal a positive trend, showcasing a significant reduction in undeclared workers and non-compliant businesses, underscoring the effectiveness of the implemented measures. In this research spanning 2014-2019, an examination of 237,455 businesses in Greece revealed that 28,044 entities (11.81%) employed undeclared workers. Among 812,460 scrutinized employees, 44,642 (5.49%) were identified as undeclared, leading to fines totalling €468,997,663 in efforts to address non-compliance with labour regulations. This study not only sheds light on the successful strategies adopted by the Greek government but also offers valuable practical lessons for policymakers globally.

Keywords: government regulations; undeclared work; ARTEMIS plan; ministry of labour; labour economics; financial crisis

INTRODUCTION

Uninsured employment presents a pressing challenge not only to the Greek economy but also to global societies, critically impacting the stability of social systems and economic prosperity. Uninsured employment refers to the failure to make timely contributions to insurance funds despite active engagement in work. This phenomenon compromises the rights and protection of workers, weakens public revenues, undermines healthy competition among businesses, and fundamentally impedes the developmental trajectory of the Greek economy. As a result, the sustainability of the Greek insurance system is under threat, necessitating urgent and effective measures to combat uninsured employment.

Uninsured employment and undeclared work in Greece have intricate origins intertwined with the nation's economic and social fabric. According to H. Burke (2020) the aftermath of the 2008 financial crisis significantly amplified unemployment rates, fostering a climate where informal employment became a necessary recourse for many. Economic instability, coupled with stringent labour market regulations, compelled both employers and employees towards undeclared work, perpetuating the cycle of informal employment. High taxation rates acted as a catalyst for this trend, encouraging businesses to engage in off-the-record transactions to evade tax burdens and social security contributions. These dynamics led to the emergence of a shadow economy, reflecting the complexities of Greece's labour market.

To combat the challenges of uninsured employment and undeclared work, the Greek government introduced the ARTEMIS operational plan during the period 2014-2019. This multifaceted initiative aimed to curtail informal labour practices through a blend of strict policies and financial incentives, as indicated by OECD (2019). Central to this plan was the imposition of substantial fines, acting as a deterrent against undeclared work. Simultaneously, the reduction of non-salary costs for businesses became a pivotal policy, making formal employment financially viable for employers, as supported by International Labour Organisation (2018) data. The advent of digital solutions, such as the ERGANI information system, played a vital role in policy implementation, enhancing transparency and accountability within the labour market. H. Burke (2020) noted that this system acted as a watchdog, making it increasingly challenging for employers to engage in undeclared work undetected.

A lot of studies has scrutinized the effectiveness of policies aimed at combating uninsured employment and undeclared work. The informal labour market in Greece perpetuates a cycle of vulnerability and exploitation, particularly among marginalized populations, such as migrants and low-skilled workers. This exploitation further widens income inequality and exacerbates social disparities, leaving these individuals without social security protection and proper working conditions. Moreover, the unregulated growth of undeclared work distorts the competitive landscape among businesses, leading to unfair competition and hindering overall economic growth. This distortion permeates the socio-economic fabric, impeding the country's overall development. More researchers contributed valuable insights into the socio-economic factors influencing policy outcomes, highlighting the necessity for tailored interventions considering the diverse economic backgrounds and challenges faced by different population segments. Interesting findings emerge from the research conducted by S.M. Dougherty & O.R. Escobar (2019), revealing varying levels of informal employment across Mexico. Their study indicates that reducing the barriers to initiate business operations has a non-linear impact on informal employment, particularly in regions with a high prevalence of microenterprises. These results underscore the importance of implementing a comprehensive set of policies aimed at enhancing labour skills, strengthening tax enforcement, and combating corruption to effectively curb informal employment. Within their study, M. Vlassis *et al.* (2019) have crafted a theoretic model to accounts for firms' decisions to conceal labour without any governmental monitoring or punishment mechanisms, such as penalties or fines, to enforce labour disclosure. However, the numerical outcomes of are contingent upon the specific proportional tax system implemented.

However, no study has yet analysed and evaluated in detail the significant impact of the ARTEMIS operational plan on undeclared labour in Greece. Therefore, the purpose of the study was to examine and evaluate the efficacy of the Ministry of Labour and Social Affairs' control mechanisms in combating undeclared work through the analysis of the ARTEMIS operational plan, implemented between 2014 and 2019.

MATERIALS AND METHODS

The data of this study, collected from the ARTEMIS operational plan, spanning from January 1, 2014, to December 31, 2019, sourced directly from the esteemed Greek Ministry of Labour and Social Affairs. Conducting an analysis, the study concentrated on pivotal variables essential for comprehending the intricacies of uninsured and undeclared employment dynamics. It is important to note that there are no data available beyond 2019, as the ARTEMIS program was implemented from 2014 to 2019. The focus of the analysis concerns the impact of new governmental policies initiated from 2014 onwards. These policies include the high fine policy, reduction in non-salary costs, creation of the ERGANI information system, and modernization of the fines framework. This examination covered a 5-year timeframe from the commencement of these policies, which allowed to assess their effects on the dynamics of uninsured and undeclared employment during this period.

The selected 5-year timeframe for analysis, spanning from the initiation of these policies in 2014 to 2019, was considered sufficient for observing and evaluating the outcomes of the

implemented governmental measures. This duration allows for a comprehensive examination of the impact of the measures taken from the Greek Government to reduce uninsured employment. Furthermore, in this study, statistical analysis served as the primary methodological tool employed for data examination. The use of statistical methods ensured a meticulous exploration of patterns, relationships, and significance within the data. This approach enhanced the reliability of the study's findings. The selected variables are as follows.

Number of Audited Businesses: this variable represents the total count of businesses that underwent inspection as part of the ARTEMIS operational plan. Each audited business was scrutinized to identify compliance with employment regulations and the presence of undeclared workers.

Number of Businesses with Undeclared Workers: this variable indicates the number of businesses where employees were found working without proper documentation or registration. It identifies businesses involved in undeclared work, providing insights into the extent of informal employment practices.

Percentage of Delinquent Businesses: this variable signifies the proportion of businesses engaged in undeclared work relative to the total audited businesses. It is calculated as a percentage and reflects the prevalence of non-compliant practices among businesses inspected during the study period.

Number of Employees: this variable represents the total workforce within the audited businesses. It includes both declared and undeclared workers, providing an overview of the scale of employment within the businesses subjected to inspection.

Number of Undeclared Workers: this variable denotes the count of employees found to be working without proper documentation or registration. It specifically focuses on individuals engaged in undeclared work, revealing the magnitude of informal employment within the audited businesses.

Percentage of Undeclared Workers in Relation to the Total Number of Workers: this variable calculates the ratio of undeclared workers to the total workforce within the audited businesses, expressed as a percentage. It highlights the proportion of informal employment concerning the overall workforce, offering insights into the prevalence of undeclared work within businesses. In this analysis, the variable 'Percentage of Undeclared Workers in Relation to the Total Number of Workers' has been abbreviated to 'Percentage of Undeclared Workers' for brevity.

Amount of Fines (in Euros): this variable represents the total monetary penalties imposed on businesses due to undeclared work practices. It quantifies the financial consequences faced by non-compliant businesses, indicating the economic impact of undeclared employment on the business community and the broader economy.

RESULTS

The ARTEMIS operational plan was a pivotal strategy crafted to address the intricate challenges posed by uninsured employment and undeclared work in Greece. Its multifaceted approach encompassed several key components. **High Fine Policy:** the plan introduced substantial fines, including a severe penalty of 10,500 euros for first-time offenders engaged in undeclared work, acting as a deterrent against illicit employment practices. **Reduction in Non-Salary Costs:** policies were implemented to alleviate the financial burden on businesses, specifically through a reduction of 6 units in insurance contributions. This reduction aimed to incentivize compliance while easing the financial strain on employers.

Creation of ERGANI Information System: It was developed to comprehensively map the labour market for the first time. This system acted as a shield, ensuring transparency and accountability for both employees and compliant businesses.

Modernization of Fines Framework: the plan continuously enhanced the fines framework for undeclared and uninsured work. This modernization involved the establishment of an electronic register of offenders and the fortification of the Labour Inspection Corps through technical upgrades and institutional reinforcement, guaranteed by a Presidential Decree.

A pivotal aspect of understanding uninsured employment lies in distinguishing insurance contributions from taxation. Unlike mere deductions, insurance contributions are financial obligations imposed by insurance legislation on both employers and insured individuals. The choice of insurance contributions as the primary financial instrument underscores their vital role in sustaining the national social security system.

Uninsured employment manifests in various forms, including the concealment of businesses from the insurance system, underreporting of employees' working hours, and providing insurance coverage based on lower wages than the actual payment. Undeclared work, the most extreme manifestation, refers to paid employment that remains unregistered with tax authorities and social security organizations, making it a focal point in the literature. Figure 1 shows the total number of audited businesses.

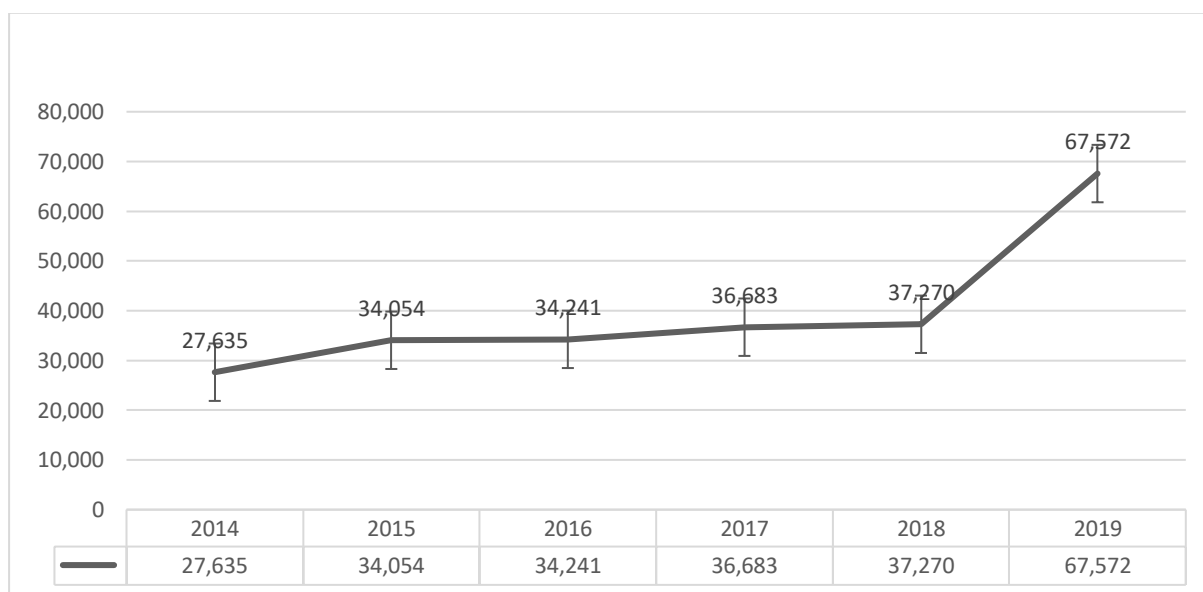


Figure 1. Number of audited businesses, 2014-2019

Source: made by the author

The data illustrates a remarkable increase in the number of audited businesses in Greece over the six-year period. Starting at 2014, the figure steadily climbed, reaching a substantial number in 2019. This upward trend signifies a proactive response from regulatory authorities to combat the challenges posed by undeclared employment and non-compliant businesses. In 2014, the 27,635 audited businesses represented a crucial starting point for regulatory initiatives. As the numbers grew in 2015-2016, it became evident that authorities were expanding their efforts to scrutinize more businesses for adherence to labour regulations. By 2017, the audited businesses had increased showcasing a continuous commitment to monitoring business practices. However, the most notable surge occurred in 2019, where the number of audited businesses nearly doubled to 67,572. This substantial increase suggests a significant shift in regulatory strategy, potentially indicating the implementation of more sophisticated auditing techniques, targeted sector-specific interventions, or an increased focus on high-risk regions.

The surge in audits in 2019 highlights a heightened determination to enforce labour laws comprehensively. The escalating numbers of audited businesses reflect a robust governmental effort to foster a fair and transparent business environment. The substantial increase in 2019 particularly emphasizes a proactive approach, showcasing a commitment to rigorous enforcement and a drive to curtail undeclared employment practices effectively. The data (Fig. 2) reveals fluctuations in the number of businesses found with undeclared workers in Greece over the six-year period.

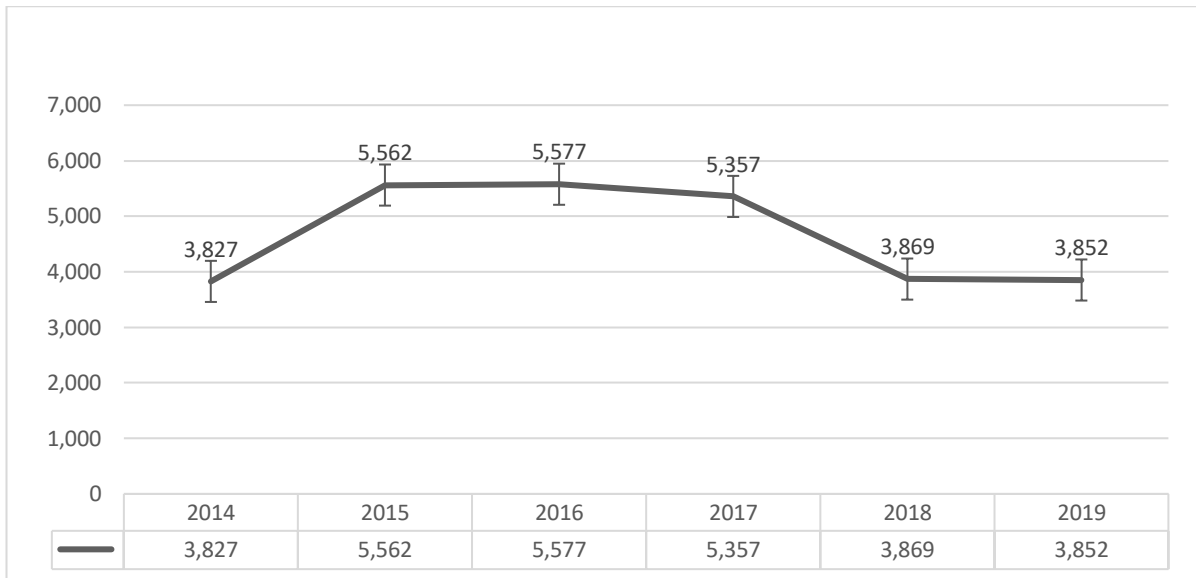


Figure 2. Number of businesses with undeclared workers, 2014-2019

Source: made by the author

Starting at 3,827 in 2014, the number rose to 5,562 in 2015, indicating an initial challenge in tackling undeclared employment. However, in the subsequent years, there was a gradual decrease in non-compliant businesses by 2019. The rise in 2015 possibly signalled an increased focus on enforcement, leading to the identification of a higher number of businesses involved in undeclared employment practices. However, the subsequent years saw a decline, suggesting that regulatory measures and awareness campaigns might have had a positive impact, leading to a reduction in such practices.

The stable figures in 2017 and 2018, followed by a marginal decrease in 2019, indicate that the efforts to curb businesses with undeclared workers remained consistent. The sustained vigilance and enforcement activities during these years likely contributed to maintaining a relatively low number of non-compliant businesses, demonstrating a commitment to fostering fair and legal employment practices. While the overall trend showcases a decrease, the persistence of some businesses engaging in undeclared employment emphasizes the need for continued vigilance and targeted interventions. The relatively stable numbers in recent years indicate a strategic focus on sustaining regulatory efforts, fostering compliance, and ensuring a level playing field for businesses operating within the legal framework. The percentage of delinquent businesses, representing the proportion of non-compliant businesses among the audited ones, demonstrates a notable decline over the six-year period in Greece (Fig. 3).

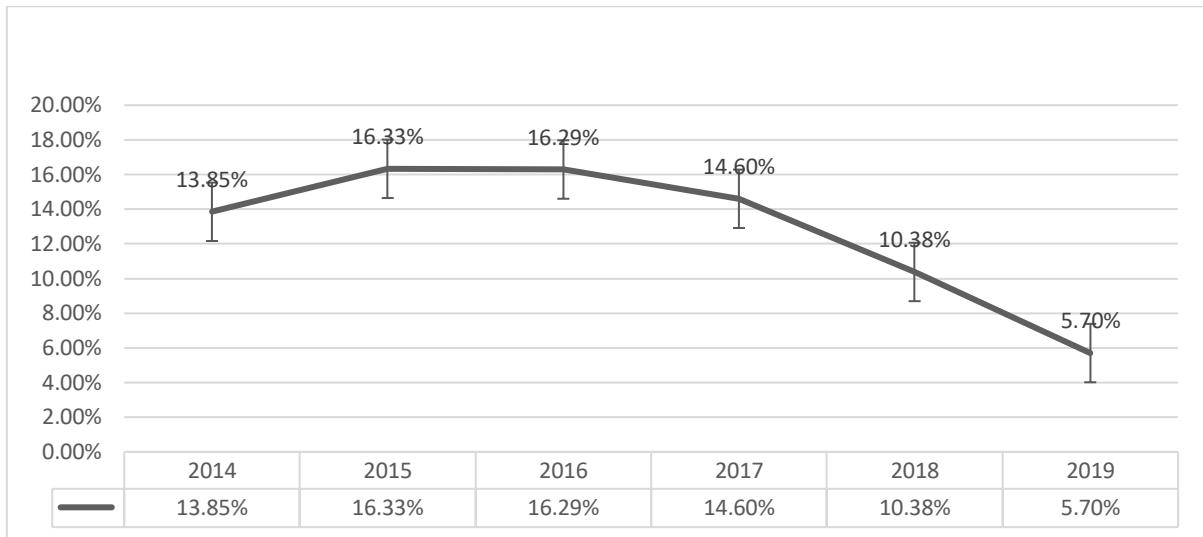


Figure 3. Percentage of delinquent businesses, 2014-2019

Source: made by the author

In 2014, 13.85% of audited businesses were found to be non-compliant, indicating a significant challenge in ensuring adherence to labour regulations. The percentage rose slightly in 2015, reflecting the persistent efforts required to tackle undeclared employment practices. However, in the subsequent years, there was a consistent decrease in the percentage of delinquent businesses. By 2019, only 5.70% of audited businesses were non-compliant, showcasing a substantial improvement in regulatory efficacy. The decline in 2016-2019 signifies a remarkable achievement. This drop suggests the implementation of effective enforcement strategies, including stricter penalties, increased surveillance, and targeted interventions. The substantial decrease in 2019 highlights a significant leap, indicating the successful implementation of new policies or enforcement methodologies. The decreasing trend underscores the dedication of regulatory bodies in fostering compliance among businesses.

The reduced percentage of delinquent businesses signifies a positive shift in the business landscape, indicating an environment where adherence to labour laws is actively encouraged and non-compliance is met with stringent consequences. The declining percentages reflect a cultural shift in the business community towards legal and ethical employment practices, showcasing the success of ongoing awareness campaigns and robust regulatory actions. The recorded figures in Figure 4 represent the workforce scrutinized for compliance with labour regulations in Greece during the specified years.

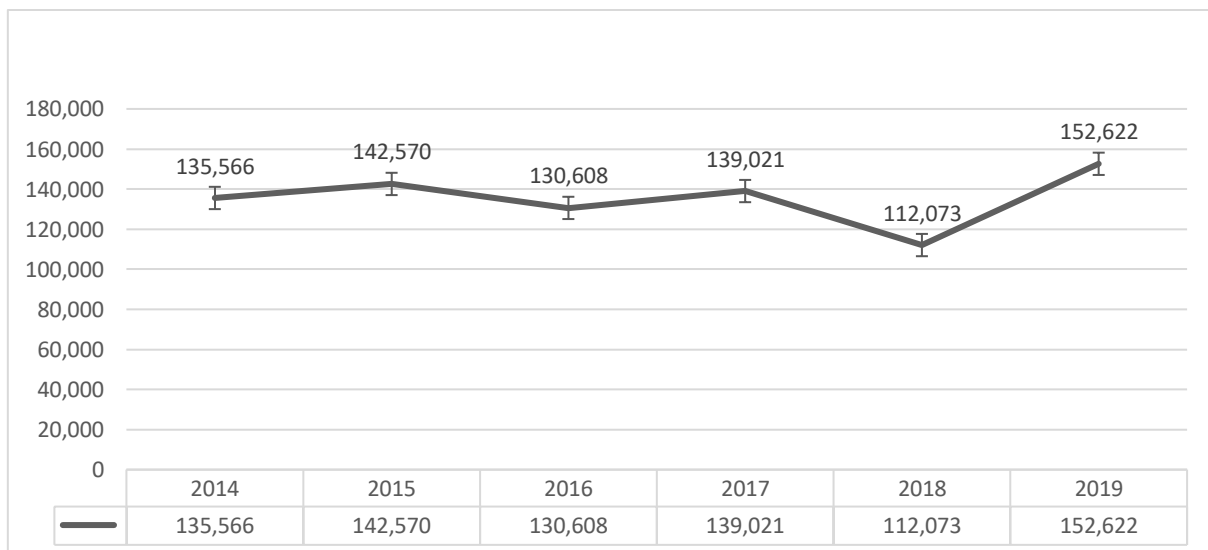


Figure 4. Number of workers checked for compliance, 2014-2019

Source: made by the author

In 2014, 135,566 employees underwent compliance checks, indicating a substantial effort by regulatory authorities to monitor adherence to employment laws. The subsequent year, 2015, saw an increase in the number of checked workers, signifying a proactive approach to ensuring legal employment practices. The following years witnessed fluctuations in the number of workers checked. In 2016, the figure decreased, possibly due to specific sectoral trends or operational focus. A subsequent rise occurred in 2017, indicating a renewed emphasis on compliance evaluation. However, a sharp decline was observed in 2018, potentially reflecting shifts in regulatory priorities or resource allocations. A significant upswing was evident in 2019, where the number of workers checked surged to 152,622.

This notable increase underscores a heightened commitment to regulatory vigilance, potentially driven by policy initiatives, increased enforcement efforts, or sector-specific interventions. These figures emphasize the proactive approach of regulatory authorities in monitoring compliance within the labour market. The fluctuations indicate the adaptable nature of enforcement strategies, tailored to address evolving challenges. The substantial increase in 2019 suggests a response to emerging trends or issues, reflecting effort to maintain a fair and legally compliant employment landscape in Greece. The number of undeclared workers is stated on Figure 5.

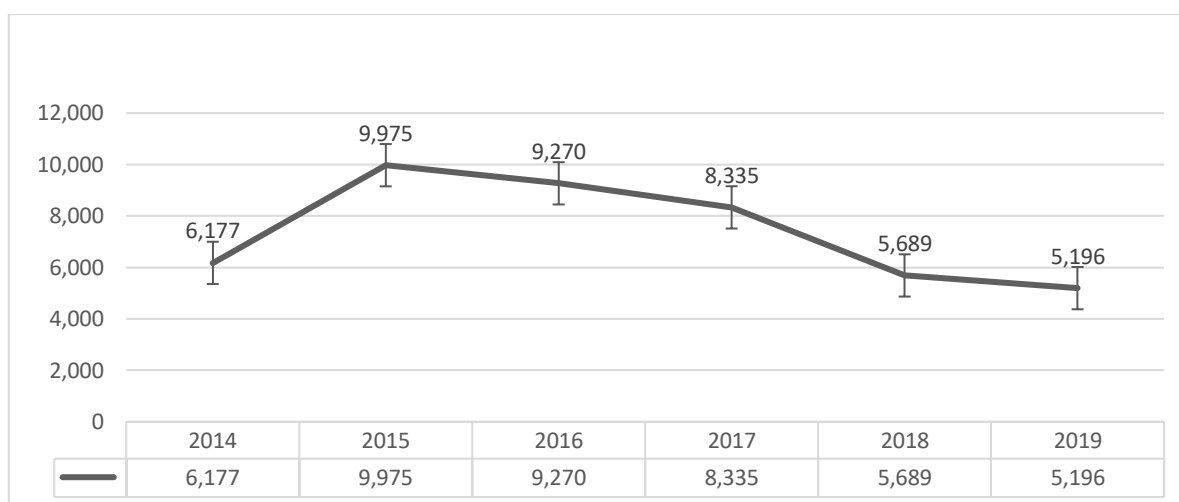


Figure 5. Number of undeclared workers, 2014-2019

Source: made by the author

In 2014, 6,177 undeclared workers were identified, signifying the extent of non-compliance with labour regulations. The number of undeclared workers surged in 2015, indicating a concerning increase in non-compliant employment practices. This rise has prompted regulatory authorities to intensify their efforts to address undeclared work. Subsequent years saw a decline in the number of undeclared workers. In 2016, there were 9,270 such workers, reflecting a concerted effort to tackle informal employment. The downward trend continued in 2017, signifying a positive shift towards regulatory success. A significant decrease occurred in 2018, with only 5,689 undeclared workers. This could be attributed to the effectiveness of enforcement measures, penalties, and regulatory initiatives. The decline persisted in 2019, indicating an ongoing commitment to curbing undeclared employment practices.

This decreasing trend suggests that regulatory efforts were successful in fostering legal and transparent employment practices. The decreasing numbers of undeclared workers underline the effectiveness of regulatory actions in reducing non-compliance and promoting adherence to labour laws. The fluctuations in the data highlight the dynamic nature of the issue and the adaptability of

enforcement measures to address emerging challenges. The substantial drop in 2018 and 2019 is particularly noteworthy, indicating a positive trajectory in the fight against undeclared employment practices in Greece. The percentage of undeclared workers, calculated concerning the total number of workers checked, serves as a vital indicator of informal employment practices in Greece (Fig. 6).

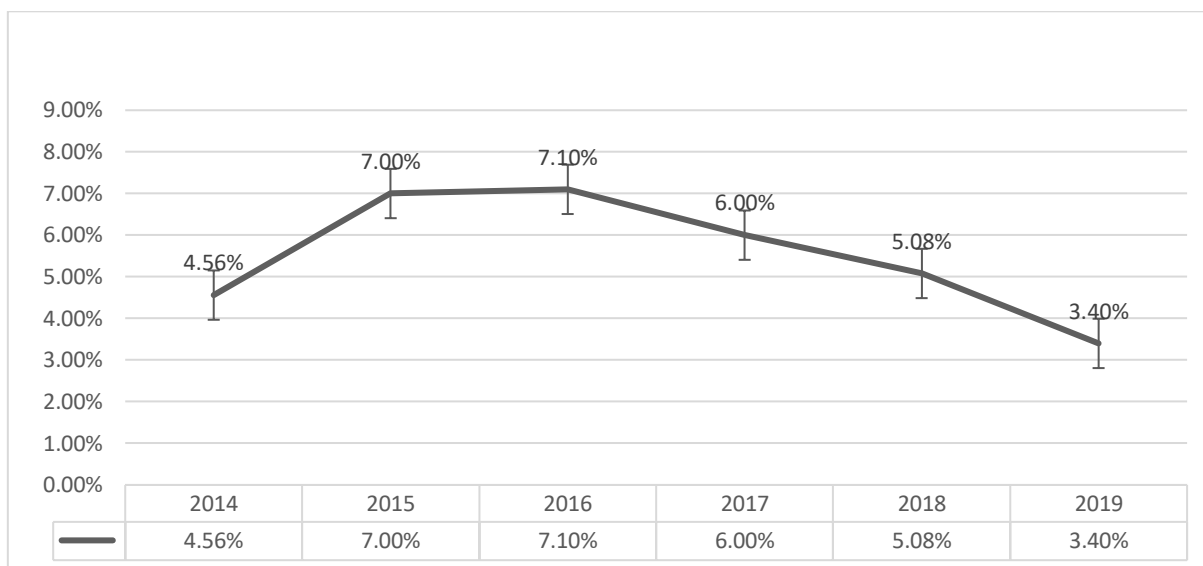


Figure 6. Percentage of undeclared workers, 2014-2019

Source: made by the author

In 2014, 4.56% of the workers examined were found to be undeclared, highlighting a significant challenge in ensuring compliance with labour regulations among the audited businesses. This percentage increased notably in 2015, indicating a concerning rise in undeclared employment practices. The spike likely prompted intensified regulatory efforts and awareness campaigns to address this issue comprehensively. In the subsequent years, there was a gradual decrease in the percentage of undeclared workers among those checked. In 2016, the figure stood at 7.10%, signifying a persistent challenge in enforcing labour laws. However, by 2017, there was a slight improvement. A significant decline occurred in 2018. This decrease signifies a positive shift, driven by stricter penalties, enhanced enforcement measures, and improved compliance from both employers and employees alike.

The most substantial drop was observed in 2019, where the percentage of undeclared workers among those checked fell to 3.40%. This significant decrease suggests a substantial improvement in regulatory effectiveness, due to targeted interventions, increased awareness, and a cultural shift towards legal employment practices among the audited businesses. These decreasing percentages reflect a positive trend, indicating the success of regulatory efforts in curbing undeclared employment practices specifically within the checked businesses. The decline from 7.00% in 2015 to 3.40% in 2019 highlights a remarkable achievement, signifying a shift towards legal and compliant labour practices within the audited sectors. The ongoing efforts to reduce the percentage of undeclared workers among those examined have significantly contributed to fostering a fair and transparent employment landscape in Greece. The fines imposed, expressed in euros (€), offer insight into the financial repercussions faced by non-compliant businesses in Greece (Fig. 7).

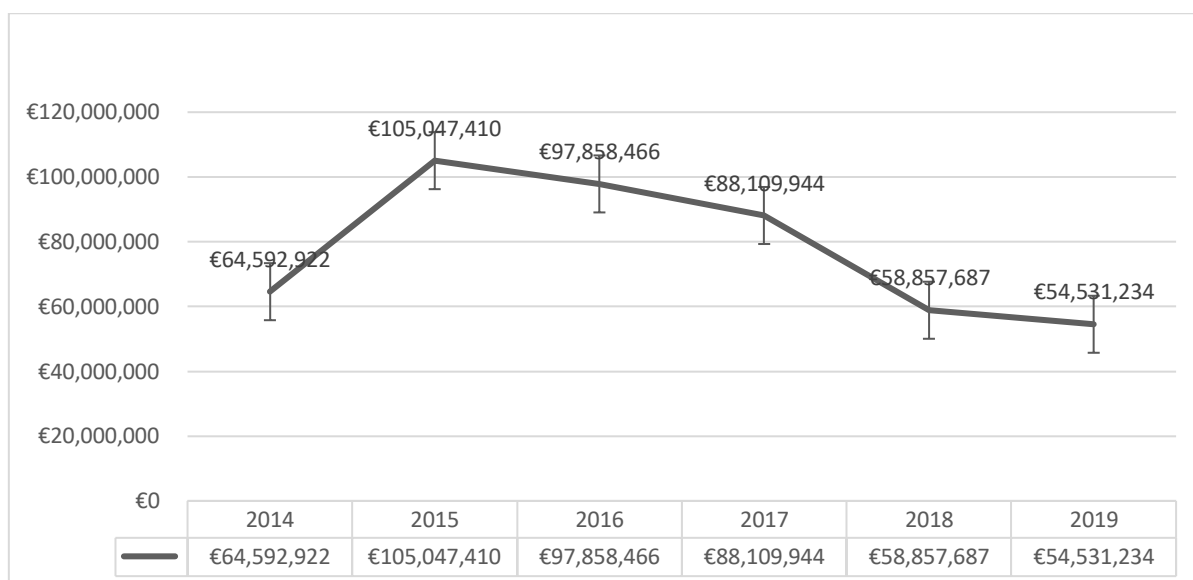


Figure 7. Amount of fines, €, 2014-2019

Source: made by the author

In 2014, fines totalling €64,592,922 were levied, indicating a substantial financial penalty for undeclared employment practices. The fines escalated significantly in 2015, reaching €105,047,410. This sharp increase might reflect stricter enforcement measures and a determination to penalize non-compliant businesses severely. In the subsequent years, the fines remained relatively high. In 2016, fines showcased the persistent efforts to maintain stringent penalties for offenders. The financial consequences for non-compliance continued in 2017. A notable decrease occurred in 2018, where fines dropped. This reduction might indicate a shift in enforcement focus, potentially towards preventive measures or alternative strategies to address non-compliance. The trend of decreasing fines persisted in 2019, with penalties amounting to €54,531,234. This decrease could be attributed to improved compliance, deterrence resulting from previous years' strict penalties, or recalibration of the fines system to ensure fairness and proportionality.

The fluctuation in fines imposed reflects the evolving strategies of regulatory bodies in addressing non-compliant businesses. While the decrease in fines might suggest a positive shift in compliance, it also necessitates continual evaluation to ensure that the penalties remain effective deterrents against undeclared employment practices. Striking a balance between strict enforcement and fairness is crucial to fostering a legally compliant business environment in Greece. The overall analysis is shown in Table 1.

Table 1. Summarized data, 2014-2019

Number of audited businesses	237,455
Number of businesses with undeclared workers	28,044
Percentage of delinquent businesses	11.81%
Number of employees	812,460
Number of undeclared workers	44,642
Percentage of undeclared workers	5.49%
Amount of fines, €	468.997.663 €

Source: made by the author

In the collective span of 2014-2019, Greece initiated a rigorous campaign to combat undeclared employment, examining 237,455 businesses. Within this extensive audit, 28,044 businesses were found to have undeclared workers, marking a challenge that needed targeted intervention. This constituted 11.81% of the audited entities, underlining the persistent issue faced by the regulatory authorities. During these years, a total of 812,460 employees underwent scrutiny, revealing the magnitude of the labour market under regulatory vigilance. Within this workforce, 44,642 individuals

were identified as undeclared workers, constituting 5.49% of the total workforce examined. This percentage, while a notable reduction, still highlighted the need for further efforts to eradicate informal employment practices entirely. The fines imposed throughout these years amounted to a substantial €468,997,663, signifying the financial consequences faced by non-compliant entities. These fines, coupled with stringent regulatory measures, served as deterrents, aiming to create a disincentive for businesses engaging in undeclared labour practices.

In evaluating the measures undertaken by the Ministry of Labour and Social Affairs in combating undeclared employment, several key observations come to light. **High Fine Policy:** The imposition of substantial fines, including the severe penalty of 10,500 euros for first-time offenders engaged in undeclared work, has played a pivotal role. By acting as a financial deterrent, this policy has underscored the seriousness of undeclared employment, compelling businesses to reconsider engaging in such practices. **Reduction in Non-Salary Costs:** The reduction of 6 units in insurance contributions for businesses not only alleviated their financial burden but also incentivized compliance. By easing the cost pressures, this measure encouraged businesses to operate within the legal framework, ensuring timely payment of contributions and declaring their workforce accurately. **Development of the ERGANI Information System:** The inception of the innovative ERGANI information system served as a protective shield, fostering transparency and accountability. Through a comprehensive mapping of the labour market, this initiative safeguarded the interests of both employees and businesses adhering to compliance. It allowed for real-time monitoring, making it significantly harder for businesses to engage in undeclared employment without facing detection. **Modernization of Fines Framework:** The continuous enhancement of the fines framework, including the establishment of an electronic register of offenders and fortification of the Labour Inspection Corps, showcased a commitment to staying ahead of evolving tactics employed by non-compliant entities. These technological advancements ensured that regulatory bodies were well-equipped to combat emerging challenges effectively. Looking ahead, policymakers and stakeholders must remain attuned to the evolving dynamics of the labour market, leveraging the lessons learned from this research to refine existing strategies and formulate targeted interventions.

DISCUSSION

The comprehensive analysis of Greece's efforts to combat uninsured employment reveals a nuanced landscape shaped by multifaceted strategies. The dynamic interplay between regulatory initiatives and the challenges presented by undeclared work underscores the complexity of fostering compliance in the labour market. Over the past years, persistent undeclared work has been acknowledged as resistant to economic development. The traditional labour market scheme of standard work forms prevailed in the Greek economy until the turn of the 21st century. According to the findings of the Hellenic Statistical Authority, full-time employment with indefinite contracts was common among the majority of employees, and there was robust collective bargaining and unionization (Labour force (quarterly data), 2023). The institutional framework of the Greek labour market was characterized by significant state intervention. However, the recession that struck Greece in 2009 laid bare structural inefficiencies, necessitating austerity measures for robust and enduring fiscal consolidation and profound structural reforms. According to D. Bunn (2018), the economic downturn also exerted considerable pressure on the private sector, with Greek companies bearing the highest tax burden among OECD countries over the past decade. This situation, coupled with an extraordinary unemployment rate reaching 27.8% in September 2013, as reported by CEIC data (Greece unemployment rate, 2019), created a backdrop for substantial labour market reforms.

The proportion of businesses engaging in undeclared activities is higher when accounting for the unreported segment of registered businesses, which may understate their turnover, number of employees, or employees' wages. Undeclared work creates unfair competition for legitimate businesses. Findings by C.C. Williams & S. Bezeredi (2018) demonstrate that businesses facing significant competition from those operating in the undeclared economy experience lower annual sales growth. Furthermore, their research shows that these businesses also exhibit lower productivity compared to those not competing with informal counterparts. The researcher M. Dzhulai (2022)

conducted a study among the younger generation of the working population of Ukraine on their motivation to work. In addition to the usual needs, such as the level of wages, the prestige of the chosen company, the fact of official employment and a fair labour market proved to be crucial for the respondents. It is crucial to recognize that the fight against undeclared employment is an iterative process, demanding adaptability in enforcement strategies to address evolving challenges. The shift towards a fair and transparent business environment is evident in Greece, which can be seen from this research, yet persistent non-compliance highlights the resilience of informal practices. The intricate relationship between regulatory measures and the complexities of undeclared work necessitates ongoing evaluation and adaptation to ensure sustained success in promoting legal and ethical employment practices.

Despite the common assertion that undeclared work is more prevalent in service industries, there has been a lack of studies evaluating the impact of governmental measures on this issue. Similarly, while addressing undeclared work is a crucial concern for both national governments and supra-national organizations, there is currently a dearth of research on policy measures aimed at reducing undeclared work. There was a widespread belief that undeclared work would naturally diminish with economic development and modernization. However, recent scholarly recognition, as highlighted by A.M. Kedir *et al.* (2018), indicates its persistence not only in developing countries but also in developed ones. The period from 2014 to 2019 witnessed concerted efforts by the Greek government to combat uninsured employment and undeclared work. While significant strides have been made through initiatives like the ARTEMIS plan and the introduction of digital monitoring systems, challenges persist. A holistic approach, grounded in rigorous research, continuous evaluation, and international best practices, is imperative. By addressing the root causes, understanding societal implications, and leveraging successful policy strategies from other nations, Greece can move toward a formalized labour market, ensuring economic growth and social security for its citizens. Thus, this paper contributes insights to the field of actuarial science, emphasizing the importance of robust regulatory frameworks in promoting fair, legal, and transparent labour markets.

Quantifying the magnitude and determinants of undeclared work presents methodological challenges, yet it is crucial for designing policy instruments that encourage declaration and deter under-reporting. Undeclared work is prevalent in household-related services, such as cleaning, childcare, and elderly care, as highlighted by the OECD (2021). Moreover, research conducted by the European Commission, Directorate-General for Employment, Social Affairs and Inclusion (2020) indicates that undeclared work is common in construction, hospitality, retail, and repair services, where taxes or social security contributions often go unreported. Various methods exist for estimating the extent of the shadow economy or undeclared work, both at macro and micro levels. Macro approaches, including the monetary transaction method, currency demand approach, income gap method, electricity approach, discrepancy method, and MIMIC estimation procedure, are discussed by P. Dybka *et al.* (2019). However, it is important to note that macro methods tend to overestimate the size of the shadow economy, as highlighted by F. Schneider (2023), whereas micro approaches provide lower-bound estimates. L. Burgstaller *et al.* (2022) delve into survey techniques alongside experimental expansions of traditional survey approaches. They stress the absence of a single supreme method for gauging and elucidating unreported labour or the entirety of the clandestine economy. Each approach possesses its own set of advantages and drawbacks, advocating for the utilization of multiple methods whenever feasible.

Macro approaches to estimating the shadow economy and undeclared work are sensitive to their underlying assumptions and calculations. These methods often encounter the “double counting problem” because they include legally purchased material, as noted by F. Schneider and A. Buehn (2018). For instance, the MIMIC method only provides relative coefficients rather than absolute values, relying heavily on calibration procedures. It is essential to recognize that while macro approaches offer insights into overall trends of the shadow economy, they struggle to distinguish between the shadow economy and undeclared work. This limitation underscores the need for complementary micro-level approaches to provide more nuanced insights into the dynamics of undeclared work. While the substantial increase in audited businesses in Greece from 2014 to 2019

reflects a proactive regulatory approach, the fluctuations in the number of businesses with undeclared workers indicate the ongoing struggle to eradicate non-compliance entirely. The declining trend in the percentage of undeclared workers and the notable increase in fines imposed underscore regulatory success but also emphasize the need for continuous vigilance.

Furthermore, F. Schneider (2023) emphasizes that the survey technique is particularly effective in distinguishing undeclared work from other activities within the shadow economy. Recent studies, such as those by P. Elek & J. Köllő (2019), have utilized survey-based methods along with administrative data to estimate the fraction of undeclared work. However, it's important to acknowledge that survey data may be susceptible to dishonest answering behaviour, known as social desirability bias. This bias arises from respondents' concerns about self-presentation, leading them to distort their answering behaviour by omitting or lying about socially undesirable decisions. Apart from surveys, questions related to tax compliance are also investigated through laboratory and field experiments. These alternative methods provide additional insights into understanding and addressing issues surrounding undeclared work and tax evasion.

The research conducted by J. Søndergaard (2023) leverages data from the Danish Labour Force Survey combined with individual-level tax information. This methodological approach allows for the calculation of undeclared work estimates consistent with prior investigations in Denmark concerning various facets of undeclared labour. Specifically, the findings indicate that around 29% of employees engage in unreported work hours, comprising 25% of those receiving wages and 37-39% of those not receiving wages. Furthermore, the monetary worth of these unreported hours is estimated to be approximately 2% of Denmark's Gross Domestic Product (GDP). N. Gavaille & A. Zasova (2023) investigate how a significant increase in the minimum wage, coupled with prevalent wage underreporting, impacts employment at the firm level. They find that firms involved in evading labour taxes remain unaffected by the minimum wage surge. Instead, these firms adapt by utilizing wage underreporting as a means of adjustment, converting a portion of their previously unreported cash payments into documented wages. While raising the minimum wage enhances tax compliance, it concurrently leads to adverse employment outcomes for law-abiding firms. The work of I. Koranyi *et al.* (2018) has linked precarious work with occupational accidents, while H. Alali *et al.* (2017) have reported specific indicators of non-standard work arrangements such as shiftwork to be notably correlated with absences due to work-related accidents. These studies collectively underscore the complex interplay between labour practices and workplace safety, emphasizing the need for comprehensive strategies to address these issues. The summarized data in this study paints a comprehensive picture of the multifaceted approach adopted by Greece to curtail undeclared employment. It demonstrates the scale of regulatory actions, the prevalence of non-compliance, and the financial penalties imposed, showcasing the complexity of the issue at hand. With these insights, policymakers can continue refining strategies, ensuring a fair, transparent, and legal labour market for Greece's workforce.

CONCLUSIONS

In summary, the detailed examination of Greece's endeavours to combat uninsured employment between 2014 and 2019 illuminates a multifaceted terrain marked by regulatory intricacies and persistent challenges in eliminating undeclared work. The substantial upswing in audited businesses underscores the government's proactive regulatory stance, signalling a commitment to fostering equitable and legal labour markets. However, the fluctuations in the incidence of businesses with undeclared workers reveal an ongoing struggle in completely eradicating non-compliance.

While the diminishing trend in the percentage of undeclared workers and the substantial reduction in fines denote regulatory successes, they also underscore the necessity for continuous vigilance. Effectively addressing undeclared employment is an iterative process, demanding adaptable enforcement strategies to grapple with emerging complexities. The trajectory toward a more equitable and transparent business environment is apparent, yet the resilience of informal practices underscores the persistent challenges faced by regulators.

The interplay between regulatory measures and the nuanced nature of undeclared work necessitates perpetual evaluation and adaptation. The period from 2014 to 2019 witnessed a concerted effort by the Greek government to curtail uninsured employment through initiatives such as the ARTEMIS plan and the implementation of digital monitoring systems. Although commendable outcomes have been achieved, challenges persist, necessitating a holistic approach grounded in rigorous research, continuous evaluation, and the integration of international best practices.

As Greece navigates the path toward a formalized labour market, comprehensive strategies addressing the root causes of undeclared work, societal implications, and successful policy frameworks from other nations become imperative. The insights derived from this research not only contribute to the field of actuarial science but also underscore the pivotal role of robust regulatory frameworks in shaping fair, legal, and transparent labour markets. Looking ahead, policymakers and stakeholders must remain attuned to the evolving dynamics of the labour market, leveraging the lessons learned from this research to refine existing strategies and formulate targeted interventions. By doing so, Greece can continue its trajectory toward a labour market characterized by economic growth, social security, and an unwavering commitment to legal and ethical employment practices. Future research endeavours should delve deeper into the intricacies of informal labour markets within specific sectors and demographic groups, providing a nuanced understanding of the complex dynamics at play.

ACKNOWLEDGEMENTS

I would like to express my heartfelt gratitude to the individuals who have been unwaveringly by my side throughout this research journey. Your constant support, encouragement, and camaraderie have been indispensable.

CONFLICT OF INTEREST

None.

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