Graduating at the wrong time: Labor market outcomes of college graduates during economic contractions

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Abstract

The severe economic contraction caused by the COVID-19 pandemic has led to high unemployment rates among college graduates. Fresh graduates entering the labor market are often highly sensitive to prevailing economic conditions. The impact of graduating at an unfavorable time can also vary significantly among workers, depending on their field of study. This study has two main objectives. First, it examines the effect of graduation timing, proxied by the unemployment rate, on labor absorption in Indonesia and how long these effects persist. Second, it analyzes the differences in job market sensitivity across disciplines among college graduates in Indonesia, particularly during economic contractions. The data used in this study come from the 2021 Indonesian National Labor Force Survey (Sakernas). The findings indicate that those who graduate during unfavorable economic conditions tend to experience significant income declines for over 10 years. Moreover, they face lower chances of obtaining decent jobs and are more likely to be overeducated for their roles. Additionally, college graduates from STEM (Science, Technology, Engineering, and Mathematics) fields experience less income compared to those from social sciences and humanities disciplines. The findings of this study are expected to provide valuable insights for policymakers in promoting income stability, aligning education with labor market demands, ensuring equal access, and fostering cross-disciplinary inclusivity. These efforts could contribute to developing a resilient and adaptive workforce capable of overcoming economic challenges and supporting sustainable economic growth.

Keywords: labor market; unemployment rate; STEM; income
JEL Classification: J24; J21; E32

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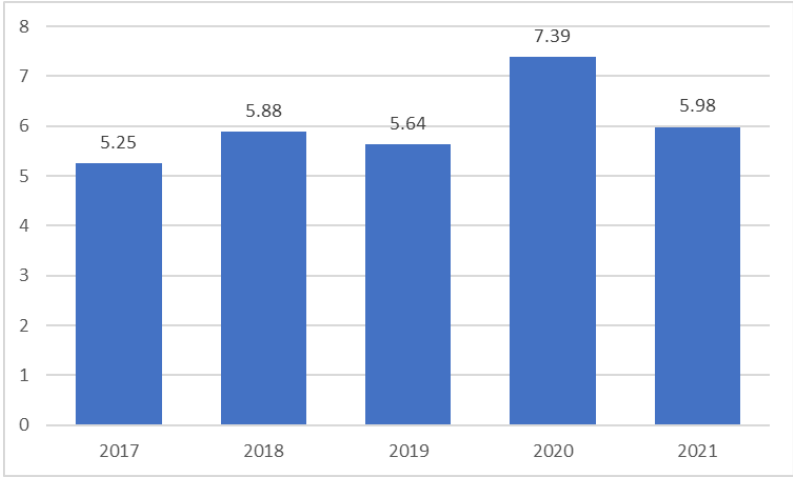
1. Introduction

The economic downturn caused by the COVID-19 pandemic has significantly disrupted labor markets worldwide, including in Indonesia. The country experienced a sharp increase in unemployment rates, with college graduate unemployment rising from 5.64% in 2019 to 7.39% in 2020. This situation has been particularly challenging for fresh graduates entering the job market for the first time, as their employment prospects are highly sensitive to prevailing economic conditions. Empirical studies have shown that graduates who enter the labor market during a recession face higher unemployment risks, lower starting wages, and reduced career progression opportunities compared to those who graduate during periods of economic stability. The long-term consequences of these unfavorable initial labor market conditions include persistent wage losses and lower lifetime earnings (Kahn, 2010; Oreopoulos et al., 2012; Berge, 2018).

Figure 1. Unemployment among University/College Graduates, 2017-2021



Source: BPS (2025), Processed by Author

In reality, the impact of the COVID-19 labor market crisis can vary significantly across different groups of workers, depending on their field of education. Graduating from different fields of study results in different levels of human capital accumulation, leading to diverse labor market outcomes. Some academic disciplines provide highly specialized and job-specific skills that translate into stronger labor market performance. In contrast, others equip graduates with more general competencies that may not align as directly with employer demands. Additionally, the pandemic has had a heterogeneous impact on different employment sectors, affecting some graduates more severely than others. Prior research (e.g., Kim et al., 2015; Kirkeboen et al., 2016) underscores the significant correlation between field of study and labor market performance, highlighting the role of educational background in shaping employment prospects.

A growing body of literature suggests that the choice of academic discipline is a critical determinant of earnings potential. Studies have consistently found that graduates from technical and quantitative disciplines—such as engineering, mathematics, computer science, finance, and business—tend to earn higher-than-average salaries, while those from less quantitative fields, such as the humanities and arts, often have lower earnings (Finnie & Frenette, 2003; Grave & Goerlitz, 2012; Webber, 2014). These trends have been observed across various countries, including Germany (Wahrenburg & Weldi, 2007), the United States (Arcidiacono et al., 2012), Australia (Chia & Miller, 2008), and Ireland (Kelly et al., 2010), all of which report a significant income gap between graduates from STEM (Science, Technology, Engineering, and Mathematics) fields and those from social sciences and humanities.

A substantial body of literature has documented the long-term effects of economic conditions at the time of graduation on individuals' labor market outcomes (Genda et al., 2010; Oreopoulos et al., 2012; Liu et al., 2016; Hur, 2018; Berge, 2018; Han, 2018). Empirical evidence suggests that graduating during an economic downturn significantly increases the likelihood of unemployment and employment in lower-wage sectors. For instance, Genda et al. (2010) examined the consequences of male graduates entering the labor market during a recession in Japan and the United States. Their findings indicate that adverse economic conditions at graduation lead to higher unemployment risks and a greater probability of employment in low-wage sectors. Similar conclusions were drawn by Kahn (2010) and Berge (2018), who found persistent labor market disadvantages for individuals who graduated during economic downturns.

However, the magnitude of these negative effects varies depending on individual characteristics, including gender and race (Kondo, 2015; Han, 2018; Schwandt & von Wachter, 2019). Kondo (2015) found that male workers are disproportionately affected when entering the labor market during periods of high unemployment. Similarly, Han (2018) and Schwandt & von Wachter (2019) reported that male college graduates experience significant income declines and reduced employment opportunities in large firms if labor demand is weak at the time of graduation. Furthermore, Schwandt & von Wachter (2019) highlighted racial disparities in the impact of graduating during a recession, showing that Black workers experience more significant earnings losses, with annual incomes declining by approximately 4.4%.

The heterogeneity in labor market outcomes due to economic conditions at graduation is also evident across fields of study. Altonji (2016) demonstrated that the extent of earnings losses varies by educational discipline, with graduates from high-skilled fields, defined by their income potential, being less sensitive to economic downturns at graduation. Specifically, individuals with degrees in traditionally high-earning fields experience an income premium of nearly one-third when they graduate during severe recessions, and these effects persist for up to seven years post-graduation. This disparity in earnings trajectories suggests that graduates from high-skilled fields are more likely to secure full-time employment and transition into stable career paths than their counterparts in lower-skilled disciplines who graduate during economic downturns.

The mechanisms underlying the relationship between economic conditions at graduation and long-term labor market outcomes are attributed mainly to human

capital accumulation and productivity dynamics. A weak labor market at the time of graduation reduces access to employment opportunities, increasing the likelihood of unemployment, underemployment, and job mismatch due to limited job availability. This constrained labor market environment can impede the accumulation of human capital and, in some cases, contribute to its depreciation (Oreopoulos et al., 2012; Kahn, 2010). The resulting gaps in human capital accumulation lead to persistent productivity differentials between those who enter the labor market under favorable economic conditions and those who graduate during downturns (Altonji, 2016). Moreover, individuals with higher levels of human capital often face steeper earnings penalties when entering the labor market during recessions, as suggested by Waldman (2006), Altonji (2016), and Kondo (2008).

Despite the potential for early-career disadvantages, research also suggests that these negative effects may be mitigated if workers successfully transition into jobs aligned with their skills and expertise. Kahn (2010) argued that individuals who experience early-career unemployment or job mismatches can recover if they secure employment in their intended career paths once economic conditions improve. In such cases, income and employment disadvantages may only persist for one to two years. However, Altonji (2016) emphasized that a poor initial labor market match, particularly prolonged unemployment, can place graduates in positions with fewer training and promotion opportunities, leading to persistent long-term disadvantages.

While existing research provides valuable insights into the relationship between economic conditions at graduation and labor market outcomes, several gaps remain. A significant portion of prior studies (Genda et al., 2010; Oreopoulos et al., 2012; Liu et al., 2016; Han, 2018) have primarily focused on the experiences of graduates in developed economies, where strong social protection systems provide some degree of labor market stability. In contrast, there is a relative lack of empirical evidence on the long-term effects of economic downturns on graduates in developing economies, where labor markets tend to be more flexible and informal. Addressing this gap is critical to understanding the broader implications of graduating during economic crises in different labor market contexts.

Horizontal educational differentiation, particularly differences in fields of study, is widely regarded as a key determinant of labor market disparities. The choices individuals make when entering higher education can significantly shape their employment prospects after graduation. These variations in labor market outcomes can be understood through the lens of human capital theory, which posits that differences in labor market returns across college majors STEM from the distinct skill sets acquired during university education (Arcidiacono, 2004; Shauman, 2006; Reimer et al., 2008). The differences in skill acquisition lead to varying productivity levels and, consequently, wage disparities among graduates. Certain academic disciplines may foster more valuable job-related human capital than others, resulting in higher market rewards for graduates from those fields.

A substantial body of literature has documented the disparities in labor market outcomes across academic disciplines (Reimer et al., 2008; Ballarino & Bratti, 2009; Kirkeboen et al., 2016). For instance, Reimer et al. (2008) found that humanities graduates face higher unemployment risks than their peers from other disciplines.

Furthermore, graduates from health and welfare fields were found to have significantly lower occupational status than other graduates.

The study suggests that variations in the skill levels of students across different fields largely drive these differences in labor market performance. Similarly, Kirkeboen et al. (2016) examined the labor market returns to different post-secondary education fields and institutions. Their findings indicate that even after controlling for institutional quality, the economic returns to different fields of study vary substantially, highlighting the significant role of academic discipline in determining employment outcomes.

Ballarino & Bratti (2009) analyzed how different fields of study influenced university-to-work transitions in Italy between 1995 and 2004. Their results indicate that graduates from humanities fields earned lower wages and were more likely to accept informal employment, which is often associated with lower earnings, poor career prospects, and minimal job security. In contrast, fields of study with the strongest labor market performance, securing stable and permanent employment, were predominantly quantitative disciplines, such as engineering, natural sciences, and mathematics.

Differences in labor market outcomes across academic disciplines are also evident in wage levels. Prior research has demonstrated significant wage gaps between graduates from different fields of study (Walker & Zhu, 2011; Grave & Goerlitz, 2012; Altonji et al., 2012; Hastings et al., 2013; Bol & Heisig, 2021). For example, Bol & Heisig (2021) examined wage differences across six academic disciplines and found that engineering graduates earned approximately 9.9% more per hour than graduates from the other combined disciplines. Conversely, consistent with Reimer et al. (2008), their study confirmed that humanities graduates earned the lowest wages among all fields.

Findings by Hastings et al. (2013) further highlighted that graduates from health and science fields experience stronger positive labor market returns compared to those in other disciplines. The variation in earnings potential is often attributed to differences like skills provided by each field of study. Academic disciplines differ in terms of the specificity, applicability, and complexity of their curricula, shaping graduates' employability and earnings potential.

Building on this perspective, Noelke et al. (2012) elaborated that some academic disciplines equip students with highly specialized, job-specific skills. In contrast, others primarily impart general skills that lack a clear occupational orientation. Consequently, graduates from fields with a more substantial alignment to specific labor market demands tend to achieve better employment outcomes than those whose skills are more broadly applicable but less directly linked to specific job roles. These findings underscore the crucial role that the field of study plays in determining post-graduation employment prospects. In particular, STEM graduates consistently outperform their peers from social sciences and humanities in terms of earnings, employment stability, and job security, reinforcing the importance of skill specificity and labor market alignment in shaping career trajectories.

Despite these insights, there remains a gap in the literature regarding the combined effect of graduation timing and field of study on long-term labor market outcomes, particularly during economic downturns. While previous research has extensively examined the effects of graduating in a recession, studies that integrate the role of academic discipline in shaping employment prospects under such

conditions are relatively scarce. This study seeks to fill this gap by analyzing the labor market outcomes of university graduates in Indonesia with the economic conditions at the time of graduation. Specifically, this research aims to determine how long the effects of graduating during an economic downturn persist and whether these effects differ between STEM and social sciences graduates.

This study utilizes secondary data from the 2021 Indonesian National Labor Force Survey (Sakernas), collected by Indonesia's Central Bureau of Statistics (BPS). The dataset provides comprehensive information on graduation cohorts, employment outcomes, and labor market absorption rates. It is well-suited for analyzing the interplay between economic conditions at graduation and labor market performance. To facilitate analysis, graduates are categorized into two broad academic disciplines: STEM, which includes natural sciences, mathematics, computer science, engineering, manufacturing, and health sciences; and Social Sciences, which encompasses education, humanities, arts, law, business, and religious studies. By addressing these research questions, this study aims to contribute to the broader discussion on labor market resilience among university graduates during economic downturns. The findings will offer valuable insights into how graduation timing affects employment prospects in a developing economy and whether differences in academic disciplines play a role in mitigating or exacerbating the negative effects of economic contractions on graduate employment.

2. Methodology

The primary data source for this study is the 2021 National Labor Force Survey (Sakernas), which includes more than 40,000 university graduates. Sakernas provides individual-level data on various labor force indicators, including socio-demographic characteristics and labor market attributes. Statistics Indonesia (BPS) conducts this survey annually and is widely utilized as a key instrument for analyzing labor market dynamics.
The equation to be estimated in this study can be formulated as follows:

$$Labor\ Outcome_i = \alpha_0 + \beta_1 U_t + \beta_2 U_t * Exp_i + \psi X_i + \varepsilon_i \quad (1)$$

Several key dependent variables in this study represent the long-term labor market outcomes of graduates who entered the workforce during an economic crisis. These include wage levels, employment status (dummy variable), formal employment (dummy variable), middle-class worker status (dummy variable), entrepreneurship (dummy variable), and overeducation (dummy variable). Meanwhile, the primary independent variable is the national unemployment rate (U) at the time of labor market entry, following previous studies by Kahn (2010), Oreopoulos et al. (2012), and Han (2018). This variable serves as a proxy for graduation timing, which is the central focus of this study.

Equation (1) is estimated using Ordinary Least Squares (OLS) regression and Logit regression for categorical dependent variables. To ensure the robustness of the estimation results, this study also employs a multilevel model (hierarchical/mixed-effects model) at the national level as an alternative estimation method. This approach accounts for potential hierarchical structures in the data, such as variations across graduation years or regional differences that may

influence national-level estimation results. Table 1 presents the sample size distribution based on graduation years. The substantial variation in national unemployment rates from 2002 to 2021, during which the sampled individuals completed their higher education, provides a valuable basis for this study. This variation allows for a more comprehensive analysis of how economic conditions at the time of graduation influence long-term labor market outcomes.

Table 1. Sample Distribution of University Graduates by Graduation Year

Graduation Year	Frequency (person)	Unemployment Rate (%)	Economic Crisis Condition
2002	1,059	9.06	Moderate
2003	1,154	9.67	High
2004	1,346	9.86	High
2005	1,498	11.24	High
2006	1,431	10.28	High
2007	1,469	9.11	Moderate
2008	1,575	8.39	Moderate
2009	1,713	7.87	Moderate
2010	2,204	7.14	Moderate
2011	2,121	6.13	Moderate
2012	2,556	6.17	Moderate
2013	2,559	6.18	Moderate
2014	2,673	5.94	Moderate
2015	2,626	6.18	Moderate
2016	2,632	5.61	Moderate
2017	2,704	5.50	Low
2018	2,776	5.30	Low
2019	3,183	5.23	Low
2020	2,726	7.07	Moderate
2021	1,384	6.49	Moderate
Total	41,389	mean = 7.42	

Source: Processed by Author

Over time, the impact of adverse economic conditions at the initial entry into the labor market may vary depending on an individual's work experience. Therefore, this study incorporates the variable Exp, which represents an individual's potential work experience, measured by the years since graduation. Additionally, U × Exp captures the interaction between the national unemployment rate and potential work experience, aiming to illustrate how the effects evolve over time. The coefficient β_1 reflects the initial impact of the unemployment rate at labor market entry on individual labor market outcomes, while β_2 indicates how this effect changes over time.

Furthermore, to examine the heterogeneity across fields of study, this study adopts the approach of Altinji et al. (2016) by modifying Equation (1) and incorporating a field-of-study dummy variable as follows:

$$Labor\ Outcome_i = \alpha_0 + \beta_1 U_t + \beta_2 U_t * Exp_i * D_{STEM} + \psi X_i + \varepsilon_i \quad (2)$$

Where D_{STEM} is a dummy variable representing graduates from STEM fields (Science, Technology, Engineering, and Mathematics), with graduates from social sciences serving as the reference category. In Equation (2), the coefficient β_2 captures the extent to which graduation timing influences individual labor market

outcomes across different fields of study over time. Additionally, this study accounts for individual characteristics X_i as control variables, which may also influence labor market outcomes. These control variables include socio-demographic attributes such as gender, age, place of residence, and marital status.

3. Results and Discussion

Appendix 1 presents the labor market outcomes for university graduates who entered the workforce during periods of economic downturn. The results indicate a negative association between the unemployment rate at graduation and earnings, with an estimated coefficient of -0.05, which is statistically significant at the 1 percent level. This implies that the higher the unemployment rate at the time of graduation, the lower the income individuals earn. In other words, graduates who enter the labor market during high unemployment tend to experience lower earnings. Individuals entering the workforce during economic downturns face particularly unfavorable job prospects. Elevated unemployment rates, combined with widespread job losses resulting from economic crises, significantly limit employment opportunities. These findings are consistent with prior studies documenting a negative correlation between graduation timing and labor market prospects (Schwandt, 2019; Oreopoulos et al., 2012; Liu et al., 2016; Hur, 2018).

The estimation results in Appendix 1 further indicate that the negative impact of economic contraction at graduation (as reflected in the increase in local unemployment rates) can persist for more than a decade (13–15 years). However, this impact gradually diminishes over time, with the coefficient value of -0.033 in the first three years declining to -0.009 in years 13 to 15. The persistence of this effect aligns with previous studies, which attribute it to the loss of human capital accumulation that would have been obtained through education (Altonji et al., 2016; Kahn, 2010), constraints and difficulties in securing stable employment (Oreopoulos et al., 2012), and declining worker productivity due to the mismatch between educational qualifications and job requirements.

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The prolonged adverse effects and the slow recovery of crisis-era graduates may also be linked to structural and economic challenges specific to developing countries. In economies without comprehensive social security protections for the unemployed, individuals are more likely to accept any available job to sustain their livelihood, often in the informal sector. Economic crises tend to accelerate the expansion of informal employment, which is typically characterized by instability, lack of access to social safety nets, and lower earnings. University graduates may be

compelled to enter this sector as a survival strategy, which, in turn, could lead to long-term negative consequences for their earnings and career progression.

The estimation results in Appendix 1 further reveal several empirical factors explaining why crisis-era graduates experience substantial income declines. Graduates who enter the labor market during economic downturns exhibit a significantly lower probability of securing employment, as reflected in the coefficient value of -0.208, which is statistically significant at the 1 percent level. However, this challenge appears temporary, as labor market entry barriers tend to ease within the first three years. This finding suggests that while crisis graduates may face an initial delay in obtaining employment during economic contractions, they can eventually reenter the labor market.

Nonetheless, despite the improved likelihood of employment over time, crisis-era graduates are disproportionately trapped in informal employment. This is evident from the estimation results, which indicate that the severity of economic turmoil at graduation is negatively associated with the probability of securing formal employment (coefficient value of -0.206, significant at the 1 percent level). More concerningly, these graduates tend to remain in the informal sector for over a decade, resulting in persistent income penalties throughout their careers compared to those who graduated during periods of economic stability. The persistence of these negative effects can be attributed to several factors, including limited access to formal employment opportunities due to reduced investment in key economic sectors during crises, as well as difficulties in meeting the skill requirements and credentials needed for formal sector jobs. Additionally, psychological effects and suboptimal policy responses may further restrict graduates' transition into formal employment.

In line with these findings, the long-term income disadvantages faced by crisis-era graduates are also linked to their lower likelihood of securing middle-class jobs within the first decade of their careers. According to the World Bank (2021), middle-class jobs are characterized by economic security, permanent contracts, and various social benefits, such as health insurance, workplace accident insurance, death benefits, retirement plans, pension schemes, paid annual leave, sick leave, and maternity leave. The estimation results in Appendix 1 indicate that adverse economic conditions at graduation significantly reduce the probability of securing middle-class employment (coefficient value of -0.167, significant at the 1 percent level). Even after a decade in the labor market, individuals who graduated during an economic crisis continue to struggle to gain access to middle-class employment opportunities.

Furthermore, the decline in earnings among recent graduates during periods of economic crisis is also associated with the phenomenon of mismatch between their level of education and the roles they undertake in the labor market. The estimation results presented in Appendix 1 indicate that the likelihood of graduates experiencing overeducation (where their educational qualifications exceed the requirements of their job) is reflected in a coefficient value of 0.154, which is statistically significant at the 1% level. Amid heightened economic uncertainty, recent graduates frequently encounter difficulties in securing employment that fully aligns with their educational background. This phenomenon has critical implications for graduates' economic well-being, as employment mismatches tend to lead to reduced productivity levels and lower earnings potential. These findings

are consistent with previous studies highlighting the negative impact of job mismatches on wages (Chevalier & Lindley, 2009; Robst, 2007; Mavromaras & McGuiness, 2012; Meroni & Vera-Toscano, 2017). The adverse effects of occupational mismatch on income can be explained by the fact that such mismatches lead to a waste of accumulated human capital, which, in turn, results in lower earnings and diminished job satisfaction (Robst, 2007; Boudarbat & Chernoff, 2012).

This study further examines the differential effects of graduating during a crisis across academic disciplines. Appendix 2 illustrates the disparities in labor market outcomes between graduates from STEM and Social Sciences and Humanities (SSH) disciplines. The results indicate that STEM graduates tend to be less affected by economic crises and exhibit higher earnings than their SSH counterparts. This suggests that graduates from SSH disciplines are more vulnerable in the labor market and experience prolonged negative impacts when graduating during an economic downturn. These findings align with previous research that has documented disparities in labor market outcomes across academic fields (Walker & Zhu, 2011; Grave & Goerlitz, 2012; Altonji et al., 2012; Hasting et al., 2013; Bol & Heisig, 2021). Strengthening the evidence on field-specific labor market outcomes, Walker and Zhu (2011) found that STEM graduates generally enjoy more significant returns on their educational investment than SSH graduates, particularly in volatile labor market conditions. Similarly, Grave and Goerlitz (2012) demonstrated that individuals with quantitative and technical skills tend to adapt more rapidly to economic changes and exhibit better long-term earning prospects. These findings reinforce that academic major selection plays a crucial role in shaping an individual's resilience to economic shocks, particularly for those graduating during a crisis.

Additionally, studies by Altonji et al. (2012) and Hasting et al. (2013) found that SSH graduates are more susceptible to prolonged periods of unemployment and face more significant challenges in aligning their skills with the evolving demands of the labor market. This can be attributed to the greater flexibility and technical expertise of STEM graduates, whose skills are more directly applicable to industry needs, particularly in an era of digitalization and automation. Consequently, the present study not only corroborates earlier findings but also provides additional evidence that economic conditions at graduation exacerbate existing disparities between academic disciplines. In this context, SSH graduates must adopt more adaptive strategies, such as enhancing their digital and technical competencies, to remain competitive in an increasingly dynamic labor market.

Furthermore, Bol and Heisig (2021) emphasize that labor market disparities between academic disciplines are not solely driven by economic factors but also by market perceptions of the skills associated with each field. STEM graduates are often regarded as possessing more concrete, job-ready competencies, whereas SSH graduates frequently require extensive experience and networking before achieving career stability. Therefore, this study not only confirms prior research but also underscores the need for more inclusive educational and employment policies to ensure that graduates from diverse academic backgrounds have equitable opportunities to navigate labor market challenges, particularly during periods of economic uncertainty.

The findings of this study contribute significantly to the existing literature on the effects of economic conditions at graduation on labor market outcomes. In line with previous research (Genda et al., 2010; Oreopoulos et al., 2012; Liu et al., 2016), the results confirm that graduates entering the labor market during economic downturns experience substantial income declines. However, this study expands upon these findings by demonstrating that the negative effects can persist for over a decade, with income losses gradually diminishing over time but remaining significant in the long term. These findings align with the work of Kahn (2010) and Altonji et al. (2016), who highlight the limitations in human capital accumulation as the primary mechanism underlying the prolonged impact of economic downturns on crisis-era graduates.

Additionally, this study provides new insights into the role of the informal sector as an intermediary in transmitting the effects of economic crises to graduates. Whereas previous studies (Kondo, 2015; Han, 2018) have focused mainly on the loss of formal employment opportunities for graduates during economic downturns, the findings of this study suggest that recession-era graduates are more likely to become trapped in informal employment for extended periods, which negatively affects their income stability. This highlights the importance of accounting for variations in labor market structures when analyzing the long-term impacts of economic crises, particularly in developing economies where the informal sector constitutes a significant portion of employment.

Moreover, this study deepens the analysis of crisis-induced heterogeneity in labor market outcomes by demonstrating that SSH graduates are more susceptible to income declines than their STEM counterparts. These findings support previous literature that underscores differences in employment prospects across academic disciplines (Walker & Zhu, 2011; Bol & Heisig, 2021) while offering new perspectives on how economic conditions at graduation exacerbate these disparities. Furthermore, this study reveals that graduates entering the labor market during a recession are more likely to experience job mismatches and overeducation, which, in turn, prolongs the negative effects of economic downturns on their careers (Robst, 2007; Chevalier & Lindley, 2009). Thus, this research not only reinforces existing findings but also enhances the understanding of how economic recessions interact with educational factors and labor market structures to shape the career trajectories of university graduates.

4. Conclusion

This study analyzes the impact of graduation timing on employment absorption in Indonesia, the duration of its effects, and the differences in employment absorption sensitivity across academic disciplines among university graduates, particularly during periods of economic contraction. The results indicate that graduates who complete their education during economic crises tend to experience a significant decline in earnings for more than a decade. Furthermore, these graduates also face lower chances of obtaining decent and well-matched employment opportunities. In addition, regarding the sensitivity of employment absorption across academic disciplines, this study finds that university graduates from social sciences and humanities disciplines tend to experience a more significant decline in earnings

compared to graduates from STEM (Science, Technology, Engineering, and Mathematics) disciplines.

A key implication of these findings is the necessity of interventions to mitigate the adverse effects of severe economic contractions. The sharp decline in earnings observed among graduates who complete their education during economic turbulence underscores the urgency of targeted policies designed to promote income stability and resilience. Policies should focus on establishing mechanisms to provide financial support, skill development, and retraining opportunities to reduce the long-term income decline these graduates face.

Moreover, given the reduced opportunities for securing decent employment and the prevalence of educational overqualification among those graduating in unfavorable economic conditions, policy interventions should prioritize aligning education and skills training with the evolving needs of the labor market. This issue requires more specific and well-coordinated collaboration between educational institutions, industries, and the government to ensure that educational programs are responsive to shifting labor market demands. Additionally, providing career counseling and guidance services can serve as an alternative approach to assist crisis-era graduates in making more informed career choices, thereby reducing the risk of persistent wage penalties throughout their careers.

Furthermore, this study highlights the importance of increasing access to decent employment for graduates of social sciences and humanities disciplines, who tend to be more vulnerable during economic downturns. This effort aims to reduce income disparities across various academic disciplines. The findings of this study are expected to make a significant contribution to policymakers in fostering income stability, ensuring alignment between education and labor market demands, and promoting equity in access while advancing inclusivity across disciplines. These efforts can potentially support the development of a resilient and adaptive workforce capable of addressing economic challenges and contributing to sustainable economic growth.

References

[1] Altonji, J. G., Blom, E., Meghir, C. (2012). Heterogeneity in human capital investments: High school curriculum, college major, and careers. Annual Review of Economics, 4 (1), 185–223.
[2] Altonji, J. G., Kahn, L. B., & Speer, J. D. (2016). Cashier or Consultant? Entry Labor Market Conditions, Field of Study, and Career Success. Journal of Labor Economics, 34(S1), S361–S401. doi:10.1086/682938
[3] Arcidiacono, P., (2004). Ability sorting and the returns to college major. Journal of Econometrics, 121 (1), 343–375.
[4] Arcidiacono, P., Hotz, V.J., Kang, S., (2012). Modeling college major choices using elicited measures of expectations and counterfactuals. Journal of Econometrics, 166 (1), 3–16.
[5] Ballarino, G., & Bratti, M. (2009). Field of Study and University Graduates' Early Employment Outcomes in Italy during 1995-2004. LABOUR, 23(3), 421–457. doi:10.1111/j.1467-9914.2009.00459.x
[6] Berge, W. van den. (2018). Bad start, bad match? The early career effects of graduating in a recession for vocational and academic graduates. Labour Economics, 53, 75–96. doi:10.1016/j.labeco.2018.05.011
[7] Bol, T., & Heisig, J. P. (2021). Explaining wage differentials by field of study among higher education graduates: Evidence from a large-scale survei of adult skills. Social Science Research, 99, 102594. doi:10.1016/j.ssresearch.2021.102594
[8] Boudarbat, B., & Chernoff, V. (2012). Education–job match among recent Canadian university graduates. Applied Economics Letters, 19(18), 1923-192
[9] Chevalier, A., & Lindley, J. (2009). Overeducation and the skills of UK graduates. Journal of the Royal Statistical Society: Series A (Statistics in Society), 172(2), 307-337.
[10] Chia, G., & Miller, P., W. (2008). Tertiary performance, field of study and graduate starting salaries. Australian Economic Review, 41 (1), 15–31.
[11] Finnie, R., & Frenette, M. (2003). Earning differences by major field of study: evidence from three cohorts of recent Canadian graduates. Economics of Education Review, 22 (2), 179–192.
[12] Genda, Y., Kondo, A., & Ohta, S. (2010). Long-Term Effects of a Recession at Labor Market Entry in Japan and the United States. Journal of Human Resources, 45(1), 157–196. doi:10.3368/jhr.45.1.157
[13] Görlitz, K., & Grave, B. S. (2012). Wage Differentials by Field of Study – The Case of German University Graduates. SSRN Electronic Journal. doi:10.2139/ssrn.2010443
[14] Han, J. (2018). Long-Term Effects of Labour Market Entry Conditions: The Case of Korea. Global Economic Review, 47(4), 434–463. doi:10.1080/1226508x.2018.1512417
[15] Hastings, J. S., Neilson, C. A., & Zimmerman, S. D. (2013). Are Some Degrees Worth More than Others? Evidence from college admission cutoffs in Chile. NBER Working Papers 19241, National Bureau of Economic Research, Inc.
[16] Hur, S. (2018). The lost generation of the Great Recession. Review of Economic Dynamics, 30, 179–202. doi:10.1016/j.red.2018.05.004
[17] Kahn, L. B. (2010). The long-term labor market consequences of graduating from college in a bad economy. Labour Economics, 17(2), 303–316. doi:10.1016/j.labeco.2009.09.002
[18] Kelly, E., O'Connell, P. J., Smyth, E. (2010). The economic returns to field of study and competencies among higher education graduates in Ireland. Economics of Education Review, 29 (4), 650–657
[19] Kirkeboen, L., Leuven, E., Mogstad, M. (2016). Field of study, earnings, and self-selection. The Quarterly Journal of Economics, 131 (3), 1057–1111.
[20] Mavromaras, K., & McGuinness, S. (2012). Overskilling dynamics and education pathways. Economics of Education Review, 31(5), 619-628.
[21] Meroni, E. C., & Vera-Toscano, E. (2017). The persistence of overeducation among recent graduates. Labour Economics, 48, 120-143.

[22] Noelke, C., Gebel, M., & Kogan, I. (2012). Uniform Inequalities: Institutional Differentiation and the Transition from Higher Education to Work in Post-socialist Central and Eastern Europe. European Sociological Review, 28, 704-716.
[23] Reimer, D., Noelke, C., Kucel, A., (2008). Labor market effects of field of study in comparative perspective an analysis of 22 European countries. International Journal of Comparative Sociology. 49 (4–5), 233–256.
[24] Robst, J. (2007). Education and job match: The relatedness of college major and work. Economics of Education Review, 26(4), 397-407.
[25] Shauman, K. A. (2006). Occupational sex segregation and the earnings of occupations: What causes the link among college-educated workers?. Social Science Research, 35(3), 577–619. doi:10.1016/j.ssresearch.2004.12.001
[26] Tran, T. Q., & Van Vu, H. (2020). Wage earning differentials by field of study: Evidence from Vietnamese university graduates. International Journal of Educational Development, 78, 102271. doi:10.1016/j.ijedudev.2020.102271
[27] Wahrenburg, M., & Weldi, M., (2007). Return on investment in higher education: evidence for different subjects, degrees and gender in Germany. Johann Wolfgang Goethe Univ., Chair of Banking and Finance.
[28] Walker, I., & Zhu, Y. (2011). Differences by degree: Evidence of the net financial rates of return to undergraduate study for England and Wales. Economics of Education Review, 30 (6), 1177–1186.
[29] Webber, D., (2014). Is the return to education the same for everybody? IZA World of Labor, Bonn, Germany.
[30] [World Bank 2021. Pathways to Middle-Class Jobs in Indonesia. World Bank

Appendix 1. Estimation Results of the Impact of Graduation Timing on Labor Market Outcomes

	Labor market outcome (all graduates)					
Variables	**ln(income)**	**Pr(employed)**	**Pr(formal sector employment)**	**Pr(middle-class employment)**	**Pr(self-employment)**	**Pr(overeducation)**
Unemployment rate at labor market entry	-0.050***	-0.208***	-0.121***	-0.167***	-0.032	0.056***
	(0.009)	(0.027)	(0.030)	(0.030)	(0.033)	(0.021)
Potential experience	0.053***	0.157***	0.059***	0.137***	0.060***	-0.060***
	(0.006)	(0.016)	(0.019)	(0.020)	(0.022)	(0.013)
Interaction between unemployment rate and potential experience:						
Unemployment rate at labor market entry						
X experience 1-3 (Years)	-0.033***	0.055**	-0.013	-0.074**	0.041	0.041**
	(0.008)	(0.024)	(0.028)	(0.029)	(0.033)	(0.020)
X experience 4-6 (Years)	-0.041***	0.057***	-0.007	-0.099***	0.035	0.020
	(0.006)	(0.019)	(0.022)	(0.020)	(0.024)	(0.015)
X experience 7-9 (Years)	-0.039***	0.015	-0.023	-0.077***	0.026	0.014
	(0.005)	(0.015)	(0.017)	(0.014)	(0.017)	(0.011)
X experience 10-12 (Years)	-0.022***	0.004	-0.012	-0.041***	0.015	0.005
	(0.003)	(0.011)	(0.011)	(0.009)	(0.011)	(0.008)
X experience 13-15 (Years)	-0.009***	-0.011	-0.025***	-0.018***	0.013	0.022***
	(0.003)	(0.010)	(0.010)	(0.007)	(0.009)	(0.006)
Constant	14.044***	-0.187	1.507***	-2.199***	-2.230***	-0.388***
	(0.059)	(0.181)	(0.200)	(0.184)	(0.214)	(0.140)
Observations	28,665	37,830	29,836	29,836	29,836	29,836

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The regression analysis also incorporates control variables, including gender, digital literacy, island of residence, and employment sector.

Appendix 2. Estimation Results of the Impact of Graduation Timing on Labor Market Outcomes by Field of Study

	Labor market outcome (all graduates)					
Variables	**ln(income)**	**Pr(employed)**	**Pr(formal sector employment)**	**Pr(middle-class employment)**	**Pr(self-employment)**	**Pr(Overeducation)**
Unemployment rate at labor market entry	-0.028***	-0.204***	-0.206***	-0.161***	-0.079***	0.154***
	(0.006)	(0.020)	(0.017)	(0.020)	(0.021)	(0.014)
Potential experience	0.059***	0.122***	0.104***	0.175***	0.068***	-0.109***
	(0.002)	(0.007)	(0.006)	(0.008)	(0.008)	(0.005)
Interaction between unemployment rate and potential experience:						
Unemployment rate at labor market entry						
STEM X experience 1-3 (Years)	0.042***	-0.038***	-0.022**	0.074***	-0.033**	-0.002
	(0.004)	(0.011)	(0.010)	(0.014)	(0.014)	(0.009)
STEM X experience 4-6 (Years)	0.023***	-0.016	0.002	0.024*	-0.002	0.018**
	(0.004)	(0.014)	(0.012)	(0.013)	(0.014)	(0.009)
STEM X experience 7-9 (Years)	0.008**	-0.055***	-0.045***	-0.008	0.009	0.054***
	(0.004)	(0.015)	(0.012)	(0.012)	(0.013)	(0.009)
STEM X experience 10-12 (Years)	0.013***	-0.030*	-0.017	0.011	0.009	0.028***
	(0.004)	(0.015)	(0.012)	(0.010)	(0.012)	(0.009)
STEM X experience 13-15 (Years)	0.016***	-0.027**	-0.038***	0.013	0.018*	0.037***
	(0.003)	(0.014)	(0.010)	(0.008)	(0.010)	(0.008)
Constant	13.639***	0.236**	0.008	-3.887***	-2.760***	0.758***
	(0.033)	(0.107)	(0.090)	(0.102)	(0.108)	(0.073)
Observations	28,665	37,830	29,836	29,836	29,836	29,836

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The regression analysis also incorporates control variables, including gender, digital literacy, island of residence, and employment sector.