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Economic Globalization and Fertility Rate: Evidence from Leading Export-Oriented Provinces in Indonesia

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ABSTRACT

*This study examines the relationship between economic globalization and fertility in Indonesia's 14 major exporting provinces during 2021–2025. Using a balanced panel dataset of 70 observations, the model is estimated through the Random Effect Model with the Panel EGLS Cross-section Random Effects method. Fertility Rate (FER) serves as the dependent variable. At the same time, Women in Higher Education (WHE), Female Labor Employment (FLE), Family Development Index (FAM), Child Care (CLD), Foreign Direct Investment (FDI), Trade Openness (TO), and Labor Leave Regulation (REG) are explanatory variables. The findings reveal that WHE, CLD, and TO significantly reduce FER, while FDI, FAM, and REG show weaker significance. FLE is not statistically significant. The positive WHE*REG interaction indicates that labor leave regulation attenuates the negative effect of women's higher education on fertility, highlighting the need for stronger maternity leave policies and interministerial policy synergy. These results highlight the necessity of institutional alignment between trade-led economic expansion and social policies, suggesting that expanding maternity benefits and standardizing interministerial policy governance are essential for maintaining demographic sustainability in rapidly globalizing developing economies.*

ABSTRAK

*Penelitian ini menguji pengaruh globalisasi ekonomi dan tingkat fertilitas pada 14 provinsi pengekspor utama di Indonesia selama periode 2021–2025. Menggunakan data panel seimbang sebanyak 70 observasi, model ini diestimasi menggunakan Random Effects Model dengan metode Panel EGLS Cross-section Random Effects. Fertility Rate (FER) bertindak sebagai variabel terikat, sedangkan Women in Higher Education (WHE), Female Labour Employment (FLE), Family Development Index (FAM), Child Care (CLD), Foreign Direct Investment (FDI), Trade Openness (TO), dan Labour Leave Regulation (REG) berfungsi sebagai variabel bebas. Temuan penelitian menunjukkan bahwa WHE, CLD, dan TO secara signifikan menurunkan FER, sementara FDI, FAM, dan REG menunjukkan tingkat signifikansi yang lebih lemah. FLE tidak signifikan secara statistik. Interaksi positif antara WHE*REG mengindikasikan bahwa regulasi cuti kerja memperlemah efek negatif pendidikan tinggi perempuan terhadap fertilitas, yang menegaskan pentingnya kebijakan cuti melahirkan yang lebih kuat serta sinergi lintas kementerian. Hasil-hasil ini menyoroti perlunya keselarasan institusional antara ekspansi ekonomi berbasis perdagangan dan kebijakan sosial. Hal ini menunjukkan bahwa perluasan manfaat cuti melahirkan serta pembakuan tata kelola kebijakan lintas kementerian sangat penting untuk menjaga keberlanjutan demografis di negara berkembang yang mengalami globalisasi secara pesat.*

1. INTRODUCTION

Globalization has emerged as a major structural force reshaping Indonesia's socioeconomic and demographic dynamics. This process operates through the integration of international trade (Cevik, 2025), the expansion of foreign direct investment flows (Alami, 2026), the deepening of global value chains (Zahoor et al., 2023), the transformation of labor markets (Hossain et al., 2022; Koutroukis et al., 2022), and the changing role of women in education and economic life (Asongu & Odhiambo, 2023; Yeganeh, 2024). These developments are reflected in the increasing importance of foreign trade within the national economy. Statistics Indonesia (Badan Pusat Statistik/BPS) reported that Indonesia's export value from January to December 2024 reached USD 264.70 billion, representing a 2.29% increase compared with the same period in 2023. Meanwhile, non-oil and gas exports amounted to USD 248.83 billion, increasing by 2.46%. This growth indicates that Indonesia's integration with global markets remains substantial and provides an important context for understanding regional socioeconomic transformation.

Indonesia has experienced a substantial fertility transition over the past five decades. Data from BPS indicate that the nation's total fertility rate (TFR) decreased from 5.61 children per woman in the 1971 Population Census to 2.18 in the 2020 Long Form Population Census. This decline signifies a noteworthy demographic transformation, specifically a transition from a high-fertility regime to a lower, more planned fertility pattern. In several prominent exporting provinces, the TFR has already fallen below or approached the population replacement level, including DKI Jakarta at 1.75, East Java at 1.98, Banten at 2.01, Central Java at 2.09, and West Java at 2.11. Nonetheless, other provinces within the group of major exporting regions continue to demonstrate relatively higher fertility levels, such as North Sumatra (2.48), North Maluku (2.47), Central Sulawesi (2.32), and South Kalimantan (2.31). This variation indicates that fertility patterns across Indonesia's leading exporting provinces are markedly heterogeneous; rather, they are influenced by disparities in economic structure, social conditions, institutional frameworks, and regional demographic characteristics.

Fertility is a crucial indicator of demographic change because it reflects reproductive decision-making within a given population and territory. Fertility should not be understood merely as a biological process or a private household decision, but rather as the outcome of interactions among economic conditions (Kotzamanis & Kostaki, 2024), educational attainment (Kountouris, 2020; Mishra & Parasnis, 2017), employment opportunities, gender norms (Ouahid et al., 2025), family quality (Yang & Spencer, 2022), and social policy support (Rovny, 2011). As economic structures change through trade openness and investment flows, households also encounter shifts in living costs, labor market opportunities, educational aspirations, and the opportunity costs of childbearing. Consequently, fertility becomes a relevant issue to investigate within the context of regional economic globalization.

In this study, fertility was measured using the fertility rate (FER) and was positioned as the dependent variable. Fertility is assumed to be influenced by economic globalization, women's educational transformation, women's participation in the labor market, the quality of family development, childcare support, and labor-related regulatory frameworks. Globalization may reduce fertility through the expansion of women's education, broader employment opportunities, urbanization, rising living costs, and changing family aspirations. Nevertheless, these effects are unlikely to be uniform across regions, since each province differs in its economic structure, institutional quality, social norms, and capacity to provide social services.

The globalization dimension in this study is measured through foreign direct investment (FDI) and trade openness (TO). FDI reflects the inflow of foreign capital that may stimulate industrialization, employment creation, technology transfer, and structural economic change at the regional level. The Ministry of Investment/BKPM records investment realization based on investment activity reports submitted by foreign and domestic investment companies, with data presented periodically by location and sector. This indicates that investment serves as an important indicator for assessing the intensity of regional economic transformation. TO captures the degree of trade openness in a region through export and import activities. In major exporting provinces, FDI and TO are particularly important indicators because both represent the extent of regional connectedness to the global economy.

Beyond globalization-related factors, this study identifies women's education and labor force participation as key mechanisms influencing fertility change. Women in Higher Education (WHE) capture women's participation in tertiary education, which may affect fertility through delayed marriage, career aspirations, greater decision-making autonomy, and increased emphasis on economic readiness and child quality. Female labor employment (FLE) represents women's engagement in the labor market. Although female labor force participation in Indonesia increased to 56.42% in August 2024, compared with 84.66% for

men, substantial gender disparities remain. Women's employment may increase household income and economic independence, while also raising the opportunity costs of childbearing. Consequently, its effect on fertility depends on factors such as employment stability, working conditions, maternity protection, and childcare support.

Family quality and childcare availability further shape fertility decisions. The Family Development Index (FAM) reflects family welfare, resilience, and functioning, which may encourage more deliberate and planned fertility decisions. However, higher family development may lead families to have fewer children while investing more in each child's quality. Similarly, Child Care (CLD) represents the availability of childcare services that can reduce caregiving burdens and facilitate women's participation in employment. Nevertheless, greater childcare availability may also characterize more urbanized and modern regions, where fertility preferences tend to be lower and more planned. This study also incorporates Labor Leave Regulation (REG), referring to workers' leave provisions under Law No. 4 of 2024 concerning Maternal and Child Welfare during the First Thousand Days of Life. This law regulates rights and obligations, duties and authorities, the implementation of maternal and child welfare, data and information systems, financing, and public participation. REG is positioned as an institutional variable that may influence fertility both directly and as a moderating factor. Directly, labor leave regulation may affect fertility decisions by providing protection for workers during pregnancy, childbirth, and early childcare. As a moderating variable, REG may strengthen or weaken the relationships between women's education, women's employment, family development, childcare, economic globalization, and fertility.

While existing studies explore fertility determinants in Indonesia and Southeast Asia, this study addresses three specific gaps. At the macro level, Subramaniam et al. (2015) confirmed long-run relationships between female labor force participation, income, infant mortality, and fertility rates across the ASEAN-5, yet their aggregate national analysis overlooked provincial variations, sub-national trade-investment splits, and labor regulation institutions. At the micro level, Bismoko et al. (2025) and Taqwim et al. (2025) demonstrated that matrilocal residence, wives' decision-making authority, and the rejection of wife-beating justifications reduce fertility preferences in Indonesian households. However, neither micro-study incorporated trade openness, foreign direct investment (FDI), childcare infrastructure, family development policy, or formal labor leave regulation, nor did they capture provincial structural aggregation. Furthermore, while Nyarko and Potter (2021) highlighted the socio-economic determinants of adolescent fertility through household wealth and employment status, broader structural shifts remain underexplored. This study addresses these gaps by shifting the unit of analysis to the provincial level across fourteen major Indonesian exporting provinces using FDI and trade openness, while introducing labor leave regulation under Law No. 4 of 2024 as a formal institutional moderator.

Based on this background, the present study seeks to address the following research question:

RQ1. How do Women in Higher Education (WHE), female labor employment (FLE), the Family Development Index (FAM), Child Care (CLD), Foreign Direct Investment (FDI), Trade Openness (TO), and labor leave regulation (REG) affect the Fertility Rate (FER) in Indonesia's 14 largest exporting provinces?

RQ2. Are economic globalization indicators, namely foreign direct investment (FDI) and trade openness (TO), associated with declining fertility or fertility change in Indonesia's major exporting provinces?

RQ3. What roles do women's higher education and women's labor absorption play in shaping the relationship between globalization and fertility?

RQ4. Do family development quality and childcare support help explain fertility variation across provinces with strong exposure to global markets

RQ5. Does Labor Leave Regulation (REG) moderate the relationships between WHE, FLE, FAM, CLD, FDI, TO and FER?

This study aims to investigate how women in higher education, female labor employment, the family development index, child care, foreign direct investment, trade openness, and labor leave regulation influence the fertility rate in Indonesia's 14 largest exporting provinces. It further examines whether labor leave regulation strengthens or weakens the effects of these explanatory variables on fertility. The findings of this study are expected to provide policy recommendations for the Ministry of Manpower, particularly in strengthening maternity leave policies for female workers. Furthermore, given the macro-level scope of the study, the results may contribute to enhancing policy synergy between the Ministry of Investment and the Ministry of Manpower, especially in promoting greater institutional concern for the welfare and protection of women workers.

2. THEORETICAL FRAMEWORK AND HYPOTHESES

Globalization, Economic Transformation, and Fertility

Fertility is fundamentally shaped by socio-economic and institutional transformations, conceptualized through the economic theory of the family as a resource allocation choice balancing child quantity against human capital quality (Becker & Barro, 1986; Nakagawa et al., 2022). Within the framework of globalization, macro-level analyses suggest that foreign direct investment (FDI) and trade openness (TO) act as structural catalysts that reshape labor markets and systematically depress fertility due to elevated opportunity costs (Li & He, 2025; Kaihao et al., 2022). However, the empirical literature on the globalization–fertility nexus remains contentious, as sub-national studies reveal that trade liberalization effects are heterogeneous and contingent upon localized institutional settings, industrial compositions, and regional economic pre-conditions (Luo & Zou, 2024; Ngoc et al., 2024).

This divergence exposes a critical research gap: macroeconomic scholarship frequently treats globalization as a uniform national force while neglecting how sub-national structural variations—such as export-oriented provincial economies—interact with institutional frameworks to determine reproductive behavior. Consequently, bridging these macroeconomic trends with micro-level proximate determinants, such as contraception, marriage age, and family norms (Bongaarts, 1978), requires shifting the unit of analysis to examine how localized globalization pressures interact with formal regulatory environments to influence fertility levels.

Women's Higher Education and Fertility

Higher education is widely theorized to depress fertility by prolonging schooling, delaying marriage, and elevating the opportunity costs of childbearing through career advancement and household cost-benefit calculi (Wang, 2025; Baltagi & Karatas, 2025; Gipson & Hindin, 2015). However, a critical examination of the empirical literature reveals that this relationship is far from a uniform linear decline. While traditional frameworks argue that educated women desire fewer children due to enhanced regulatory capacity and economic independence (J. Kim, 2023), contemporary demographic studies challenge this absolute reductionist view. For instance, empirical evidence from Canada demonstrates that higher education compresses fertility distribution rather than driving universal childlessness, showing that educated women are actually more likely to have at least one child while remaining less prone to large family sizes, thereby pointing toward highly planned reproductive behaviors (DeCicca & Krashinsky, 2023). This friction exposes a critical nuance, that education acts less as a simple suppressor of birth rates and more as a structural tool that restructures family planning and timing. Consequently, utilizing Women in Higher Education (WHE) to examine fertility rates (FER) requires a localized critical lens, particularly in major exporting provinces where integration into the global economy amplifies modern labor market opportunities.

Female Labour Absorption and Fertility

The relationship between women's employment and fertility is a central issue in economic demography. Theoretically, Brewster and Rindfuss (2000) argue that increased female labor force participation reduces fertility because employment raises the opportunity cost of childbearing. Pregnancy, childbirth, and childcare require substantial time and energy, which may disrupt employment continuity, particularly when the workplace does not provide adequate flexibility and social protection. Under such conditions, women may postpone marriage, delay childbirth, or limit the number of children they have.

Nevertheless, the effect of women's employment on fertility is not always negative. This relationship depends heavily on job quality, employment sector, wage level, flexibility, job security, and institutional support, including maternity leave and child care services. Wu and Wan (2023) and Shim and Park (2020) emphasized that stable and protected employment may strengthen household economic security, whereas inflexible work arrangements or jobs lacking adequate protection may intensify work-family conflict. Therefore, women's employment status alone is insufficient to explain fertility, unless the quality and conditions of employment are also considered.

Economic openness may increase the demand for female labor, particularly in manufacturing, services, trade, and export-oriented industries. However, its implications for family decisions depend on whether such employment provides adequate income, maternity protection, and compatibility with caregiving responsibilities. Evidence from Indonesia (Oishi & Wie, 2023), Brazil (Gaddis & Pieters, 2017), and Ethiopia (Giovannetti et al., 2022) consistently demonstrates that the impact of trade openness on women's employment may vary across regions and is strongly conditioned by the economic structure and the characteristics of expanding sectors.

Female labor employment (FLE) is used in this study to represent women's absorption into the labor market. FLE is expected to be associated with fertility because women's employment can alter household income, time allocation, the opportunity cost of childbearing, and family decision-making (Finlay, 2021). However, its effect may be heterogeneous because FLE does not necessarily capture employment quality, formal or informal sector status, work flexibility, or access to social protection (Qiuyan & Sheng-Ya, 2023; Sunday et al., 2024).

Familty Development and Fertility

Family is the primary social unit within which reproductive decisions are formed. Doohan (2024) argues that childbearing decisions are not determined solely by individual economic circumstances but also by the quality of family relationships, household resilience, welfare conditions, caregiving capacity, and the family's ability to allocate resources. Accordingly, family development constitutes an important dimension in explaining fertility, particularly in societies undergoing economic and social modernization.

Strengthening family capacity may encourage a shift in orientation from child quantity to child quality. More prosperous and better-planned families may choose to have fewer children to invest more substantially in each child's education, health, and welfare (Nakagawa et al., 2022). Therefore, family development does not necessarily lead to higher fertility. On the contrary, it may be associated with lower but more deliberate fertility, accompanied by a stronger emphasis on caregiving quality.

In this study, the family development index (FAM) was used to represent the quality of family development. The FAM reflects the capacity of families to perform protective, caregiving, welfare, and human capital formation functions. This variable is important because fertility is influenced not only by individual women's decisions but also by the readiness of the family as a social institution. In major exporting provinces experiencing rapid economic change, FAM may help explain how families respond to rising living costs, shifting norms, and growing demands for investment in child quality (Nielson et al., 2025).

Childcare, Caregiving Support, and Fertility

Childcare services constitute an institutional factor that may shape the relationship between women's employment and fertility rates. The availability of childcare may reduce domestic care burdens, help women maintain employment after childbirth, and improve compatibility between productive and reproductive roles. Therefore, childcare support is often regarded as an important instrument for mitigating work-family conflict (Tommar et al., 2022).

However, the relationship between childcare and fertility is not necessarily linear. On the one hand, childcare may encourage fertility by reducing the time costs of caregiving and enabling women to remain employed (Fukai, 2017). In contrast, Chen et al. (2023) found that childcare services are often more developed in urban, modern areas with higher levels of female labor force participation. Such regions also tend to be characterized by smaller family size preferences, higher living costs, and a stronger orientation toward child quality. Consequently, childcare may be associated with lower fertility when it reflects the characteristics of more modern regions and more planned family behaviors.

In this study, Child Care (CLD) is used to represent caregiving support. CLD is positioned as a factor that influences the ability of families, particularly women, to balance employment and childcare responsibilities. In provinces that are more open to the global economy, the demand for childcare becomes increasingly important because of intensified economic activity, urbanization, and women's growing participation in education and employment (Sen et al., 2026; Yakita, 2019).

Labour Leave Regulation and Fertility

Labor leave regulation represents an institutional form of support that may influence fertility by protecting workers, especially women, during pregnancy, childbirth, and early childcare. Family-friendly leave policies may reduce the risks of job loss, income decline (Nandi et al., 2018), discrimination (Lyu, 2025), and career disruption associated with childbearing (Bae & Yang, 2017). In this regard, leave regulation may enhance the compatibility between employment and family life.

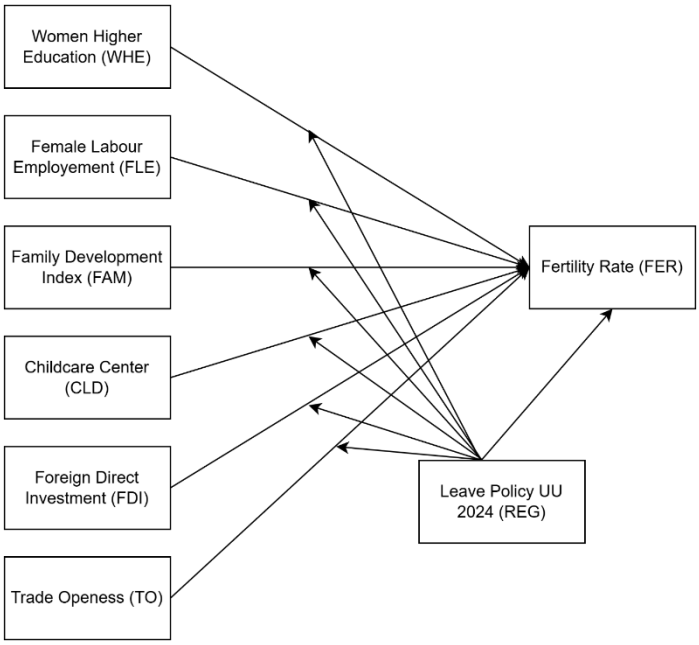
Family policies that support work-care balance may alleviate the pressures associated with low fertility, particularly among highly educated women and formal-sector workers (E. J. Kim & Parish, 2022). Within this context, leave regulation functions not only as a labor protection mechanism but also as a social policy instrument that shapes reproductive decision-making. When women receive adequate leave protection, the decision to have children may become more compatible with career continuity.

In this study, Labor Leave Regulation (REG) refers to workers' leave provisions under Law No. 4 of 2024. REG is positioned as a direct explanatory variable and a moderating variable. As a direct variable, REG

is expected to influence FER by providing protection for workers during pregnancy, childbirth, and early caregiving. As a moderating variable, REG is expected to strengthen or weaken the relationships between WHE, FLE, FAM, CLD, FDI, TO, and FER. More specifically, REG is expected to attenuate the negative effects of women's education and employment on fertility because leave regulation helps reduce conflict between productive and reproductive roles (E. J. Kim, 2020).

Conceptual Framework and Hypotheses

The conceptual framework of this study is built on the assumption that fertility in Indonesia's major exporting provinces is shaped not only by internal demographic factors but also by structural changes arising from economic globalization, the transformation of women's roles, family development, and social policy support. Figure 1 illustrates the study's conceptual framework.



Source: Authors' Work (2026)

Figure 1. **Conceptual Framework**

In this study, the fertility rate (FER) is positioned as the dependent variable, reflecting changes in reproductive behavior at the provincial level. Meanwhile, women in higher education (WHE), female labor employment (FLE), the family development index (FAM), child care (CLD), foreign direct investment (FDI), trade openness (TO), and labor leave regulation (REG) are treated as variables expected to influence fertility either directly or through moderating mechanisms.

Based on the proposed conceptual framework, the following research hypotheses were formulated:

H1: Women in Higher Education (WHE) have a negative effect on the fertility rate (FER) in Indonesia's 14 largest exporting provinces.

H2: Female labor employment (FLE) has a negative effect on the fertility rate (FER) in Indonesia's 14 largest exporting provinces.

H3: The Family Development Index (FAM) affects the fertility rate (FER) in Indonesia's 14 largest exporting provinces.

H4: Child care (CLD) affects the fertility rate (FER) in Indonesia's 14 largest exporting provinces.

H5: Foreign direct investment (FDI) has a negative effect on fertility rate (FER) in Indonesia's 14 largest exporting provinces.

H6: Trade openness (TO) has a negative effect on fertility rate (FER) in Indonesia's 14 largest exporting provinces.

H7: Labor Leave Regulation (REG) affects the fertility rate (FER) in Indonesia's 14 largest exporting provinces.

H8: Labor Leave Regulation (REG) moderates the relationship between Women in Higher Education (WHE) and the Fertility Rate (FER).

H9: Labor Leave Regulation (REG) moderates the relationship between female labor employment (FLE) and the fertility rate (FER).

H10: Labor Leave Regulation (REG) moderates the relationship between the Family Development Index (FAM) and Fertility Rate (FER).

H11: Labor Leave Regulation (REG) moderates the relationship between child care (CLD) and the fertility rate (FER).

H12: Labor Leave Regulation (REG) moderates the relationship between Foreign Direct Investment (FDI) and the Fertility Rate (FER).

H13: Labour Leave Regulation (REG) moderates the relationship between Trade Openness (TO) and the Fertility Rate (FER).

3. RESEARCH METHOD

Research Design

This study employs a quantitative research approach using a panel data design to examine the relationships among globalization, women's education, female labor absorption, family development, childcare support, labor leave regulation, and fertility in Indonesia. The panel data approach is considered appropriate because it combines both cross-sectional and time-series dimensions, thereby enabling the analysis to capture variations across provinces as well as changes in the observed variables over the study period.

The empirical focus of this study is on provinces that demonstrate strong integration with the global economy through export activities. Accordingly, this study is not intended to describe fertility patterns across all Indonesian provinces in a general sense. Rather, it specifically aims to explain fertility dynamics in regions characterized by relatively high economic openness.

Global economic connectedness is not evenly distributed across Indonesian regions. Certain provinces play a more prominent role in export activities because of their economic bases in manufacturing, mining, plantations, processing industries, primary commodities, trade, and modern services. Publications by Statistics Indonesia (Badan Pusat Statistik/BPS) on exports by province of origin indicate that Indonesia's export data are classified by 38 provinces, sectors, commodity groups, commodities, destination countries, net weight, and free-on-board (FOB) value. This classification reveals substantial variations in export contributions across regions.

In this context, the study focuses on Indonesia's 14 largest exporting provinces: North Sumatra, Riau, South Sumatra, Lampung, Riau Islands, DKI Jakarta, West Java, Central Java, East Java, Banten, South Kalimantan, East Kalimantan, Central Sulawesi, and North Maluku. These provinces represent regions that are relatively more exposed to economic globalization through exports, investment, industrialization, and international trade. The observation period covers the years 2021–2025. With 14 provinces observed over five years, this study employs a balanced panel dataset consisting of 70 observations. A balanced panel structure indicates that each province has the same number of observations throughout the research period. This structure is important for maintaining estimation consistency and minimizing potential bias arising from unequal data availability across regions or time periods.

The dependent variable in this study is the fertility rate (FER), which represents the level of fertility in each province. FER is positioned as the main indicator for assessing how economic, social, and institutional changes are associated with reproductive decision-making among the population.

The main independent variables were women in higher education (WHE), female labor employment (FLE), the family development index (FAM), child care (CLD), foreign direct investment (FDI), trade openness (TO), and labor leave regulation (REG). WHE is used to capture women's participation in higher education. FLE represents the absorption of women into the labor force. FAM reflects the quality of family development, while CLD represents the availability or support of childcare services. FDI and TO are employed as indicators of economic globalization, whereas REG refers to labor leave regulation based on Law No. 4 of 2024.

In addition to being examined as a direct independent variable, REG is also incorporated as a moderating variable. The moderation analysis is conducted through interaction terms between REG and each of the main explanatory variables, namely, WHE*REG, FLE*REG, FAM*REG, CLD*REG, FDI*REG, and TO*REG. These interaction terms are used to assess whether labor leave regulation strengthens or weakens the relationships among socio-economic variables, globalization indicators, and fertility.

Research Model

The empirical model of this study was designed to examine both direct and moderating effects. The direct effects were assessed through the relationships between Women in Higher Education (WHE), Female Labour Employment (FLE), the Family Development Index (FAM), Child Care (CLD), Foreign Direct Investment (FDI), Trade Openness (TO), Labor Leave Regulation (REG), and the Fertility Rate (FER). Meanwhile, the moderating effects were examined through interaction terms between REG and each of the principal explanatory variables.

In general, the research model is specified as:

$$FER_{it} = \beta_0 + \beta_1 WHE_{it} + \beta_2 FLE_{it} + \beta_3 FAM_{it} + \beta_4 CLD_{it} + \beta_5 FDI_{it} + \beta_6 TO_{it} + \beta_7 REG_{it} + \beta_8 (WHE_{it} \times REG_{it}) + \beta_9 (FLE_{it} \times REG_{it}) + \beta_{10} (FAM_{it} \times REG_{it}) + \beta_{11} (CLD_{it} \times REG_{it}) + \beta_{12} (FDI_{it} \times REG_{it}) + \beta_{13} (TO_{it} \times REG_{it}) + \mu_i + \varepsilon_{it} \quad (1)$$

In this equation, i denotes province, t denotes year, β_0 represents the intercept, β_1–β_{13} denote the estimated coefficients, μ_i captures the random effect component across provinces, and ε_{it} represents the idiosyncratic error term. This model enables the study to account for unobserved interprovincial characteristics that may not be fully captured by the observed explanatory variables but may influence fertility outcomes.

The estimation is conducted using the Random Effect Model (REM) with the Panel EGLS Cross-section Random Effects method. The random effects specification is employed because the dataset has a panel structure that incorporates both cross-provincial and intertemporal variations. REM allows interprovincial heterogeneity to be incorporated into the model through a cross-section-specific error component (Hill et al., 2020; Kiross et al., 2020).

The use of the REM is particularly relevant because Indonesia's 14 largest exporting provinces differ considerably in their economic, social, and institutional characteristics. Some provinces are predominantly characterized by manufacturing and modern service-based economies, whereas others are more strongly associated with mining, plantations, primary commodities, industrial zones and international trade. These structural differences may influence fertility through women's education, labor market participation, family development, childcare availability, and the intensity of global economic integration.

Data analysis was conducted in several stages. First, a panel dataset was constructed based on Indonesia's 14 largest exporting provinces over the 2021–2025 period. Second, the dependent, independent, and interaction variables were specified in accordance with the conceptual framework of the study. Third, the model was estimated using the Random Effect Model with the Panel EGLS Cross-section Random Effects method. Fourth, the estimation results were evaluated based on coefficient direction, probability values, model fit indicators, and simultaneous statistical significance. Coefficient interpretation was conducted by considering both the direction of the relationship and the level of statistical significance. A negative coefficient indicates that an increase in the corresponding independent variable is associated with a decrease in FER, while a positive coefficient indicates a positive association with FER.

The moderating effect of REG is interpreted through the coefficients of the interaction terms. If an interaction coefficient is statistically significant, REG strengthens or weakens the relationship between the relevant explanatory variable and FER. Conversely, if the interaction coefficient is not statistically significant, REG is not statistically supported as altering the relationship between the main variable and fertility.

Model adequacy was evaluated using R-squared, adjusted R-squared, F-statistic, and Prob(F-statistic) values. R-squared was used to assess the proportion of variation in FER explained by the variables included in the model. Adjusted R-squared provides a measure of explanatory power after accounting for the number of predictors in the model. The F-statistic and Prob(F-statistic) were used to determine whether the independent variables and interaction terms were jointly significant in explaining fertility.

In addition, the random effects component was examined to assess the extent to which interprovincial variation contributes to the model. The rho value in the cross-section random component indicates the proportion of total variation attributable to differences across provinces. A high cross-section rho value implies that regional heterogeneity plays an important role in explaining fertility. This is

particularly relevant because major exporting provinces differ in terms of economic structure, industrialization level, educational quality, social support systems, and local labor market conditions.

4. DATA ANALYSIS AND DISCUSSION

Descriptive Statistics

Table 1 presents the descriptive statistics of the main variables used in this study. The total number of observations varies across variables owing to data availability during the 2021–2025 period for 14 provinces in Indonesia.

Table 1. **Descriptive Statistics**

Indicators	FER	WHE	FLE	FAM	CLD	FDI	TO
Mean	2.213000	54.52714	52.48000	60.94429	120.6429	43895342	118.1124
Median	2.220000	54.67500	52.26500	61.55000	47.00000	26918313	74.39479
Maximum	3.070000	62.34000	63.37000	75.60000	589.0000	1.39E+08	473.6869
Minimum	1.750000	48.32000	43.28000	51.50000	1.000000	1673382.	27.28437
Std. Dev.	0.220456	2.556283	4.704287	5.448192	162.5049	37418250	114.2180
Skewness	0.689842	0.288157	0.226766	0.297864	1.835140	0.924158	1.710238
Kurtosis	4.990283	3.778435	2.304616	2.654205	5.131692	2.810331	5.103846
Observations	70	70	70	70	70	70	70

Source: Authors Calculation (2026)

The descriptive statistics presented in Table 1 provide an overview of the distributional characteristics of the variables used in this study based on 70 balanced panel observations covering 14 major exporting provinces in Indonesia over the 2021–2025 period.

The dependent variable, fertility rate (FER), has a mean value of 2.213, with a median of 2.220. This indicates that, on average, fertility in the observed provinces is slightly above two children per woman, reflecting a relatively low and controlled fertility pattern among Indonesia's major exporting regions. The minimum value of FER is 1.750, while the maximum reaches 3.070, suggesting that fertility levels vary across provinces and years. The standard deviation of 0.220 indicates that the dispersion of fertility across the sample is relatively limited. However, the positive skewness value of 0.690 suggests that the distribution is moderately right-skewed, meaning that a number of observations record fertility levels above the sample average. The kurtosis value of 4.990 indicates a leptokurtic distribution, implying that FER values are more concentrated around the mean but contain relatively more extreme observations than a normal distribution.

Women in Higher Education (WHE) recorded a mean value of 54.527%, with a median of 54.675%. This suggests that women's participation in higher education in the selected provinces was relatively substantial. The minimum value of WHE was 48.320%, while the maximum reached 62.340%, indicating moderate variation across provinces and years. The standard deviation of 2.556 shows that differences in women's higher education participation are not highly dispersed. The skewness value of 0.288 indicates a slight right-skewed distribution, while the kurtosis value of 3.778 suggests that the distribution is somewhat more peaked than the normal distribution. Overall, these figures imply that women's higher education participation was relatively stable across the observed provinces.

Female labor employment (FLE), measured in percentage terms, has an average value of 52.480%, with a median of 52.265%. This indicates that slightly more than half of the female population or female labour-related group represented in the dataset is absorbed into employment across the selected provinces. The minimum value is 43.280%, while the maximum is 63.370%, showing that female labor absorption differs meaningfully across regions. The standard deviation of 4.704 indicates a moderate degree of variation. The positive skewness value of 0.227 suggests that the distribution is slightly right-skewed, while the kurtosis value of 2.305 indicates a relatively flatter distribution compared with the normal distribution. This suggests that FLE is more evenly spread across observations, with fewer extreme concentrations around the mean.

The family development index (FAM) had a mean value of 60.944 and a median of 61.550. These values indicate that the quality of family development in the observed provinces was generally at a moderate level. The index ranged from a minimum of 51.500 to a maximum of 75.600, suggesting notable differences in family development quality among the provinces. The standard deviation of 5.448 reflects a moderate level of dispersion. The skewness value of 0.298 shows a mild right-skewed distribution, while the kurtosis value

of 2.654 indicates that the distribution is slightly flatter than a normal distribution. These results suggest that although most provinces are clustered around the average level of family development, some provinces demonstrate substantially higher family development performance.

The Child Care (CLD) variable, measured by the number of childcare facilities or childcare-related units, shows a mean value of 120.643, whereas its median is considerably lower at 47.000. This large gap between the mean and median indicates that the distribution of childcare availability is highly uneven across the provinces. The minimum value is 1, while the maximum reaches 589, demonstrating substantial disparities in childcare provision among Indonesia's major exporting provinces. The standard deviation of 162.505 further confirms the high degree of variation in this variable. The skewness value of 1.835 indicates a strongly right-skewed distribution, meaning that a small number of provinces have very high childcare availability compared with the rest. The kurtosis value of 5.132 suggests a leptokurtic distribution, indicating the presence of extreme data values. This pattern implies that childcare services are likely to be concentrated in more urbanized, economically advanced, or institutionally developed provinces.

Foreign direct investment (FDI), measured in billion Indonesian rupiah, recorded a mean value of 43,895,342, with a median of 26,918,313. The difference between the mean and median indicates that FDI inflows are unevenly distributed across the observed provinces. The minimum value was 1,673,382, while the maximum reached 139,000,000, showing substantial disparities in foreign investment intensity. The standard deviation of 37,418,250 reflects a very high level of dispersion. The positive skewness value of 0.924 indicates that the distribution is right-skewed, suggesting that several provinces receive substantially higher FDI inflows than others. The kurtosis value of 2.810 is close to the normal distribution benchmark, although the high standard deviation still indicates considerable interprovincial inequality in foreign investment. These findings suggest that global capital exposure is concentrated in certain major exporting provinces.

Trade openness (TO), measured as a percentage, has a mean value of 118.112%, with a median of 74.395%. The fact that the mean is substantially higher than the median suggests that trade openness is not evenly distributed across the sample. The minimum value is 27.284%, while the maximum reaches 473.687%, indicating very large differences in the degree of external trade integration among the provinces. The standard deviation of 114.218 also reflects a high level of variation. The skewness value of 1.710 indicates a strongly right-skewed distribution, suggesting that several provinces are extremely open to international trade relative to the others. The kurtosis value of 5.104 further confirms the presence of extreme observations. This pattern is consistent with the study's focus on major exporting provinces, where some regions are highly dependent on export-oriented activities, international trade flows, and global market integration.

Panel Selection Model

To determine the most appropriate panel data estimation model, a sequence of model selection tests was conducted, including the Chow Test, Hausman Test, and Lagrange Multiplier (LM) Test.

Table 2. **Panel Selection Model**

Selection Test	Indicator	t-Statistic	Probability Value
Chow Test	Cross-Section F-statistic	8.168876	0.0000**
	Cross-Section Chi-square	87.083968	0.0000**
Hausman Test	Chi-square statistic	6.240418	0.9370
Lagrange Multiplier (Breusch–Pagan) Test	Cross-sectional effect	22.28509	0.0000**

Source: Authors Calculation (2026)

The Chow Test was first employed to compare the Common Effects Model (CEM) and the Fixed Effects Model (FEM). The results indicate that the cross-section F-statistic is 8.168876 with a probability value of 0.0000, while the cross-section Chi-square statistic is 87.083968 with a probability value of 0.0000. Since the p-values are below the 5% significance level, the null hypothesis of a common effect model is rejected, suggesting that the FEM is preferable to the CEM. Subsequently, the Hausman Test was performed to determine whether the Fixed Effects Model or the Random Effects Model (REM) is more appropriate. The test produced a Chi-square statistic of 6.240418 with a probability value of 0.9370. As the p-value exceeds 0.05, the null hypothesis cannot be rejected, indicating that the Random Effects Model is more suitable than the Fixed Effects Model. Finally, the Lagrange Multiplier (Breusch–Pagan) Test was applied to compare the Random Effects Model with the Common Effects Model. The Breusch–Pagan statistic for cross-sectional effects is 22.28509 with a probability value of 0.0000, indicating the presence of significant random effects.

Therefore, the Random Effects Model is preferred over the Common Effects Model. Based on the combined results of the Chow Test, Hausman Test, and Lagrange Multiplier Test, the REM was selected as the most appropriate model for estimating the panel data regression.

Panel Regression Estimation Results

The estimation results using the random effect model, as presented in Table 3, indicate that the proposed research model is capable of explaining the relationship among globalization, women's education, female labor absorption, family development, childcare support, labor leave regulation, and fertility across Indonesia's 14 largest exporting provinces during the 2021–2025 period. The model provides an empirical basis for understanding how structural economic openness, women's socioeconomic transformation, and institutional support mechanisms are associated with fertility variation across regions with strong exposure to international trade and investment. Its use is particularly relevant because the selected provinces exhibit diverse economic, social, and demographic characteristics that may influence reproductive behavior differently over time.

Overall, the model demonstrates adequate statistical validity. The weighted R-squared value indicates that a substantial proportion of the variation in FER can be explained by the variables included in the model. The adjusted R-squared further suggests that, even after accounting for the number of predictors, the model retains a satisfactory level of explanatory power. Moreover, the F-statistic and its associated probability value confirm that the independent variables and interaction terms are jointly significant in explaining variations in fertility. Accordingly, the model provides a relevant empirical basis for interpreting the interrelationships among globalization, socioeconomic factors, institutional support, and fertility in Indonesia's leading exporting provinces.

The random effects component also underscores the importance of interprovincial variation in explaining fertility outcomes. The high rho value for the cross-section random component indicates that a large proportion of the unexplained variation is attributable to differences across provinces, while the remaining variation is idiosyncratic. This finding confirms that fertility in Indonesia's major exporting provinces cannot be treated as a homogeneous phenomenon. Each province possesses distinct economic, social, institutional, and demographic characteristics, including differences in industrial structure, urbanization, educational access, labor market conditions, family quality, and the degree of global economic integration. Therefore, the use of a panel model with random effects is appropriate for capturing such regional heterogeneity.

Table 3. **Random Effect Model Estimation Results**

Variables	Coefficient	Standard Error	t-Statistic	Prob.
C	8.217772	1.257879	6.533039	0.0000
WHE	**-2.825099**	**1.073359**	**-2.632017**	**0.0109****
FLE	0.006038	1.065184	0.005668	0.9955
FAM	**-0.521403**	**0.306723**	**-1.699914**	**0.0947***
CLD	**-0.137641**	**0.052691**	**-2.612211**	**0.0115****
FDI	**-0.094397**	**0.049314**	**-1.914209**	**0.0607***
TO	**-0.157864**	**0.049086**	**-3.216046**	**0.0022*****
REG	**-4.234449**	**2.403735**	**-1.761612**	**0.0836***
WHE*REG	**3.349863**	**1.534712**	**2.182731**	**0.0333****
FLE*REG	0.275424	0.662701	0.415608	0.6793
FAM*REG	0.404883	0.531213	0.762186	0.4491
CLD*REG	-0.002451	0.029529	-0.083012	0.9341
FDI*REG	0.034102	0.031121	1.095769	0.2779
TO*REG	-0.004578	0.038178	-0.119904	0.9050
Effects Specification			**S.D.**	**Rho**
Cross-section random			0.307562	0.8925
Idiosyncratic random			0.106756	0.1075
Weighted Statistics				
R-squared	0.544294			
Adjusted R-squared	0.438506			

F-statistic	5.145103
Prob(F-statistic)	0.000007

*,**, and *** denote significance at 10%, 5%, and 1% levels, respectively

Source: Authors Calculation (2026)

The estimation results reveal that the explanatory variables do not exert uniform effects on fertility. Among the seven main variables examined, women in higher education (WHE), child care (CLD), and trade openness (TO) are found to have negative and statistically significant effects on fertility rate (FER) at the five percent significance level. Meanwhile, foreign direct investment (FDI), the family development index (FAM), and labor leave regulation (REG) exhibit negative effects with weaker statistical significance at the ten percent level. By contrast, female labor employment (FLE) does not show a statistically significant effect on FER.

The coefficient of WHE is negative and statistically significant, indicating that increased female participation in higher education is associated with lower fertility rates. Substantively, this finding suggests that women's higher education constitutes one of the most important determinants of changing reproductive behaviour in Indonesia's major exporting provinces. Higher education may extend the duration of schooling, delay the transition into marriage, strengthen career aspirations, enhance women's autonomy in household decision-making, and encourage more rational birth planning. Thus, higher WHE levels are associated with a preference for fewer and more deliberately planned children.

Highly educated women are more likely to enter formal employment, develop stronger career orientations, and face greater opportunity costs when deciding to have children. In the absence of adequate employment protection, higher education may encourage delayed marriage, postponed childbirth, or a reduction in desired family size. However, as emphasized by Chai et al. (2022), when labor leave regulations provide protection during pregnancy, childbirth, and early childcare, the conflict between career and family responsibilities may be reduced. Thus, REG may function as a buffering mechanism that slows the decline in fertility among highly educated women.

The findings of this study indicate that fertility in Indonesia's major exporting provinces is more strongly influenced by women's educational transformation, trade openness, and regional socio-economic characteristics than by female labor absorption alone. The negative effect of WHE on FER confirms that women's higher education is a crucial channel of fertility change (Wang, 2025). Baltagi and Karatas (2025) emphasize that education not only enhances women's economic capacity but also transforms life orientation, career aspirations, age at marriage, decision-making autonomy, and preferences regarding family size.

The role of WHE is becoming increasingly important in the context of major exporting provinces. These provinces generally experience more dynamic economic activity, broader employment opportunities, and stronger connections with industrial sectors, trade, modern services and investment. Such environments provide greater opportunities for highly educated women to pursue careers and achieve social mobility. However, these opportunities also increase the childbearing opportunity cost. Consequently, higher women's education may be associated with lower fertility, especially when there is insufficient institutional support for family life.

The CLD variable also showed a negative and statistically significant relationship with FER. This indicates that greater childcare availability or a stronger childcare-related environment is associated with lower fertility in the selected exporting provinces. Theoretically, childcare can assist families in balancing their employment and caregiving responsibilities. However, in the context of these findings, CLD also appears to represent the characteristics of regions that are more urbanized, modern, and integrated into market-oriented economic systems than others. Areas with more developed childcare indicators generally tend to exhibit more planned family behavior, higher female economic participation, and a stronger orientation toward child quality rather than child quantity.

The negative effect of CLD on FER must also be interpreted carefully. Normatively, childcare services support women's employment and reduce work-family conflict. However, the findings show that higher childcare indicators are associated with lower fertility. This may suggest that CLD is more strongly present in urban, modern regions characterized by smaller family patterns (Liu et al., 2024). Thus, CLD may not only reflect caregiving support but also broader socio-economic advancement, including more planned family behavior and lower preferred family size (Hashimoto & Naito, 2021, 2024).

Trade openness (TO) demonstrates the strongest negative and significant effect among the globalization indicators. This result indicates that provinces with higher levels of trade openness tend to exhibit lower fertility rates. This finding reinforces the argument that integration into international trade can influence fertility through structural economic transformation, increased social mobility, shifting

employment opportunities, rising living costs, and changing family aspirations. In provinces that are strongly connected to export and import activities, households are likely to face higher opportunity costs of childbearing, particularly when education, employment, and investment in child quality become increasingly prioritized. High trade openness may transform regional economic structures through exports, imports, industrialization, labor mobility, and changing consumption patterns. Under these conditions, households tend to adjust their reproductive strategies by considering living costs, employment stability, children's education, and long-term economic capacity (Ou et al., 2023). Therefore, TO does not merely reflect international economic activity, but also serves as an indicator of broader social transformation within families and households (Khobai & Moyo, 2021).

FDI has a negative effect on FER, with weaker statistical significance. This suggests that FDI tends to be associated with declining fertility, although its explanatory strength is less pronounced than that of WHE, CLD, and TO. Substantively, FDI may affect fertility through industrialization, employment creation, changes in local economic structure, and stronger regional integration with the global economy. However, the effect of FDI on fertility may vary across provinces depending on the sectoral composition of investment, the extent of female labor absorption, employment quality, and the distribution of economic benefits generated by investment. These findings are supported by Ghazalian (2024), although its statistical significance is weaker. This suggests that foreign investment may be associated with declining fertility, but its mechanism is less direct than that of trade openness. The effect of FDI likely depends on the sectoral structure of investment in each province. Investment in labor-intensive manufacturing (Yu et al., 2016), modern services (Bogliaccini & Egan, 2017), mining, or extractive industries (W. Li et al., 2023) may have different implications for women's employment, household income, urbanization, and living costs. Therefore, the effect of FDI on fertility is more contextual and should be interpreted in relation to each province's economic structure.

The Family Development Index (FAM) also shows a negative relationship with fertility, although its statistical significance is relatively weak in this study. This finding suggests that improvements in family development quality are associated with declining fertility. The direction of this relationship can be understood through the shift in family orientation from child quantity to child quality. Families with stronger development capacities are more likely to plan births, allocate resources more efficiently, and invest more in children's education, health, and welfare. Therefore, FAM may be interpreted as an indicator of changing family preferences toward more rational and planned fertility behaviors.

The negative effect of FAM at the ten percent significance level suggests that family development is associated with more planned fertility. Families with higher development quality tend to have greater capacity to manage resources, plan the number of children, and invest in child quality. This finding supports previous arguments that family modernization does not necessarily increase fertility but may instead lead to a preference for fewer children with better caregiving quality (Cavalcanti et al., 2023; Mont et al., 2020; Newson et al., 2005). Accordingly, family development should be understood not only as an effort to improve family welfare but also as a process that reshapes reproductive preferences.

The REG variable shows a negative direct association with FER, with weak statistical significance. This suggests that labor leave regulation is associated with lower fertility when examined as a direct explanatory variable. However, since REG is also tested as a moderating variable, its interpretation must be approached with caution. The negative direct effect of REG may reflect the fact that labor leave regulation is more visible or relevant in formal, competitive, and modern labor market contexts, which are socio-economic environments often associated with lower fertility preferences. Consequently, REG should not be interpreted solely as an independent direct effect but should also be assessed in relation to its interaction with other variables.

Unlike the other variables, FLE does not exhibit a statistically significant effect on FER. This indicates that female labor absorption does not have a meaningful direct statistical relationship with fertility in the model. The finding suggests that women's employment status does not automatically influence fertility decisions. The effect of women's work on fertility is likely to depend on the type of employment, formal or informal sector status, wage level, work flexibility, employment stability, maternity protection, and access to childcare services. Thus, the quality of women's employment is more important than the mere level of female labor absorption. The insignificance of FLE provides an important analytical contribution. Theoretically, increased female employment is often assumed to reduce fertility by raising the opportunity cost of childbearing. However, the findings of this study indicate that female labor absorption alone is insufficient to explain fertility changes. This may occur because FLE in the Indonesian context does not distinguish between employment quality, formal and informal sector status, contractual arrangements, wage levels,

working-hour flexibility, or access to social protection (Haris, 2022). In other words, employment does not necessarily mean that women enjoy a more secure economic position or adequate protection to balance work and family responsibilities.

The contrasting results between WHE and FLE indicate that women's education exerts a stronger influence on fertility than women's employment status. Higher education transforms women's capacities, aspirations, and life planning in a more fundamental way (J. Yang et al., 2025). In contrast, women's employment may generate varying effects depending on job quality and working conditions. Women employed in informal or low-wage sectors may continue to face substantial caregiving burdens and may not receive leave protection, meaning that employment status does not automatically translate into fertility change (Clark et al., 2019; Horwood et al., 2020). Therefore, policies that merely encourage female labor participation are insufficient without improvements in job quality and family support systems.

The moderation test was conducted to determine whether Labour Leave Regulation (REG) modifies the relationships between WHE, FLE, FAM, CLD, FDI, TO, and FER. The estimation results indicate that among all interaction terms tested, only the interaction between WHE and REG has a statistically significant effect on fertility. This finding shows that REG significantly moderates the relationship between women's higher education and fertility. Because the direct coefficient of WHE is negative, while the coefficient of the WHE*REG interaction is positive, REG can be interpreted as a factor that attenuates the negative effect of women's higher education on fertility. In other words, although higher female education tends to reduce fertility, the presence of labor leave regulation may lessen this downward pressure. This finding suggests that worker leave policies play an important institutional role in helping highly educated women reconcile educational, occupational, and family aspirations.

Conversely, the interaction terms FLEREG, FAMREG, CLDREG, FDIREG, and TO*REG are not statistically significant. This indicates that REG does not statistically moderate the relationships between female labor absorption, family development, childcare, foreign investment, trade openness, and fertility. The insignificance of most interaction terms suggests that the moderating role of REG is selective rather than universal. Labor leave regulation cannot be assumed to influence all determinants of fertility in the same manner. Its effect is more pronounced in the relationship between women's higher education and fertility, possibly because highly educated women are more closely connected to formal employment and are more likely to access leave protection (Haris, 2022; Sahu & Behera, 2025). By contrast, for women workers more generally, particularly those in informal or unstable employment, leave regulation may not operate effectively (Goodman et al., 2024).

The moderating effect of WHE*REG represents the most prominent policy-relevant finding of this study. Labor leave regulation attenuates the negative effect of women's higher education on fertility (Golightly & Meyerhofer, 2022). This finding indicates that family-friendly employment policies can reduce the dilemma faced by highly educated women in balancing career and family aspirations (Raute, 2019). However, the absence of significant REG effects in other interaction terms suggests that labor leave regulation is not sufficient to moderate all fertility determinants. The effectiveness of leave regulation depends on the coverage of formal workers (Son, 2024), firm-level compliance (Vu & Glewwe, 2022), women workers' access to leave rights, and its integration with other policies, such as childcare provision and informal worker protection (Baek & Choi, 2020).

Diagnostic Test

The results of the correlation matrix in Table 4 indicate that the correlations among variables are relatively low to moderate, with the highest correlation being 0.5303 (below the threshold of 0.80) between FLE and CLD. Thus, there is no strong indication of multicollinearity based on the inter-variable correlations.

Table 4. **Correlation Matrix**

	WHE	FLE	FAM	CLD	FDI	TO
WHE	1.000000	0.257644	0.219903	0.022385	-0.333582	-0.167761
FLE	0.257644	1.000000	0.123034	0.530284	-0.117623	-0.106477
FAM	0.219903	0.123034	1.000000	0.058395	0.033048	0.045824
CLD	0.022385	0.530284	0.058395	1.000000	-0.042663	-0.380111
FDI	-0.333582	-0.117623	0.033048	-0.042663	1.000000	0.199885
TO	-0.167761	-0.106477	0.045824	-0.380111	0.199885	1.000000

Cross-sectional dependence in Table 5 refers to a condition in which one observational unit in panel data is correlated with other units during the same period. In this study, the observational units were provinces. This implies that conditions or shocks occurring in one province may affect others, for instance, through trade, national policies, economic circumstances, or interregional linkages. The test results show that the Breusch–Pagan LM, Pesaran Scaled LM, and Bias-corrected Scaled LM are significant at the 1% level, indicating the presence of cross-sectional dependence. However, the Pesaran CD test is not significant (p = 0.3004).

Table 5. **Residual Cross-Section Dependence**

Test	Statistic	Prob
Breusch-Pagan LM	183.9221	0.0000***
Pesaran scaled LM	6.887844	0.0000***
Bias-corrected scaled LM	5.137844	0.0000***
Pesaran CD	1.035495	0.3004

Robustness Test

The robustness test in Table 6 comparing Western and Eastern Indonesia reveals that the relationships among variables are not entirely homogeneous across regions.

Table 6. **Regional Sub Sample Robustness Test**

Variables	Indonesia	Western Indonesia	Eastern Indonesia
C	7.365920 (0.800135)	5.357977 (0.774643)	10.04226 (1.293110)
WHE	0.399240 (0.495112)	0.691279* (0.384645)	-0.467586 (0.692550)
FLE	0.076240 (0.358127)	-0.467479 (0.542781)	0.943030** (0.402320)
FAM	-1.102614*** (0.192080)	-0.591614*** (0.189656)	-1.714109*** (0.310094)
CLD	-0.071689*** (-0.071689)	-0.029478 (0.029522)	-0.045740* (0.024874)
FDI	-0.035062** (0.013847)	-0.043395*** (0.16100)	-0.058234** (0.018160)
TO	-0.033038 (0.033576)	-0.041579 (0.042518)	0.056488* (0.033323)
REG	-2.335703* (1.377784)	0.002650 (0.032706)	0.081796 (0.061674)

FAM and FDI emerged as the most robust results, as both consistently exhibited negative and significant effects for Indonesia as a whole, as well as across the two regional subsamples. In contrast, WHE and FLE revealed regional heterogeneity: WHE was positively significant only in Western Indonesia, whereas FLE was positively significant only in Eastern Indonesia. CLD continued to show a negative direction, but its significance was stronger in the national sample and Eastern Indonesia. Interestingly, TO shifted from a negative relationship in the national sample and Western Indonesia to a positive and significant effect in Eastern Indonesia. These findings suggest that regional economic characteristics and trade structures may influence the relationships between these variables and exports.

Compared with the 14 major exporting provinces, the main estimation results revealed a notably different pattern. WHE demonstrates a negative and significant effect on exports (−2.8251; p = 0.0109), whereas in the regional robustness analysis, WHE is insignificant in the national and Eastern Indonesia samples but positively significant in Western Indonesia. This discrepancy indicates that the relationship between WHE and exports is sensitive to the composition of the provinces in the sample. Conversely, FAM and FDI consistently showed negative effects, underscoring the robustness of the findings.

5. CONCLUSION, IMPLICATION, SUGGESTION, AND LIMITATIONS

This study reveals that fertility dynamics in Indonesia's major exporting provinces are shaped by the interplay between economic globalization, women's socioeconomic transformation, family development, child care support, and labor-related institutional arrangements. Fertility is not a uniform demographic phenomenon but reflects substantial regional heterogeneity in economic structures, social conditions, and institutional capacities. Women's higher education, childcare availability, and trade openness emerged as the most influential factors associated with declining fertility, while FDI, family development, and labor-leave regulation showed comparatively weaker effects. However, female labor absorption does not significantly explain fertility changes, suggesting that employment status alone may be insufficient without considering job quality, security, flexibility, and family support conditions.

The moderation results show that labor leave regulation significantly modifies the relationship between women's higher education and fertility, as indicated by the positive and significant WHE×REG interaction. This suggests that leave protection may attenuate the negative association between higher education and fertility by helping women reconcile educational, occupational, and family aspirations. However, this finding should not be interpreted as evidence that stronger maternity or labor leave policies will directly increase fertility. Rather, it indicates that labor protection may influence how women's educational attainment is associated with fertility decisions, while the absence of significant moderating effects for other variables suggests that leave regulation alone is insufficient as a family policy instrument. The regional robustness results further indicate that these relationships are not entirely homogeneous between Western and Eastern Indonesia.

From a policy perspective, export and investment-oriented development should be accompanied by family-friendly employment policies, including stronger worker protection, accessible labor leave, affordable childcare, and greater workplace flexibility. These policies should not be designed solely to increase fertility but also to reduce potential conflicts between employment and family formation and enable women and households to make reproductive decisions with greater institutional support. Future research should employ longer observation periods, household-level data, and mediation or spatial approaches to further examine the mechanisms linking globalization, labor-market institutions, and fertility.

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