

The Impact of Economic Empowerment on the Age–Crime Curve of Children Involved in Fuel Smuggling: A Study of the Suburban Areas of Zahedan, Iran

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Article Info

How to cite this paper: Saeid Gohari. (2025). The Impact of Economic Empowerment on the Age–Crime Curve of Children Involved in Fuel Smuggling: A Study of the Suburban Areas of Zahedan, Iran. *World Copmpetition*, 48(2), 95–136. <https://doi.org/10.54648/woco234320>

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ISSN Online: 1875-8436

ISSN Print: 1011-4548

Received: 13.01.2025

Revised: 14.04.2025

Accepted: 04.05.2025

Article Type: **ORIGINAL Research**



ABSTRACT

The present study aims to examine the impact of economic empowerment programs on the age–crime curve of children involved in fuel smuggling in the suburban areas of Zahedan, Iran. The research employs a survey–correlational design. The statistical population includes all children and adolescents engaged in activities related to fuel smuggling in 2024. Using the Cochran formula and convenience sampling, a total of 384 participants were selected. Data were collected through a researcher-made questionnaire containing 19 items measured on a five-point Likert scale (from “strongly disagree” to “strongly agree”). Exploratory factor analysis revealed that economic empowerment programs influence the age–crime curve through five main components: increasing legitimate opportunities, strengthening self-control, career orientation, internalizing legitimate norms, and reducing economic pressures. The results of regression analysis indicated that the variables internalization of values (0.77), increasing legitimate opportunities (0.75), strengthening self-control (0.73), career orientation (0.60), and reducing economic pressures (0.65) have the greatest effects, respectively, on the age–crime curve of children involved in fuel smuggling.

Keywords :

Economic empowerment, Age–crime curve, Fuel smuggling, Children and adolescents, Zahedan suburbs.

Introduction

The involvement of children and adolescents in criminal activities—particularly in border regions—is one of the most serious challenges faced by policymakers working on crime prevention in many Asian countries, including Iran. This issue is deeply rooted in economic and social deprivation. Field studies conducted in Sistan and Baluchestan Province, especially in the suburban areas of Zahedan, indicate that fuel smuggling has become a livelihood strategy for many families (Yaghubi & Allahbakhsh, 2012). In most of these illegal activities, children participate alongside adults. Such economic practices have destructive effects on economic development and often create severe social crises (Varvaei & Sayad Shir-Kesh, 2016; Farzammehr & Moradi, 2022). Economic empowerment of families—defined as providing legitimate job opportunities and sustainable income sources, particularly for those living in deprived urban margins—has been emphasized as a key approach in Iran’s social policy framework (Hosseinzadeh et al., 2020; Barati et al., 2018). Programs such as the Razagh Plan, the National Program for Strengthening Border Dwellers’ Livelihoods, and the Local Business Development Plan have been implemented to improve economic resilience in border regions. Additionally, initiatives for poverty reduction and welfare enhancement led by the IRGC (Islamic Revolutionary Guard Corps) are examples of ongoing governmental strategies.

Nevertheless, there remains a significant gap in the literature on crime prevention regarding the precise relationship between economic empowerment of families and the age–crime curve among children involved in fuel smuggling, particularly in marginal and border regions like Zahedan. In criminological research, the age–crime curve demonstrates that the prevalence of crime tends to increase from late childhood, peaks during adolescence or early adulthood, and declines thereafter (Loeber & Farrington, 2014; Schroeders et al., 2025; Steffensmeier, 2025). The causes of this pattern, however, are interpreted differently across theoretical perspectives. From the standpoint of developmental criminology, many juvenile crimes are viewed as natural byproducts of biological and psychological maturation during adolescence—a stage often characterized by risk-taking and impulsivity (Steffensmeier et al., 2025). In contrast, social control and strain theories emphasize the role of social and economic pressures, arguing that when legitimate means for meeting basic needs are limited, children are more likely to engage in illicit economies and remain in them for longer durations (Sweeten et al., 2013). Accordingly, one of the most effective strategies for controlling juvenile delinquency rates in developing countries is to implement

programs such as vocational training and targeted cash transfers aimed at reducing children's participation in criminal activities (Stacy et al., 2024). The theoretical framework of this study is based on the assumption that a family's objective economic conditions (income level, stable employment, livelihood support) affect the subjective perceptions of both parents and children (future orientation, hope, economic security), which in turn shape behavioral choices between legal and illegal paths. In this model, improving a family's economic situation not only reduces the likelihood of children's involvement in crime but may also delay the age of onset and alter the age distribution of such involvement.

However, evaluating the effectiveness of such interventions on the age–crime curve among children vulnerable to economic crimes requires empirical evidence—an area that has received limited scholarly attention. Zahedan, as a border city, provides an important case for this inquiry. Its informal settlements suffer from high rates of poverty, ethnic marginalization, and inadequate economic infrastructure (Sheibani-Moghadam & Sarvar, 2019). Field observations show that many children engage in fuel smuggling to support their families. Despite the prevalence of this phenomenon, few studies have empirically examined the impact of government-led economic empowerment programs—such as local development initiatives, vocational training for slum residents, or welfare and subsidy schemes (e.g., direct cash transfers)—on the timing and persistence of children's participation in fuel smuggling. Therefore, the central question of this study is: Does economic empowerment of families affect the age–crime curve of children involved in fuel smuggling in the marginal areas of Zahedan? This research aims to fill this gap by examining the relationship between economic empowerment and the age–crime pattern among children engaged in fuel smuggling in Zahedan's marginalized communities. To achieve this, the study first reviews relevant theoretical and empirical literature on the age–crime curve and economic empowerment, especially in developing countries. It then outlines the research methodology, presents the key findings, and concludes by discussing the theoretical and policy implications for crime prevention in Zahedan's peripheral communities.

2-Literature Survey

The involvement of children and adolescents in criminal activities—particularly in fuel smuggling within impoverished urban fringes—is one of the clearest manifestations of crime stemming from

underdevelopment, unequal resource distribution, and extreme economic deprivation in Sistan and Baluchestan Province (Yaghubi & Allahbakhsh, 2012; Ebrahimzadeh, Abbassian & Irandegani, 2012). This phenomenon reflects deep structural deficiencies, such as the lack of access to legitimate employment opportunities and adequate social protection for all members of society. From a *critical criminology* perspective, social inequality, marginalization, and insufficient developmental policies create environments that push individuals—especially children—toward criminal behavior (Jafari et al., 2024). Ethnographic research on street children in large Iranian cities (Street Children in Iran, 2023) further underscores the need for revising social prevention policies and strengthening structural justice mechanisms in marginalized and deprived communities. At the same time, *developmental criminology*'s age–crime curve provides a framework for analyzing the quantitative trends and underlying causes of delinquency across the life course. Empirical findings consistently show that the prevalence of crime rises from late childhood, peaks in adolescence, and then declines with age (Loeber & Farrington, 2014). Although the shape of this curve varies across societies, it remains a reliable model for understanding age-related crime patterns (Steffensmeier, Slepicka & Schwartz, 2025).

In marginalized urban contexts—where poverty and social inequality are more severe—the structural conditions facilitating early exposure to crime are more pronounced. Consequently, the age–crime curve tends to start earlier and persist longer. Theories of *strain* attribute this trend to the shortage of legitimate opportunities to meet basic needs (De Courson & Nettle, 2021). Thus, children's participation in fuel smuggling in the outskirts of Zahedan likely originates from structural deficiencies in the equitable distribution of legitimate economic opportunities. Nevertheless, evaluating this perspective requires empirical and scientific field assessments. Existing studies indicate that only a limited number of research efforts have examined the impact of economic empowerment on the age–crime curve among children involved in criminal activities in marginalized areas of Iran. The few studies conducted suggest that economic interventions — including targeted financial support, vocational and technical training, and the expansion of legitimate employment opportunities — have helped shift the government's preventive policies from being solely punitive to more socially preventive approaches (Babaei & Ansari, 2014). It appears that economic empowerment, as an effective preventive policy influencing the age–crime curve of children, aims to transform individuals from a state of incapacity to one of economic decision-making ability through a three-factor process (resources, agency, and achievements)

(Tanga & Tangwe, 2014). In practice, this process, by fostering social participation among local institutions, families, and children involved in criminal activities, can strengthen social crime prevention. Consequently, it can lead to a tangible reduction in juvenile delinquent behavior (Vaschenko et al., 2017).

However, conceptual ambiguities and operational challenges surrounding the effectiveness of economic empowerment programs on the age–crime curve of children engaged in fuel smuggling can be analyzed in three main areas. First, most economic empowerment initiatives—such as the Women and Youth Entrepreneurship Development Foundation in cooperation with the Hoda House, the establishment of savings funds and self-help groups, and vocational training for marginalized women—have been designed without considering their potential effects on the age–crime curve of children and adolescents involved in criminal activities, especially those engaged in fuel smuggling. Neglecting delinquent or at-risk children in the marginalized areas of Zahedan during program implementation may negatively affect the age–crime curve. The effectiveness of such programs will only be achieved if they are designed, implemented, and funded within the framework of a strategic crime prevention policy (Saeedi & Soleimani Khorgo, 2023). Second, the formulation and design of economic empowerment programs in the marginalized areas of Zahedan have often been carried out in a top-down manner, lacking genuine participation from families and affected children. From a social crime prevention perspective, such an approach results in limited resource allocation and superficial skill training, creating a significant gap between the intended goal—reducing the age–crime curve among children and adolescents engaged in fuel smuggling—and actual outcomes. Finally, the effectiveness of these measures in reducing delinquency is highly dependent on the understanding of child delinquency and the integration of economic policy with social justice. In other words, if responsible institutions lack the knowledge and skills required for social crime prevention—especially regarding children involved in criminal activities such as fuel smuggling in marginalized areas—the implementation of these measures may not have any tangible impact on the age–crime curve.

In this regard, previous studies have shown that employing economic empowerment approaches to address juvenile delinquency in marginalized areas, despite their considerable benefits, also faces limitations and challenges (Amadeh et al., 2023). Nevertheless, few empirical studies have evaluated the implementation of economic empowerment policies in relation to crime reduction

and the age–crime curve in areas such as the outskirts of Zahedan. While economic empowerment, as a social crime prevention strategy, offers an effective alternative to traditional penal control models—because it focuses not on suppression and punishment but on enhancing economic opportunities and reducing the structural roots of crime—it can play a significant role in transforming preventive policies. Accordingly, the successful implementation of economic empowerment interventions depends not merely on resource allocation, but on shifting the criminal justice policy orientation from punitive control toward a social and preventive model—a shift that compels the state to actively intervene in the social roots of crime. However, sufficient and comprehensive evidence is still lacking regarding the extent and mechanisms through which such interventions influence the age–crime curve among children involved in fuel smuggling in deprived areas such as the outskirts of Zahedan, Iran.

3. Case Study

Zahedan, located in southeastern Iran, is surrounded by suburban areas predominantly inhabited by low-income and migrant families (Abkhesht et al., 2024). Poverty and unemployment have led to spatial and physical disorders in these neighborhoods (Ibrahimzadeh et al., 2004). Prior to the implementation of various poverty alleviation programs, cultural, social, and economic challenges posed serious threats that increased crime rates in marginalized zones (Keykha et al., 2015). Given this situation, the government initiated economic empowerment programs—including vocational training and job creation opportunities for parents—to alleviate social problems in Zahedan’s marginalized areas (Aramesh et al., 2021). Nevertheless, field observations indicate that children and adolescents are heavily involved in fuel smuggling in these neighborhoods. Moreover, due to specific demographic characteristics—such as a high number of children engaged in hazardous economic activities and the presence of newly arrived families from Afghanistan and Pakistan—these areas face a high risk of continued criminal activities. Despite the numerous challenges in conducting this research, the marginalized areas of Zahedan provide a suitable case for studying the impact of economic empowerment on the age–crime curve of children. This case can demonstrate how targeted programs may influence this curve, offering insights into the relationship between economic deprivation, empowerment interventions, and behavioral changes

among children and adolescents in marginalized contexts. The findings can further inform practical policy recommendations aimed at improving quality of life and reducing crime.

4. Methodology

The aim of this study is to examine the impact of social support on the age–crime curve, taking into account economic empowerment programs. Developmental criminological theories, which investigate the effects of economic, social, and psychological factors on crime rates, suggest that improving a family’s economic condition can reduce children’s and adolescents’ psychological pressures and structural stressors within the family environment (Ge et al., 1994; Chen et al., 2023). This reduction in pressure, in turn, decreases exposure to delinquent models and the learning of deviant behavior (Bao et al., 2012). Furthermore, Hirschi’s social bond theory and related empirical findings emphasize that strong ties to school, family supervision, and belief in conventional values are significantly associated with lower delinquency rates (Özbay & Özcan, 2006). The survey questionnaire included demographic information, history of participation in fuel smuggling, extent and type of involvement, access to skill training and financial support programs, attitudes and motivations toward legal and illegal work, and the perceived effects of economic empowerment programs on occupational decision-making and delinquent behavior. The items were measured on a five-point Likert scale (from “strongly disagree” to “strongly agree”). Construct validity was assessed using exploratory factor analysis (EFA) via the principal components method with Varimax rotation. The Kaiser–Meyer–Olkin (KMO) measure was 0.884, indicating sampling adequacy. Bartlett’s test of sphericity ($\chi^2 = 2148.67$, $p < 0.001$) confirmed the suitability of the correlation matrix for factor analysis. The EFA results revealed five significant factors explaining 68.58% of the total variance.

The questionnaire was designed and administered in Persian, and the standardized version is provided in the appendix. Reliability analysis showed Cronbach’s alpha values ranging from 0.785 to 0.891 across the five factors and 0.924 for the overall scale, indicating high internal consistency. Confirmatory factor analysis (CFA) was performed using a second-order model, with model fit indices ($\chi^2 = 342.1$, $df = 160$, $SRMR = 0.052$, $RMSEA = 0.061$, $GFI = 0.949$, $TLI = 0.9$, $CFI = 0.92$) demonstrating acceptable fit. All standardized factor loadings were significant at the 95% confidence level, confirming the meaningful impact of each factor on the dependent variable—the

age–crime curve of children engaged in fuel smuggling. The survey was conducted from April 5, 2024, to February 7, 2025 (Farvardin 17 to Bahman 18, 1403 in the Iranian calendar). The target population consisted of all children and adolescents aged 10–18 residing in marginalized neighborhoods of Zahedan who were involved in fuel smuggling. Based on field evidence and local reports, five districts—Shirabad, Kargar, Zibashahr, Hafezabad, and Resalat—were identified as the main centers of such activities and served as the sampling framework. Due to the lack of precise statistical data on the population size in each district, stratified random sampling with equal allocation was applied, with each district representing one stratum and 76 respondents selected per stratum. Interviewers conducted individual interviews with children and adolescents involved in fuel smuggling and completed self-report questionnaires. In total, 384 respondents participated in the survey. The collected data were analyzed using SPSS version 21 for descriptive and inferential analyses, and AMOS version 24 for factor analysis.

Table 1. Results of the validity and reliability analysis

Factor	AVE	Cronbach's alpha coefficient	CR
Increase legitimate opportunities	0.543	0.891	0.855
Career orientation	0.689	0.832	0.816
Internalization of legitimate norms	0.510	0.785	0.757
Strengthening self-control	0.610	0.801	0.824
Alleviating economic pressures	0.609	0.812	0.824
Total			0.815

Table 2. Test of data normality

Factor	Number	Test statistic	p-value
Increase legitimate opportunities	384	0.093	0.006
Career orientation	384	0.200	0.000
Internalization of legitimate norms	384	0.155	0.000
Strengthening self-control	384	0.168	0.000
Alleviating economic pressures	384	0.146	0.000

5. Demographic Descriptions

The statistical population of the present study consisted of 384 children and adolescents involved in fuel smuggling-related activities. All participants had at least eight years of residence in the suburban areas of Zahedan city. The age range of the respondents was 10 to 19 years, and all of them were male. Based on the age distribution, 29.4% were in the 10–13 years age group, 38.5% in the 14–16 years group, and 32.1% in the 17–19 years group. In terms of educational status, 42.7% were studying in lower secondary school, 36.9% in upper secondary school, and 20.4% had dropped out of school.

6-Findings

An exploratory factor analysis (EFA) was conducted on 18 items to determine the construct validity of the instrument. To assess the suitability of the data for factor analysis, the Kaiser-Meyer-Olkin (KMO) index and Bartlett's test of sphericity were examined. The KMO value (0.884) indicated that the data were adequate for factor analysis, and the significance of Bartlett's test of sphericity (Chi-Square = 2148.67, $p < 0.001$) showed that the correlation matrix was not an identity matrix; therefore, factor analysis was justified. To extract the factors, the principal component analysis (PCA) method was used, and for factor rotation, the orthogonal Varimax rotation technique was applied. To determine how many factors saturated the instrument designed to examine the effect of economic empowerment on the age-crime curve of children involved in fuel smuggling, indicators such as eigenvalues, explained variance ratio, and the scree plot were

analyzed. Table 3 presents the eigenvalues and the percentage of explained variance for each of the five extracted factors after Varimax rotation. Together, these five factors explained 68.58% of the total variance of the items.

Table 3. Exploratory Factor Analysis Results

Factor	Eigenvalue	Explained Variance Percentage	Cumulative Explained Variance Percentage
Increase legitimate opportunities	8.92	40.54	40.54
Career orientation	2.15	9.77	50.31
Internalization of legitimate norms	1.78	8.09	58.40
Strengthening self-control	1.23	5.59	63.99
Alleviating economic pressures	1.01	4.59	68.58

In Table 4, the factor loadings of the 18 items of the scale examining the impact of economic empowerment on the age-crime curve of children involved in fuel trafficking are presented after rotation for each factor (component). The naming of the factors was based on the concepts of the items within each factor, particularly focusing on the item with the highest factor loading among the items in that factor. Accordingly, the Internalization of Legitimate Norms factor included 7 items, the Occupational Orientation factor included 2 items, the Reinforcement of Lawfulness factor included 3 items, the Enhancement of Self-Control factor included 3 items, and the Reduction of Economic Pressures factor included 3 items.

Table 4. Factor Loadings and Naming of Extracted Factors

R o w	Statements	Symbo l	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
1	Participation in vocational and technical training programs reduces the motivation to engage in fuel smuggling activities.	s1	0.82	0.12	0.04	-0.01	0.1
2	Training in skills or providing financial support reduces the likelihood of children engaging in fuel smuggling.	s2	0.79	0.15	0.08	0.12	0.05
3	The longer children participate in empowerment programs, the less likely they are to engage in delinquency at younger ages.	s3	0.65	0.21	0.14	0.18	-0.03
4	If financial support is provided sustainably, there will be greater efforts to learn technical skills.	s4	0.73	0.09	0.22	0.11	0.12
5	Attending skills training classes leads to fewer children engaging in fuel smuggling at younger ages.	s5	0.68	0.17	0.13	0.09	0.19
6	Skill-based programs increase children's motivation to participate in legal occupations.	S6	0.61	0.28	0.13	0.2	0.06
7	Vocational training for children enhances their range of legitimate and lawful occupational choices.	S7	0.54	0.42	0.18	0.12	0.1
8	Vocational and technical education reduces the tendency toward high-risk activities such as smuggling.	S8	0.12	0.85	0.06	0.09	0.04
9	Learning occupational skills makes fuel smuggling less appealing to me.	S9	0.15	0.81	0.11	0.08	0.12

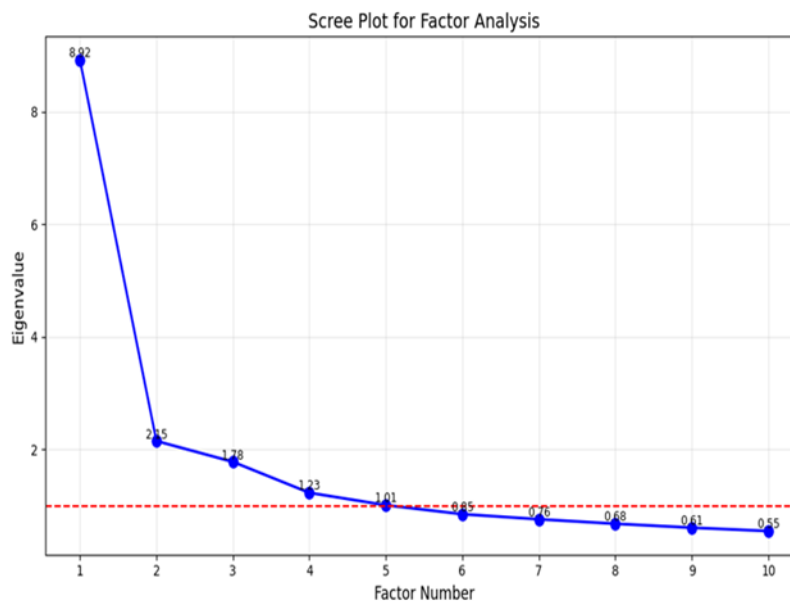
R o w	Statements	Symbo l	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
10	Receiving financial assistance encourages greater effort toward leading a lawful and honorable life.	s10	0.18	0.09	0.75	0.14	0.07
11	Stable financial support reduces thoughts about engaging in criminal activities.	s11	0.21	0.11	0.68	0.19	0.1
12	Individuals with occupational skills envision a brighter future for themselves.	s12	0.25	0.22	0.71	0.08	0.13
13	Placing children in healthy work environments encourages them to correct delinquent behaviors.	s13	0.09	0.14	0.12	0.82	0.05
14	Learning occupational skills improves individuals' ability to control risky behaviors.	s14	0.11	0.08	0.15	0.79	0.11
15	Having access to legal job opportunities keeps individuals away from engaging in illegal activities.	s15	0.19	0.12	0.1	0.73	0.14
16	Financial need at younger ages is one of the main reasons for engaging in fuel smuggling.	S16	0.22	0.07	0.13	0.12	0.81
17	Children raised in low-income families tend to turn to fuel smuggling at younger ages.	S17	0.08	0.21	0.06	0.09	0.78
18	Adolescents are more likely to engage in fuel smuggling due to their higher risk-taking tendencies.	S18	0.13	0.15	0.11	0.14	0.75

The reliability of the extracted factors was examined using internal consistency and by calculating Cronbach's alpha for the exploratory factors, and the results are presented in Table 5.

Table 5: Internal Consistency Results of Exploratory Factors

Factor	Title	Number of Items	Variables	Cronbach's Alpha
1	Increasing Legitimate Opportunities	7	s1, s2, s3, s4, s5, s6, s7	0.891
2	Career Guidance	2	S8, s9	0.832
3	Internalization of Legitimate Norms	3	s10, s11, s12	0.785
4	Strengthening Self-Control	3	S13, s14, s15	0.801
5	Reducing Economic Pressures	3	s16, s17, s18	0.812

The results indicate that the alpha values for the exploratory factors range from 0.785 to 0.891, which are higher than 0.6, indicating adequate internal consistency and confirming their reliability. Additionally, the overall Cronbach's alpha for the entire instrument was found to be 0.924, confirming the overall reliability of the instrument.

**Figure 1:Scatter Plot**

In a scree plot, the elbow point refers to the point where the slope of the curve significantly decreases, and the line approaches a nearly horizontal orientation. Factors appearing after the elbow point are generally considered non-significant, as their eigenvalues are minimal and resemble “pebbles scattered at the foot of a mountain.” According to the scree plot, five factors are deemed significant.

1-6. Confirmatory Factor Analysis (CFA)

After identifying the factors affecting economic empowerment on the age-mass curve of children involved in fuel smuggling through exploratory factor analysis (EFA), it is necessary to assess the fit of items for each factor (first-order confirmatory factor analysis) and the fit of factors for the main construct (second-order confirmatory factor analysis). This helps reduce the potential error in the final structural equation modeling (SEM) that may arise due to measurement errors in each dimension. For this purpose, confirmatory factor analysis was performed in two stages for the exploratory factors using AMOS version 24. In the first-order CFA, the question addressed is whether the identified items for each exploratory factor appropriately represent and measure that factor. In this analysis, any item with an absolute factor loading greater than 0.4 is considered for inclusion in the multidimensional model. In the second-order CFA, the goal is to assess the extent to which the identified factors adequately represent the main construct, i.e., the effect of economic empowerment on the age-mass curve of children involved in fuel smuggling. The output of this stage, after checking for outliers using Mahalanobis distance and making model adjustments by drawing error covariances to improve the fit indices, is presented in Figure 2.

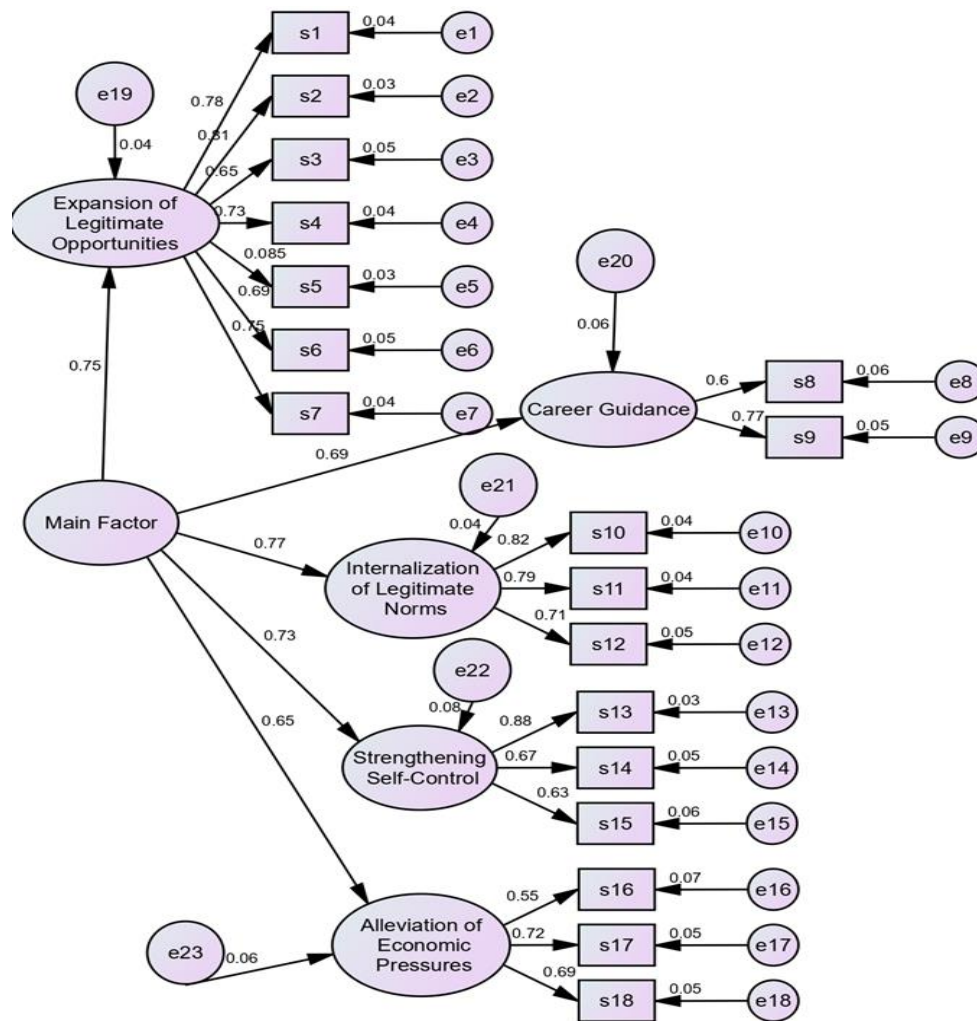


Figure2: drawing error covariances to improve the fit indices

Fit indices related to the second-order confirmatory factor analysis (CFA) model of the factors affecting the effectiveness of economic empowerment programs on the age-crime curve of children involved in fuel smuggling are reported in Table 6. The results of this table indicate a good fit and confirm the validity of the CFA model.

Table 6. Fit Indices for the Second-Order Confirmatory Factor Analysis Model

Interpretation	Acceptable Criterion	Observed Value	Fit Index
Acceptable	$\chi^2/df < 3$	342.1 (160)	χ^2 (df)
Good	< 0.08	0.052	SRMR
Good / Acceptable	< 0.08	0.061	RMSEA
Good	> 0.90	0.949	GFI

Marginally Acceptable	> 0.90	0.90	TLI
Good	> 0.90	0.92	CFI

In Table 7, the standardized (factor loadings) and unstandardized regression coefficients of the five factors in relation to the construct of program effectiveness on the age-crime curve are reported. Table 7 shows that the factor loadings are greater than 0.4 and are significant at the 95% confidence level. Therefore, it can be concluded that the identified factors significantly influence the age-crime curve of children involved in fuel smuggling activities. By comparing the standardized coefficients, it can be seen that the factors have the following order of impact on the age-crime curve: internalization of values (0.77), increasing legitimate opportunities (0.75), strengthening self-control (0.73), career orientation (0.60), and reducing economic pressures (0.65).

Table 7. Regression Coefficients of Factors Affecting the Age-Crime Curve in Children

Factors	Standard coefficient	Standard error	Statistics	Probability value	Result
Increasing Legitimate Opportunities	0.75	19.80	0.04	0.001>	Meaningful
Career Guidance	0.69	12.70	0.06	0.001>	Meaningful
Internalization of Legitimate Norms	0.77	18.15	0.04	0.001>	Meaningful
Strengthening Self-Control	0.73	17.74	0.08	0.001>	Meaningful
Reducing Economic Pressures	0.65	12.02	0.06	0.001>	Meaningful

7. Discussion

This study examined the impact of economic empowerment programs on the age-crime curve among children involved in fuel smuggling activities in the marginal areas of Zahedan. Based on the findings from exploratory and confirmatory factor analyses, five key factors were identified as the main dimensions of the effectiveness of these programs: increasing legitimate opportunities,

career orientation, internalization of legitimate values, enhancement of self-control, and reduction of economic pressures. These factors are discussed in detail below.

7.1. Increasing Legitimate Opportunities

The results of the present study indicate that interventions such as skills-based programs and financial support can significantly reduce the likelihood of early entry of children into fuel smuggling activities and have a promising impact on the age–crime curve. Participation in skill-training programs (s1, 0.82) not only delays the age of entry into smuggling-related activities but also alters the age distribution pattern of criminal behavior, weakening their motivation to join smuggling networks (s5, 0.68). However, achieving sustainable prevention of children and adolescents entering smuggling activities requires continued participation in skill-based programs (s3, 0.65). Moreover, financial support from various institutions can reduce the likelihood of involvement in smuggling in marginalized areas of Zahedan (s2, 0.79) and positively affect those children and adolescents who had already engaged in delinquent behavior before the program (s4, 0.73). Economic support policies act as social buffers, reducing livelihood pressures and providing legitimate alternative pathways for children. These findings align with previous studies showing that interventions, such as programs providing financial incentives for employment, can encourage youths to desist from criminal activities (Oswald, 2023:52). Additionally, systematic reviews on technical and vocational education indicate that skill-building reduces recidivism among adolescents and increases legitimate employment opportunities (Hassan & Rosly, 2021:642).

The study demonstrated that skill-based programs tailored to community needs not only decrease children's motivation to engage in fuel smuggling activities (s8, 0.61) but also increase legitimate employment opportunities (s9, 0.54). Unlike previous research, this study emphasizes the shift in the age distribution of crime, indicating that changes in temporal patterns of offending are directly related to reducing overall delinquency in local communities. This represents a missing link in the crime prevention literature, which has been rarely addressed. The findings suggest that the age–crime curve, which typically peaks during adolescence according to developmental criminology theories (Moffitt, 2001:91), can be shifted or smoothed through educational and economic interventions.

However, some limitations should be considered. First, generalizing the findings to other marginalized areas should be done cautiously, as the data were based on a limited sample of children and adolescents in Zahedan. The cultural and social diversity of Zahedan's marginalized areas may have contributed to the results. Therefore, similar outcomes should not be expected in other regions with different contexts. Second, due to the cross-sectional nature of this study, longitudinal research is necessary to verify the long-term effects. Despite these limitations, the results can be relatively generalized to areas with similar socio-economic and cultural conditions. For example, evaluations of cash transfer programs in Zimbabwe have shown that sustained cash payments reduce crime rates by improving household purchasing power, food security, caregiver mental well-being, and reducing child labor in informal jobs (Chakrabarti et al., 2020). Therefore, the present findings can inform social and developmental crime prevention policies by providing evidence for designing integrated and sustainable interventions that delay or prevent the onset of delinquent behavior.

7.2. Career Orientation

The findings suggest that technical and vocational training programs can reduce children's inclination and motivation to participate in fuel smuggling activities in marginalized areas of Zahedan. Technical and vocational education decreases their motivation to engage in smuggling activities ($s10, 0.85$) and provides more legal and legitimate income-generating pathways ($s11, 0.81$). Developing skill-based programs prevents children from choosing smuggling-related activities and, by providing legitimate employment options, reduces their motivation to join criminal networks. These findings align with international research showing that vocational education in correctional settings significantly reduces recidivism (King, 2018; Wilson et al., 2000) and are consistent with Merton's strain theory, which argues that access to legitimate and legal opportunities can reduce the pressure leading to criminal behavior (Özbay, 2002). Policy interventions in skill development for children in poverty-stricken areas with limited formal job opportunities can therefore produce similar preventive effects. Appropriate and sustainable employment policies can significantly deter delinquency (Heller, 2014). Thus, the present findings support the necessity of comprehensive employment-oriented approaches in the marginal areas of

Zahedan, providing legitimate job opportunities and practical skills to shape positive and sustainable pathways for the future.

7.3. Internalization of Legitimate Norms

The results indicate that sustained financial support and occupational skills play a crucial role in fostering the internalization of socially respected norms, promoting law-abiding behavior, and preventing criminal acts. By reducing economic pressures, these interventions provide children and adolescents with opportunities to acquire legitimate skills and strengthen intrinsic motivation to comply with societal norms from an early age (s12, 0.75). A positive vision of the future further enhances their motivation to acquire sustainable occupational skills. This factor acts as a preventive mechanism, increasing motivation to pursue legal pathways and legitimate opportunities (s13, 0.68; s14, 0.71). The combination of financial support and skill development effectively encourages children to follow legal paths and discourages engagement in criminal behavior, aligning with Hirschi's social control theory, which posits that investment in skills strengthens commitment, attachment, involvement, and belief, thereby reducing risky behaviors and delinquency (Breckin, 2019). Moreover, studies have shown that participation of low-income families in conditional cash transfer programs has long-term positive effects on child development (Ozer et al., 2009). Conditional cash transfer programs can reduce poverty and improve adolescents' life opportunities, serving as significant preventive measures against risky behaviors (Evans-Lacko et al., 2023). Unlike previous studies, this research emphasizes the impact of empowerment programs on children's future outlook and lawful livelihood choices, effectively shifting the timing patterns of delinquency in Zahedan's marginalized children and reducing juvenile delinquency.

7.4. Enhancement of Self-Control

The findings demonstrate that providing healthy work environments and stable jobs plays a significant role in reducing children's inclination toward criminal behavior and strengthening internal monitoring to avoid delinquency. Children and adolescents with stable employment opportunities acquire technical skills that encourage them to abstain from criminal activities (s17,

0.73). Participation in healthy work environments enhances their social character and acts as a form of internal self-control to prevent criminal behavior (s15, 0.82). Moreover, diverse empowerment programs in marginalized areas of Zahedan reduce children's tendency toward delinquency by enhancing their ability to control risky behaviors. These findings are consistent with studies showing that social and economic mechanisms serve as effective incentives for crime prevention (Burt, 2020) and that economic and supportive interventions in low-income families significantly prevent delinquent behavior by reinforcing self-control at a young age (Brody et al., 2020; Moffitt et al., 2011). The distinct contribution of this study is the simultaneous effect of acquiring legitimate skills in healthy environments and financial support, reducing overall delinquency and strengthening children's internal monitoring to follow legal pathways, which shifts the age-crime curve by delaying or eliminating entry into criminal behaviors.

7.5. Reduction of Economic Pressures

This study found that economic pressures are a major driver for children and adolescents engaging in criminal activities related to fuel smuggling. Financial need at an early age is one of the main motivators for involvement in such activities, as children under financial pressure are more likely to engage in illegal activities to meet basic needs (s18, 0.81). Children from low-income families, due to limited access to legitimate income opportunities, engage in fuel smuggling at an earlier age, reducing their motivation to pursue lawful paths (s19, 0.78). Economic pressure indirectly increases risk-taking and non-compliance with societal norms, leading to a higher likelihood of engaging in smuggling activities (s20, 0.75). These findings align with prior research showing that economic interventions improve social behavior and reduce delinquency; reducing economic pressures through financial support and stable employment decreases the probability of criminal behavior (Ivaschenko et al., 2017). Recent studies in the UK have also shown that austerity policies, particularly in low-income areas, exacerbate economic pressures, which in turn increase crime rates (Giulietti & McConnell, 2020). Unlike previous research, this study emphasizes the combined effects of economic factors and adolescents' psychological characteristics: the interplay of financial need, family deprivation, and psychological pressures due to poverty explains the early age of entry into fuel smuggling. Semantic analysis indicates that economic pressures and family deprivation limit legitimate pathways, pushing adolescents toward risky behavior. Early financial

need, coupled with risk-taking tendencies, shifts the age–crime curve downward, meaning children enter smuggling activities earlier, making behavior correction without intervention more difficult. Preventive interventions must simultaneously reduce economic deprivation, increase legitimate income opportunities, and teach risk-coping skills to achieve sustainable reductions in youth involvement in smuggling. These findings can guide social policies and intervention programs in other regions with similar conditions, highlighting the importance of addressing both economic and psychological factors in preventing juvenile delinquency.

8-Conclusions

Reducing children's and adolescents' involvement in fuel smuggling requires a comprehensive approach that addresses economic, social, and psychological factors simultaneously. Research shows that participation in fuel smuggling results from the complex interaction of these factors. Poverty and economic deprivation, growing up in low-income families, and adolescents' risk-taking tendencies push them toward illegal activities and lower the age of entry into delinquency.

Effective prevention strategies include economic empowerment through skills training and sustainable financial support, which reduce early involvement in illegal activities and shift delinquency to older ages. Providing legitimate and stable employment opportunities increases children's motivation to follow legal paths and offers alternatives to illegal income. Additionally, creating healthy work environments and family support plays a crucial deterrent role, reducing criminal behavior and strengthening responsibility. Moreover, training in risk management skills helps children choose legal pathways when facing economic pressures.

Overall, integrated programs combining skills training, sustainable financial support, and legitimate employment can alter the age–crime pattern, reduce delinquency levels, and guide children and adolescents toward lawful behavior and brighter future opportunities.

CRediT authorship contribution statement

Saeid Gohari: Writing – review & editing, Writing – original draft, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of Competing Interest

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request from referees.

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