



Analyzing Effective Factors in Establishing Informal Settlements in Babol City using Pathway Analysis (PA) Model

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Abstract. Slumming (marginalization) and informal accommodation in present term is the outcome of industrial revolution emerged following structural changes, and abundant social and economic problems including increased urbanization, uncontrolled immigrations in different countries around the world, especially third world cities. Iran not excluded by this phenomenon also experienced urban growth due to increased urbanization. Babol city is of historical and intermediate cities turned into an immigration pole in Mazandaran province as its high economic potential. Increased population resulting from natural growth and immigration caused physical and uncontrolled growing so that urbanization outperforms urban planning, which manifested in developing informal, peripheral settlements. This research focuses on explaining social and economic factors of forming informal settlements in Babol. Research methodology was descriptive-analytical and data collection tools included filed observation, researcher field studies, as well as documents and household inventory. Factors' effects were analyzed using pathway analysis method. Research findings show that there are ten most important factors influence forming informal settlement in Babol. Research results reveal that the two classes of social and economic factors similarly influence forming informal habitats in Babol.

Keyword: Informal settlement, Slumming (marginalization), Goal oriented community, Babol city, pathway analysis

1. INTRODUCTION

Poverty, principally, is an economic-politic issue results from systems' mechanisms and dominant institutes in society. Spatial realization of this mechanism can be observed in depriving of low-income people from housing, rural immigration, and vandalism, etc (Palizban et al, 2010; 116). Rapid development of urbanization led to an urban image of poverty. Urban poverty is closely related to increased poor habitats lacking life facilities, particularly in developing countries (Alaeddini and Amin Naseri, 2008; 89). Informal habitats (settlements) considered as the symbol of urban poverty. Reflection of developing urban poverty can be observed in physical disconnection of some residential areas from whole city and in framework of reduced access to urban, social services, the quality of living; and on the other hand, marginalization and social isolation of some groups in such habitats (Meshkini et al, 2011; 124). It can be stated that marginalization referred as spatial or physical reflection of isolation or marginalization of some part of the society in southern countries. In other word, the general feature of isolation in southern countries emerges as marginalization (Sargaran Ghavi, 2008; 3). In general, informal settlement defined as clear manifestation of urban poverty automatically formed within or around cities lacking construction permits and formal urban planning by concentrated low-income population at low-level quality and quantity. It is what called marginalization, informal settling, unorganized

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settlements, and slum dwelling (Marsoosi et al, 2012; 86). Slumming and informal settlement, in its present term, is the outcome of industrial revolution emerged following structural changes, and abundant social and economic problems including increased urbanization, uncontrolled immigrations in different countries around the world, especially third world cities.

Increasingly growing of urban population overtook the potential of governmental and non-governmental organizations in developing and delivering urban services and facilities; in addition, unsatisfied housing need of low-income families in formal environment and urban planning somehow formed and developed informal settlement (Keshvar dust and Kazem khah, 2008; 193). Undoubtedly, evolutions appeared by forming international division of labor and transformation of national economic structure, increasing and accumulation of oil income and land reforms following 1940s are major reasons of accelerating urbanization and consequently, creating informal settlement. Deprivation and informal habitats lacking urban life facilities comparing other urban areas made them at the focus of urban complex issues and against sustained human development. Certainly, many citizens marginalized and excluded of many social supports in globalization process (Firouzi et al, 2011; 117). Islamic republic revolution is a milestone in informal settlement of Iranian cities such that it is strongly offered as one principal issue of major and intermediate cities in Iran comparing past.

Babol is one of intermediate cities in Mazandaran province highly populated as its high economic potential; according to census in 2011, its population estimated 219467 individuals (Iran statistics center, 2011). Physical growth and immigration from adjacent villages led to unorganized physical growth in Babol. Regarding significance of the issue, considering such phenomenon (informal settlement) in Babol is necessarily critical taking account the social, economic, cultural, and physical dimensions as the city development determines that 38.56% of the city area, namely 1058.9 hectares, occupied by informal (illegal) habitats all located in city's legal range benefited urban services. The four neighborhoods including Mouziraj, Kati, Haft tan, and Sadat Mahale are the most important informal settlements in Babol situated at east, southeast, and west of Babol. Being located along Babol's exit roads has no physical restriction for developing or increasing immigrant attraction. Uncontrolled and unauthorized constructions with unstable physical appearance are clearly observable at neighborhoods' boundaries. Studying these neighborhoods' use shows residential use is the major neighborhood use. Investigating main usages also indicated that these neighborhoods suffer from problems mainly respecting entertainment spaces, parks, and green spaces, and particularly lack of sports halls, libraries, swimming pool, especially for women. Further, they encounter health problems such as shortage of clinic and drugstore. In addition to the aforementioned, other requirements are like improving the quality of pavements and permanent cleaning of the streets. According to many informal settlements in Babol and city acute problems caused by developing these settlements, this research tries to identify the social and economic reasons of forming informal (illegal) settlements in this city. The research replying the questions how much the residents are satisfied with neighborhood, What elements largely contribute in creating and developing illegal settlements in Babol marginal areas, studied illegal residents in Babol and identified contribution priority of the aforementioned factors through recognizing marginalized in terms of housing, socioeconomic, and physical status. The paper analyzed effective factors of forming informal (illegal) residents in Babol according to pathway analysis model, which determines the effect of each factor. Moreover, obtaining effective factors of illegal settlements in Babol, the research proposed some solutions to release this problem; and finally, improve and empower illegal settlements regarding environmental, socioeconomic, and cultural capabilities.

2. LITERATURE REVIEW

Many studies conducted on national informal settlement, some of which referred in Table 1 as follows:

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Table 1. Studies conducted on informal settlement.

First name and last name	Year	Title	Result
Mahdie Khalou Bagheri and Mohammad Shayan Ghoreyshi	2011	Economic inequality and creating and developing informal settlements in cities-focused on Iran case	Developing informal settlements caused by several factors, the most important of which is economic inequality in cities
Najma Ismaeil pour	2010	Studying housing in informal habitats and introducing organizing strategies; Case study: Hassan Abaad neighborhood, Yazd	Some housing features have uncommon, abnormal conditions at informal habitats; though, have better conditions comparing other countries due to principal servicing and more appropriate status of housing factors
Sarvar and Jafari	2009	Continuous immigration and increased rate of urban population in Tehran metropolitan district	Diversity and inconsistency of managing metropolitan area and low speed of structural reforms of effective factors in developing informal settlement in Tehran
Irandoost and Sarrafi	2007	Hope and despair in informal habitats (case study: Kermanshah)	Fundamental differences can be seen among informal habitats developing (progressing) and declining results from their socioeconomic, physical, and environmental evolution as well as the managerial approach.
Hamid Majedi and Koroush Lotfi	2006	Informal (illegal) urban settlements in Ahvaz	Urban and rural immigrations are the critical factor of forming and developing informal (illegal) habitats in metropolis of Ahvaz

In addition to what reported in Table 1, other studies on marginalization are as follows:

Meshkini et al, in a paper named organizing informal settlements through empowerment (case study: Bagher Shahr); Firouzi et al in a study named analyzing effective factors of developing informal settlement in Khuzestan cities and offering empowerment and organizing strategies; Hosseini and Chini Chiyani in a paper called analyzing informal settlement features in Arak city (Bagh Khalaj neighborhood and Imam Ali estate). Palizban et al (2010) research naming informal settlement and housing poverty (Case study: Pakdasht city). Keshvar doost and Kazem khah (2008), in a paper named analyzing outcomes of informal settlements in Langroud city, studied the factors and features of informal settlement to deal with such marginalized settlements. However, several other studies also performed in other countries as follows:

Daniel Gabriel, in a paper naming informal settlements and squatting in Romania: socio-spatial patterns and typologies, analyzed social, economic, and spatial features of informal settlements in Romania in 2013. P. Hofmann. , Strobl, J., Blaschke, T., Kux, H (2008), in a research named detecting informal settlements from Quick bird data in Rio De Janeiro using an object based approach; Alhassan Ziblim (2013) studied dynamicity of informal settlements in South Africa by a research named the dynamics of informal settlements upgrading in South Africa. Tshikotshi Victor (2009) conducted a study named the challenges of eradicating informal settlements in South Africa. Daniel Weldegebriel AMBAYE (2011), in a research naming Informal Settlement in Ethiopia, the Case of two Kebeles in Bahir Dar City, studied effective factors of forming informal settlements throughout the world.

The present study divides informal settlements, according to forming actors of informal settlements, into two social and economic factors; then, determines each social and economic factor contribution in forming informal settlements in Babol through using pathway analysis model.

3. MATERIALS AND METHODS

This is descriptive-analytical research gathering information through documentary and survey methods. Therefore, the factors contributing in forming and establishing Babol's informal settlements were determined and applied to achieve research objectives. Immigration, housing prices, land price, rents, income, unemployment, urban regulations, urban development, family relationships, and ownership are research independent variables and informal settlement identified as dependent variable. Since studied area (informal settlements) is geographically wide abroad and high numbers of statistical population, data collected through sampling method and questionnaire. Research statistical population consisted of residents of Babol's informal areas with over 28702 populations dwelling in four neighborhoods: Sadat Mahale, Kati, Haft Tan, and Mouziraj. Sample volume determined 318 head of households through sampling by Cochran formula (95% and error 0.05). Research applied stratified random sampling method in term of head of household. The investigator picks out sample points in each stratum or regional space according to neighborhood; then, selects a household corresponding the area population's relative percentage (individuals selected by simple random method and the questionnaires distributed) and the head of household or respondee fill out the questionnaire. Once questionnaires collected and reviewed to ensure that residents replied to all questions, coding initiates. Each item valued respecting proper measuring unit when the questionnaires coded; next, information classified in terms of considered indicators; thus, coded, classified, and valued data statistically analyzed using SPSS software. Considering literature review and theoretical basics, social and economical indicators extracted and 10 indicators (including land price, housing price, income, immigration, rent, unemployment, urban regulations, urban development, ethnic and family relations, as well as ownership) were studied. Research data descriptively and inferentially analyzed. In descriptive statistics, indicators such as mean, percentage, and frequency applied for analysis; and, inferential analysis used t-test and pathway analysis according to research questions and hypotheses. T-test compared the current status with desired status and measured life satisfaction. There are several multivariate analysis methods in socioeconomic studies investigating the effects and relations between research variables. Such methods mainly examine direct effect of one variable on another. However, pathway analysis method is of multivariate techniques that not only studies the direct effect of independent variables on dependent one, but also concerns variables' indirect impacts and examines the relations between variables according to existing realities. Furthermore, excel and GIS software applied for data analysis and graph plotting.

4. INTRODUCING UNDERSTUDIED AREA

Babol is one of Mazandaran province main cities located at longitude 52° and 44', 20" and latitude 36°, 34', 10" in the western part of Sari, capital city of Mazandaran province at 48 km distances. The city area is 3052 hectare.

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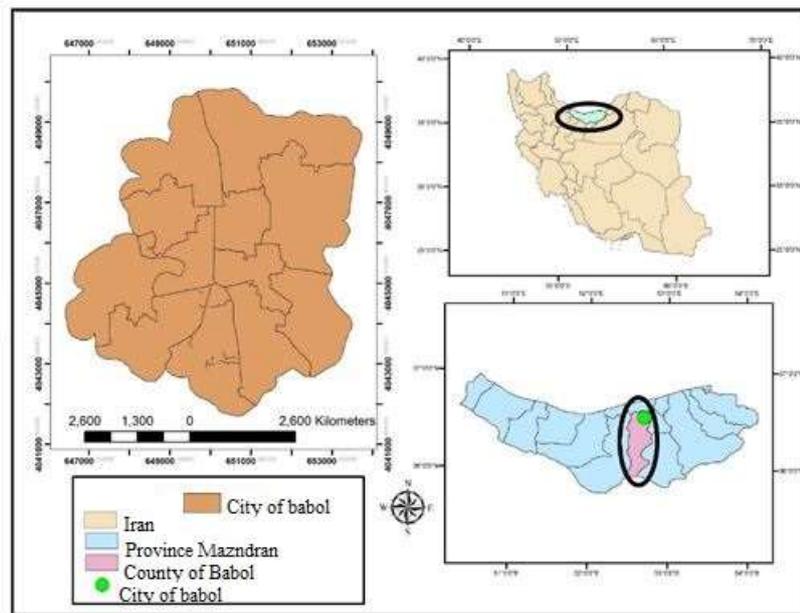


Figure 1. Babol situation in country, province, and city.

The following table represents understudied informal neighborhoods' names, area, population level, and position.

Table 2. Population, area, and neighborhood's position to city boundaries (Neighborhoods: Sadat Mahale, Kati, Haft tan, Mouziraj).

Neighborhood	Neighborhood population	Area(hectare)	Neighborhood position to city boundary
Sadat Mahale	5485	29.23	East
Kati	4621	62.36	South east
Haft Tan	8915	71.56	South east
Mouziraj	9051	129.45	West

Source: Informal settlements Empowerment project, Babol (2011)



Figure 2. Boundaries of informal settlements in Babol

Source: researchers adopting from informal settlements empowerment project in Babol (2011)

5. DEFINITIONS, NOTIONS, AND THEORETICAL PERSPECTIVES

Some notions and terms associated with informal settlement are defined in significance as follows:

Marginalization

Marginalization, in general, embraces all individuals dwelling in city's economic area but not economically absorbed. Urban attractions and urban welfare made these people, mostly rural migrants, leaving their hometown and turning toward industrial poles and labor markets to achieve better life (Yavari, 2004; 612). Marginalization referred as the concept of individuals and households living in undesirable conditions in term of housing, health, social and public services, as well as urban infrastructures; and, these individuals mostly involve in nonproductive activities of urban labor market as lack of sufficient investment, technical and professional expertise to be employed in urban economy. Urban marginalization is a phenomenon occurs in all developing countries since the time of independence and implementing modernization projects and economic development; it totally stems from uneven urbanization and rapid pace of urbanization (Haj Yousefi, 2002; 13).

Informal settlement

Informal settlement in Iran entitled by different names like marginalization, spontaneous and unorganized settlements, and shed communities (Hakimi et al, 2011; 201). Thus, it needs concerning that; firstly, this notion is a procedural view not haphazardly and suddenly occur; secondly, it highlights the illegality and necessarily informality of these places (Ahadiyan and Shaker Ardakani, 2012; 314). Informal settlement is the obvious figure of urban poverty spontaneously established within or around cities (especially large cities), without construction and formal urban planning permit, with concentrated population of low-income people and lower level of life quality and quantity. It is called as marginalization, informal settlement, spontaneous and unorganized settlements. As marginalization and shedding terms are not comprehensive enough to describe all different forms of this phenomenon, informal settlement term applied instead with a more comprehensive interpretation. Thus, informal settlement embraces marginalization and several forms (Kaman Roudi, 1998; 19). Jhon, F, Terner believes that

informal settlement is poor housing planning for communities in which planners lack the opportunity to provide shelter monitoring plan for urban poor (Hosseini and Chin Chiyan, 2011; 66).

Different types of informal settlements in Iran

Slums or poor neighborhoods: highly populated settlements with low servicing level; though, legal

Usurped settlements: illegal settlements often lacking predetermined design

Settlements with illegal isolation, on the contrary to the two aforementioned, have previously thought design; however, illegally established (Mahmoudi Pati and Mohammad Pouromran, 2008; 82).

Informal settlement in Iran

Rapid growth of population and structural evolutions in Iran rural economic system following sealing in 1966 causes cities; particularly, major cities widely attract immigrants as the destination of rural movement. Of these, most immigrants with low affordability were not able to dwell in formal areas paying for residence expenditures within legal boundaries inclined toward marginal areas of large cities. However, the intensity and volume of this issue varies in different cities and provinces depending on economic conditions and industrial concentration. It is clear that informal residence phenomenon is one of the critical problems of major cities like Tehran, Mashhad, Tabriz, Isfahan, Kermanshah, and Ahvaz, Bandar e- Abbas, Zahedan, and Rasht. It is estimated that one seventh of these cities population dwell in unorganized, informal settlements (Pour aghaie, 2004; 46).

Why informal settlements formed (established)

In fact, developing capitalism, like many countries, in Iran is followed by urbanization dominance as the prominent, top model, and indeed, capitalism required pattern versus rural and nomadic life style. In this regard, joining to the world economy and world labor division along with manufacturing industry led to creating a class system, isolation, and marginalizing some social groups (Kani et al, 2012; 7). This embraces historical basic of many isolation and establishing informal settlements (Iran dust, 2010; 158).

Marginalization is a global phenomenon. It created by several different reasons that may differ from one place to the other. Anyhow, immigration is one significant factor of marginalization. Of the main causes, people prefer marginal areas to other urban areas include low land price and lower rent fees. In total, it can be expressed that a combination of the factors causes immigrants and urban low-income population losing access to proper housing (Zangi Abadi et al, 2005; 182-183). Other major problem of all marginal areas is unemployment issue, which is critical (Zangi Abadi et al, 2005; 183).

Informal settlement consists of two internal and external aspects. People usually interested in appearance aspect and make judgment based on external dimensions. People, in these conditions, dwell in areas with less relation to host community; further, there is seen a type of separation between where they live and the city main area. This can be attributed to undesired economic condition and families' financial inabilities that make them unable to afford living in main urban areas due to life high costs(Hosseini and Chni Chiyan, 2011; 66); whereas, informal settlement internal aspect associates with social-cultural system as well as people mental state (Hosseini and Chni Chiyan, 2011; 66). In summary, all informal settlement views classified in three classes:

A. Liberal

It is founded based on liberal theories. According to this view, the main reason of creating such settlements is population and immigration. This school believes that labor and production surplus produced at a stage of communities' development; thus, initiates a wave of rural immigration to cities. Once this population approaches the city, inevitably dwells in informal settlements as city lack of accountability in housing and employment. In general, increased population is the main factor of developing such settlements and its solution is controlling the population (Dadash pour and Alizade, 2011; 49).

B. Fundamentalist views

Fundamentalist view since 1970s up to present, totally considered foundations and origins of forming marginalization and informal settlement; in addition, it largely focuses on the close relation between communities' economic and political system among developing countries. This view tries to discern the reasons of informal settlement in the form of space political economy (Ahadiyan and Shaker Ardakani, 2013; 316). In contrast to liberal view, space political economy investigates genesis of different settlements trying to be involved in the issue origins. This view assigns mono-city of urban system and its heterogeneity to external factors (imperialism) making any efforts to solve the problem by adjusting working, production, distribution, and consumption structures i.e. economic construction, and finally, communities' fundamental changes. Therefore, no instruction provided for sectional and case dealing of informal settlement; at best, they are like sedatives that may hide the pain origin, too (Hakimi et al, 2013; 3).

C. Socialism or goal-orienting

The new socialist attitudes maintain that informal settlement and emerging marginal groups in urban communities of developing countries results from the natural trend of the contrast between work and investment (capital). Forcible outcome of rules performance governing capitalist economy system i.e. capital concentration and accumulation is uneven economic growth, and social contrast outbreaks (contrasts of rural and urban life, class contrast, and like). Therefore, during capitalism uneven evolutions, emerging contrasts and social problems including informal settlement in large cities is inevitable (Dadash pour and Alizade, 2011; 50). Goal-oriented perspective in 1980s and 1990s, continuing to the present, expresses why informal settlement and marginalization occur; and, regarding the history of interventions in marginal contexts, in practice, opposed to concepts of destruction; it mostly considers notions like empowerment, improvement, and renovation. Therefore, according to the aforementioned, it can be viewed that informal settlement and marginalization caused by different factors. This research viewed informal settlement in respect to community- and goal-oriented approach trying to empower such settlements.

Table 3. Different views of time periods' attitudes and dealing with informal settlement.

Views	Attitudes	Time period	Dealing way
Liberalism	Transient problem	Up to 1960s	Ignoring
Conservatism	Gland pus	1960 to 1970	Evacuation and demolition
Radicalism	Rooted in unequal capitalism systems	1970 to 1980	Self-assistance
New liberalism	Legal and bureaucratic approach	1950 to 1980	Public housing
Oscal Luis	Culture poverty	1980 to 1990	Improved housing
Charles Abrahams	Adjusting attitudes of international institutes	1990 up to present	Social and economic empowerment

Source: Firouzi et al, 2011; 120

6. ANALYSIS & FINDINGS

Socioeconomic characteristics of informal settlements of Haft Tan, Sadat Mahale, Kati, and Mouziraj:

According to Table 4, most head of households in Mouziraj, Sadat Maahle, Haft Tan, and Kati are men; and education level of 91% is less than bachelor degree (guidance and high school education). This low education level may lead to ethical issues such as addiction and economic problems like poverty.

Table 4. Residents' sex and education level of informal settlements in Babol.

Sex	Education level				
	Female	Eelemntary	Secondary	High school	Bachelor and upper
91	9	3.19	30	5.29	6.20

According to documentary and field studies, the following results are summarized in Table 5.

Table 5. Socioeconomic characteristics of informal neighborhoods in Babol.

Indicator	Haft Tan	Kati	Sadat Mahale	Mouziraj
Neighborhood population	9856	9485	11986	11897
Household numbers	2842	2740	3110	2514
Household dimension	3.78	3.81	3.68	3.73
Population density (per hectare)	124.58	74.10	187.65	69.92
Total literate population	8133	7952	9970	8982
Working population	2980	2936	3654	1257
Unemployed population	403	377	504	451
Guardianship	3.20	3.36	3.27	3.14
Total immigrant population	2146	2340	1957	2015
Illiteracy rate	9.48	7.87	7.98	13.84
Male illiteracy rate	7.03	5.94	5.46	10.09
Female illiteracy rate	12.02	9.84	17.73	10.61
Unemployment rate	5.71	1.57	6.47	9.95
Male unemployment rate	4.70	1.12	6	7.18
Female unemployment rate	12.50	5.41	9.47	27.07
Economic participation rate	41.11	37.19	42.28	28.86

Source: field studies and informal settlements empowerment project in Babol

Physical characteristics of informal settlements of Haft Tan, Sadat Mahale, Kati, and Mouziraj

Housing ownership

Safety and security in housing occupation is a critical, effective social and mental housing dimension as it causes the household feel secure in terms of its living prospect leading to increased mental comfort. On the other hand, lien security is significant for low-income groups to improve housing status over time. Studying the type of housing ownership revealed that the dominant type is private occupation; therefore, it concluded that forced ownership is absent in Babol informal settlements and these areas established due to inefficient formal housing market versus increased requests of low-income people.

Table 6. Housing ownership of informal settlements in Babol

The type of Ownership	Private	Mortgage	Renting	Arrogated	Total
Percent	6.75	6.6	4.13	4.3	100

Source: Researcher field studies

Number of housing units

According to field and documentary studies in term of housing unit numbers, Sadat Mahale with 2976 units has the highest units. In addition, Mouziraj, Haft Tan, and Kati have 2514, 1475, and 1644 units, respectively.

Table 7. Housing unit numbers of informal settlements in Babol

Neighborhood	Haft Tan	Kati	Sadat Mahale	Mouziraj
Housing unit numbers	2027	1644	2976	2514

Source: Researcher filed studies and informal settlements empowerment project in Babol

Housing public indicators

Kati neighborhood has the highest numbers of households per units according to library and research studies. Considering the obtained results, Kati neighborhood has the highest numbers of individuals per units. Research results are summarized in Table 8 as follows.

Table 8. Housing public indicators of informal settlements in Babol

Neighborhood	Unit area	Number of household per unit	Numbers per unit	Net residential density	Fine grained
Haft Tan	1.307184	1.4	4.86	2.290	05.41
Kati	3.178455	1.6	5.7	9.258	20.43
Sadat Mahale	2.129412	1.04	4.02	8.423	32.39
Mouziraj	3.141377	1.3	4.92	2.640	38.40

Source: Field studies and informal settlements empowerment project in Babol

Inferential findings

At this stage to do field studies, once research questions and questionnaire provided, the questionnaires filled out by the help of local residences of informal settlements; then, collected data analyzed using SPSS software as follows. Research tries to analyze data consistent with the raised questions and avoids unnecessary results.

In order to evaluate environmental desirability of the sample neighborhoods, all indicators integrated and research hypothesis, which is residents’ satisfaction and desirability of the quality and status of the settlement, tested by statistical t-test (Table 9).

According to table data, all respondees and residents of Haft Tan, Kati, Sadat Mahale, and Mouziraj dissatisfying with settlements’ condition and quality neighborhoods evaluated the status undesirable. Among which, Mouziraj residents with the mean value of -59.0, less than standard, had the minimum settlement satisfaction; next, was Sadat Mahale with the mean -58.0, less than mean level. Kati neighborhood, also, with -52.0, smaller than average level, could not meet residents’ satisfaction. The highest satisfaction rate and desirability belonged to Haft Tan neighborhood with the average value of -38.0, satisfaction level is higher comparing other neighborhoods. According to the obtained results, smaller means demonstrate that heads of households (respondees) in sample neighborhoods generally lack positive view toward environmental life quality. Thus, the hypothesis stating residents’ low satisfaction of informal settlements’ desirability and quality will be maintained.

Table 9. Residents’ satisfaction level of the quality and desirability of informal settlements in Babol

Variable	N	M	S .D	M.S.D	T-test	D.F	Sig	M.D	Difference at 95% Confidence interval	
									Highest	Least
Haft Tan	75	61.2	41.0	05.0	-37.7	74	000.0	-38.0	-48.0	-27.0
Kati	69	47.2	52.0	06.0	-14.8	68	000.0	-52.0	-65.0	-39.0
Sadat Mahale	90	41.2	39.0	04.0	-88.11	89	000.0	-58.0	-68.0	-49.0
Mouziraj	86	40.2	50.0	06.0	-58.9	85	000.0	-59.0	-72.0	-74.0

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When the level of residents' satisfaction of environmental quality and desirability, economic and social factors of establishing informal settlements in understudied scope, the effect of independent variables on dependent variables, as well as the effect of factors were measured using pathway analysis test.

There are several multivariate analysis methods in the area of socioeconomic studies investigating the effects and relations between research variables. such methods mainly examines direct effects of one variable on the other; however, pathway analysis considered as multivariate techniques not only discerns direct and indirect effect of a variable on the other variable, but also considers variables' indirect effects and analyses the relations between variables according to existing realities (facts) (Kalantari, 2006; 223).

In order to analyze effective social and economic factors on informal settlements in Babol, the factors identified using pathway analysis model and their effectiveness determined. To validate research analytical model, model error rate was studied. In pathway analysis method, analysis variables only explain a part of dependent variable variance; hence, what unidentified in pathway analysis as effects represented by 'e', which is known as 'error quantity' (Kalantari, 2006; 242). 'e' value indicates the variance of the variable that the current independent variables cannot explain attained by $R^2 = 1 - e^2$ formula. In this research, the dependent variable variance level explained by determination coefficient (R²). The obtained determination coefficient in the following table is for all research variables.

Table 10. Independent variables error coefficient level.

Error level	Standardized determination coefficient	R ²	R
0.052	.982	0.984	0.992

As the above table shows, determination coefficient equals 0.984 meaning that 98.1% of the related adjustments determined by using pathway analysis and independent variables. Furthermore, error coefficient attained by coefficient, which is 6.1 according to $R^2 = 1 - e^2$. In other word, this model only do not explain 1.5% of the dependent variable variance. Once model validated, the most important factors of creating informal settlements in Babol considered as independent variables and informal settlement as dependent variable. In the next step, the direct effect of each independent variable indicator determined using regression method by 'Enter' approach. Direct effect of independent variables in establishing informal settlements in Babol illustrated. Finally, regarding each variable pathway, β coefficients of the variables multiplied; then, each pathway influence identified.

Table 11. β coefficients of independent variables in dependent variables.

Indicators	β	Indicators	β
Immigration	0.201	Housing price	0.185
Unemployment	0.142	Land price	0.196
Income	0.155	Rent	0.162
Ethnical and family relations	0.102	Ownership	0.175
Urban regulations	0.138	Urban development	0.102

In the following, diagrams of independent variables' coefficients plotted according to different pathways influenced by informal settlements by measuring effect level on dependent variable (informal settlement). Once β coefficients achieved, direct and indirect effects of each independent variable calculated; therefore, the effects of independent variables compared based on β coefficients to determine the effective variable. In fact, each variable has two influences including direct and indirect that integrating these two leads to variable total effect. In order to calculate indirect effects, each pathway β coefficient multiplied until reaches to dependent variable. Adding the effects of the two variables' indirect pathways, achieves total indirect effects

of a variable on another. Computations of direct and indirect effects of independent variables on dependent variable are presented in Table 12.

Table 12. Sum of direct and indirect effects of independent variables on dependent variable (informal settlements of Babol).

Effect ranking	Sum of each variable direct and indirect effects (%)	Sum of direct and indirect effects	Direct effects	Indirect effects	Independent variable
3	14	0.315	0.175	0.14	Ownership(X1)
1	19	0.427	0.185	0.242	Housing price (X2)
5	9	0.196	0.196	-	Land price(X3)
7	7	0.162	0.162	-	Rent price (X4)
2	18	0.411	0.201	0.21	Immigration (X5)
4	9	0.205	0.155	0.05	Income (X6)
8	6	0.142	0.142	-	Unemployment (X7)
9	5	0.102	0.102	-	Urban development (X8)
6	8	0.178	0.138	0.04	Urban regulations (X9)
10	5	0.101	0.101	-	Ethical and family relations (X10)

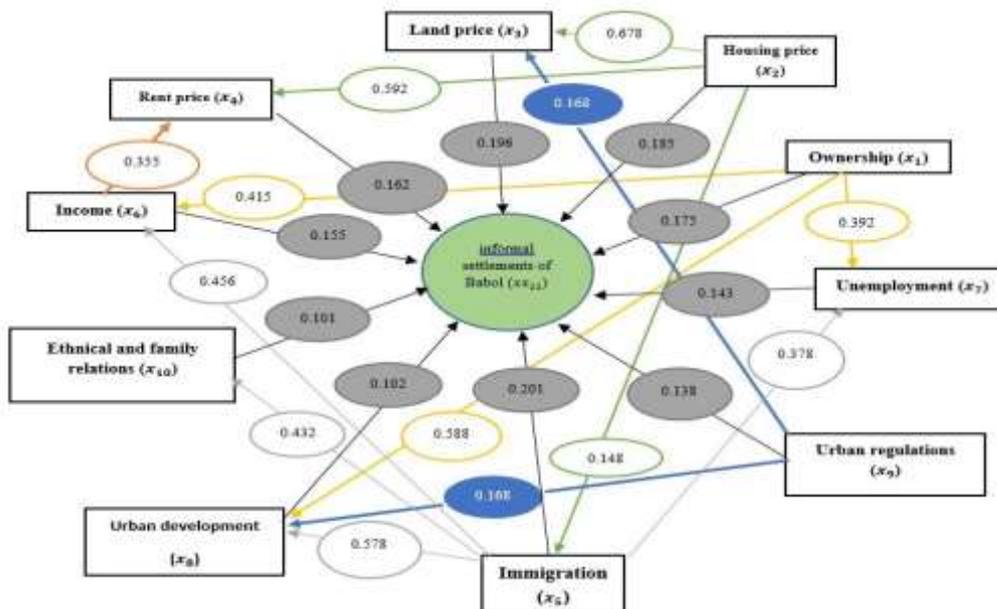


Figure 3. Graphical chart of independent variables coefficients versus dependent variable.

Above table and figures reveal that housing price, immigration, and ownership variables largely influence, in order; and in the total direct and indirect effects have the highest effectiveness in establishing informal settlements in Babol. Income, land price, urban regulations, rent price, unemployment, urban development, and ethical and family relations variables ranked in order. The factors divided into two economic and social classes such that the impact of establishing informal settlements' factors in Babol would be more evident. Land price, housing price, income, rent price, and unemployment are economic factors; and immigration, ownership, ethical and family relations, urban development, and urban regulations considered as social factors.

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Table 14. Effective socioeconomic factors (in percent) in establishing informal settlements in Babol.

Economic factors	Factors (in percent)	Social factors	Factors (in percent)
Housing price (X2)	19	Ownership (X1)	14
Land price (X3)	9	Immigration (X5)	18
Rent price (X4)	7	Urban development (X8)	5
Income (X6)	9	Urban regulations(X9)	8
Unemployment (X7)	6	Ethnic and family relations (X10)	5
Total effects	50	Total Effects	50

Regarding the aforementioned table and the effect of economic and social factors as independent variables influencing dependent variable (informal settlement in Babol), it can be understood that social and economic factors similarly influence establishing informal settlements in Babol.

7. CONCLUSION

Babol city is one of the cities facing with the phenomenon of population growth and appearance of informal settlements and marginalization. Haft Tan, Kati, Sadat Mahale, and Mouziraj neighborhoods are the most significant informal settlements in Babol situated in east, southeast, southeast, and west of Babol, respectively, with undesired and disorganized conditions. Factors such as rural immigrating around Babol, residents' poverty, cheap land comparing adjacent areas, house price, income, urban regulations, tax, urban development led to establishing and intensifying informal settlement in Babol. According to research findings by pathway analysis method, it is demonstrated that factors such as land price, house price, rent price, income, and unemployment as economic factors with about 50% are effective in creating Haft Tan, Kati, Sadat Mahale, and Mouziraj neighborhoods. Of these, house price with 19% had the highest impact. Thus, it can be stated that inability to afford house, low income, and high land price are important factors of dwelling people in Haft Tan, Kati, Sadat Mahale, and Mouziraj neighborhoods. Social factors including ownership, immigration, urban development, urban regulations, and family relations, also, with 50% contribute in founding informal settlements in Babol. Considering that most population lacks ownership, unable to own the land in suitable places, they dwell in lower areas. According to immigration factor, as most immigrants lack job and proper income they inclined toward these neighborhoods as low rent price and land price. According to what we have discussed, it concluded that both economic and social factors similarly influence establishing informal settlements in Babol. This indicates that if planners and policy makers intend to harness and extend informal settlements in cities, they require considering its roots in rural areas and immigrants. Most programs must concentrate on agriculture in order to attract higher working forces and enhance employment in rural areas as this prevents ungovernable rural immigrations to cities and consequently marginalization. Moreover, urban managers and authorities must concern organizing informal settlements and implement urban development respecting city and population demands to avoid its enhancement.

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