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Identifying Gender-Specific Risk Factors for Income Poverty across Poverty Levels in Urban Mexico: A Model-Based Boosting Approach

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Abstract: This paper aims to identify income-poverty risk factors in urban Mexican households. Special emphasis is paid to examine differences between female- and male-headed families. To this, a dataset with 45 theoretical factors at the individual/household, community, and regional levels, integrating information from nine sources, is created. To these data, additive quantile models are estimated via the boosting algorithm. From a gender standpoint, the following main contributions come from this paper. First, educational lag is particularly relevant for female-headed households. Second, there is a gendered life cycle in the income trajectory for poor households with a head having a medium level of education. Third, some households, traditionally disregarded, are found to be even poorer: those lacking social connectedness, without credit cards, with an extended composition, in which the female head spends a large part of her time on housework, and families headed by young women with a medium level of education. Finally, communities and regions where families have a lower income-to-poverty ratio are characterized as having an unequal income distribution, lower human development, lower levels of women's economic participation, poor quality of services, and lower gender-based violence levels in the public sphere but higher gender-based violence levels in the family context.

Keywords: income poverty; gender; additive quantile models; boosting algorithm

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1. Introduction

Poverty stands as one of the greatest obstacles facing Mexico today, impacting not only the individuals' ability to purchase essential goods and services crucial to their well-being but also their capacity to exercise fundamental rights. While poverty is a complex multidimensional phenomenon, it is frequently viewed in monetary terms. Typically, the income of an individual is compared with a threshold, below which a person is considered to live in poverty (Gillie 1996; Hagenaars and van Praag 1985; van Praag et al. 1982). According to the 2016 official poverty data, approximately 53.4 million people in Mexico (50.6% of the total population) had an income below the poverty line (INEGI 2016a). Most of them, about three out of every four persons, lived in urban communities (CONEVAL 2020).

Although urban settlements offer activities, conditions, and outputs promoting adequate living standards, their conditions and dynamics also induce the proliferation and worsening of multiple social issues such as marginalization, inequality, violence, pollution, and high population density (Sridhar 2015; Vilar-Compte et al. 2021). This context has also been pointed out in the case of Mexico (CONAPO 2021; CONEVAL 2010, 2014). Given this situation, it is important to study how individuals and their families experience, adapt to, and cope with poverty in urban communities. A key aspect in this regard is the identification of the urban-specific risk factors for poverty.

From a socio-ecological perspective, poverty is the outcome of the interplay of multiple factors at three different levels: individual and household, community, and region (Haughton and Khandker 2009). At the first level, it is extensively recognized that women,

young people, and persons with low education levels, from minority groups, with poor health conditions, without access to credit, lacking social networks, socially deprived, devoting a large amount of time to unpaid housework, and/or members of large families are more likely to have low income levels (ECLAC 2004; Fusco et al. 2011; Peng et al. 2019; Haughton and Khandker 2009; Munoz Boudet et al. 2018; Das 2019; Iacovou 2013). Particularly for the case of Mexico, Garza-Rodriguez et al. (2021) found that large families, headed by a woman, and/or of indigenous origin, are more likely to be poor. In addition to these risk factors, in Fernández-Ramos et al. (2016), the results indicate that households with a large number of older adults and/or children, with a head having a low level of education, and lacking access to potable water and electricity, tend to be poorer.

Although much of the literature for the case of Mexico has reached similar conclusions regarding the association of the abovementioned variables with poverty (CONEVAL 2010; Rojas García 2003), existing studies also indicate mixed results regarding the relationship between the age of the household head and poverty. While traditional theories indicate that the age–income linkage is described by an inverted U-shaped curve, this suggests that people's incomes are lower in the early and late stages of life. While evidence supporting this inverted U-shaped curve exists for Mexico (Garza-Rodriguez et al. 2021), some studies suggest a linear increasing relationship between age and income (Fernández-Ramos et al. 2016; Serratos Sotelo 2015), and others have concluded that age and income are not significantly associated (Székely 1998). However, it is important to remark that these conclusions could be biased towards linear effects, since these studies assumed a priori a linear effect instead of using flexible nonlinear approaches. Furthermore, to the best of my knowledge, other variables at the individual/household level, such as social networks and time use, remain understudied for the case of Mexico.

Regarding community characteristics, the literature indicates that higher poverty levels are concentrated in communities socially marginalized, exposed to natural disasters, with high levels of income inequality, with lower participation in industrial activities—oriented to the primary sector—and with significant levels of out-migration (Baez et al. 2020; McKenzie 2017; Haughton and Khandker 2009; Adelman and Jaret 1999). These findings have been corroborated in research on urban Mexico (Urzúa and Brambila 2009; CONEVAL 2010; Iniguez-Montiel and Kurosaki 2018).

At the regional level, research indicates that households in poverty tend to live in regions with a low quality of government, high crime incidence, and corruption (Aina 2014; Haughton and Khandker 2009; Gupta 1998). Regarding gender issues, Gillum (2019) and Terry (2004) found that gender-based violence and poverty are significantly associated. For the case of Mexico, only a handful of studies have analyzed the association of regional level factors and poverty. Garza-Rodriguez (2016) examined the determinants of poverty in the Mexican states bordering with the United States and found the existence of geographic regional patterns. Calderón and Valero Gil (2012) and Enamorado et al. (2016) found that poverty and violent crimes are correlated in Mexico.

Although these findings are relevant, results were obtained from the analysis of data aggregated at the municipal or state level which do not allow us to understand the effect of the communities and regions on the experiences of individuals and their families. It is important to highlight that most of the studies for the case of Mexico exclusively analyze the data from the ENIGH, and thus, only individual/household-level factors are examined.

2. Materials and Methods

2.1. Data Description and Sources

The dependent variable in this study is the household's income-to-poverty ratio. This ratio is calculated by dividing the total household income by the corresponding poverty threshold according to the number of family members. This ratio has been used in previous poverty studies (Peng et al. 2019; Heggeness and Hokayem 2014; Greenwell et al. 2001), and has the advantage of capturing how far/close the household income from the poverty

line is, i.e., how far/close is the family to be able to afford the cost of their basic needs (Heggeness and Hokayem 2014).

The information source for income data is the 2016 National Survey of Household Income and Expenditure (ENIGH) carried out by the National Institute of Statistics and Geography (INEGI). For further details, see INEGI (2016a). The official criterion for establishing the poverty threshold is set by the National Council for the Evaluation of Social Development Policy (CONEVAL). According to it, a person lives in income poverty if their income is not enough to afford the total cost of both basic food and non-food baskets (including education, transportation, entertainment, and health, etc.). A person is considered to live in extreme poverty if their income is not even sufficient to cover the cost of their basic food basket (CONEVAL 2019, 2020). In urban communities, the poverty and extreme poverty thresholds were, respectively, calculated by CONEVAL at MXN 2660.40 and MXN 1310.94 monthly per capita. Thus, considering the urban poverty threshold as a reference, an income-to-poverty ratio equal to one suggests that the household lives at the poverty line. When the income-to-poverty ratio is less than one, the family is considered to live in poverty. Particularly, if the income-to-poverty ratio is less than 0.493 (1310.94 divided by 2660.40), the family is extremely poor.

The covariates are chosen from the literature and include a total of 45 variables at the individual/household, community, and regional levels. The list of variables is shown in Table 1, where Column 4 indicates the modeling alternatives considered for each variable. For continuous variables, both linear and nonlinear effects are introduced for each of them. For instance, for variable head's age, linear, non-linear, interaction effects with education level, and marital status are considered.

Table 1. List of covariates included in the full model *.

Level	Variable	Definition	Relationship	Source
Individual/household	Indigenous origin	Indigenous self-identification of the household head.	Linear	ENIGH
		Categories:		
		"yes": if the head self-identifies as indigenous;		
		"no": otherwise.		
	Social networks	Degree of perception of the household head on the easiness to obtain support from social networks in six hypothetical circumstances: need of money, care due to illness, help to get a job, to be accompanied to a medical appointment, collaboration to improve neighborhood conditions, and childcare assistance.	Linear	CONEVAL with data from ENIGH
		Categories:		
		"low": if obtaining support from social networks in most hypothetical situations is perceived by the head as difficult or impossible;		
		"high": if obtaining support from social networks in the majority of hypothetical situations is perceived by the head as easy or very easy;		
		"medium": otherwise.		
	Credit card	Holding of a credit card by at least one household member.	Linear	ENIGH
		Categories:		
		"yes": if at least one member holds a credit card;		
		"no": otherwise.		

Table 1. *Cont.*

Level	Variable	Definition	Relationship	Source
Individual/household	Disability	Reported status of disability (having a developmental delay; a mental illness; and/or difficulties or limitations performing one or more basic/everyday activities such as moving their arms, moving their legs, walking, seeing, hearing, speaking, bathing, toileting, eating, dressing, and/or learning basic skills or concepts) of the household head.	Linear	ENIGH
		Categories:		
		"yes": if the head has a disability;		
		"no": otherwise.		
	Type of household	Type of household based on the number of members and the relationship between them.	Linear	ENIGH
		Categories:		
		"one-person": consisting of only one member (head);		
		"nuclear": made up of the head, and its partner; the head, its partner, and their children; the head, and its children; the head, and its parents; or the head, and its siblings;		
		"extended": consisting of the head, their nuclear family (in case of having), and at least another member whose kinship tie with at least one of the other household members is beyond the nuclear family kinship ties (i.e., aunts, uncles, nephews, nieces, grandparents, grandchildren, and/or cousins);		
		"other": formed by the head, their nuclear family (in case of having one), and/or their extended family (in case of having one), and at least another member without a kinship tie with any of the rest of the household members.		
	Access to food	Reported status of access to nutritious and quality food. The respondent is asked if in the last three months, due to lack of money or lack of other resources, at least one of the household members aged 18 or older experienced the following six circumstances: had a diet based on a very small variety of foods; stopped having breakfast, lunch or dinner; ate less than he/she considers should eat; was left without any food; felt hungry but did not eat; and/or ate just once a day or stopped eating for a whole day. Households having at least one member aged under 18 are asked the same questions to separately capture the information for this particular age group.	Linear	CONEVAL with data from ENIGH
		Categories:		
		"yes": a household without members aged < 18 is considered to have access to nutritious and quality food if the respondent answered affirmatively to less than three out of the six questions made (i.e., less than three circumstances experienced in the last three months). Less than four for households with at least one member aged < 18 years;		
		"no": otherwise.		

Table 1. *Cont.*

Level	Variable	Definition	Relationship	Source
Individual/household	Access to health services	Reported status of access to public health services.	Linear	CONEVAL with data from ENIGH
		Categories:		
		"yes": if the head is ascribed or affiliated directly or by kinship to one of the public health institutions or programs;		
		"no": otherwise.		
	Dwelling with adequate quality and sufficient space	Reported status of the access to a dwelling with adequate quality and sufficient space. This indicator takes into account four dwelling conditions: if the floor is made of concrete or is coated; if the roofs are made of concrete slab or slab joists with roof, wood, metal sheets, asbestos, or any superior quality; if the walls are made of concrete, brick, block, stone, or any superior quality; and/or, if the number of household members per room (including the kitchen, but excluding hallways and bathrooms) is at most 2.5.	Linear	CONEVAL with data from ENIGH
		Categories:		
		"yes": a household is considered to have a dwelling with adequate quality and sufficient space if the dwelling meets the four conditions abovementioned;		
		"no": otherwise.		
	Educational lag	Reported status of the educational lag of the head. It indicates if the head is lagging behind the compulsory level of education according to their age.	Linear	CONEVAL with data from ENIGH
		Categories:		
		"yes": the head has an educational lag if he/she was born before 1982 and has not yet completed elementary school; or, if he/she was born on or after 1982 and has not yet completed secondary-level schooling;		
		"no": otherwise.		
	Access to basic housing services	Reported status of the household's access to basic services. It takes into account four basic services: piped water within the dwelling (or outside, but within the dwelling grounds); drainage connected to the public service (or to a septic tank); electricity; and use of natural or LP gas, or electricity like cooking fuel (or coal but having a chimney).	Linear	CONEVAL with data from ENIGH
		Categories:		
		"yes": a household is considered to have access to basic services if the dwelling has access to the four services abovementioned;		
		"no": otherwise.		

Table 1. *Cont.*

Level	Variable	Definition	Relationship	Source
Individual/household	Access to social security	Reported status of the access to social security of the head. This indicator takes into account four circumstances: if the head is economically active and has access to social security (public health services and to the pension system); if the head is not economically active but has access to social security due to direct kinship; if the head is retired and receives a pension; and/or, if the head is 65 years old or older and receives a monetary transfer from a public program.	Linear	CONEVAL with data from ENIGH
		Categories:		
		"yes": if, according to their age, working condition, and kinship, the head has access to the corresponding benefits from the social security;		
		"no": otherwise.		
	Education level	Degree of formal education level completed by the head.	Linear; and/or interaction with age	ENIGH
		Categories:		
		"low": if the maximum completed level by the head is primary education;		
		"medium": if the head has minimum secondary education and a maximum of high school;		
		"high": if the head has completed at least a university degree.		
	Marital status	Marital status of the household head.	Linear; and/or interaction with age	ENIGH
		Categories:		
		"single"; "open-union"; "married"; "separated"; "divorced"; and, "widowed"		
	Age	Age in years of the household head.	Linear; non-linear; interaction with education level; and/or interaction with marital status.	ENIGH
	Weekly housework hours	Time in hours spent on housework (washing, ironing, cooking, etc.) by the household head per week.	Linear; and/or non-linear	ENIGH

Table 1. *Cont.*

Level	Variable	Definition	Relationship	Source
Community	Social marginalization	Degree of social marginalization in 2015 of the municipality of household residence. This indicator takes into account nine socioeconomic indicators at the municipal level: percentage of the population aged 15 years and over who are illiterate; percentage of the population aged 15 years and over who have not completed elementary school; percentage of the population living in dwellings without drainage nor a toilet; percentage of the population living in dwellings without electricity; percentage of the population living in dwellings without piped water; percentage of the population living in overcrowding conditions (number of household members per room, including the kitchen, but excluding hallways and bathrooms, is greater than 2.5); percentage of the population living in dwellings with dirt floor; percentage of the population living in settlements with fewer than 5000 inhabitants; and percentage of the employed population having an income of up to two minimum wages. The official methodology elaborated by CONAPO applies the principal component analysis to the data and reduces their dimensionality to a single variable, which is then categorized.	Linear	CONAPO
		Categories:		
		"very low"; "low"; "medium"; "high"; and, "very high"		
	Emergencies due to weather	The average annual number of declarations of emergency, disaster, or contingency due to weather between 2010 and 2015 in the municipality of household residence.	Linear; and/or non-linear	CENAPRED
	Gini index	Gini index in 2015 of the municipality of household residence.	Linear; and/or non-linear	CONEVAL
	Human-development index	Human-development index in 2015 of the municipality of household residence.	Linear; and/or non-linear	PNUD
	Municipal functional capacities	Local functional capacities index in 2015 of the municipality of household residence. This is a composite indicator taking into account five functional capacities of the municipal public administration: capacity to involve relevant stakeholders; capacity to diagnose; capacity to formulate public policies and strategies; capacity to budget, manage, and implement; and capacity to evaluate.	Linear; and/or non-linear	PNUD
	Women-to-men ratio of housework hours	Number of hours spent by women aged 12 years and over doing housework per hour spent by men aged 12 years and over doing housework in 2015 in the municipality of household residence.	Linear; and/or non-linear	ENIGH
	Women's political participation	Share of senior positions in the local public administration held by women in 2015 in the municipality of household residence. Expressed in decimal form.	Linear; and/or non-linear	National Census of Municipal and Delegational Governments

Table 1. *Cont.*

Level	Variable	Definition	Relationship	Source
Community	Migration of women	Share of the 2015 women's population aged 5 years and over in the municipality of household residence who lived in another state or country in 2010. Expressed in decimal form.	Linear; and/or non-linear	Intercensal Population Survey
	Migration of men	Share of the 2015 men's population aged 5 years and over in the municipality of household residence who lived in another state or country in 2010. Expressed in decimal form.	Linear; and/or non-linear	Intercensal Population Survey
	Women's household headship	Share of the 2015 population living in female-headed households in the municipality of household residence. Expressed in decimal form.	Linear; and/or non-linear	Intercensal Population Survey
	Women's economically active population	Share of the 2015 women's population aged 12 years and over who were economically active in the municipality of household residence. Expressed in decimal form.	Linear; and/or non-linear	Intercensal Population Survey
	Men's economically active population	Share of the 2015 men's population aged 12 years and over who were economically active in the municipality of household residence. Expressed in decimal form.	Linear; and/or non-linear	Intercensal Population Survey
	Women working in the primary sector	Share of the 2015 women's working population aged 12 years and over who were employed in the primary sector in the municipality of household residence. Expressed in decimal form.	Linear; and/or non-linear	Intercensal Population Survey
	Men working in the primary sector	Share of the 2015 men's working population aged 12 years and over who were employed in the primary sector in the municipality of household residence. Expressed in decimal form.	Linear; and/or non-linear	Intercensal Population Survey
	Women working in the secondary sector	Share of the 2015 women's working population aged 12 years and over who were employed in the secondary sector in the municipality of household residence. Expressed in decimal form.	Linear; and/or non-linear	Intercensal Population Survey
	Men working in the secondary sector	Share of the 2015 men's working population aged 12 years and over who were employed in the secondary sector in the municipality of household residence. Expressed in decimal form.	Linear; and/or non-linear	Intercensal Population Survey
	Women working in the trade sector	Share of the 2015 women's working population aged 12 years and over who were employed in the trade sector in the municipality of household residence. Expressed in decimal form.	Linear; and/or non-linear	Intercensal Population Survey
	Men working in the trade sector	Share of the 2015 men's working population aged 12 years and over who were employed in the trade sector in the municipality of household residence. Expressed in decimal form.	Linear; and/or non-linear	Intercensal Population Survey
	Women working in the service sector	Share of the 2015 women's working population aged 12 years and over who were employed in the service sector in the municipality of household residence. Expressed in decimal form.	Linear; and/or non-linear	Intercensal Population Survey
	Men working in the service sector	Share of the 2015 men's working population aged 12 years and over who were employed in the service sector in the municipality of household residence. Expressed in decimal form.	Linear; and/or non-linear	Intercensal Population Survey
	Municipality of residence	Municipality of household residence.	Random	ENIGH
	Centroid coordinates	Longitude and latitude of the centroid of the municipality of household residence.	Spatial	INEGI

Table 1. *Cont.*

Level	Variable	Definition	Relationship	Source
Region	Corruption	Share of the 2015 population aged 18 years and over who considered corruption a common or very common problem in their region of residence. Expressed in decimal form.	Linear; and/or non-linear	National Survey of Quality and Governmental Impact
	Satisfaction with public services	Share of the 2015 population aged 18 years and over who were satisfied with the basic and on-demand public services provided in their region. Expressed in decimal form.	Linear; and/or non-linear	National Survey of Quality and Governmental Impact
	Gender-based violence against women and girls at school	Share of the 2016 women's population aged 15 years and over who were victims of psychological, physical, and/or sexual gender-based violence at school between October 2015 and October 2016 in the region of household residence. Expressed in decimal form.	Linear; and/or non-linear	National Survey on the Dynamics of Household Relationships
	Gender-based violence against women and girls in the workplace	Share of the 2016 women's population aged 15 years and over who were victims of psychological, physical, and/or sexual gender-based violence in the workplace between October 2015 and October 2016 in the region of household residence. Expressed in decimal form.	Linear; and/or non-linear	National Survey on the Dynamics of Household Relationships
	Gender-based violence against women and girls in the family context	Share of the 2016 women's population aged 15 years and over who were victims of economic, psychological, physical, and/or sexual gender-based violence in the family context between October 2015 and October 2016 in the region of household residence. Expressed in decimal form.	Linear; and/or non-linear	National Survey on the Dynamics of Household Relationships
	Gender-based violence against women and girls by an intimate partner	Share of the 2016 women's population aged 15 years who were victims of economic, psychological, physical, and/or sexual gender-based violence by an intimate partner between October 2015 and October 2016 in the region of household residence. Expressed in decimal form.	Linear; and/or non-linear	National Survey on the Dynamics of Household Relationships
	Gender-based violence against women and girls in the public sphere	Share of the 2016 women's population aged 15 years who were victims of psychological, physical, and/or sexual gender-based violence in the public sphere (perpetrated by a friend, an acquaintance, or a stranger with whom the victim has no family nor intimate relationship, and where the perpetrator is not her co-worker nor her schoolmate) between October 2015 and October 2016 in the region of household residence. Expressed in decimal form.	Linear; and/or non-linear	National Survey on the Dynamics of Household Relationships
	State of residence	Region of household residence.	Random	ENIGH

* See the electronic Supplementary Materials for summary statistics.

As shown in Table 1, in addition to using the ENIGH, data from the 2015 National Census of Municipal and Delegation Governments (INEGI 2015a), the 2015 Intercensal Population Survey (INEGI 2015b), the 2015 National Survey of Quality and Governmental Impact (INEGI 2015c), the National Population Council (CONAPO 2016), the 2016 National Survey on the Dynamics of Household Relationships (INEGI 2016b), the microdata for poverty estimation (CONEVAL 2018), the human-development index (UNDP 2019), and the National Center for Prevention of Disasters (CENAPRED 2020) are integrated. A description of the data integration process can be found in the electronic Supplementary Materials. Original datasets are freely available at www.coneval.org.mx (accessed on 12 September 2020), www.inegi.org.mx (accessed on 12 September 2020), www.datos.gob.mx

(accessed on 12 September 2020), and www.mx.undp.org (accessed on 12 September 2020). The data (and metadata) used in this paper, i.e., after combining all the sources, are publicly available from Figshare at https://doi.org/10.6084/m9.figshare.22132139.v1. These data are composed of 10,503 female-headed households and 22,570 male-headed households.

2.2. Empirical Strategy

The additive quantile regression models are applied to examine how and to what extent the covariates are linked to the income-to-poverty ratio of urban Mexican households. This approach has two advantages. First, instead of establishing a priori a particular functional shape to describe the linkage between the income-to-poverty ratio and a given covariate, the additivity structure enables to simultaneously introduce different alternative effects, such as linear, non-linear, and interaction effects, and posteriorly, a selection of the most appropriate form (Hastie and Tibshirani 1986, 1999). Second, the quantile approach estimates regression parameters for specific quantiles of the distribution of the income-to-poverty ratio, which enables us to focus on the effects on the income-to-poverty ratio of the quantiles corresponding to poor and extremely poor households (Koenker 2010; Fenske et al. 2011).

All in all, four additive quantile models are estimated. Two models analyze female-headed families and are estimated for the quantiles corresponding to the poor and extremely poor families. Analogously, the other two models are applied to data on poor and extremely poor households headed by a man. By doing this, it is possible to posteriorly compare and examine whether the association between the income-to-poverty ratio and the covariates differs by the head's sex and poverty level.

To formally express the preceding paragraphs, let $y_{\tau i}^{sex}$ be the income-to-poverty ratio of household i at quantile τ, for $sex = \{woman,\ man\}$, according to the head's sex. The vectors $\mathbf{w_i} := \left(1,\ \boldsymbol{w}_{i1}, \ldots, \boldsymbol{w}_{ip}\right)'$ and $\mathbf{z_i} := \left(\boldsymbol{z}_{i1}, \ldots, \boldsymbol{z}_{iq}\right)'$ represent the p categorical and q continuous covariates. Then, both for female- and male-headed households, the model corresponding to the quantile τ of the income-to-poverty ratio is expressed as the following:

$$y_{\tau i} = \mathbf{w}_i'\boldsymbol{\beta}_\tau + \sum_{k=1}^{q} s_{k\tau}(\mathbf{z}_{ik}) + \varepsilon_{\tau i}, \tag{1}$$

Incorporating the variables from Table 1:

$$\begin{gathered} y_{\tau i} = \boldsymbol{\beta}_{0\tau} + \sum_{j=1}^{14} \mathbf{w}_{ij}'\boldsymbol{\beta}_{j\tau} + \sum_{k=1}^{28} s_{k\tau}(\mathbf{z}_{ik}) + \sum_{l=13}^{14} \delta_{l\tau}(\boldsymbol{z}_{i28}, \boldsymbol{w}_{il}) + \\ \sum_{s=1}^{2} \vartheta_{s\tau}(\boldsymbol{rn_s}) + \varphi_\tau(\boldsymbol{sp_i}) + \varepsilon_{\tau i}, \end{gathered} \tag{2}$$

where $\boldsymbol{\beta}_{0\tau}$ is the model intercept and $\epsilon_{\tau i}$ represents the regression errors. Equation (2) has five components at the right-hand-side. First, $\sum_{j=1}^{14} \mathbf{w}_{ij}'\boldsymbol{\beta}_{j\tau}$ is introduced to capture the linear effects of the categorical covariates. Second, $\sum_{k=1}^{28} s_{k\tau}(\mathbf{z}_{ik})$ estimates the effect of the continuous variables included in Table 1. Here, parameters $s_{k\tau}(\mathbf{z}_{ik})$ are smooth functions that can be decomposed into a linear part and a non-linear polynomial modelled by P-splines (Eilers and Marx 1996). This decomposition allows us to leave a priori the functional shape of the continuous variables unspecified. Accordingly, the effect of each of the continuous covariates can have three alternative results: a non-significant effect, a purely linear effect, and a non-linear effect (Hofner et al. 2014). Component $\sum_{l=13}^{14} \delta_{l\tau}(\boldsymbol{z}_{i28}, \boldsymbol{w}_{il})$ captures the interaction effects, which enables us to estimate how the relationship between income-to-poverty ratio and head's age differs with education level and marital status. Fourth, $\sum_{s=1}^{2} \vartheta_{s\tau}(\boldsymbol{rn_s})$ captures random effects from the unobserved heterogeneity across municipalities and states due to the hierarchical data structure. Finally, $\varphi_\tau(\boldsymbol{sp_i})$ is introduced for the geospatial effects, estimated by bivariate tensor product P-splines (Kneib et al. 2009).

Since the model in equation (2) has a high-dimensional structure, traditional inference methods cannot find a solution. To overcome this situation, a methodology based on three steps is executed. First, the boosting algorithm for estimation. This algorithm is a computer-intensive iterative process combining estimation with automatic variable

selection and model choice (Hothorn et al. 2020). To avoid overfitting and to optimize the prediction accuracy, it is used cross-validation. By doing this, multicollinearity problems are also avoided (Hofner et al. 2014). Posteriorly, stability selection as proposed by Shah and Samworth (2013) is used to prevent the false selection of non-relevant variables. Finally, 95% confidence intervals are computed by drawing 1000 random samples from the empirical distribution of the data using a bootstrap method based on pointwise quantiles (Hofner et al. 2016).

All computations are implemented in the R package "mboost" (Hothorn et al. 2020). The code for replicating these estimations can be found in the Electronic Supplementary Materials and is also publicly available from Figshare at https://doi.org/10.6084/m9.figshare.22132139.v1.

3. Results

Table 2 reports the estimates of the selected covariates for the income-to-poverty ratio of female- and male-headed households living either in poverty or in extreme poverty in urban Mexico. The coefficients indicate the effect of each covariate on the response while other variables remain unchanged. Specifically, they quantify the size of the effect as a proportion of the poverty line, i.e., as a share of the income required to cover the cost of the basic food and the non-food baskets. In the context of quantile regression, coefficients are interpreted as in other regression models. For categorical covariates, coefficients show the variation in the estimated effect of a particular category concerning the estimated effect of the reference category. For continuous covariates with purely linear effects, the coefficient captures the change in the income-to-poverty ratio per unit change in the covariate. An interpretation of the nonlinear effects is best performed by visualizing the respective plots. By comparing the estimations between the models, it is possible to analyze how the effects differ with the intensity of poverty and by the head's sex. By way of example, the coefficient for extremely poor female-headed households that do not have a credit card is −0.207. It suggests that the income-to-poverty ratio for them is 0.207 units lower than the estimated income-to-poverty ratio of those with a credit card. This parameter can also be understood as the size of the effect as a percentage of the per capita monthly cost of the basic food and the non-food baskets, i.e., 20.7% of the MXN 2660.40 (poverty line), which is equivalent to MXN 550.71 per household member per month.

Table 2. Estimated coefficients for significant covariates and their 95% confidence intervals (CI) *.

Variable	Categories	Extremely Poor				At the Poverty Line			
		Female-Headed		Male-Headed		Female-Headed		Male-Headed	
		Coef.	95% CI	Coef.	95% CI	Coef.	95% CI	Coef.	95% CI
Social networks (reference category: low)	medium	0	[−0.024, 0.03]	−0.032	[−0.051, −0.016]	**−0.055**	**[−0.081, −0.027]**	−0.05	[−0.067, −0.029]
	high	0.101	[0.071, 0.132]	**0.067**	**[0.051, 0.084]**	0.133	[0.097, 0.167]	**0.132**	**[0.109, 0.155]**
Credit card (reference category: yes)	no	**−0.207**	**[−0.247, −0.17]**	−0.211	[−0.233, −0.187]	**−0.382**	**[−0.427, −0.337]**	−0.407	[−0.438, −0.379]
Type of household (reference category: nuclear)	one-person	**0.07**	**[0.037, 0.104]**	**0.195**	**[0.138, 0.256]**	**0.159**	**[0.121, 0.205]**	**0.649**	**[0.569, 0.731]**
	extended	−0.048	[−0.072, −0.026]	−0.021	[−0.04, −0.003]	−0.147	[−0.172, −0.124]	−0.09	[−0.111, −0.069]
	other			0.036	[0.008, 0.068]			0.055	[0.014, 0.102]
Access to food (reference category: no)	yes	**0.095**	**[0.069, 0.125]**	**0.102**	**[0.082, 0.124]**	**0.198**	**[0.17, 0.228]**	**0.15**	**[0.129, 0.172]**
Educational lag (reference category: no)	yes	**0.067**	**[0.037, 0.098]**			**0.083**	**[0.047, 0.118]**		
Access to social security (reference category: no)	yes	**0.171**	**[0.141, 0.199]**	**0.218**	**[0.197, 0.239]**	**0.235**	**[0.202, 0.268]**	**0.271**	**[0.248, 0.296]**
Age by education level	medium			**0.06**	**[0.04, 0.09]**	**Non-linear (Figure 1a)**		**Non-linear (Figure 1b)**	
	high	**0.53**	**[0.45, 0.61]**	**0.44**	**[0.4, 0.48]**	**1.04**	**[0.93, 1.17]**	**1.03**	**[0.96, 1.1]**

Table 2. *Cont.*

Variable	Categories	Extremely Poor				At the Poverty Line			
		Female-Headed		Male-Headed		Female-Headed		Male-Headed	
		Coef.	95% CI	Coef.	95% CI	Coef.	95% CI	Coef.	95% CI
Age by marital status	married					**Linear (slope: 0.005)**		**0.09**	**[0, 0.19]**
	separated								
	divorced								
	widowed								
	open union			−0.13	[−0.17, −0.08]			−0.21	[−0.27, −0.16]
Weekly housework hours		Linear (slope: −0.001)				Linear (slope: −0.002)			
Gini index				Linear (slope: −1.047)				Linear (slope: −1.528)	
Human-development index		Linear (slope: 1.074)		Linear (slope: 0.998)		Linear (slope: 1.987)		Linear (slope: 2.219)	
Migration of men								**Linear (slope: 1.748)**	
Women's economically active population				Linear (slope: 0.347)				Linear (slope: 0.379)	
Women working in the trade sector						Linear (slope: −0.578)		Linear (slope: −0.565)	
Satisfaction with public services				**Linear (slope: 0.089)**					
Gender-based violence against women and girls in the public sphere		**Linear (slope: 0.191)**							
Gender-based violence against women and girls in the family context								**Linear (slope: −2.235)**	

* Coefficients in **bold** letters suggest that the estimated effect differs with income level, i.e., keeping the head's sex unchanged, the 95% confidence intervals of the estimated coefficients for the extremely poor and the poor families do not intersect. Correspondingly, coefficients emphasized in **grey** suggest that the effect on the income-to-poverty ratio statistically varies with the head's sex, i.e., keeping the poverty level unchanged, the 95% confidence intervals of the estimated coefficients for the female- and male-headed families do not intersect. For categorical covariates, estimations specify the change in the coefficient for a category about the reference (shown in parenthesis next to the name of the covariate). For continuous covariates with linear effects, only the mean coefficient is shown; see (Hofner et al. 2016) for further details on pointwise bootstrap confidence intervals. Empty cells indicate that the respective variable (or category) is not stability-selected for that particular model, and in consequence, their coefficient is set to zero; see (Hofner et al. 2015; Shah and Samworth 2013) for further details on stability selection.

Overall, the results reveal two different effects. On the one hand, gender-unbiased effects occur when the estimated covariate effect on the income-to-poverty ratio does not statistically differ between female- and male-headed households. On the other hand, gender-biased effects are observed when the estimated coefficient for female-headed households is statistically different than the one estimated for their male-headed counterparts. To determine if an effect varies with the head's sex, 95% confidence intervals of their respective estimated coefficients within the same poverty level must be compared to see if the intervals overlap or not. Importantly, for each of these two effects, it is possible to identify effects varying with the family poverty level. In the following lines, all these results are commented on in detail.

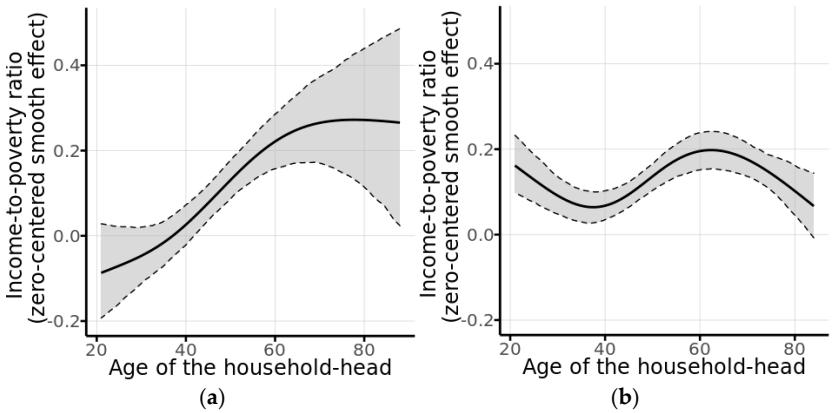

Figure 1. Income−to−poverty ratio and age in poor households with a head with medium education level by head's sex: (**a**) female−headed households; (**b**) male−headed households. The

bold line indicates the expected value whereas the grey area within the dashed lines represents the 95% confidence interval. Results indicate the existence of gender differences in the estimated effects when 95% confidence intervals for female− and male−headed households do not overlap. Medium level of education refers to heads having a minimum of lower−secondary education and a maximum of upper−secondary.

3.1. Gender-Unbiased Effects

Evidence of non-significant gender differences between female- and male-headed households is observed in eight covariates, namely, social networks, credit card, type of household, access to food, access to social security, education level, community's human development, and the share of women working in the trade sector.

Regarding the perception of social networks, a high degree of connectedness is associated with a greater income-to-poverty ratio compared to families whose head has a low or medium degree of social network. For the extremely poor families with a head with a high degree of social network, the estimated parameters are 0.1 and 0.067 for female-and male-headed households, respectively. For poor families with a head with a high degree of social network, the coefficient for those headed by a woman is 0.133, and for male-headed households it is 0.132. For male-headed families, the parameter for a high degree of social network significantly increases as family income goes from extreme poverty up to the poverty level.

The findings indicate that urban families in which a member holds a credit card tend to exhibit a greater income-to-poverty ratio. For extremely poor families, the coefficient for households without access to credit cards and with a woman as the head is -0.207, and for their male-headed counterparts the coefficient is -0.211. Only for female-headed families, the magnitude of the effect varies across poverty levels. Poor households without a credit card have an income-to-poverty ratio lower in 0.382 when they are headed by a woman, and 0.407 units when they are headed by a man.

In extremely poor extended families (composed of a nuclear family group and other family members, such as aunts, uncles, grandparents, and cousins, etc.), those headed by a woman have an income-to-poverty ratio of approximately 0.05 units lower than the ratio of nuclear families. For male-headed families, this difference is of about 0.021 units.

Lacking access to adequate food is linked to poorer households. No evidence of gender dissimilarities is found. For extremely poor households, it is expected that both female- and male-headed families having access to adequate food have approximately an income-to-poverty ratio 0.10 units greater than households lacking access to it. At the poverty level, female-headed households with access to food have an income-to-poverty ratio between 0.17 and 0.23 units higher than the ratio of families deprived of food. For male-headed households, this difference is between 0.13 and 0.17 units for households with access to food.

Access to social security is also found to have a gender-unbiased effect. Households deprived of the social security system tend to be poorer than those accessing the social security system. Both for female- and male-headed households, the size of the coefficient is expected to be larger for families at the poverty line.

Education level is strongly linked to income-to-poverty ratio. In fact, among the parametric effects for categorical variables, the larger coefficients are observed in the correlation of this covariate for families headed by a person with a high level of education (at least a university degree). Keeping the poverty level constant, the correlation of education level with income is not gendered. For extremely poor households, families with a highly educated woman as their head have an income-to-poverty ratio between 0.45 and 0.61 units greater than families with a woman as the head with a low educational attainment. For extremely poor male-headed households, this difference is between 0.4 and 0.48 units. The coefficients are larger for families whose income is at the poverty line. For these households, the income-to-poverty ratio of families with a highly educated head is approximately one unit greater than households with a head having a low level of education.

The estimated parameter for the association of the human-development index in the four models indicates a linearly increasing effect without evidenced gender differences between female- and male-headed households, nor between poverty levels.

Regarding the link of the income-to-poverty ratio with the share of women working in the trade sector, the effect is described by a linear decreasing trend significant only for poor households. The effect for female- and male-headed families is not statistically different.

3.2. Gender-Biased Effects

Evidence of heterogeneous effects between female- and male-headed families is found in eleven covariates. These include the type of household, educational lag, age by education level, age by marital status, weekly housework hours, Gini index, migration of men, women's economically active population, satisfaction with public services, and gender-based violence both in the public sphere and in the family context.

Concerning the type of household, greater income-to-poverty ratios are expected in households composed of only one person, followed by other types of households (households composed of unrelated individuals), nuclear families, and extended households (nuclear family group and other family members such as aunts, uncles, grandparents, and cousins). There are marked gender differences regarding the type of household, i.e., having the same family structure, households headed by a woman have an expected income-to-poverty ratio statistically lower than households headed by a man. Among one-person households, the coefficient for men is much larger than the coefficient for women, almost three times for extremely poor families, and approximately four times for the case of households at the poverty line. For extended families, there are gender differences only for poor families, disproportionally affecting those headed by a woman: extended female-headed households show an income-to-poverty ratio 0.15 units lower than the ratio of nuclear households and 0.31 points less than the ratio of one-person families.

Educational lag is significant only for women-headed households. This correlation indicates that families with a woman head lagging behind the compulsory level of education show a lower income-to-poverty ratio; approximately 0.07 points for extremely poor families and about 0.08 points for those at the poverty line.

For the age and education level interaction, only the effect for households at the poverty line with a head with a medium education level is selected with a nonparametric linkage, depicted in Figure 1. Here, it is possible to observe the dynamic of poverty throughout the lifetime and how it is gendered. Approximately, for between 20- and 40-year-olds, the income-to-poverty ratio of male-headed households is about 0.3 units greater than the corresponding ratio of their counterparts headed by a woman. At this life stage, both curves follow different trajectories, an increasing trend for families with a woman as head, and a decreasing curve for male-headed households. Both curves meet at around 40 years old and then they follow a similar increasing path up to around 60 years old. After around 60 years old, the income-to-poverty ratio of women-headed households seems to stabilize. For men-headed households, the income-to-poverty ratio seems to decrease with age from 60 years old. However, considering the 95% confidence intervals, after 60 years old both curves are not statistically different.

On marital status, among men-headed households, those with a head living in an open union are expected to be poorer than those whose head has another marital status. A larger income-to-poverty ratio is observed in households with a separated male head. For separated women-headed households, a linear increasing effect is selected as significant for families living in poverty; the income-to-poverty ratio of these households rises as age increases at a constant factor of 0.005 per year.

As can be seen in Table 2, housework time is only associated with female-headed households. The linkage between the time of housework in hours and the income-to-poverty ratio is described by a constantly decreasing line, indicating that for families headed by a woman, devoting more time to housework is associated with a lower income-to-poverty ratio.

Regarding the Gini index, a larger income-to-poverty ratio of male-headed families is correlated with communities with better income distribution among their households. This association is described by a linear declining effect having a larger coefficient size for households at the poverty line (coefficient equal to −1.528) than those in extreme poverty (−1.047). For female-headed households, no association with the Gini index is found.

The immigration of men in the community is selected as an influential variable exclusively for poor households headed by a man. For these families, municipalities with larger shares of men who lived in another state or country in the previous five years (recent immigrants) are associated with a better income-to-poverty ratio.

For male-headed households, the share of women economically active in the municipality is positively associated with the income-to-poverty ratio. The coefficient for this effect is similar both for households in extreme poverty and for those at the poverty line.

Moreover, as the share of the population satisfied with the basic and on-demand public services provided in their region increases, the income of extremely poor male-headed households linearly increases.

Furthermore, higher income-to-poverty ratios in extremely poor female-headed households are expected in regions with larger proportions of women victims of gender-based violence in community settings (public transportation, streets, and parks, etc.). Likewise, regions with larger shares of women victims of violence in family contexts are linked to a lower income-to-poverty ratio for poor households headed by a man.

4. Discussion

It is important to analyze the results in the context of the existing research aiming to extract potential explanations. It is noteworthy to mention that all the findings in the previous section estimate statistical associations between the covariates and the response, and although they do not indicate causality, they do provide insights about important aspects for the analysis of income poverty in urban Mexican families.

Social networks can be both a cause and an effect of poverty. On the one hand, a supportive social network plays a role in addressing poverty by providing goods and services the poor need but cannot afford (access to job opportunities, help in childcare, financial support, or help in emergencies). On the other hand, poor people can also be socially excluded due to time and material restrictions or stigma. Moreover, participation in social activities with peers has a financial cost, e.g., clothing and transportation (Lister 2021). These findings are in line with previous work from different countries (Rosas 2001; Marques 2015; Lubbers et al. 2020; Kalinowski 2022).

The correlation between holding a credit card and the income-to-poverty ratio can be understood as follows. First, not having access to credit can be a limiting factor for household income, especially because poor families do not have enough resources to invest in income-generating activities, smoothing consumption, or having savings to face economic hardships. But, similarly, poverty could be at the same time a barrier to access financial services. A further discussion on this regard is found in Karlan and Zinman (2010) and Das (2019).

As found in Musgrove (1980) and Munoz Boudet et al. (2018), the reasoning behind the effect of the type of household is related to the number of family members depending on the same income. Other types of households show the second largest income-to-poverty ratio, probably because they are unrelated individuals having each of them their own income source, a situation that may not occur in nuclear or extended families.

The results provide evidence of the linkage between monetary and non-monetary poverty (social deprivations). Regarding access to food, it may indicate a two-way effect. On the one hand, having a nutritious diet involves allocating sufficient money for buying adequate food, which can be a challenge for families struggling with income. On the other hand, the consumption of nutritious food helps to maintain good health status, and in turn, it improves the ability of people to take part in the labor force. These results match well with earlier findings (Battersby and Watson 2018; Cook and Frank 2008).

Educational lag is found to be associated with a lower income-to-poverty ratio of female-headed households. This fact could be connected to the key role played by elementary and secondary school in poor women, possibly linked to female empowerment due to better access to knowledge about different life choices that do not conflict with their well-being or information on health issues at this life stage, and, in turn, helping them to delay getting pregnant or married (King and Hill 1993; Subbarao and Raney 1995; Klasen 2002). Viewing educational lag as an effect of poverty points to the fact that female heads without basic education did not have the chance to attend school because they probably come from adverse economic contexts, making it difficult or impossible to afford education.

Our results also support the existence of a consistent positive relationship between income and access to the social protection system. It is important to mention that social security is granted to workers in formal jobs, which are normally better paid than informal jobs in Mexico (INEGI 2021).

Consistent results both for female- and male-headed families indicate that households whose heads completed at least a university have a higher income, which is a commonsense result (Haughton and Khandker 2009). For poor households with a head with a medium level of education (a minimum of lower-secondary education and a maximum of upper-secondary), it is corroborated with the existence of a cycle of poverty. Approximately, between 20- and 40-year-olds, the income-to-poverty ratio of male-headed households is greater than the corresponding ratio of their counterparts headed by a woman. Among other reasons, this could be due to the existence of difficulties in entering the labor market or the effect of childcare disproportionately affecting women, as indicated by (INEGI 2019). At this life stage, both curves follow different trajectories that meet at around 40 years old, and then they follow a similar increasing path up to around 60 years old, the retirement age. A potential explanation for this growing segment of the curve between being 40 and 60 years old is that children reach an age high enough for working and contributing to the family income or they leave home, reducing the number of dependents. After around 60 years old, the mean income seems to stabilize, but the large variability at this life stage may also indicate very different situations experienced by elderly women. Similar conclusions can be found in previous research (Munoz Boudet et al. 2018).

The results confirm significant differences according to marital status. Nevertheless, in contrast to other studies indicating that lower-income levels are observed in families that experienced a dissolution (McManus and DiPrete 2001; Haughton and Khandker 2009), a greater income-to-poverty ratio is observed for households with a separated head, independently of their sex.

What is particularly interesting is the effect of housework hours on income, given that it reflects the existence of a kind of trade-off between the time devoted to paid and unpaid work that exclusively affects female-headed families, i.e., the female head cannot increase her housework time without reducing the household income-to-poverty ratio. Comparable conclusions have been obtained in previous studies on time use (Cash et al. 2005; Merz and Rathjen 2014).

At the community level, the Gini and the human-development indexes reflect the quality of life in a municipality, and their linkage with the income-to-poverty ratio must be understood as a two-way causality. More equal and more developed communities may offer better income-generating opportunities to their inhabitants. Yet, income improvements for the poor and extremely poor households in turn can propel income equality and development in the community.

On the effect of the immigration of men, this linkage could indicate that the presence of poor households with a relatively better income-to-poverty ratio is influencing households' residential decisions, attracting more men. In addition to this, the recent immigration of men could lead to a dynamization of the labor markets, more tax contributions, and a supplement to the stock of human capital in communities, which finally could have an impact on the increase in the income of poor male-headed families.

The results indicate that male-headed families living in urban communities where an important proportion of women is involved in the economy have on average a better income-to-poverty ratio. Some possible explanations can be that the inclusion of women in the economically active population helps address labor-market imbalances in urban communities, expands the working-age population, or contributes to boosting human capital. Regarding the link of income with the share of women working in the trade sector, the effect is described by a linear decreasing trend significant only for poor households.

The findings suggest that the quality of the public provision of goods and services is positively associated with the income-to-poverty ratio. On the one hand, it can indicate that extremely poor households generally have residence in states with a lower quality of public services, which are in turn more likely to have a lower cost of living. Furthermore, families with an income sufficient to afford the cost of living tend to reside in a region with a better provision of public services. On the other hand, it may also indicate that the provision of public services impacts the income of the families via an improvement in their quality of life (Bramley 2018; Hewett and Montgomery 2001).

Finally, regarding gender-based violence against women and girls, based on previous analysis (Terry 2004; Slabbert 2017; Gillum 2019), there are some potential explanations for these results. First, maybe due to financial and time restrictions, lower income levels are linked to lower social interactions, keeping the likelihood of victimization in the public space at low levels. As the income of extremely poor female heads improves, their interactions increase, including contact with more potential perpetrators. In this regard, despite the greater economic empowerment of women within the family, there could be still some obstacles to gender equality in other spheres of public life; thus, stereotypes and traditional gender roles are manifested in acts of violence against women in different public contexts. Concerning the linkage with violence in family contexts, it can be hypothesized that lower levels of violence against women by family members indicate lower domination experienced by women in the private sphere, and in this way, in male-headed households, women can better contribute to the household by engaging in paid or unpaid work, increasing household income.

5. Conclusions

In this paper, the aim was to detect a subset of significant factors for the income-to-poverty ratio of urban families in Mexico. Special focus is paid to dissimilarities between female- and male-headed families, and variations according to their depth of poverty.

From a gender standpoint, the findings provide evidence on two important aspects in the analysis of poverty in urban Mexico. First, a subset of factors is found to be consistently linked to the income-to-poverty ratio regardless of the head's sex and regardless of the poverty level. These covariates have a high level of social networks, credit card possession, access to food, access to social security, a high level of education, and a human-development index of the community of residence. Second, there are some factors whose linkage with the response variable differs by sex, and this effect is significant both for poor and extremely poor households. These covariates include living in a one-person household, educational lag, having a medium level of education, families whose head lives in an open-union, weekly housework hours, municipal Gini index, and women's economically active population.

The results provide five main contributions. First, the educational lag of the head is particularly relevant for female-headed households. Second, evidence supports the existence of a gendered life cycle in the trajectory of the income-to-poverty ratio for poor households with a head holding a medium education level. Third, some of the relevant effects vary with the family's depth of poverty, for instance, access to food and access to social security. Fourth, by controlling by a large set of covariates, the findings allow us to underscore the circumstances in which female- and male-headed households face disadvantages. In this regard, it is observed that some households, traditionally disregarded, may experience even worse situations of poverty. These are, among others, families lacking

social connectedness, without access to credit cards, extended households, households in which the woman head spends more time on housework, and families headed by a young woman with a medium level of education. Finally, the results indicate that communities and regions where families have a lower income-to-poverty ratio are characterized as being unequal, with low human development, having a low economic participation of women, with a poor quality of services, with low levels of gender-based violence against women and girls in the public sphere, but high levels of gender-based violence in the family context.

Even though the response variable, the income-to-poverty ratio, allows us to examine how the effect of different risk factors varies with the severity of poverty, it is crucial for future studies to broaden their scope. Researchers should consider exploring different poverty indicators, examining various distributional parameters, or adopting alternative concepts of poverty, such as the multidimensional or subjective approach, to contribute to a more comprehensive understanding of the multifaceted nature of this socioeconomic challenge. Limitations of this study are related to the inherent features of cross-sectional data. Estimations only apply to urban Mexico in the period of reference. Future research endeavors should extend beyond the current temporal and geographical scope of this paper to consider the broader social and political context, comparing results with research conducted in other regions to gain a fuller understanding of this complex issue. In addition, income poverty is both a cause and an effect of many covariates included in this research, and it is difficult to determine causality.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/socsci13030159/s1, Note S1: Data-cleaning process, Note S2: Data-integration process, Note S3: Metadata, Note S4: Summary statistics of the response variable, Note S5: Summary statistics of continuous covariates, Note S6: Summary statistics of categorical covariates, Note S7: R Code for model estimation.

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