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"Be a man": male unemployment and rape in Mexico

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Abstract
Despite the pervasiveness and severity of sexual violence, the economic literature on its determinants remains limited. This study examines whether male unemployment contributes to sexual violence in Mexico. Using an ordinary least squares method with fixed effects, it juxtaposes male unemployment rates derived from the National Labor Survey with rape rates reported by the National Public Security System across states and quarters from 2015 to 2019. The analysis shows that a 1 percentage point rise in male unemployment corresponds to an 8.1 percent increase in rape rates. Robustness checks address concerns related to omitted variables, simultaneity, and changes in reporting rates, among others. Further analysis indicates that the association is concentrated among women aged 25 to 34. Additionally, there is suggestive evidence that the finding is not driven by changes in relationship dynamics or increased stress, but rather by a backlash against women with more progressive attitudes. This article is among the first to comprehensively identify a positive relationship between male unemployment and sexual violence, underscoring the need to address traditional gender norms to combat violence against women.

Keywords Male unemployment · Sexual violence · Backlash · Mexico

JEL Classification J16 · J60 · B54

1 Introduction

Sexual violence is one of the most common forms of violence against women. Globally, in 2018, 30 percent of women aged 15 or older have been subjected to physical and/or sexual intimate partner violence, non-partner sexual violence, or

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both, during their lives (WHO, 2021). In Mexico, almost one in every two women aged 15 years and over has experienced some form of sexual violence during their lifetime (INEGI ENDIREH, 2021). The repercussions of this kind of violence can extend to severe and enduring mental, reproductive, and physical consequences (Campbell et al., 2009; Jina & Thomas 2013), potentially leading to compromised outcomes in the labor market (Loya, 2015; Sabia et al., 2013). Additionally, the perceived risk of sexual harassment and assault hinders women's unrestricted and secure mobility, influencing their decisions in education and labor force participation (Borker, 2021; Chakraborty et al., 2018; Siddique, 2022). While various disciplines have explored the roots of sexual violence, the economic literature on the subject remains limited. Nevertheless, certain economic elements may contribute to determining its prevalence. Specifically, the relationship between male unemployment and sexual violence is theoretically ambiguous. On the one hand, male unemployment might decrease sexual crimes by reducing social interactions or by translating into improved gender equality. On the other hand, male unemployment could increase rapes by reducing males' probability of being in a relationship, exposing women to potential aggressors within their close circles, heightening men's financial stress, and challenging established masculinity norms. Only a few studies have empirically explored this relationship, yielding mixed results (Caruso, 2015; Raphael & Winter-Ebmer, 2001; Saridakis & Spengler, 2012). At the same time, the literature on a related facet of gender-based violence, encompassing sexual violence among its forms, has acknowledged the relevance of male unemployment in affecting the prevalence of intimate partner violence, albeit in an ambiguous direction (Aizer, 2010; Anderberg et al., 2016; Bhalotra et al., 2021; Tur-Prats, 2021).

This study aims to investigate whether male unemployment affects a specific type of crime and form of gender-based violence: sexual violence. It empirically explores the question in the context of Mexico, examining the relationship between the male unemployment rate and the rates of rape, for each state and trimester from 2015 to 2019, through ordinary least squares regressions with state, quarter, and year-fixed effects, controlling for sex ratios. Unemployment rates are derived from the National Labor Survey (*Encuesta Nacional de Ocupación y Empleo*), while information on sexual crimes is obtained from the National Public Security System (*Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública*). Additional data sources, including victimization and gender-based violence surveys as well as administrative records on population, nuptiality, and mortality, are then used to conduct robustness checks and explore the underlying mechanisms driving the observed association.

The analysis indicates that a 1 percentage-point increase in the male unemployment rate corresponds to an 8.1 percent (0.264 cases per 100,000 people) increase in rape rates. The finding withstands various robustness checks, including population weighting, controlling for female unemployment, considering lagged male unemployment, altering variables' functional forms or estimators, incorporating state-specific annual trends, excluding one state at a time, implementing Oster (2019) and Diegert et al. (2022) sensitivity analyses for omitted variable bias, and investigating general trends in crime. Additionally, analysis based on the National Victimization Survey (*Encuesta Nacional de Victimización y Percepción sobre Seguridad Pública*) suggests that the main result is not driven by measurement errors or changes in reporting rates to authorities and indicates that an increase in male unemployment

contributes to a rise in sexual assaults particularly against women aged 25 to 34 years.

The analysis then explores potential mechanisms underlying the observed positive association, specifically examining the *motivational*, *exposure*, *stress*, and *backlash* channels. The *motivational* mechanism suggests an increase in sexual crimes due to the reduced likelihood of unemployed males initiating or sustaining relationships. The *exposure* channel posits that the reduced mobility of unemployed individuals may contribute to an increase in sexual violence if the perpetrator is a family member or close friend. The *stress* mechanism attributes the rise in rapes to higher psychological and financial stress following job losses, while the *backlash* mechanism sees it as a way of reaffirming the traditional masculine identity threatened by declining job opportunities. Firstly, the result does not appear to be explained by changes in relationship dynamics, as male unemployment does not influence divorce and marriage rates. Additionally, male unemployment is not associated with the rates of male suicide and death from mental or behavioral disorders, suggesting that the *stress* mechanism may not play a significant role in this context. Unfortunately, the *exposure* channel cannot be directly explored due to data limitations. Still, a heterogeneity analysis based on baseline women's opinions about gender roles provides suggestive evidence supporting the *backlash* channel. Specifically, male unemployment is positively associated with sexual violence only in states where women had more progressive attitudes.

The study contributes to the existing literature in several ways. While prior economic studies have predominantly explored the relationship between overall unemployment and various crime categories, only a limited number have independently addressed sexual violence and considered gender-specific labor market opportunities. Notably, studies such as Caruso (2015) in Europe, Raphael & Winter-Ebmer (2001) in the USA, and Saridakis & Spengler (2012) in Greece found weak evidence that male unemployment increased rape. Therefore, the analysis contributes to the discussion of these articles by exploring the relationship between male unemployment and sexual violence in a different context. Indeed, Mexico is a middle-income country in Latin America, with possibly different socioeconomic and cultural environments relative to the European and US contexts. Moreover, the analysis introduces an original conceptual framework to better understand the potential directions of this relationship and its underlying mechanisms. It integrates insights from economic literature with perspectives from other disciplines, providing a more comprehensive view. Additionally, it empirically examines the significance of the identified channels, offering a deeper investigation into their relevance in the context under study. Finally, a broader literature exploring the effects of gender-specific job opportunities on intimate partner violence has yielded mixed evidence depending on the relative influence of bargaining power and male backlash channels (Aizer, 2010; Anderberg et al., 2016; Bhalotra et al., 2021; Tur-Prats, 2021). This study contributes by highlighting that male unemployment may trigger a backlash, increasing violence against women possibly both within and beyond the household, paralleling the recent evidence of an Indian public festivity's impact on assaults against women in public spaces (Martínez and Poblete-Cazenave, forthcoming).

2 Conceptual framework and literature review

2.1 Conceptual framework

The paper delves into the complex relationship between male unemployment and sexual violence. In this section, I outline the conceptual framework underlying the relationship, drawing on insights from economic, evolutionary, and feminist literature. Theoretical predictions are ambiguous, as different mechanisms may drive the association in opposing directions. While *opportunity* and *gender equality* channels suggest a potential decline in sexual crimes, male unemployment could also increase violence through *exposure*, *motivation*, *backlash*, or *stress*. Each of these channels is now discussed in detail.

2.1.1 Negative relationship between male unemployment and sexual violence

Male unemployment may exert a diminishing impact on sexual violence through two distinct channels: the *opportunity* mechanism rooted in economic literature and the *gender equality* channel drawn from feminist perspectives.

The *opportunity* mechanism emanates from economic considerations, positing that criminal acts require offenders to encounter unguarded targets (Cohen & Felson, 1979). Following this rationale, male unemployment, by reducing social interactions and increasing the presence of individuals in homes or neighborhoods (where protection is more likely), is associated with a decline in crime (Cantor & Land, 1985). This reduction is attributed to a dual impact: the decreased social activity of potential perpetrators and the heightened guardianship of potential victims, collectively constituting the *opportunity* channel. Importantly, the negative influence of male unemployment on sexual violence through the *opportunity* mechanism specifically applies to crimes in which the offender is typically a stranger to the victim and usually occur in public spaces.

Additionally, drawing from feminist literature, male unemployment may contribute to a reduction in sexual violence through the *gender equality* channel. Indeed, feminist theories, despite their diverse strands, consistently conceptualize sexual crimes as expressions of power, with males seeking dominance rather than satisfying sexual desires (Bevacqua, 2000; Brownmiller, 1975; McPhail, 2016). Consequently, increased male unemployment, by potentially enhancing women's relative status, may lead to a decrease in the prevalence of sexual violence (Avakame, 1999; Martin et al., 2006).

2.1.2 Positive relationship between male unemployment and sexual violence

On the other hand, male unemployment may increase rapes. The positive direction of this relationship may be explained by four potential channels: *exposure*, *motivational*, *backlash*, and *stress*.

Firstly, the *exposure* mechanism is the counterpart to the *opportunity* channel in crimes where the perpetrator is typically a family member or a known individual residing nearby. In these scenarios, the reduced social activities and mobility of the unemployed may lead to an increased opportunity for offenders to commit the crime

or, concurrently, heightened exposure of victims to potential perpetrators (Cantor & Land, 1985; Hsu & Henke, 2021). Therefore, to differentiate between cases where the channel is associated with a reduction or increase in sexual violence, it is termed the *opportunity* channel when related to a decrease and the *exposure* channel when linked to an increase. The relevance of the contrasting mechanisms would hinge on the specific characteristics and relationships between victims and perpetrators prevalent in each crime. Given that rape often involves perpetrators known to the victim[1], the *exposure* channel may play a more significant role. However, these two opposing channels ultimately lead to an ambiguous overall effect.

Secondly, the *motivational* channel is rooted in a long-history economic perspective but is adapted to the context of this analysis through evolutionary theories. Indeed, a positive link between unemployment and crime has been extensively hypothesized in the economic literature, grounded in the rational choice perspective that posits lower economic status implies reduced opportunity costs for engaging in illegal activities (Becker, 1968). However, this literature predominantly addresses property crimes, requiring an adaptation when examining violent crimes, particularly sexual offenses. In fact, the criminal act in question lacks an economic reward, diminishing the relevance of the *motivational* channel. However, evolutionary theories introduce an alternative interpretation of the mechanism, suggesting that rape may represent a direct or indirect adaptation of a strategy evolved to enhance men's reproductive success (Thornhill & Palmer, 2000). While these theories have faced substantial criticism (Smith et al., 2001; Vandermassen, 2011; Ward & Siegert, 2002), they are nonetheless incorporated into the current conceptual framework. According to this view, if unemployment reduces men's chances of finding or maintaining a partner (for example, by decreasing marriage opportunities or increasing the likelihood of divorce), this could potentially lead to a *motivational* increase in rape. In this case, the perceived reward from the criminal act is sexual intercourse and reproductive possibility, a concept also known as the *mate deprivation hypothesis* (McKibbin et al., 2008).

Thirdly, feminist theories propose a contrasting mechanism to the *gender equality* channel mentioned earlier: the *backlash* mechanism, suggesting a positive relationship between male unemployment and sexual violence (Avakame, 1999; Martin et al., 2006)[2]. In societies characterized by a widespread male breadwinner norm, a decline in job opportunities for men could challenge their sense of identity. This may elevate frustration levels, leading to a heightened propensity for engaging in violent behaviors. Indeed, considering that societal norms regarding one's gender influence behavior (Akerlof & Kranton, 2000), in communities where masculinity is deeply

[1] Based on data from the Mexican National Victimization Survey (*Encuesta Nacional de Victimización y Percepción sobre Seguridad Pública* – ENVIPE, INEGI), one in every two rape victims indicated that the perpetrator was a close friend or family member, with only one-fourth reporting the assailant as a stranger. Parallelly, around 50 percent of the rapes happened in a house, 11 percent at the workplace, and 27 percent in the street.

[2] Note that the contrasting channels derived from feminist theories parallel the *bargaining* and *backlash* hypotheses of economic models on the relationship between gender-specific unemployment and intimate partner violence (Aizer, 2010; Anderberg et al., 2016; Bhalotra et al., 2021; Tur-Prats, 2021). However, the feminist literature extends the economic *bargaining* mechanism into a *gender-equality* channel at the societal level, potentially reducing violence against women beyond the household context.

perceived in terms of power and authority, unemployment may pose a threat to men's sense of identity, and violence - including sexual misconduct - may be seen as a way of reaffirming it (Bosson et al., 2009). Therefore, the *backlash* mechanism is more likely to emerge where men hold less gender-equal opinions, and/or where women are more progressive, intensifying the perceived threat to masculine identity (Martìnez and Poblete-Cazenave, forthcoming).

Lastly, the economic literature on domestic violence against women introduces another potential motive applicable to the context of interest: the *emotional cue* or *stress* hypothesis (Bhalotra et al., 2021; Card & Dahl, 2011; Díaz & Saldarriaga, 2023). The premise suggests that job loss may elevate psychological and financial stress, diminishing emotional and impulse control and/or escalating alcohol and drug consumption, potentially increasing sexual violence. Notably, the *backlash* and *stress* hypotheses can be interconnected and challenging to differentiate: psychological stress due to unemployment may be more pronounced where the male breadwinner norm prevails, while financial stress is heightened if the man is the primary household provider (Bhalotra et al., 2021; Díaz & Saldarriaga, 2023).

In summary, the relationship between male unemployment and sexual violence is theoretically ambiguous, moving through different channels derived from various strands of economic and other disciplines' literature. On the one hand, male unemployment may reduce rapes due to the *opportunity* or *gender equality* mechanisms. On the other hand, it may increase sexual violence through *motivational*, *exposure*, *backlash*, or *stress* channels. The prevailing relationship's direction and the relevant underlying mechanisms are thus empirical questions.

2.2 Empirical evidence

The empirical evidence on the unemployment impact on crime is mixed, reflecting the contrasting underlying mechanisms at play. Concerning non-violent-crimes, such as burglary, larceny, and fraud, the estimated effects are generally positive, meaning that unemployment increases non-violent crimes (Altindag, 2012; Carmichael & Ward, 2001; Edmark, 2005; Gould et al., 2002; Öster & Agell, 2007; Raphael & Winter-Ebmer, 2001; Wu & Wu, 2012). Some suggest short-term negative effects due to the *opportunity* channel but tend to become positive in the long run due to the economic incentives derived from illegal activities (Andresen, 2012; Britt, 1994; Cantor & Land, 1985). However, for violent crimes, such as murder and assault, where there is no such economic return, the evidence typically suggests an indiscernible impact (Cantor & Land, 1985; Edmark, 2005; Gould et al., 2002; Raphael & Winter-Ebmer, 2001; Wu & Wu, 2012). A limited number of studies have specifically examined the effect on rape and have explored the separate impacts of gender-specific unemployment rates. However, these differentiations are critical given the distinct characteristics of sexual crimes, where offenders and victims are almost exclusively defined based on gender[3]. The findings on the effect of total unemployment on rape prevalence are generally inconclusive (Cantor & Land, 1985;

[3] For instance, in Mexico, around 99 percent of sexual assault perpetrators are males and around 90 percent of the victims are females (INEGI ENVIPE, 2016–2019). Moreover, note that, throughout the paper, I am interchangeably using the terms gender/sex, men/males, women/females.

Edmark, 2005; Fougère et al., 2009; Wu & Wu, 2012), with little evidence of unemployment reducing rapes through the *opportunity* channel (Altindag, 2012; Britt, 1994; Raphael & Winter-Ebmer, 2001; Saridakis & Spengler, 2012).

To the best of my knowledge, only three articles within this literature have undertaken the analysis considering gender-specific unemployment rates. Raphael & Winter-Ebmer (2001) utilized annual US state-level data from 1971 to 1997 and found that, if anything, female unemployment decreased sexual assaults, while male unemployment increased them. However, the authors note that the statistical significance of the results strongly depends on the model specification. Moreover, they argue that the weak observed negative effect of total unemployment is masking gender-specific dynamics and is influenced by the *opportunity* mechanism, as the negative relationship between female unemployment and rape cannot be explained by changes in offenders' behavior but rather by alterations in interpersonal exposure. Saridakis & Spengler (2012) employed data from 13 Greek regions spanning from 1991 to 1998 and found that total unemployment decreases rapes, similar to Raphael & Winter-Ebmer (2001). However, when gender-specific unemployment rates were considered, the effect had a negative sign for females and a positive one for males. As with the previous study, the authors explained the negative result of female unemployment as a consequence of women's lower exposure to potential offenders but did not provide a detailed explanation for the positive effect of male unemployment. Lastly, Caruso (2015) used police records for an unbalanced panel of 60 European regions from 2000 to 2011. In contrast to the two prior studies, the author observed a positive association between both total and female unemployment and rape, while the result for male unemployment was not conclusive. Notably, when focusing on youth unemployment (people aged 15 to 24 years), only male unemployment appeared associated with increases in sexual assaults. Caruso (2015) concluded that the *opportunity* channel does not hold for the crime of rape. However, similar to the other articles, the author did not extensively investigate the underlying mechanisms driving the findings. Finally, all three mentioned papers did not consider the potential reverse causality regarding the female unemployment results (Bhattacharya, 2015; Borker, 2021; Chakraborty et al., 2018; Sabia et al., 2013; Siddique, 2022).

Additional insights can be drawn from the economic literature on intimate partner violence (IPV), which includes sexual violence as a subset. Moreover, both IPV and sexual crimes can be interpreted as manifestations of gender-based violence, and thus they may be affected by similar mechanisms adapted to their specific contexts. Existing literature on unemployment and IPV generally reveals null effects of total unemployment while indicating differentiated impacts of gender-specific unemployment (see Clerici & Tripodi (2021) for an extensive literature review). Studies by Aizer (2010) in the USA and Anderberg et al., (2016) in the UK found that decreases in wages or job opportunities for females increased IPV, while the opposite was observed for males. This aligns with the household bargaining model, where enhanced labor market prospects for women relative to men augment their outside options and reduce violence. While this model cannot be directly applied to sexual crimes due to the absence of bargaining powers and threat points, it may have relevance to the feminist *gender equality* mechanism[4]. However, Bhalotra et al.,

[4] See Martin et al., (2006) for a review of the feminist and sociological empirical evidence on the *gender equality* and *backlash* hypotheses. Generally, the evidence is mixed, similarly to the economic literature.

(2021), using data from 31 developing countries, found that in societies where cultural or legal barriers limit women's access to divorce, male unemployment was associated with an increase in IPV, while female unemployment was linked to a decrease. This study suggests that, in the absence of tangible threat points, the *stress* and male *backlash* channels may be predominant. Additionally, Tur-Prats (2021) demonstrated that, in Spain, the direction of the IPV effect resulting from changes in relative unemployment depends on gender norms derived from historical family structures. In regions with more gender-equal norms, the effects align with the bargaining model. Conversely, in areas where the male breadwinner stereotype is more pronounced, male unemployment increases IPV, while female unemployment reduces it, providing support for the *backlash* hypothesis.

Further, Martínez and Poblete-Cazenave (forthcoming) find that the Holi festival in India leads to an increase in assaults against women in public spaces. Notably, they observe that this effect is stronger in areas where men hold conservative views on violence against women but also in areas where women hold progressive attitudes, indicating a *backlash* effect. This underscores the role of gender norms in shaping violence against women both within and beyond the household. Taken together, these findings highlight potential mechanisms through which male unemployment may influence violence against women and emphasize the importance of considering community- and societal-level factors in this relationship.

3 Mexican context

Mexico, or *Estados Unidos Mexicanos*, is a federation comprising 31 states along with the federal district of Mexico City. Throughout the years considered in the study, the country witnessed a decrease in the unemployment rate, consistently maintaining levels below the Organization for Economic Co-operation and Development countries' average (OECD, 2023) and with the female rates slightly exceeding the male ones. However, there exists considerable variation in unemployment rates among states, ranging from Guerrero with an average of 1.7 percent to Tabasco with 7.1 percent (INEGI ENOE, 2015–2019). Furthermore, more than half of the population is in a situation of labor informality, representing individuals vulnerable in terms of employment or with unrecognized labor dependencies. Lastly, a distinctive feature of the Mexican labor market, setting it apart from other OECD countries, is the absence of unemployment benefits.

Mexico is ranked 31st in the 2022 Global Gender Gap Index, measuring gender parity across economic, health, education, and political dimensions, and it is 4th in the Latin America and Caribbean region (WEF, 2022). However, the country grapples with pervasive violence against women. A 2021 representative survey on gender-based violence revealed that 70 percent of women in Mexico have experienced at least one form of psychological, physical, sexual, economic, or patrimonial violence during their lifetime (INEGI ENDIREH, 2021). Also in this case, there is substantial variation across states, ranging from 48.7 percent in Chiapas to 78.7 percent in the State of Mexico. Sexual violence ranks as the second most common form, with one in two women having experienced it, and it especially affects younger, more educated, or single women. Moreover, the percentage of women who

have suffered sexual violence has increased relative to the 2016 round of the survey. The pattern is confirmed by the data of the National Public Security System (*Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública*), showing growing numbers of preliminary inquiries and investigation files for sexual crimes over the time frame of the analysis (see Fig. 1 in Appendix B).

The Mexican General Law on Women's Access to a Life Free from Violence (*Ley General de Acceso de las Mujeres a una Vida Libre de Violencia*) defines sexual violence as: "any act that degrades or damages the body and/or sexuality of the Victim and therefore violates her freedom, dignity and physical integrity. It is an expression of abuse of power that implies male supremacy over women, denigrating them and conceiving them as objects" (LGAMVLV, 2007). The specific categories and corresponding sanctions may vary, as it is each state's responsibility to define them in their Penal Codes. However, the country suffers from extensive impunity regarding sexual violence. In 2021, there were an average of 243 rapes per day, but only one person for every 157 sexual crimes was sentenced to prison in that year (Giles Navarro, 2023). The low reporting rate contributes to this figure, with around 30 percent of women who experienced sexual assaults reporting it to the authorities, according to the National Victimization Survey (INEGI ENVIPE, 2016–2019). Due to the widespread nature of sexual and gender-based violence, the Mexican Congress has recently enacted new laws and is deliberating on others. For instance, the Chamber of Deputies and Senate are discussing proposed laws aiming to redefine rape by focusing on the absence of the victim's consent and considering the introduction of chemical castration as a penalty for rapists (Giles Navarro, 2023). Nevertheless, a debate exists on the appropriateness and legality of employing chemical castration as a measure to combat sexual violence (Núñez Trejo, 2018). At the same time, many advocate for cultural and institutional changes to diminish the prevalence of sexual crimes, address impunity, and elevate reporting rates.

4 Data and empirical strategy

4.1 Data

To investigate the relationship between male unemployment and sexual violence in Mexico, I use two main data sources: the National Labor Survey (INEGI ENOE, 2015–2019) and the National Public Security System (NPSS, 2015–2019) data. The National Labor Survey, or *Encuesta Nacional de Ocupación y Empleo* (ENOE), is a quarterly continuous survey[5], representative at the national and state levels, collecting information on Mexico's labor force and employment conditions of people 15 years old or older. A person is considered employed if he or she has worked – formally or informally - at least one hour during the previous week, while is considered unemployed if he or she was looking for a job in the preceding month. If the person has not looked for a job during the previous month and was not available to

[5] In the ENOE, 80% of the sample remains constant each quarter, with 20% refreshed, and the sample is divided into five rotation panels. Each household lasts for five quarters before being replaced, and they are visited once per quarter.

work during the preceding week, is considered as not economically active (see Appendix A for the precise definitions).

Data on rapes derives from the National Public Security System (*Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública* or NPSS). It contains monthly and municipality-level data on the initiations of preliminary inquiries and/or openings of investigation files reported by the Attorney General's Offices and General Prosecutors of the 32 federal states from the year 2015 onwards (del Sistema, 2018). The date refers to the initiation of the preliminary inquiry or opening of the investigation file, while the location refers to the municipality or delegation where the crime occurred. The NPSS homologates the information to overcome the possible different crime' definitions established by each state's Penal Codes or laws. Rape is considered as non-consensual sexual intercourse, committed with physical or psychological violence or targeting individuals unable to understand or resist the act (see Appendix A for the exact definition). Note that the NPSS does not contain information on the victims' or aggressors' demographic characteristics. However, since about 99 percent of sexual assault perpetrators are males and 90 percent of the victims are females (INEGI ENVIPE, 2016–2019), throughout the study it is assumed that sexual violence is perpetrated by males against females. Moreover, the NPSS includes data on other crime categories, such as offenses against life, freedom, property, and other criminal activities.

Finally, in the robustness checks and analysis of mechanisms, I use other data sources, such as the National Victimization Survey (INEGI ENVIPE, 2016–2019), the National Survey on Household Dynamics (INEGI ENDIREH, 2011, 2016, 2021), the 2010 Census of Population and Housing (INEGI, 2010), and the National Institute of Statistics and Geography administrative records on nuptiality (INEGI, 2015–2019a) and mortality (INEGI, 2015–2019b). Furthermore, data from Mexico's National Population Council (CONAPO) on population structure by semester is used to construct sex ratios by age groups, which serve as control variables in the analysis.

The male and female unemployment rates are constructed as the number of unemployed over the number of economically active males or females, by state and trimester, per 100. Then, the NPSS's data is used to construct the crime rate as the number of sexual violence preliminary inquiries or investigation files by state and trimester per 100,000 inhabitants, where the population data comes from CONAPO. As mentioned, the information is available for the 32 states and 4 trimesters starting from the year 2015. However, the state of Oaxaca does not have complete data on crime for the years 2015 and 2016, thus it is excluded for these two years. Moreover, the COVID-19 pandemic, which spread globally in 2020, influenced data collection processes and, importantly, the variables of interest during and after its onset. To exclude potential systematic impacts of the pandemic and ensure the largest continuous panel of data, the analysis focuses on the years up to 2019. The final sample includes 632 state-trimester observations.

Table 1 provides the descriptive statistics for the main variables used in the analysis. The average male unemployment by state and trimester during the years 2015 to 2019 is 3.54, while female unemployment is slightly higher. Male unemployment rates show high variation, ranging from a minimum of 0.74 to a maximum of 8.09. Considering sexual violence, the average number of preliminary inquiries or investigation files per 100,000 inhabitants by trimester is 3.25, and it also is highly

Table 1 Descriptive statistics

	Mean	SD	Min	Max	N
Male Unemployment	3.540	1.188	0.742	8.087	632
Female Unemployment	3.726	1.316	1.021	8.479	632
Rape	3.250	1.810	0.223	9.842	632

The table shows summary statistics for the state-trimester observations in the 2015–2019 timeframe. The unemployment rates are the number of unemployed over the number of economically active people, per 100, using data from the ENOE. The rape rate is the number of crimes per 100,000 inhabitants, using information from the NPSS.

floating. Fig. 1 in the Appendix shows the evolution of the variables at the national level during the timeframe of the analysis. While male unemployment has generally decreased and sexual violence increased, the figure does not reveal a clear relationship, requiring further investigation at the state level. At the same time, Fig. 1 underscores the importance of accounting for seasonality, as reported rapes tend to peak in the second quarter of each year, while male unemployment appears higher in the third quarter.

4.2 Empirical strategy

The analysis aims to explore the relationship between male unemployment and sexual violence in Mexico. To do so, I adopt an ordinary least squares (OLS) model with fixed effects, relating the state's male unemployment rate with the local rates of rapes. In particular, I estimate the following equation:

$$R_{sty} = \alpha + \beta U_{sty} + \gamma X_{sty} + \sigma_s + \rho_t + \lambda_y + \varepsilon_{sty} \quad (1)$$

where R_{sty} is the outcome of interest (rape rates per 100,000 inhabitants for state s in trimester t and year y) and U_{sty} represents the male unemployment rate for state s in quarter t and year y. X_{sty} represents the control variables used in the analysis, including sex ratios by age groups (0–17, 18–24, 25–34, 35–44, 45–59, 60+), which help account for changes in population structure and migration patterns. Additionally, it encompasses variables included in robustness checks to ensure the reliability of the findings. The state fixed effects (σ_s) account for time-invariant heterogeneities across states, the trimester fixed effects (ρ_t) consider possible seasonality in both unemployment and rape rates, and the year fixed effects (λ_y) capture annual aggregate trends. Therefore, the parameter of interest, β, represents the average association of a one-percentage-point increase in male unemployment with sexual violence. The association is identified through the analysis of variations in male unemployment and sexual violence rates within each state across different quarters and years while accounting for time-invariant state characteristics, yearly trends, seasonality, and changing population structure. The standard errors (ε_{sty}) are clustered at the state level to account for potential correlations within states. However, considering that Mexico comprises 32 states and that the rule-of-thumb for the validity of this inference procedure requires at least 50 clusters, the statistical significance of the

Table 2 Male unemployment and sexual violence

	(1) Rape	(2) Rape
Male Unemployment	0.235** (0.088)	0.264** (0.098)
Observations	632	632
Mean	3.250	3.250
Adj. R-sq	0.735	0.741
State FE	Yes	Yes
Year FE	Yes	Yes
Trim FE	Yes	Yes
Sex Ratios	No	Yes

The table presents the relationship between male unemployment and rape. The analysis includes state, year, and trimester fixed effects, covering the period from 2015 to 2019. Male unemployment is defined as the number of unemployed males over the economically active population, per 100, constructed using data from the ENOE. Rape rates represent the number of crimes per 100,000 inhabitants, utilizing information from the NPSS. Sex ratios, calculated as the number of males per 100 females in each state using CONAPO data, are measured by age groups (0–17, 18–24, 25–35, 35–44, 45–59, 60+) and semesters. Standard errors, clustered by state, are reported in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, according to the wild-cluster bootstrap p-value

coefficients is marked according to the p-values computed with wild-cluster bootstrapping, as suggested by Cameron et al., (2008) for dealing with clusters' small number[6].

5 Results

5.1 Main results

The study explores the relationship between male unemployment and sexual violence in Mexico. Table 2 presents the main result, estimated through an OLS model with fixed effects, as just described. Column 1 indicates that, for a 1 percentage-point increase in the male unemployment rate, the rate of rapes rises on average by 0.235 cases per 100,000 people. Column 2 adds sex ratio by age groups as control variables and reveals that, for a 1 percentage-point increase in male unemployment, the sexual violence rate rises on average by 0.264 cases per 100,000 people, equivalent to an 8.1 percent increase relative to the sample mean, all other things being equal. The result

[6] Since the clusters correspond to the 32 states, the number of observations per cluster is determined by the number of trimesters in the analysis period - four trimesters per year over five years - resulting in 20 observations per cluster for all states except Oaxaca, which has 12 observations due to incomplete crime data for 2015–2016. Additionally, the main findings remain robust when clustering standard errors at the state-year level (160 clusters with 4 observations per cluster) or at the state-trimester level (128 clusters with 5 observations per cluster). Results are available upon request.

is in line with those of Caruso (2015), Raphael & Winter-Ebmer (2001), and Saridakis & Spengler (2012), who similarly observed a positive – even if not always statistically significant - relationship between male unemployment and rape in Europe, USA, and Greece, respectively.

Nevertheless, the interpretation of this analysis may face challenges from factors like omitted variables, misspecification of functional forms, measurement errors, and simultaneity, among others. Consequently, it is essential to perform additional tests to enhance confidence in the robustness of the estimated association.

5.2 Robustness checks

The baseline model indicates that male unemployment rates are positively associated with rape rates. To assess the robustness of the findings, a series of checks are conducted, among which: population weighting, controlling for female unemployment, considering lagged male unemployment, excluding Mexico City and one state at a time, including state annual trends, reporting Oster (2019) delta and Diegert et al., (2022) breakdown point, altering the variables' functional forms or the estimator, investigating general crime trends, and conducting the analysis using data from the National Victimization Survey (*Encuesta Nacional de Victimización y Percepción sobre Seguridad Pública*). The results of the first set of checks are presented in Table 3.

The basic finding is shown in Column (1), while in Column (2) population weights are introduced. The main analysis omits population weights due to debates on their appropriateness in causal inference (Lee & Solon, 2011; Solon et al., 2015)[7], but it is considered good practice to compare the results with and without weights since major differences may be a sign of model misspecification. Reassuringly, the results obtained using weights are consistent with those of the main specification, showing an association of a similar magnitude - albeit smaller - while maintaining statistical significance[8]. In the second test, a potentially significant omitted variable, female unemployment, is incorporated (Column 3). Although omitted from the basic specification due to concerns of multicollinearity and endogeneity, its inclusion does not substantially alter the estimates. Moreover, its coefficient is not statistically significant but points to a positive direction, similar to what was observed by Caruso (2015) but differently from Saridakis & Spengler (2012) and Raphael & Winter-Ebmer (2001)[9]. The subsequent test involves excluding Mexico City, a common

[7] Weighting is sometimes used as a way to correct heteroskedastic error terms. However, this possibility is already taken into account in the analysis by computing heteroskedasticity-robust standard errors clustered at the state level. In this case, estimates from ordinary least squares (OLS) regressions may be more precise than those from weighted least squares (WLS) (Lee & Solon, 2011). Moreover, one may want to weigh to identify the population average partial effects, but WLS estimates could not be the answer. Indeed, suppose the model is misspecified, failing for instance to take into account some heterogeneous effects. In that case, both OLS and WLS estimators are inconsistent and none is better than the other (Solon et al., 2015).

[8] The estimated coefficients remain largely unchanged also if introducing the annual state's population as a control variable rather than as weight.

[9] The inclusion of only female unemployment as independent variable does not yield any significant result. However, this analysis is likely to be biased since the experience and risk of sexual violence may affect women's labor market outcomes (Borker, 2021; Chakraborty et al., 2018; Loya, 2015; Sabia et al., 2013; Siddique, 2022).

Table 3 Robustness checks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Male Unemployment	0.264** (0.098)	0.205** (0.082)	0.234** (0.096)	0.226** (0.098)		0.228** (0.089)	0.171* (0.088)
Female Unemployment			0.109 (0.108)				
Lagged Male Unemployment					0.199* (0.100)	0.144 (0.087)	
Observations	632	632	632	612	632	632	632
Mean	3.250	3.250	3.250	3.276	3.250	3.250	3.250
Adj. R-sq	0.741	0.808	0.741	0.750	0.739	0.742	0.893
WCB P-value	0.016	0.016	0.020	0.035	0.072	0.014	0.058
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Trim FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sex Ratios	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pop. Weights	No	Yes	No	No	No	No	No
CDMX	Yes	Yes	Yes	No	Yes	Yes	Yes
State-Year FE	No	No	No	No	No	No	Yes
Oster δ (delta)	−10.541						
DMP $\bar{r}_x$ (bp)	0.640						

The table presents the robustness checks for the relationship between male unemployment and rape. The outcome variable is the number of rape investigation files per 100,000 inhabitants, per state and trimester, for the years 2015–2019, utilizing information from the NPSS. Male and female unemployment rates are the state's same-quarter number of unemployed over the economically active population of the same sex per 100, while the lagged male unemployment refers to the previous quarter, constructed using data from the ENOE. "Pop. Weights" refers to the use of the state's annual population as weight in the analysis. "State FE", "Year FE", "Trim FE", and "State-Year FE" refer to the inclusion of state, year, trimester, and state*year fixed effects, respectively. "Sex ratios" are the number of males per 100 females in each state by age groups (0–17, 18–24, 25–35, 35–44, 45–59, 60+) and semesters using CONAPO data. "CDMX" stands for Mexico City. "Oster δ (delta)" and "DMP $\bar{r}_x$ (bp)" refer to the breakdown points calculated following Oster (2019), with the rule-of-thumb $R^2_{\max} = 1.3 \times R^2$, and Diegert et al., (2022), where the sex ratios are used as calibration covariates. Standard errors, clustered by state, are reported in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, according to the wild-cluster bootstrap p-value

practice in Mexican analyses, given its unique characteristics. Indeed, the city, beyond being vastly populated, generally differs from the rest of the country in terms of both crime rates and economic performances and policies. Omitting Mexico City (Column 4) slightly reduces the magnitude of the estimated association but does not alter the main result. Moreover, Fig. 2 in the Appendix shows the estimated coefficients of male unemployment on rape excluding one state at a time. The graph demonstrates that the significant positive association is not driven by any specific state, thus the main result does not appear to be due to an outlier.

The following two tests focus on the previous quarter's male unemployment[10]. Column (5) introduces the lagged independent variable instead of the

[10] The National Labor Survey (ENOE) round of the IV trimester of 2014 is used to construct the lagged male unemployment rate and not lose observations.

contemporaneous to address concerns of simultaneity. The coefficient of the preceding quarter's male unemployment remains positive, even if of a smaller magnitude. Column (6) includes both lagged and contemporaneous male unemployment rates to account for the potential dynamics and persistence of the association. This introduces a risk of multicollinearity but reveals that the relationship between male unemployment and rape rates seems to be only contemporaneous. Column (7) introduces state-per-year fixed effects to account for unobserved state-specific factors that may be correlated with unemployment and sexual violence and vary yearly, such as states' judicial responses to changes in employment and crime levels (Tur-Prats, 2021). The positive coefficient of male unemployment on rape rates remains robust, albeit smaller (a one-percentage-point increase in male unemployment is associated with a rise in the rape rate by 5.3 percent relative to the sample mean).

Finally, the rows labeled "Oster δ (delta)" and "DMP $\overline{r}_x$ (bp)" present additional robustness tests for omitted variable bias, using the approaches proposed by Oster (2019) and Diegert et al., (2022). As mentioned, unobserved factors correlated with both male unemployment and sexual violence - such as alcohol consumption, general violence, or incarceration rates - could introduce bias into the results. While fixed effects and state-specific linear trends may help account for some of these variables, applying the methods from Oster (2019) and Diegert et al., (2022) provides further confidence in the robustness of the findings. Both approaches define a sensitivity parameter - δ in Oster (2019) and $\overline{r}_x$ in Diegert et al., (2022) - which represents the maximum degree of selection on unobservables relative to selection on observables that would render the coefficient of interest not statistically different from 0. The key distinction between the two methods is that Oster (2019) assumes exogenous controls, while Diegert et al., (2022) allow for omitted variables to be correlated with the included covariates. Oster (2019) suggests that if the absolute value of δ exceeds 1, unobservables are unlikely to drive the results, as in this case, where $|\delta| = 10.541$. Additionally, the estimated $\overline{r}_x$ from Diegert et al., (2022) indicates that the coefficient of male unemployment on sexual violence remains positive as long as selection on unobservables is at most 64% as large as selection on observables. Together, these results suggest that the main findings are quite robust to concerns about omitted variable bias.

Moreover, Tables 6 and 7 in Appendix B indicate that the findings are not due to the variables' functional forms nor to the chosen estimator. In particular, Table 6 presents the results of the analysis where the sexual crime rates are transformed as either natural logarithms or inverse hyperbolic sines, and male unemployment is either unchanged or transformed according to the outcome variables. These transformations could improve the linearity of the relationship and the normality of the variables' distribution. Across all specifications, the positive significant association is confirmed. In particular, the results in Columns (2) and (4) indicate that a 1 percent increase in male unemployment is associated with rape rises by around 0.28 percent[11]. The estimated coefficients are lower than those observed by Saridakis & Spengler (2012) in Greece, but higher than the estimates in Raphael & Winter-Ebmer

[11] Recently, there has been a debate on when and how the inverse hyperbolic transformations' results can be interpreted as elasticities. See Bellemare & Wichman (2020) for a detailed discussion. Applying the corrections suggested by the authors does not change the results.

(2001) for the USA and in Caruso (2015) for Europe. Finally, Appendix Table 7 shows the incidence rate ratios estimated through Negative Binomial regressions, following Caruso (2015), where the dependent variable is the rape counts (Column 1) or rate (Column 2). Considering the raw number of preliminary inquiries and investigation files may be relevant since the information on the state's population used to construct the rates is annual rather than trimestral. These additional checks confirm that the estimated results hold when changing the estimator and using alternative forms of the dependent variables.

In summary, the battery of tests conducted above consistently demonstrates the robustness of the positive association between male unemployment and rape. However, two additional robustness checks are necessary to determine whether the results are driven by a general trend in crime or by changes in reporting rates to authorities. First, Table 8 in Appendix B shows that male unemployment is not significantly associated with other crime categories unrelated to gender-based violence (see Appendix A for their definition). This rules out the possibility that the observed positive coefficient is simply part of a broader crime trend. Additionally, this check suggests that the main finding is not driven by changes in police behavior related to rises in male unemployment. Indeed, if it were, an increase in other crime rates would also be expected. Second, a final robustness check is needed to address potential measurement errors in the outcome variable and assess whether changes in reporting rates to authorities could be influencing the observed relationship. As explained, the NPSS records data on the initiation of preliminary inquiries and opening of investigation files. However, the proportion of victims who report sexual crimes to the authorities is low[12], and the independent variable may influence this reporting rate. To address these concerns, the analysis is conducted using data from the National Victimization Survey (*Encuesta Nacional de Victimización y Percepción sobre Seguridad Pública* - ENVIPE). This annual cross-sectional survey is representative at the national and state levels and gathers information on sociodemographic characteristics and crime incidence affecting households and individuals aged 18 and older. Notably, the ENVIPE inquires whether the person interviewed was forced, through physical violence or threat, by someone known or unknown, to engage in an unwanted sexual activity during the previous year, how many times, and in which month(s) and state(s) it occurred. This information is utilized to construct the female rape rate per 100,000 female inhabitants aged 18 and older by state and trimester. In particular, the ENVIPE rounds from 2016 to 2019 are used to gain information on victimization from 2015 to 2018, aligning with the main analysis timeframe, while the 2020 round is not included as was conducted during the pandemic[13].

[12] According to the National Victimization Survey (ENVIPE), the percentage of sexual assault victims who answered they have reported it to public authorities is around 30 percent (INEGI ENVIPE, 2016–2019).

[13] Since the questions refer to victimization during the previous year, the information on the 2019 year was collected in 2020. However, this round is excluded since in 2020 the COVID-19 pandemic spread around Mexico, affecting the possibility and way of conducting surveys. Another concern may be the possible misreporting of the months and state of occurrence of sexual assaults. However, given the dramatic nature of the crime, it is assumed that the victims can correctly remember when and where it occurred.

Table 4 Robustness checks: ENVIPE analysis

	(1) Rape - F	(2) Rape - F 18–24	(3) Rape - F 25–34	(4) Rape - F 35–44	(5) Rape - F 45–59	(6) Rape - F 60+
Male Unemployment	10.600 (7.037)	0.439 (4.508)	12.272** (6.325)	−2.335 (2.297)	0.302 (2.633)	−0.078 (0.208)
Observations	512	512	512	512	512	512
Mean	41.254	13.848	15.030	7.677	4.200	0.498
Adj. R-sq	0.051	0.018	0.050	0.039	0.005	0.000
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Trim FE	Yes	Yes	Yes	Yes	Yes	Yes
Sex Ratios	Yes	Yes	Yes	Yes	Yes	Yes

The table presents the relationship between male unemployment and the rates of rape of women aged 18 years old or more. The analysis includes state, year, and trimester fixed effects, covering the period from 2015 to 2018. Male unemployment is defined as the number of unemployed males over the economically active population, per 100, constructed using data from the ENOE. The outcome variable is the number of rapes of females (in total or by age group) per 100,000 females 18 years old or older, utilizing information from the ENVIPE. Sex ratios, calculated as the number of males per 100 females in each state using CONAPO data, are measured by age groups (0–17, 18–24, 25–35, 35–44, 45–59, 60+) and semesters. Standard errors, clustered by state, are reported in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, according to the wild-cluster bootstrap p-value

Table 4, Column (1), presents the relationship between male unemployment and rape using the ENVIPE data. While the result is positive, it is not statistically different from zero. However, it becomes pertinent to consider the relationship with the rape rate for different age groups, recognizing that victims of sexual violence are typically young and that the ENVIPE suffers from an important limitation by not interviewing people younger than 18 years old[14]. The analysis reveals that male unemployment is not significantly associated with the rate of sexual assaults against women aged 18–24 and 35 or older, but it is positively associated with rapes against women aged 25–34 (Column 3 of Table 4). This suggests that the main result with NPSS data is indeed related to an increase in sexual violence incidence rather than in reporting rates to authorities.

To further investigate this point, the ENVIPE queries victims about whether they reported the crime to the Public Ministry or any other institution. Consequently, the rape reporting rate is constructed as the number of reported crimes over the number of rapes suffered by women, per 100, by state and trimester, and its relationship with male unemployment is investigated. However, it is crucial to acknowledge that this analysis can be no more than exploratory due to sample selection bias. Indeed, the question about reporting is posed only to women who have experienced sexual assaults, and their number and characteristics may have been influenced by the independent variable. The

[14] According to the National Survey on Household Dynamics (*Encuesta Nacional sobre la Dinámica de las Relaciones en los Hogares* - ENDIREH), around 1.8% of women aged 15 to 17 years old suffered from some form of sexual violence in the family setting, 12.8% in the school, and 32.8% in the community during 2015. Moreover, 9.4% of the women aged 15 years old or more reported having suffered from sexual violence during childhood, a percentage that increased to 12.6% in 2021 (INEGI ENDIREH, 2016-2021).

analysis reveals a potential negative relationship, if any, between male unemployment and the reporting rate of rapes (see Appendix Table 9). The sign may be explained by increased fear of reporting when male unemployment rises, possibly due to the spread of men in public spaces or by a reduction in trust in authorities associated with unemployment surges. Despite its exploratory nature, this result may shed light on part of the difference in magnitude observed between the coefficients using data from the NPSS and the ENVIPE. Moreover, it may imply that the result with the NPSS data represents a lower bound of the true association. In conclusion, the analysis utilizing the National Victimization Survey data suggests that the primary results are unlikely driven by measurement errors or changes in reporting rates to authorities, and it indicates that male unemployment is positively associated with sexual assault incidence particularly against women aged 25–34, and possibly younger than 18.

5.3 Mechanisms

The analysis outlined above underscores the robustness of the positive association between male unemployment and rape rates. This section delves into the exploration of the *motivational*, *exposure*, *stress*, and/or *backlash* mechanisms in explaining the observed relationship.

The first potential channel is the *motivational* one, proposing that the surge in sexual assaults may stem from the diminished likelihood of unemployed males initiating or sustaining relationships, under the hypothesis that rape is an adapted strategy to enhance men's reproductive success (McKibbin et al., 2008; Thornhill & Palmer, 2000). To assess the relevance of this mechanism, Appendix Table 10 relates male unemployment rates with the number of divorces and marriages per 1000 inhabitants, extracted from the National Institute of Statistics and Geography (INEGI) administrative records, including state, year, and quarter fixed effects and controlling for sex ratios. The analysis does not reveal any significant association, affirming that the rise in sexual violence is not attributable to shifts in relationship dynamics.

Secondly, the *exposure* channel suggests that the diminished mobility of unemployed individuals may lead to an increase in sexual crimes if the perpetrators are family members or close acquaintances. Unfortunately, there is insufficient data to directly test this hypothesis. However, since this mechanism may be counterbalanced by the *opportunity* channel, where it is assumed that the offenders are mostly strangers, it is likely not the most significant factor in explaining the observed positive relationship.

The third theory that could potentially explain why male unemployment is positively associated with sexual assaults is the *stress* hypothesis. Unemployment may elevate stress levels, leading to diminished emotional and impulse control, as well as increased substance abuse, thereby raising the likelihood of violent behavior. Appendix Table 11 explores whether male unemployment influences rates of male suicides and deaths related to mental and behavioral disorders, derived from the mortality records of the National Institute of Statistics and Geography (INEGI). The findings of the analysis do not support the hypothesis associated with the *stress* channel, as male unemployment is not significantly associated with the mentioned outcomes indicative of heightened stress.

Finally, the *backlash* channel posits that male unemployment may escalate sexual violence in response to the perceived threat against traditional masculine identity caused by reduced job opportunities. This theory suggests that the observed positive relationship

is likely more pronounced in communities where men hold conservative gender views and/or in states where women have more progressive opinions (Martínez and Poblete-Cazenave, forthcoming). Due to the lack of data on men's attitudes, the analysis focuses solely on the latter aspect of the *backlash* hypothesis - namely, that male unemployment may particularly heighten sexual violence in states where women hold more progressive views on gender roles. In such contexts, the perceived risk to men's sense of identity may be greater, with reduced job opportunities seen as a more significant threat to masculinity, potentially intensifying frustration and triggering backlash against more progressive women in the form of sexual violence[15]. To test this hypothesis, a heterogeneous analysis is conducted based on women's gender attitudes, using data from the National Survey on Household Dynamics (*Encuesta Nacional sobre la Dinámica de las Relaciones en los Hogares* – ENDIREH). As both unemployment and sexual violence may influence gender attitudes, the data are retrieved from the first survey round before the current analysis's time frame (2015–2019), specifically the 2011 ENDIREH round. The analysis considers women's responses to ten questions about masculine and feminine roles, constructing an indicator of the states' female baseline progressivity (see Appendix A for a detailed explanation). The variable equals one if the average number of women's agreements to the questions in the state exceeds the median for the whole of Mexico[16]. Table 5 presents the results of fully-interacted models to account for possible progressive-specific effects over time.

The association between male unemployment and rape in states where women held more conservative views on gender roles is small and not statistically different from 0, while it is positive and statistically significant in states with more progressive women at baseline. Moreover, the magnitude of the coefficient is larger than that of the main analysis. Therefore, the heterogeneity analysis provides suggestive evidence that male unemployment is positively associated with sexual violence through the *backlash* channel[17].

[15] Note that this would not be the case in communities and societies where *both* men and women have progressive views overcoming traditional gender roles. However, while men's and women's gender attitudes are generally positively correlated, they are not perfectly aligned, and this alignment may vary significantly across countries and regions (Sardinha & Catalán, 2018).

[16] Table 12 in Appendix B shows the results of the analysis using the national mean to construct the indicator for female progressivity and keeping the variable as continuous. The main finding holds.

[17] However, other factors may also contribute to the results in Table 5, as states classified as having low or high female progressivity differ significantly in various other baseline characteristics, as shown in Appendix Table 13. Indeed, according to the 2010 Census of Population and Housing (INEGI, 2010), states with higher female progressivity tend to be more urbanized, have a lower age dependency ratio, higher employment rates, a lower proportion of people born in the state, a smaller indigenous population, and higher levels of literacy and education (see the variables' construction in Appendix A). To examine the potential influence of these confounders, a parallel analysis to Table 5 is conducted for each of these variables in Appendix Table 14. The findings suggest that differences in baseline age dependency ratios, employment, and indigenous and native population may contribute to the observed heterogeneity. Notably, the percentage of people born in the state emerges as the strongest confounder. However, this result may stem from certain states having extreme values for this variable while also being classified as either highly or less progressive. Indeed, excluding the six states at the extremes of the distribution eliminates statistical differences in baseline characteristics between high- and low-female progressivity states (see Appendix Table 15), while the rape's association with male unemployment and its interaction with female progressivity remains strong (see Appendix Table 16). Therefore, although this discussion remains exploratory, it suggests that the positive relationship between male unemployment and sexual violence in states where women hold more progressive attitudes may be primarily driven by *backlash*, even if the influence of other socioeconomic differences between the groups of states cannot be entirely ruled out.

Table 5 Mechanisms: heterogeneity analysis on the state's female progressivity

	(1) Rape
Male Unemployment	0.002 (0.075)
Male Unemployment * Female Progressive	0.508*** (0.128)
Observations	632
Mean	3.250
Adj. R-sq	0.746
State FE	Yes
Year FE	Yes
Trim FE	Yes
Female Progressive-Year FE	Yes
Female Progressive-Trim FE	Yes
Sex Ratios	Yes

The table presents the heterogeneity analysis of the relationship between male unemployment and rape, with respect to the gender-equal opinions of women in the state. Male unemployment is defined as the number of unemployed males over the economically active population, per 100, constructed using data from the ENOE. Sexual violence rates represent the number of crimes per 100,000 inhabitants, utilizing information from the NPSS. "Female Progressive" is an indicator equal to 1 if the average number of questions about gender roles that women in the state agree to is higher than the median number for Mexico, according to the 2011 ENDIREH round. The analysis includes state, trimester, year, trimester*female progressive, and year*female progressive fixed effects, covering the period from 2015 to 2019. Sex ratios, calculated as the number of males per 100 females in each state using CONAPO data, are measured by age groups (0–17, 18–24, 25–35, 35–44, 45–59, 60+) and semesters. Standard errors, clustered by state, are reported in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, according to the wild-cluster bootstrap p-value

Furthermore, Appendix Table 17 suggests that this finding is not driven by different reporting rates to the authorities between more and less progressive women. Indeed, Table 17 presents the results of the heterogeneity analysis using data from the ENVIPE, indicating that the interaction term is positive and significant for women aged 25 to 34 years.

6 Conclusion

This analysis underscores that male unemployment contributes to heightened rates of rape in Mexico. Utilizing ordinary least squares regressions with state, year, and quarter fixed effects, the study establishes a positive association between male unemployment rates, sourced from the National Labor Survey, and sexual violence rates reported by the National Public Security System for the years 2015–2019. Rigorous checks ensure the robustness of the results, addressing concerns related to omitted variables, simultaneity, variables' functional forms, general crime trends, and changes in reporting rates to authorities. The association appears stronger with

assaults against women aged 25 to 34 years. Furthermore, suggestive evidence indicates that the identified outcomes are not a product of shifts in relationship dynamics or heightened stress levels. Instead, they point to a *backlash* against the perceived threat to traditional masculine identity posed by diminishing job opportunities, specifically observed in states where women exhibited more progressive attitudes.

Prior research in the United States and Europe has sporadically identified a positive link between male unemployment and sexual violence. However, such findings were not the primary focus of the investigations. This study brings a novel interdisciplinary perspective to unravel the intricate relationship between male unemployment and sexual violence, uniquely exploring this dynamic within a Latin American country, whose sociocultural context may differ from the US and European ones. Furthermore, the empirical findings are rigorously tested and thoroughly discussed, contributing to a more comprehensive understanding of the underlying mechanisms.

While the analysis incorporates robustness checks to mitigate potential threats to the findings, certain limitations remain. Consequently, the results are interpreted as – strong – associations rather than definitive causal effects. For instance, one concern is the possibility of selective migration, where more aggressive men may move from high to low-unemployment states, potentially introducing a downward bias (Tur-Prats, 2021). Future investigations could benefit from leveraging natural experiments to establish exogenous changes in male unemployment. Additionally, limitations stem from data constraints. The National Public Security System (NPSS) data lack sociodemographic information and suffer from the low reporting rate of sexual crimes. Although the National Victimization Survey (ENVIPE) helps address these issues, it has other shortcomings, such as excluding individuals under 18 from interviews. Finally, data constraints hinder a detailed exploration of mechanisms, particularly concerning the *exposure* channel, as well as a more granular analysis at a sub-state level.

However, in light of the findings, potential policy interventions are suggested to mitigate the positive association of male unemployment with sexual violence. Indeed, the policies currently under scrutiny by the Mexican Congress may not effectively address this issue. Chemical castration of rapists, despite legal uncertainties, may not appropriately reduce the observed associations, potentially heightening threats to masculine identity. Redefining rape to focus on the absence of the victim's consent could be a step toward a comprehensive understanding of sexual violence, particularly if combined with educational programs for boys and men focused on the concept of consent. Nonetheless, these potential reforms are hindered by Mexico's low reporting and high impunity rates, necessitating institutional and cultural changes such as strengthening law enforcement and judicial systems through specialized training and units, enhancing victim support services, and combating cultural victim-blaming through public campaigns. Moreover, while introducing unemployment benefits might alleviate men's post-job loss frustration, it may contradict the male breadwinner norm and fail to address underlying gender role issues. Thus, while short-term relief may come from unemployment benefits and stricter penalties for sexual crimes, sustainable solutions involve forward-looking policies at the community and societal levels addressing institutional flaws and sociocultural gender roles, for instance through educational programs and awareness campaigns. Ultimately, by breaking the link between masculine identity, the male breadwinner norm, and aggressive behaviors, these policies can reduce *backlash* reactions and foster a more equitable societal environment in the long term.

Data availability The original datasets used for the analysis can be accessed through the links in the References.

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Compliance with ethical standards

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7 Appendix A – Variables' definition and construction

Employment variables (ENOE - *Encuesta Nacional de Ocupación y Empleo*)

Employed: A person of 15 years or more is considered employed if:

Has worked at least one hour the previous week;
Has spent at least one hour the previous week engaging in an activity that provided income or assisting with the land or business of a family member or another person;
Did not work last week because of strike or labor stoppage, technical stoppage, temporary suspension of work (salaried), attendance at training courses, or other reasons (vacations; permission, illness, or personal matters; lack of a vehicle or machinery breakdown; lack of raw materials, financing, or clients; bad weather or natural phenomenon; end of work or harvest season) receiving salary or earnings;
Did not work for one of the previous reasons (vacations; permission, illness, or personal matters; lack of a vehicle or machinery breakdown; lack of raw materials, financing, or clients; bad weather or natural phenomenon; end of work or harvest season) without receiving salary or earnings, but will return to the same job this week.

Unemployed: A person of 15 years or more is considered unemployed if:

Did not work the previous week because will start a new job or business;
During the previous month, has looked for a job in another country or made

preparations to cross the border, has looked for a job in Mexico, or has started a business or engaged in an activity on their own without being able to start yet, and was available to work the previous week;
Did not work for one of the various reasons (vacations; permission, illness, or personal matters; lack of a vehicle or machinery breakdown; lack of raw materials, financing, or clients; bad weather or natural phenomenon; end of work or harvest season) without receiving salary or earnings and without returning to the same job this week, looking for a job (looked for a job in another country or made preparations to cross the border, looked for a job in Mexico, or started a business or engaged in an activity on their own without being able to start yet) during the previous month and available to work the previous week.

Economically active population: Employed population + Unemployed population.

Crime variables (NPSS - *Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública*)

Rape: includes "simple rape" and "aggravated or equated rape". "Simple rape" is defined as engaging in sexual intercourse with a person of any gender without their consent through physical or moral violence. "Aggravated or equated rape" is defined as: engaging in sexual intercourse with a person who lacks the capacity to understand the significance of the act or who, for any reason, cannot resist it; or the introduction by anal or vaginal means of any object, instrument, or part of the human body other than the penis into a person who lacks the capacity to understand the significance of the act or who, for any reason, cannot resist it.

Crimes – Life: includes homicide, injuries, and other life-related offenses, excluding those possibly related to gender-based violence (femicide, abortion).

Crimes – Freedom: includes kidnapping, child trafficking, and other freedom-related crimes, excluding those possibly related to gender-based violence (abduction).

Crimes – Property: includes robbery, fraud, breach of trust, extortion, property damage, dispossession, and other property-related crimes.

Crimes – Other: includes drug-related crimes, threats, trespassing, falsification, forgery, prison escapes, environmental crimes, public service-related offenses, electoral crimes, and other common jurisdiction crimes, excluding those possibly related to gender-based violence (corruption of minors, human trafficking).

All other crimes – No GBV: includes all the crimes reported above, except rape and other crimes explicitly related to gender-based violence (domestic violence, gender-based violence not related to domestic violence, noncompliance with family support obligations, other crimes against family, sexual abuse, sexual harassment, incest, and other crimes related to sexual freedom or security).

Mechanism variables

Mortality from mental and behavioral disorders (INEGI mortality records): Deaths because of dementia; Alcohol Dependence Syndrome; other mental and behavioral disorders due to alcohol use; mental and behavioral disorders due to other psychoactive substance use; schizophrenia, schizotypal disorders, and delusional disorders; mood disorders; neurotic syndromes, stress-related disorders, and somatoform disorders; behavioral syndromes associated with physiologic disturbances and physical factors; mental retardation.

Female Progressivity (ENDIREH - *Encuesta Nacional sobre la Dinámica de las Relaciones en los Hogares*): States where the average of women aged 15 or older who agreed to the following questions is higher than the Mexican median:

Should a wife NOT obey her husband or partner in everything he orders?
Should a woman have the right to choose her friends?
Should a man NOT be responsible for all the expenses of the family?
Does a woman have the same capacity as a man to earn money?
Is it NOT a woman's obligation to have sexual relations with her husband or partner?
Is a woman free to decide if she wants to work?
Does a man NOT have the right to beat his wife?
Should the care of the children be shared between the couple?
Do the parents NOT have the right to beat their children?
If there is hitting or abuse in the home, is it NOT a family matter and should NOT it remain there?

Variable	Construction
Unemployment Variables	
Male Unemployment	Number of male unemployed over number of economically active males, by state and trimester, per 100
Female Unemployment	Number of female unemployed over number of economically active females, by state and trimester, per 100
Lagged Male Unemployment	Number of male unemployed over number of economically active males, by state and in the previous trimester, per 100
Crime Variables	
Rape / Crime categories	Number of preliminary inquiries and investigation files on rape or on all the crimes of that category, by state and trimester, over the state's population of that year, per 100,000
Sex Ratio Variables	
Sex Ratios	Number of males over females, by age groups (0–17, 18–24, 25–35, 35–44, 45–59, 60+), across states and semesters, per 100
Transformations	
LN *Variable*	Natural logarithm of the Variable plus 1
IHS *Variable*	Inverse hyperbolic sine of the Variable

Table continued

Variable	Construction
Variable Count	Number of preliminary inquiries and investigation files on that kind of sexual violence, by state and trimester
ENVIPE Variables	
Rape - F	Number of females older than 18 who reported having suffered rape, by state and trimester, over the number of the state's females older than 18 in that year, per 100,000
Rape - F - *Age Group*	Number of females of Age Group who reported to have suffered rape, by state and trimester, over the number of the state's females older than 18 in that year, per 100,000
Rape Report Rate - Pub Min / Tot	Number of rapes reported to the Public Ministry or to any authority, by state and trimester, over the number of rapes of females, per 100
Mechanisms	
Divorce - Demand/Register	Number of divorce demands or registrations, by state and trimester, over the state's population of that year, per 100,000
Marriage	Number of marriage registrations, by state and trimester, over the state's population of that year, per 100,000
Suicide - Occurrence/ Register	Number of male suicides, by trimester and state of occurrence or registration, over the state's population of that year, per 100,000
Mortality Mental Disorder - Occurrence/Register	Number of male deaths because of mental and behavioral disorders, by trimester and state of occurrence or registration, over the state's population of that year, per 100,000
Female Progressive	Equal to 1 if the average number of questions about gender roles that women in the state agree to is higher than the median number for Mexico of 8.26, or higher than the mean number for Mexico of 8.19 in the robustness checks
Census of Population and Housing (2010)	
Urbanization	Population living in areas with more than 2499 inhabitants, over the total population, per 100, by state

Table continued

Variable	Construction
Catholic	Population identifying as Catholic, over the total population excluding those with unknown religious affiliation, per 100, by state
No religious	Population identifying as non-religious, over the total population excluding those with unknown religious affiliation, per 100, by state
Sex ratio	Male over female population, per 100, by state
Age dependency ratio	Population aged 0–14 and 65 or more, over the population aged 15–64, excluding those with unknown age, per 100, by state
Employment rate	Employed population aged 12 or more, over the total population aged 12 or more excluding those with unknown employment condition, per 100, by state
Indigenous	Population aged 5 or more speaking an indigenous language, over the total population aged 5 or more, excluding those without information on language, per 100, by state
Born in state	Population born in the state where they live, over the total population excluding those with unknown birth location, per 100, by state
Know write & read	Population aged 12 or more who can write and read, over the total population aged 12 or more excluding those without this information, per 100, by state
M/F diff in Know write & read	Male to female difference in the "Know write & read" variable by sex
At least basic education	Population aged 12 or more who have completed at least basic education, over the total population aged 12 or more excluding those with unknown educational attainment, per 100, by state
M/F diff in At least basic edu	Male to female difference in the "At least basic education" variable by sex
Right to sanitation	Population aged 12 or more with the entitlement to healthcare services, over the total population aged 12 or more excluding those without this information, per 100, by state
Married	Married population aged 12 or more, over the total population aged 12 or more excluding those with unknown marital status, per 100, by state

Table continued

Variable	Construction
No children	Female population aged 12 or more who have not had children, over the total female population aged 12 or more excluding those with unknown children, per 100, by state
Urban	Equal to 1 if the state's value of "Urbanization" is higher than the Mexican median of 77.22
Age dependent	Equal to 1 if the state's value of "Age dependency ratio" is higher than the Mexican median of 55.14
Employed	Equal to 1 if the state's value of "Employment rate" is higher than the Mexican median of 50.68
High indigenous	Equal to 1 if the state's value of "Indigenous" is higher than the Mexican median of 2.59
High native	Equal to 1 if the state's value of "Born in state" is higher than the Mexican median of 83.49
Literate	Equal to 1 if the state's value of "Know write & read" is higher than the Mexican median of 94.60
Educated	Equal to 1 if the state's value of "At least basic education" is higher than the Mexican median of 94.60

8 Appendix B – Additional Tables and Figures

Figures 1 and 2
Table 6
Table 7
Table 8
Table 9
Table 10
Table 11
Table 12
Table 13
Table 14
Table 15
Table 16
Table 17

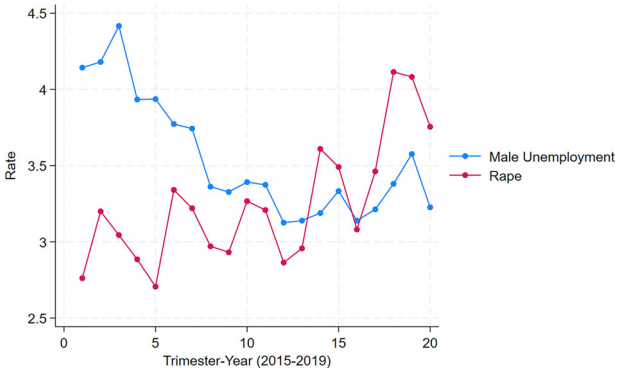


Fig. 1 Evolution of male unemployment and rape. The figure shows the evolution over time of male unemployment and rape rates, for the period 2015–2019, using population weights. Male unemployment is the number of unemployed males over the economically active population, per 100, using the ENOE. The sexual violence rate is the number of crimes per 100,000 inhabitants, utilizing the NPSS

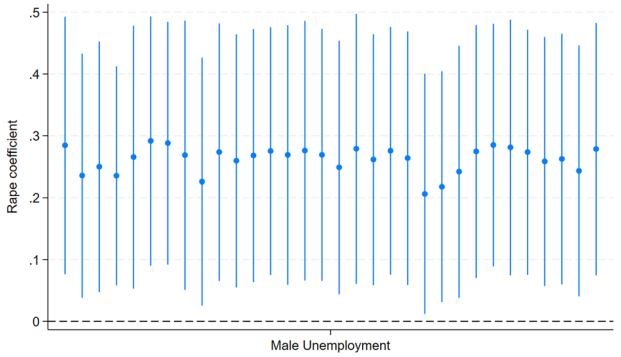


Fig. 2 Robustness check: excluding 1 state at a time. The figure shows the estimated association between male unemployment and rape excluding one state at a time. The specification includes state, year, and trimester fixed effects, and sex ratios, covering the years 2015 to 2019. Male unemployment is the number of unemployed males over the economically active population, per 100, using the ENOE. The sexual violence rate is the number of crimes per 100,000 inhabitants, using information from the NPSS. Sex ratios, calculated as the number of males per 100 females in each state using CONAPO data, are measured by age groups (0–17, 18–24, 25–35, 35–44, 45–59, 60+) and semesters. Standard errors are clustered by state

Table 6 Robustness checks: Variables' functional form

	(1) LN Rape	(2) LN Rape	(4) IHS Rape	(6) IHS Rape
Male Unemployment	0.056**		0.070**	
	(0.020)		(0.026)	
LN Male Unemployment		0.276**		
		(0.102)		
IHS Male Unemployment				0.281**
				(0.108)
Observations	632	632	632	632
Mean	1.355	1.355	1.758	1.758
Adj. R-sq	0.735	0.736	0.730	0.731
State FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Trim FE	Yes	Yes	Yes	Yes
Sex Ratios	Yes	Yes	Yes	Yes

The table shows the relationship between male unemployment and rape rates, where the outcome is transformed as either the natural logarithm or the inverse hyperbolic sine, and the independent variable is either unchanged or transformed as the outcome. The analysis includes state, year, and trimester fixed effects, for the years 2015–2019. Male unemployment is the number of unemployed males over the economically active population, per 100, using the ENOE. Sexual violence rates are the number of crimes per 100,000 inhabitants, utilizing the NPSS. Sex ratios, calculated as the number of males per 100 females in each state using CONAPO data, are measured by age groups (0–17, 18–24, 25–35, 35–44, 45–59, 60+) and semesters. Standard errors, clustered by state, in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, according to the wild-cluster bootstrap p-value

Table 7 Robustness checks: alternative estimators and outcomes

	(1) Rape - Count	(2) Rape
Male Unemployment	0.065** (0.026)	0.075*** (0.024)
Observations	632	632
Mean	112.973	3.250
Log-Likelihood	−2923.170	−996.670
State FE	Yes	Yes
Year FE	Yes	Yes
Trim FE	Yes	Yes
Sex Ratios	Yes	Yes

The table presents the incidence rate ratios of male unemployment on the number and rate of rape estimated through Negative Binomial regressions. The analysis includes state, year, and trimester fixed effects, for the years 2015–2019. Male unemployment is the number of unemployed males over the economically active population, per 100, using the ENOE) The outcomes are the number of rape preliminary inquiries and openings of the investigation file in Columns (1) and (3), or the number per 100,000 inhabitants in Columns (3) and (4), utilizing the NPSS. Sex ratios, calculated as the number of males per 100 females in each state using CONAPO data, are measured by age groups (0–17, 18–24, 25–35, 35–44, 45–59, 60+) and semesters. Standard errors, clustered by state, in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8 Robustness checks: other crime categories

	(1) All other crimes - No GBV	(2) Crimes – Life	(3) Crimes –Freedom	(4) Crimes –Property	(5) Crimes – Other
Male Unemployment	1.837 (6.694)	0.707 (0.956)	0.058 (0.134)	0.555 (5.340)	0.517 (2.252)
Observations	632	632	632	632	632
Mean	323.926	48.110	3.556	199.762	72.498
Adj. R-sq	0.882	0.838	0.791	0.883	0.836
State FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Trim FE	Yes	Yes	Yes	Yes	Yes
Sex Ratios	Yes	Yes	Yes	Yes	Yes

The table presents the relationship between male unemployment and various crime categories. The analysis includes state, year, and trimester fixed effects, covering the period from 2015 to 2019. Male unemployment is defined as the number of unemployed males over the economically active population, per 100, constructed using data from the ENOE. Crime rates represent the number of crimes per 100,000 inhabitants, utilizing information from the NPSS. Sex ratios, calculated as the number of males per 100 females in each state using CONAPO data, are measured by age groups (0–17, 18–24, 25–35, 35–44, 45–59, 60+) and semesters. Standard errors, clustered by state, are reported in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, according to the wild-cluster bootstrap p-value

Table 9 Robustness checks: rape reporting rate (ENVIPE)

	(1) Rape Report Rate - Pub Min	(2) Rape Report Rate - Tot
Male Unemployment	-14.083^{**} (5.645)	-19.511^{***} (6.613)
Observations	208	208
Mean	23.934	29.249
Adj. R-sq	0.144	0.168
State FE	Yes	Yes
Year FE	Yes	Yes
Trim FE	Yes	Yes
Sex Ratios	Yes	Yes

The table presents the relationship between male unemployment and the reporting rate of rapes of females aged 18 years old or more. The analysis includes state, year, and trimester fixed effects, for the years 2015–2018. Male unemployment is the number of unemployed males over the economically active population, per 100, using the ENOE. The reporting rate is the number of rapes reported to the Public Ministry (Column 1) or any authority (Column 2) over the number of rapes of females, per 100, utilizing the ENVIPE. Sex ratios, calculated as the number of males per 100 females in each state using CONAPO data, are measured by age groups (0–17, 18–24, 25–35, 35–44, 45–59, 60+) and semesters. The low number of observations is due to the high number of state-trimester groups without any sexual assault. Standard errors, clustered by state, in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, according to the wild-cluster bootstrap p-value

Table 10 Mechanisms: effect on divorce and marriage rates

	(1) Divorce - Demand	(2) Divorce - Registered	(3) Marriage
Male Unemployment	0.001 (0.005)	0.008 (0.006)	0.017 (0.025)
Observations	632	632	632
Mean	0.302	0.320	1.106
Adj. R-sq	0.895	0.877	0.572
State FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Trim FE	Yes	Yes	Yes
Sex Ratios	Yes	Yes	Yes

The table presents the relationship between male unemployment and divorce and marriage rates. The analysis includes state, year, and trimester fixed effects, from 2015 to 2019. Male unemployment is the number of unemployed males over the economically active population, per 100, using the ENOE. Nuptiality rates are the number of divorce demands (Column 1) or registrations (Column 2) and of marriage registrations (Column 3) per 1000 inhabitants, using INEGI nuptiality records. Sex ratios, calculated as the number of males per 100 females in each state using CONAPO data, are measured by age groups (0–17, 18–24, 25–35, 35–44, 45–59, 60+) and semesters. Standard errors, clustered by state, in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, according to the wild-cluster bootstrap p-value

Table 11 Mechanisms: effect on male suicide and mortality from mental disorder rates

	(1) Suicide - Occurrence	(2) Suicide - Register	(3) Mortality mental disorder - Occurrence	(4) Mortality mental disorder - Register
Male Unemployment	0.002 (0.038)	0.010 (0.035)	−0.029 (0.018)	−0.013 (0.018)
Observations	632	632	628	632
Mean	1.247	1.271	0.683	0.683
Adj. R-sq	0.746	0.767	0.635	0.645
State FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Trim FE	Yes	Yes	Yes	Yes
Sex Ratios	Yes	Yes	Yes	Yes

The table presents the relationship between male unemployment and male suicide and mortality from mental and behavioral disorders rates. The analysis includes state, year, and trimester fixed effects, from 2015 to 2019. Male unemployment is the number of unemployed males over the economically active population, per 100, using the ENOE. Suicide and mortality rates are number of male dead because of these reasons, by trimester and state of occurrence (Columns 1 and 3) or register (Columns 3 and 4), per 100,000 inhabitants, utilizing INEGI mortality records. Sex ratios, calculated as the number of males per 100 females in each state using CONAPO data, are measured by age groups (0–17, 18–24, 25–35, 35–44, 45–59, 60+) and semesters. Standard errors, clustered by state, in parentheses. Standard errors, clustered by state, in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, according to the wild-cluster bootstrap p-value

Table 12 Mechanisms' robustness: female progressivity variable

Rape	(1) Median	(2) Mean	(3) Continuous
Male Unemployment	0.002	−0.004	−6.487***
	(0.075)	(0.088)	(1.152)
Male Unemployment * Female Progressive	0.508***	0.443***	0.818***
	(0.128)	(0.135)	(0.141)
Observations	632	632	632
Mean	3.250	3.250	3.250
Adj. R-sq	0.746	0.743	0.752
State FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Trim FE	Yes	Yes	Yes
Female Progressive-Year FE	Yes	Yes	Yes
Female Progressive-Trim FE	Yes	Yes	Yes
Sex Ratios	Yes	Yes	Yes

The table presents the heterogeneity analysis of the relationship between male unemployment and rape rates, with respect to the gender-equal opinions of women in the state. Male unemployment is defined as the number of unemployed males over the economically active population, per 100, constructed using data from the ENOE. Sexual violence rates represent the number of crimes per 100,000 inhabitants, utilizing information from the NPSS. "Female Progressive" is an indicator equal to 1 if the average number of questions about gender roles that women in the state agree to is higher than the median number for Mexico in Column 1, than the mean number in Column 2, and is continuous in Column 3, according to the 2011 ENDIREH round. The analysis includes state, trimester, year, trimester*female progressive, and year*female progressive fixed effects, covering the period from 2015 to 2019. Sex ratios, calculated as the number of males per 100 females in each state using CONAPO data, are measured by age groups (0–17, 18–24, 25–35, 35–44, 45–59, 60+) and semesters. Standard errors, clustered by state, are reported in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, according to the wild-cluster bootstrap p-value

Table 13 Mechanisms' robustness: balance table - Low/high female progressivity

	(1) No progressive	(2) Progressive	(3) Difference
2010 Urbanization	69.063 (12.815)	81.845 (11.876)	12.782*** (4.434)
2010 Catholic	82.801 (10.456)	85.284 (7.559)	2.482 (3.275)
2010 No religious	5.283 (3.471)	5.108 (3.407)	−0.174 (1.235)
2010 Sex ratio	96.029 (2.338)	96.963 (3.967)	0.934 (1.169)
2010 Age dependency ratio	58.072 (4.932)	53.634 (4.625)	−4.438** (1.716)
2010 Employment rate	49.419 (2.974)	51.932 (3.112)	2.512** (1.092)
2010 Indigenous	9.889 (11.052)	4.046 (5.129)	−5.843* (3.092)
2010 Born in state	86.615 (7.389)	75.138 (12.776)	−11.477*** (3.746)
2010 Know write & read	91.730 (4.204)	95.517 (2.189)	3.788*** (1.203)
2010 M/F diff in Know write & read	0.089 (0.044)	0.065 (0.082)	−0.024 (0.024)
2010 At least basic education	92.184 (3.502)	95.189 (1.998)	3.005*** (1.023)
2010 M/F diff in At least basic education	1.831 (2.195)	1.100 (0.922)	−0.731 (0.604)
2010 Right to sanitation	66.416 (9.875)	70.094 (5.991)	3.678 (2.931)
2010 Married	41.379 (4.239)	40.832 (4.498)	−0.547 (1.569)
2010 No children	32.491 (1.778)	32.179 (2.210)	−0.311 (0.720)
Observations	16	16	32

The table shows the means and differences in means of socioeconomic and demographic characteristics between states with low and high female progressivity. The socioeconomic and demographic characteristics are derived from the Census of Population and Housing of 2010, INEGI. Progressive is an indicator equal to 1 if the average number of questions about gender roles that women in the state agree to is higher than the median number for Mexico, according to the 2011 ENDIREH round. Standard errors of the difference in means, clustered by state, are reported in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 14 Mechanisms' robustness: heterogeneity analysis on possible confounders

Rape	(1) Urban	(2) Age dependent	(3) Employed	(4) High indigenous	(5) High native	(6) Literate	(7) Educated
Male Unemployment	0.171 (0.117)	0.381* (0.150)	0.032 (0.105)	0.332** (0.116)	0.396*** (0.127)	0.238 (0.127)	0.238 (0.127)
Var * Male Unemployment	0.219 (0.172)	−0.296 (0.199)	0.343* (0.168)	−0.122 (0.191)	−0.367** (0.173)	0.080 (0.171)	0.080 (0.171)
Observations	632	632	632	632	632	632	632
Mean	3.250	3.250	3.250	3.250	3.250	3.250	3.250
Adj. R-sq	0.743	0.742	0.745	0.741	0.743	0.739	0.739
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Trim FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 14 continued

Rape	(1) Urban	(2) Age dependent	(3) Employed	(4) High indigenous	(5) High native	(6) Literate	(7) Educated
Var-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Var-Trim FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sex Ratios	Yes	Yes	Yes	Yes	Yes	Yes	Yes

The table presents the heterogeneity analysis of the relationship between male unemployment and rape rate, with respect to various characteristics that significantly differ between low and high female progressivity states. Male unemployment is defined as the number of unemployed males over the economically active population, per 100, constructed using data from the ENOE. Sexual violence rates represent the number of crimes per 100,000 inhabitants, utilizing information from the NPSS. The interaction variables are indicators equal to 1 if the state's value of the corresponding continuous variable is higher than the Mexican median, according to the 2010 Census of Population and Housing. The analysis includes state, trimester, year, trimester*var, and year*var fixed effects, covering the period from 2015 to 2019. Sex ratios, calculated as the number of males per 100 females in each state using CONAPO data, are measured by age groups (0–17, 18–24, 25–35, 35–44, 45–59, 60+) and semesters. Standard errors, clustered by state, are reported in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, according to the wild-cluster bootstrap p-value

Table 15 Mechanisms' robustness: balance table - Low/high female progressivity (Restricted sample)

	(1) No progressive	(2) Progressive	(3) Difference
2010 Urbanization	73.136 (10.394)	80.226 (12.576)	7.090 (4.610)
2010 Catholic	84.248 (9.419)	87.777 (5.038)	3.530 (3.018)
2010 No religious	4.969 (3.228)	3.929 (2.165)	−1.040 (1.098)
2010 Sex ratio	96.466 (2.215)	95.536 (2.865)	−0.930 (1.023)
2010 Age dependency ratio	56.246 (3.428)	54.739 (4.419)	−1.506 (1.581)
2010 Employment rate	49.991 (3.003)	50.745 (2.032)	0.754 (1.025)
2010 Indigenous	84.817 (7.032)	80.284 (7.098)	−4.533 (2.823)
2010 Born in state	6.267 (8.114)	3.417 (4.271)	−2.850 (2.591)
2010 Know write & read	93.449 (2.422)	95.260 (2.316)	1.812* (0.947)
2010 M/F diff in Know write & read	0.081 (0.041)	0.097 (0.051)	0.016 (0.018)
2010 At least basic education	93.612 (1.988)	94.980 (2.148)	1.368 (0.827)
2010 M/F diff in At least basic education	0.966 (1.317)	1.169 (0.980)	0.203 (0.464)
2010 Right to sanitation	68.922 (9.259)	69.841 (6.451)	0.919 (3.189)
2010 Married	41.890 (4.204)	41.777 (4.447)	−0.112 (1.729)
2010 No children	32.242 (1.827)	32.319 (2.325)	0.077 (0.835)
Observations	13	13	26

The table shows the means and differences in means of socioeconomic and demographic characteristics between states with low and high female progressivity, excluding the states with extreme values in the "Born in state" variable of the 2010 Census. The socioeconomic and demographic characteristics are derived from the Census of Population and Housing of 2010, INEGI. Progressive is an indicator equal to 1 if the average number of questions about gender roles that women in the state agree to is higher than the median number for Mexico, according to the 2011 ENDIREH round. The excluded states are: Chiapas, Guerrero, Oaxaca, Quintana Roo, Baja California, Baja California Sur. Standard errors of the difference in means, clustered by state, are reported in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 16 Mechanisms' robustness: male unemployment, rape, and female progressivity (Restricted sample)

	(1) Rape	(2) Rape
Male Unemployment	0.216** (0.088)	0.014 (0.071)
Male Unemployment * Female Progressive		0.426** (0.144)
Observations	520	520
Mean	3.250	3.250
Adj. R-sq	0.762	0.779
State FE	Yes	Yes
Year FE	Yes	Yes
Trim FE	Yes	Yes
Female Progressive-Year FE	No	Yes
Female Progressive-Trim FE	No	Yes
Sex Ratios	Yes	Yes

The table presents the relationship between male unemployment and rape and its heterogeneity with respect to the gender-equal opinions of women in the state, excluding the states with extreme values in the "Born in state" variable of the 2010 Census. Male unemployment is defined as the number of unemployed males over the economically active population, per 100, constructed using data from the ENOE. Sexual violence rates represent the number of crimes per 100,000 inhabitants, utilizing information from the NPSS. "Female Progressive" is an indicator equal to 1 if the average number of questions about gender roles that women in the state agree to is higher than the median number for Mexico, according to the 2011 ENDIREH round. The analysis includes state, trimester, year, trimester*female progressive, and year*female progressive fixed effects, covering the period from 2015 to 2019. Sex ratios, calculated as the number of males per 100 females in each state using CONAPO data, are measured by age groups (0–17, 18–24, 25–35, 35–44, 45–59, 60+) and semesters. The excluded states are: Chiapas, Guerrero, Oaxaca, Quintana Roo, Baja California, Baja California Sur. Standard errors, clustered by state, are reported in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, according to the wild-cluster bootstrap p-value

Table 17 Mechanisms: heterogeneity analysis on state's female progressivity (ENVIPE)

	(1) Rape - F	(2) Rape - F 18–24	(3) Rape - F 25–34	(4) Rape - F 35–44	(5) Rape - F 45–59	(6) Rape - F 60+
Male Unemploy.	2.525 (7.705)	1.611 (6.189)	2.505 (4.034)	−1.532 (3.276)	0.269 (4.714)	−0.328 (0.370)
Male Unemploy. *Female Progr.	15.336 (16.204)	−4.909 (10.600)	22.106* (13.691)	−2.234 (3.952)	−0.146 (5.109)	0.519 (0.389)
Observations	512	512	512	512	512	512
Mean	41.254	13.848	15.030	7.677	4.200	0.498
Adj. R-sq	0.048	0.020	0.065	0.045	0.004	−0.004
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Trim FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 17 continued

	(1) Rape - F	(2) Rape - F 18–24	(3) Rape - F 25–34	(4) Rape - F 35–44	(5) Rape - F 45–59	(6) Rape - F 60+
F Prog-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
F Prog-Trim FE	Yes	Yes	Yes	Yes	Yes	Yes
Sex Ratios	Yes	Yes	Yes	Yes	Yes	Yes

The table presents the heterogeneity analysis of the relationship between male unemployment and the rates of rape of women aged 18 years old or more, for the gender-equal opinions of women in the state. Male unemployment is the number of unemployed males over the economically active population, per 100, using the ENOE. The outcome variable is the number of female rapes per 100,000 females 18 years old or older, utilizing the ENVIPE. "Female Progr." is an indicator equal to 1 if the average number of questions about gender roles that women in the state agree to is higher than the Mexican median, according to the 2011 ENDIREH. The analysis includes state, trimester, year, trimester*female progressive, and year*female progressive fixed effects, from 2015 to 2019. Sex ratios, calculated as the number of males per 100 females in each state using CONAPO data, are measured by age groups (0–17, 18–24, 25–35, 35–44, 45–59, 60+) and semesters. Standard errors, clustered by state, are reported in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, according to the wild-cluster bootstrap p-value

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