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# MENOPAUSE EFFECTS ON LABOR OUTCOMES FOR MEXICAN WOMEN

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# Summary

Menopause is an inevitable event for all women, with serious effects on their bodies: health, mood, emotions, and even cognitive abilities can be severely impacted. At the same time, Mexican women are still far from achieving the same labor force participation rates as men. In this context, studying the effects of menopause on women's labor and health outcomes becomes essential.

This study uses the National Household Living Standards Survey (ENNViH) to explore the causal relationship between the early onset of menopause or the presence of severe symptoms and labor outcomes such as employment, monthly income, and weekly work hours.

No statistically significant results were found regarding early menopause. However, as women age, the negative effects of early menopause become increasingly pronounced. In terms of health, early menopause is associated with a higher likelihood of developing chronic conditions such as diabetes, hypertension, and heart disease. Experiencing six or more physiological symptoms was liked to lower monthly income and fewer weekly work hours. Experiencing six or more symptoms—whether physiological or emotional— reduced the likelihood of being employed.

As women's participation in the workforce continues to grow, addressing health-related barriers to their full economic engagement becomes critical. Evidence from this thesis shows that severe menopausal symptoms substantially limit women's earnings and labor market participation. These findings call for the urgent design and implementation of targeted workplace policies and health programs that directly support menopausal women. Policy action in this area is essential not only to advance gender equity but also to strengthen the productivity of the broader economy.

# Contents

# 1 Introduction

Menopause, as a complex physiological process, has significant implications for women's lives. This study investigates whether the experience of menopause, particularly the early onset or the presence of severe symptoms, affects women's labor outcomes. Specifically, it examines how early menopause and experiencing six or more symptoms influence three key labor market indicators for Mexican women: employment, monthly income, and weekly work hours.

Women face distinct challenges from those of men, both structurally and socially. These differences are attributable to a range of factors, including social, cultural, and physiological distinctions. Among these, reproductive health plays a crucial role in shaping labor patterns. Understanding the impact of menopause—an inevitable biological process for all women— is essential to comprehend broader trends in female labor force participation, more specifically, the persistent gender disparities in labor outcomes. This research is particularly relevant in the current context of increasing female labor force participation alongside an aging workforce and seeks to fill a gap in the literature by analyzing how early menopause and severe menopausal symptoms impact Mexican women's labor outcomes.

As for previous empirical evidence, the intersection of female health and labor outcomes has only recently gained attention within labor economics. In particular, the effects of biological processes unique to women, such as menopause remain insufficiently studied despite their potential influence on labor market participation. The existing literature has focused predominantly on other aspects of female reproductive health, such as pregnancy and premenstrual syndrome (PMS), examining their impact on absenteeism and workplace performance. Studies on menopause are relatively scarce but have begun to document its adverse effects on labor outcomes.

For instance, Conti et al. (2024) analysis revealed that earning decline over the four years after menopause diagnosis, driven by a decrease in both hours worked and employment. For women experiencing early menopause, significant effects on labor outcomes were observed three to four years post-diagnosis. The work of Bryson et al. (2022) on UK women further highlighted that not all menopausal symptoms impact labor market participation equally: physiological symptoms, in particular, were found to have the most significant effects on participation; additionally, early menopause was

shown to negatively affect employment rates.

While these findings highlight the relevance of menopausal symptoms and early menopause in shaping labor market outcomes, they are predominantly based on studies in developed countries. There is a notable absence of research that addresses these dynamics within the Mexican context. This study seeks to explore the causal relationship between experiencing early menopause, or severe menopause symptoms, and labor outcomes for Mexican women.

This study utilized panel data from the National Household Living Standards Survey (ENNViH) for the years 2002, 2005, and 2009, to identify the causal relationship between menopause and labor outcomes. The sample comprises women aged 35-60, ensuring a focus on the population most likely to experience menopausal symptoms and their subsequent labor market effects.

The empirical strategy employs an Ordinary Least Squares (OLS) approach, specifically set to women aged 46 and older to capture the post-early menopause period. This strategy leverages the exogenous variation in the onset of menopause and the number of symptoms as shocks to assess their impact on women's employment, monthly income, and weekly work hours.

The findings reveal that early menopause did not yield statistically significant results. However, as women age, the effects of early menopause become increasingly negative and pronounced. These adverse effects are particularly concentrated among highly educated women, who experience a more important reduction in labor outcomes associated with early menopause.

Regarding health outcomes, early menopause coefficients suggest an increased likelihood of developing chronic conditions such as diabetes, hypertension, and heart disease. Interestingly, highly educated women show a slight mitigation of the likelihood of developing diabetes, albeit with the minimal statistical confidence.

In contrast, experiencing six or more physiological symptoms reduces monthly income by $434 MXN, at the highest level of confidence. Similarly, weekly work hours decrease by 3.2 hours per week, with a 90% confidence level. Furthermore, experiencing six or more symptoms of any type (physiological or emotional) reduces the likelihood of employment by 5.21 percentage points, at the 90% confidence level.

These findings suggest that severe menopausal symptoms not only reduce

women's earnings but also limit their labor supply, highlighting the importance of addressing health- related barriers to women's economic participation. Additionally, the results suggest that targeted workplace policies and health interventions are essential to support menopausal women, especially those experiencing many symptoms. These interventions are critical to promoting gender equity and ensuring that the aging female workforce remains economically active and productive.

# 2 Context

Menopause is defined as the permanent cessation of menstruation due to a loss of ovarian follicular function and it is confirmed after 12 consecutive months of amenorrhea[1]. On average, menopause occurs around the age of 51 (Greendale et al., 1999).

The menopausal process has distinct stages. Prior to menopause, women are considered premenopausal if they have had a menstrual within the lasts three months. The transitional phase before menopause, called perimenopause, typically last between two to eight years. Women with 3−11 months of amenorrhea fall into this category, characterized by irregular menstrual cycles—usually shorter cycles intermingled with longer gaps between periods. The start of perimenopause occurs with the dysregulation of the neurohormonal system that control ovulation (Greendale, 1999). Once a woman has reached permanent amenorrhea, either naturally or surgically, she is considered postmenopausal. The following diagram illustrates the previously discussed stages.

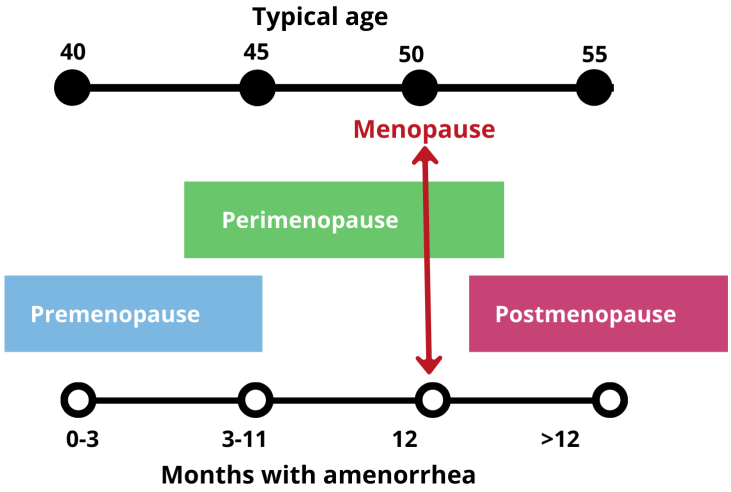
Menopause symptoms are broad and varied: physiological symptoms include hot flashes, urinary incontinence, urinary tract infection, lack of energy, vaginal atrophy, reduced sexual function, cold sweats, vertigo, headaches, insomnia, palpitations, diarrhea or constipation, persistent cough, backaches, aches in joints, shortness of breath, and menstrual problems; while emotional symptoms include depression, loss of appetite, difficulty concentrating, and nervous tension. Furthermore, is associated with increased risk of coronary heart disease, osteoporosis, hypertension and diabetes (Greendale et al., 1999; Mckinlay et al., 1992).

Hormone replacement therapy is a common treatment to alleviate menopausal

[1] Amenorrhea refers to the absence of menstrual periods.

symptoms and may also be used to prevent chronic diseases associated with menopause (Greendale et al., 1999). It is specially recommended for woman that experience premature and early menopause (NHS Inform, 2024).

Figure 1: Diagram of Menopause Stages




Source: Author's own elaboration. This figure shows the stages of menopause, premenopause, perimenopause, and postmenoause; with respect to months of amenorrhea and the typical age women experience them.

In some cases, menopause can occur prematurely or early. Premature menopause refers to reaching menopause before age 40. On the other hand, early menopause occurs between the ages of 40 and 45. A spontaneous, i.e. natural, early menopause affects approximately 5% of the population before the age of 45 (NHS Inform, 2024). Causes of premature and early menopause include primary ovarian insufficiency (POI), certain cancer treatments, or surgery. Symptoms for premature and early menopause mirror those of menopause at the expected age.

Genetics and lifestyle factors can influence the likelihood of early menopause. Women could have a higher chance of experiencing early menopause if it also occurred in other women within their maternal family. Risk factors include starting menstruation early (before age 8), never giving birth or only giving birth once or twice, smoking, or being underweight (NHS, 2021).

# 3 Literature Review

Regarding the female reproductive cycle and their effects on work, there is some literature—though limited—on the effects of PMS (Premenstrual Syndrome) and

other gynecological conditions on productivity, labor absenteeism, and additional labor market-related variables. Most of these studies find that these symptoms have a null or negative effect on labor outcomes (Heinemann et al., 2010; Dean and Borenstein, 2004). However, literature on the effects of menopause is scarce and very recent (Verdonk et al., 2022) and can be divided into two major categories: the majority are purely correlational studies, generally from medicine, and that use self-perception questionnaires; on the other hand, from the economics perspective, there are few studies that use quasi-experimental methods.

Firstly, with respect to PMS, Ichino and Moretti (2009) show that work absences for women under 45 follow a 28-day cycle, unlike absences for men and women over 45 (women likely in menopause) do not follow this pattern; linking menstrual cycles to increased absenteeism. This explains at least 14% of the income differences between men and women. Similarly, Heinemann et al. (2010) find that employed women with moderate to severe premenstrual symptoms experience a higher rate of productivity impairment and absenteeism compared to women without symptoms. Herrmann and Rockoff (2013) confirm that menstrual issues contribute to the gender gap in absenteeism but not explain the wage differences.

Of the studies that explore the relationship of menopause with labor outcomes, the vastly majority pertain to correlation studies. Authors mainly find negative outcomes for women with menopause. One of which is absenteeism, a problem mainly for women in the work force, is associated with menopause. A study conducted by Hashimoto et al. (2021) for Japanese women, showed that absolute presenteeism was negatively correlated with the number of menopausal symptoms experienced. Likewise, Faubion et al. (2023) (on the Mayo Clinic, USA) found that 10.8% of women report having missed work due to menopause-related symptoms. They also find that the likelihood of reporting an adverse work outcome increases with the severity of the symptoms. Specifically, the probability that a woman faces an adverse work outcome is 15.6 times higher for women in the highest quartile of menopausal symptoms compared to those in the first quartile.

Similar results are shown for the Netherlands: Geukes et al. (2016) conducted a cross- sectional study comparing the abilities of a sample of healthy Dutch women aged 44 to 60 with a sample of women of the same age attending a menopause clinic for the first time. The results indicate that women with menopausal symptoms scored lower on the Work Ability Index than the reference group and were 8.4 times mora likely

to report low work abilities than their counterparts.

In the analysis of menopausal symptoms−divided by emotional and physiological−, there are several studies. Particularly, Nosek et al. (2010) collects data from women self-identified as African American, European American, or Mexican/Central American in California, who began the study in the premenopausal stage. The authors found that women with lower incomes, a more negative attitude towards aging, and higher stress levels reported more intense vasomotor symptoms of menopause. Moreover, the percentage of Mexican women who reported vasomotor symptoms, was higher in comparison with other groups.

With respect to the emotional repercussions associated with menopause and their effect on women's workplace, Converso et al. (2019) associated menopause symptoms and women's support networks with their burnout at work. Results show that menopausal symptoms are significantly associated with emotional burnout and that personal and social resources do not mitigate these effects.

Finally for correlational studies, Dennerstein et al. (2002) followed middle-aged Australian women over nine years on an annual basis. They discovered that as women transitioned from early to later stages of the process, negative mood decreased significantly. Therefore, the authors concluded that overall well-being improves as women enter the later stages of menopause.

Considering studies that use quasi-experimental designs, Daysal and Orsini (2014) examine the effect of hormone replacement therapy, a common treatment for alleviating menopausal symptoms, on the employment of middle-aged women. The study's results indicate substantial benefits from using the treatment in the short-term employment of women at these ages.

Moreover, Conti et al. (2024) aim to calculate the labor market, health and social welfare costs of menopause. They use administrative data from Norway and Sweden and employ a difference-in-difference design. Defining a "base age" as a potential age for menopause, they construct a panel of five years before and four years after the base age. If the base age aligns with the actual menopause age, that panel is treated; otherwise, it serves as a control. The authors find that earnings fall by 7% over the four years post-diagnosis. This decline is driven by both the extensive and intensive margin effects: there is a 0.5 percentage point decrease in the likelihood of working and 0.5% decrease

in hours worked among women who are employed. The labor market effects grow over

time. No impact on sick leave days is observed. Results show that negative impacts are concentrated among women without a college degree. In an early menopause sample, they find no impacts on the likelihood of full-time work, hours work or earnings in the first two years post-diagnosis. However, by year three and four, labor supply reduction led to a 20% earnings decline.

The most similar study to the present one regarding the effects of early menopause is by Bryson et al. (2022). It is a cohort panel study in the United Kingdom. The authors use a Difference-in-Differences estimator to find the causal relationship of the effect of early menopause and its symptoms on the employment of women in their 50s. In this study, the authors find that vasomotor symptoms do not tend to be associated with lower employment rates, while psychological symptoms do. Each additional psychological problem associated with menopause reduces employment and full-time employment by 1-2 percentage points, increasing to 2-4 when these symptoms are more severe.

Bryson's study is comparable with this one as they follow a similar logic. Using early menopause as the exogenous variable. However, given the differences of the data available, we use a cross-sectional approach, additionally we mark our post period 46 years or older, instead of at age 50 as Bryson do. Finally, the authors use time employed and full-time employment as dependent variables, and we use employment, weekly work hours, and monthly labor income. Not to mention that we explore early menopause effects on labor for Mexican women.

In summary, while significant research has examined the impact of gynecological conditions such as PMS on productivity and absenteeism, studies specifically focusing on menopause as a determinant of labor outcomes remain limited. Most existing literature on menopause and labor effects is correlational, with few quasi-experimental studies that ensure causality. The existing literature shows that menopause negatively affects relevant work indicators such as employment, worked hours and earnings. It becomes apparent the lack of quasi-experimental studies that explore menopause effect on women's labor outcomes, specially within the Mexican context, that is vastly particular in relation to labor market and female labor participation.

This study seeks to contribute to that absence in the literature by providing a causal analysis of how early menopause impact labor market outcomes in Mexico.

Additionally, the present study aims to be part of a precedent to help understand and encourage women's participation in the labor market through tailored policies; as well

as highlight the importance of including female health related questions in Mexican major surveys. When speaking of female health conditions, visibility is a major issue. Studying the effects of menopause—among other gynecological conditions—remarks women's health importance, both in the labor market and out of it.

# 4 Empiric Methodology

## 4.1 Data, Sample and Variables

The objective of this study is to capture exogenous variation—specifically whether a woman has entered menopause earlier than the average age derived from medical standards, or the number of symptoms related to menopause they experience— and its effect on both the intensive and extensive margins of labor market participation. To achieve this, we use individual-level panel data from the National Household Living Standards Survey (ENNViH) for the years 2002, 2005, and 2009. The sample is nationally representative across geographic regions, urban and rural distinctions, and demographic and economic variables. This survey was developed by the *Universidad Iberoamericana*, the *Centro de Investigación y Docencia Económicas*, and *Duke University*.

The first round of data collection occurred in 2002 and gather information of 35,000 individuals from 8,400 households located in 150 Mexican localities. The second and third round were conducted in 2005-2006 and 2009-2012, respectively. As this is a longitudinal survey, the subsequent rounds re-surveyed the original sample, including individuals who migrated inside the country or emigrated to the United States. The recontact rate was close to 90% from the original household sample.

The ENNViH survey collects data on participants' employment, health, and family life, among other variables. The key variables of interest in this study are outlined in the table below:

The data allows for the estimation of changes in labor outcomes depending on the onset of perimenopause, menopause, or postmenopause. The subsample used consists of 10,299 women aged 35 to 60, chosen to align with the typical age for menopausal onset. The sample carefully disregards women who reported menopause in one period and no menopause in the next, minimizing fouled observations.

Table 1: Description of Variables and Time Variation

| Variable | Description | Time variation |
|---|---|---|
| Employment status | Dummy equal to one if the woman reported doing a paid activity in the last week. | Time-variant |
| Worked hours per week | Number of hours worked per week, including zero for unemployed women. | Time-variant |
| Labor income | Monthly earnings in Mexican pesos. | Time-variant |
| Early menopause | Dummy equal to one if the woman has ever experienced early menopause. | Time-invariant |
| Physiological symptoms | Dummy equal to one if the woman experience six or more physiological symptoms associated with menopause | Time-variant |
| Emotional symptoms | Dummy equal to one if the woman experience six or more emotional symptoms associated with menopause | Time-variant |
| Education | Years of education. | Time-invariant |
| Age | In years. | Time-variant |
| Entity | A set of dummies for each state in the republic. | Time-invariant |
| Underage child(ren) | Dummy equal to one if the woman has at least one child under the age of 18. | Time-variant |
| Married | Dummy equal to one if the woman is married or in cohabitation. | Time-invariant |

Of this sample, 41% report that they are employed (SD = 0.492). The mean of labor income is $4,744.93 MXN (SD = $6,233.88) for employed women, and $1,101.24 MXN (SD = $3,609.49) when accounting for unemployed women as well. On average, employed women work 37 hours a week (SD = 20.24). Furthermore, 13.52% (SD = 0.342) of the women in the sample have experienced menopause, while 3.14% (SD = 0.174) have experienced early menopause. Among those who have undergone menopause, 23% reached menopause before age 45. The evolution of average employment, monthly income, and weekly worked hours by age is shown in the graphs on the Appendix.

## 4.2 Estimating Equation

Given that menopause is an inevitable biological process, the primary difference among women lies in the age at which they experience it. The variation is considered exogenous, as the onset of menopause is not influenced by labor-related variables, nor can women control its timing. In the same manner, the number and magnitude of the symptoms they experience are exogenous to them.

Early menopause is defined as the occurrence of menopause before the age of 45 (Woman's Health Office, 2022). While numerous medical studies examine the causes of early menopause, it is generally treated as an exogenous event. Therefore, women who experience early menopause form the treatment group. For example, let $i$ be a woman who reported menopause in 2009, at the age of 45. In this case, her treatment status would be coded as one for all years.

As for the number of symptoms, the survey asks participants if they have experienced certain conditions in the past week. Specifically for physiological symptoms, the dummy equals to one if the woman reported at least six of the following symptoms associated with menopause: flu symptoms, respiratory problems, aches, pain in the body, joint pain, headaches or migraines.

Pertaining to the emotional symptoms, the survey asked the following for the last week: feeling sad, poor sleep, feeling down, lack of concentration, tiredness, feeling pessimistic or feeling nervous. The woman chose in between the answers: (a) not at all, (b) yes, few times, (c) yes, frequently, or (d) yes, all the time. The emotional symptoms dummy equals one if the woman experienced frequently or all the time at least 6 of the mentioned feelings. Moreover, we impose a restriction on observations to include only those aged 46 and older. This restriction allows us to compare outcomes between women who have already gone through early menopause, and those who have not yet experienced it.

The model to be estimated is as follows:

$$y_{(it,age\geq 46)} = \alpha + \beta M_i + \gamma X_{it} + u_{it} \quad (1)$$

Where $y_{it}$ represents labor outcomes—such as employment status, work hours per week, or labor income—for woman $i$ in year $t$, observed only for ages 46 and older. $\beta$ is the coefficient associated with early menopause, or symptoms, whatever the case corresponds. $X_{it}$ is a vector of control variables, i.e., woman's age, years of education, state, year, if she has one or more underage children, and marital status. Finally, $u_{it}$ is the error term.

To account for potential serial correlation and clustered standard errors, we apply White's correction, treating each woman as a cluster unit, in line with the recommendations of Bertrand et al. (2004).

## 4.3 Method

We can analyze the difference in means for some characteristics to test whether women that experience early menopause are similar to those who do not. Table 2 shows the mean of the variables of interest for the group that experienced early menopause, the one that does not and the difference between said means. The balance test shows that women in the sample that did not went through early menopause are, in means, less than a year older, earn $596.35 more monthly, have an extra year and a half of education. In other dimensions, woman from both groups is similar.

Table 2: Mean Differences between Early Menopause and No Early Menopause

| | Early Menopause | No Early Menopause | Difference |
|---|---|---|---|
| Age | 43.963 | 43.131 | -0.832** |
| | (4.448) | (5.616) | |
| Employed | 0.385 | 0.414 | 0.029 |
| | (0.487) | (0.492) | |
| Weekly work hours | 12.869 | 15.111 | 2.242 |
| | (20.944) | (22.326) | |
| Monthly labor income | 523.311 | 1,119.664 | 596.353*** |
| | (1,701.229) | (3,652.526) | |
| Years of education | 5.151 | 6.648 | 1.496*** |
| | (3.929) | (4.352) | |
| Underage child(ren) | 0.262 | 0.252 | -0.011 |
| | (0.441) | (0.434) | |

Notes: Robust standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. Source: Author's own elaboration. This table shows the summary statistics for women in the sample by Early Menopause, No Early Menopause, and the statistical difference between the two groups.

This study employs an Ordinary Least Squares approach due to the nature of the available data. Given that the survey is done only in three periods, we do not have a long panel with sufficient observations to analyze a Treated post-period. Additionally, we use the outcomes for women older than 46 years to ensure all observations are post menopause for women who experienced early menopause.

# 5 Main Results

In the present section, the results of the estimation are presented. Addressing first the effects of early menopause, followed by the analysis of the impact of physiological and emotional symptoms.

## 5.1 Early Menopause

Table 3 presents the estimates of the impact of early menopause on employment, monthly labor income, and weekly work hours, based on the implementation of Equation 1. As suggested in the first column of the table, women who experienced early menopause are
4.75 percentage points more likely to be employed compared to those who did not; however, this result is not statistically significant. Column 2 indicates that women who undergo early menopause earn, on average, $77.62 MXN less that those who do not, though this result is also not statistically significant. Lastly, Column 3 implies that women in the early menopause group work, on average, 1.29 more hours per week than those in the comparison group, but again, the result lacks statistical significance.

### 5.1.1 Robustness Checks

In order to check robustness, we restricted the sample to women aged 46-55 years, and the results remain consistent. Table 9 in the Appendix provides the estimates based on Equation 1 for this age group, showing no significant deviations from the main findings. Similarly, the results remain stable when the sample is adjusted to include only women who reported either (a) amenorrhea for at least three months or (b) menopause, during at leastone survey in the period 2002-2009. These alternative results are presented in Table 10 in the Appendix.

### 5.1.2 Heterogeneous Effects

Turning to the heterogeneous effects of age, Table 4 presents the results of the interaction between early menopause and age. Although the findings are not statistically significant, the results indicate that the impact of early menopause on

employment becomes increasingly negative with age. This suggests that as women age, experiencing early menopause further reduced the likelihood of being employed. Later, a similar pattern is observed in Column 3, where the effect of early menopause on weekly work hours follows the same direction, becoming more pronounced with age. Table 5 shows the effect of early menopause with each year of age.

Table 3: OLS Estimates of the Impact of Early Menopause on Labor Outcomes

| | Employment | Monthly income | Work hours/week |
|---|---|---|---|
| Early menopause | 0.0486 | -74.1132 | 1.335 |
| | (0.0597) | (330.12) | (2.473) |
| Age | -0.0088*** | -54.14** | -0.444*** |
| | (0.0031) | (24.32) | (0.144) |
| Education | 0.0224*** | 284.4*** | 0.907*** |
| | (0.0022) | (33.16) | (0.0959) |
| 2005 Round | 0.0220 | 497.0*** | 1.407 |
| | (0.0287) | (146.1) | (1.251) |
| 2009 Round | 0.0549* | 631.0*** | 2.402* |
| | (0.0313) | (163.9) | (1.393) |
| Underage child(ren) | 0.0457 | 30.16 | 1.342 |
| | (0.0334) | (140.2) | (1.494) |
| Married | -0.309*** | -1,154*** | -13.40*** |
| | (0.0239) | (277.3) | (1.260) |
| Constant | 1.368*** | 7,568*** | 58.92*** |
| | (0.138)) | (1,085) | (6.358) |
| Observations | 3,400 | 2,680 | 3,368 |
| R-squared | 0.123 | 0.154 | 0.107 |

Notes: Robust standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. Source: Author's own elaboration. This table shows the OLS Estimates of the Impact of Early Menopause

While no statistically results were obtained, exploring the interaction of early menopause with higher education (defined here as at least a year of high school) reveals the negative effects of early menopause are concentrated among highly educated women. For this group, the likelihood of employment decreases by 0.55 percentage points, and monthly income is reduced by $1,465 MXN. This outcome may reflect that highly educated women are more likely to exit the labor market when experiencing symptoms associated with menopause. In summary, the coefficients for early

menopause have the expected sign−negative−for monthly labor income, and for employment and weekly work hours when interacted with age. However, there is no sign of statistical significance for any of them.

Table 4: OLS Estimates of the Impact of Early Menopause and Age on Labor Outcomes

| | Employment | Monthly income | Work hours/week |
|---|---|---|---|
| Early menopause | 1.318 | -4,345 | 63.04 |
| | (0.973) | (4,314) | (52.33) |
| Age | -0.00834*** | -54.62** | -0.422*** |
| | (0.00313) | (24.53) | (0.146) |
| Early menopause*Age | -0.0255 | 85.44 | -1.239 |
| | (0.0193) | (86.02) | (1.030) |
| Education | 0.0224*** | 284.9*** | 0.906*** |
| | (0.00218) | (33.20) | (0.0960) |
| 2005 Round | 0.0207 | 498.0*** | 1.348 |
| | (0.0288) | (146.5) | (1.253) |
| 2009 Round | 0.0526* | 626.2*** | 2.295 |
| | (0.0313) | (164.3) | (1.396) |
| Underage child(ren) | 0.0461 | 29.62 | 1.360 |
| | (0.0334) | (140.2) | (1.494) |
| Married | -0.307*** | -1,140*** | -13.33*** |
| | (0.0240) | (273.7) | (1.252) |
| Constant | 1.348*** | 7,595*** | 57.94*** |
| | (0.139) | (1,095) | (6.409) |
| Observations | 3,400 | 2,680 | 3,368 |
| R-squared | 0.123 | 0.154 | 0.107 |

Notes: Robust standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. Source: Author's own elaboration. This table shows the OLS Estimates of the Impact of Early Menopause including the Early Menopause and Age interaction

## 5.2 Physiological and Emotional Symptoms

Using six or more physiological symptoms as the explanatory variable yields the results presented in Table 7. First, experiencing six or more physiological symptoms is associated with a 5-percentage point reduction in the likelihood of being employed, although this result is not statistically significant. With respect to monthly income, the

analysis indicates that physiological symptoms significantly reduce monthly income by $434.16 MXN, with statistical significance at the 1% level, compared to individuals who report less than six of these symptoms. Additionally, individuals experiencing six or more symptoms work 3.18 fewer hours per week, a result that is also statistically significant at the highest level of confidence.

Table 5: Heterogeneous Effects of Early Menopause on Labor Outcomes by Age

| Age | Employment | Monthly income | Work hours/week |
|---|---|---|---|
| 46 | 0.1450 | -414.76 | 6.046 |
| 47 | 0.1195 | -329.32 | 4.807 |
| 48 | 0.0940 | -243.88 | 3.568 |
| 49 | 0.0685 | -158.44 | 2.329 |
| 50 | 0.0430 | -73.00 | 1.090 |
| 51 | 0.0175 | 12.44 | -0.149 |
| 52 | -0.0080 | 97.88 | -1.388 |
| 53 | -0.0335 | 183.32 | -2.627 |
| 54 | -0.0590 | 268.76 | -3.866 |
| 55 | -0.0845 | 354.20 | -5.105 |
| 56 | -0.1100 | 439.64 | -6.344 |
| 57 | -0.1355 | 525.08 | -7.583 |
| 58 | -0.1610 | 610.52 | -8.822 |
| 59 | -0.1865 | 695.96 | -10.061 |
| 60 | -0.2120 | 781.40 | -11.30 |

Source: Author's own elaboration. This table shows the Effect of Early Menopause including the Effect of the Interaction of each old.

When both physiological and emotional symptoms are considered together, experiencing at least six symptoms of either type reduces the likelihood of employment by 5.21 percentage points. This result is similar to that of physiological symptoms alone, but it achieves statistical significance at the 5% level.

Including both types of symptoms slightly mitigates the reduction in monthly income, with earnings decreasing by $430.75 MXN—$4 MXN less than the effect of physiological symptoms alone— while maintaining the same level of statistical significance. A comparable pattern is observed for weekly hours worked, where the combined effect of all symptoms is smaller in absolute terms than that of physiological symptoms alone but remains statistically significant at the 1%

confidence level.

Panel B of Table 7 presents the results of including both physiological and emotional symptoms as separate variables in the same equation. This approach isolates the effect of each type of symptoms while controlling for the other. The results are consistent with those in Panel A, confirming that the negative effects are primarily driven by physiological symptoms.

Table 6: OLS Estimates of the Impact of Early Menopause and High Education on Labor Outcomes

| | Employment | Monthly income | Work hours/week |
|---|---|---|---|
| Early menopause | 0.0497 | 236.2 | 0.195 |
| | (0.0634) | (190.9) | (2.418) |
| Age | -0.00870*** | -53.29** | -0.439*** |
| | (0.00310) | (24.28) | (0.144) |
| Education | 0.0224*** | 286.6*** | 0.901*** |
| | (0.00219) | (33.57) | (0.0965) |
| Early Menopause*High Education | -0.00556 | -1,465 | 5.746 |
| | (0.170) | (1,259) | (8.375) |
| 2005 Round | 0.0216 | 492.5*** | 1.391 |
| | (0.0288) | (146.0) | (1.252) |
| 2009 Round | 0.0534* | 620.7*** | 2.336* |
| | (0.0313) | (164.3) | (1.395) |
| Underage child(ren) | 0.0459 | 30.76 | 1.345 |
| | (0.0334) | (140.5) | (1.494) |
| Married | -0.307*** | -1,145*** | -13.31*** |
| | (0.0240) | (274.2) | (1.253) |
| Constant | 1.364*** | 7,537*** | 58.74*** |
| | (0.138) | (1,083) | (6.357) |
| Observations | 3,400 | 2,680 | 3,368 |
| R-squared | 0.123 | 0.154 | 0.107 |

Notes: Robust standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. Source: Author's own elaboration. This table shows the OLS Estimates of the Impact of Early Menopause including the Early Menopause and High Education interaction. High Education is defined as at least a year of high school or more.

## 5.3 Limitations

As discussed earlier, the used data only surveyed participants on three occasions, covering seven years in total. This, along with the fact that only ask women about their reproductive health until age 50, limits the analysis. With respect to the study of physiological and emotional symptoms, another limitation is raised: the questionnaire does not ask explicitly about menopause symptoms, but about a significant number of symptoms that can be related to different conditions. We took into account those that are associated with menopause. Lastly, chronic illnesses are self-reported (except for overweight, which is defined as BMI = 25-29.9, and weight and height are objective). This can lead to unreported conditions, as the report depends on a previous diagnosis.

Table 7: OLS Estimates of the Impact of Experiencing Six or More Symptoms on Labor Outcomes

| | Employment | Monthly income | Work hours/week |
|---|---|---|---|
| **Panel A: Each variable as its own regression** | | | |
| Physiological symptoms | -0.0507 | -434.16*** | -3.1857** |
| | (.0358) | (160.629) | (1.525) |
| Emotional symptoms | -0.0919 | -76.41 | -3.1979 |
| | (0.0608) | (461.742) | (2.8613) |
| All symptoms | -0.0521** | -430.26*** | -3.0139*** |
| | (0.0257) | (133.538) | (1.0728) |
| **Panel B: Variables together in the same regression** | | | |
| Physiological symptoms | -0.0508 | -434.75*** | -3.1890** |
| | (.0359) | (160.622) | (1.525) |
| Emotional symptoms | -0.0921 | -85.96377 | -3.2123 |
| | (0.0610) | (461.760) | (2.8625) |
| Constant | 1.3789*** | 7,653.95*** | 59.5741*** |
| | (0.138) | (1,086.84) | (6.364) |
| Observations | 3,400 | 2,680 | 3,368 |
| R-squared | 0.123 | 0.154 | 0.107 |

Notes: Robust standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.
All regressions control for: age, education, round year, entity, underage child(ren) and marital status. Source: Author's own elaboration. This table shows the OLS Estimates of the Impact of having six or more Physiological and Emotional Symptoms on labor outcomes.

# 6 Additional Results: Chronic Illnesses

A secondary analysis was conducted, using health outcomes as dependent variables ($y_i$ in Equation 1) and early menopause as the exogenous explanatory variable. The results indicate that experiencing early menopause increases the likelihood of developing diabetes by 11.11 percentage points, hypertension by 0.08 pp, and heart disease by 1.116 pp; however, none of these effects are statistically significant. Conversely, early menopause is associated with an 11.52 pp reduction in the likelihood of being overweight, with statistical significance at the 10% level.

When early menopause is interacted with high education, the analysis reveals that the risk of diabetes decreases by 5.17 pp for highly educated women, compared to the prior analysis, achieving statistical significance at the 10%. This suggests that higher education mitigates the risk of developing diabetes associated with early menopause. A similar pattern is observed for hypertension, although the results are not statistically significant. For heart disease, the interaction terms is negative and statistically significant at the highest level of confidence, indicating that early menopause reduces the risk of heart disease by 2.24 pp. However, this result does not remain significant for the interaction with high education. Finally, the effect on overweight status retains its level of significance, increasing by 1.86 pp in absolute terms, though the interaction does not yield statistically significant results.

Table 8: OLS Estimates of Early Menopause on Chronic Illnesses

| | Diabetes | Hypertension | Heart disease | Overweight |
|---|---|---|---|---|
| **Panel A: Simple Model** | | | | |
| Early menopause | 0.1111 | 0.0008 | 0.0116 | -0.1152* |
| | (0.0677) | (0.0633) | (0.0346) | (0.0637) |
| Constant | -0.4252*** | -0.4782*** | -0.0103 | 1.0541*** |
| | (0.1169) | (0.1259) | (0.0456) | (0.1256) |
| Controls | Yes | Yes | Yes | Yes |
| **Panel B: High education Interaction** | | | | |
| Early menopause | 0.1533* | -0.0266 | -0.0224*** | -0.1338* |
| | (0.0789) | (0.0738) | (0.005) | (0.0727) |
| Early menopause*High Education | -0.2127* | -0.1300 | 0.1717 | 0.0888 |
| | (0.1215) | (0.1226) | (0.1552) | (0.1470) |
| Constant | -0.4243*** | -0.4777*** | -0.0111 | 1.054 |

| | | | | |
|---|---|---|---|---|
| | (0.1169) | (0.1259) | (0.0457) | (0.1256) |
| Controls | Yes | Yes | Yes | Yes |
| Observations | 3,324 | 3,324 | 3,324 | 2,967 |
| R-squared | 0.024 | 0.020 | 0.013 | 0.033 |

Notes: Robust standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. Source: Author's own elaboration. This table shows the OLS Estimates of the Impact of Early Menopause on various chronic illnesses
All regressions control for: age, education, round year, entity, underage child(ren) and marital status.

# 7 Summary and Concluding Remarks

This study estimates the effects of early menopause, as well as the physiological and emotional symptoms of menopause, on employment, weekly work hours, and monthly income for Mexican women. Using an Ordinary Least Squares identification strategy, we exploit the exogenous nature of early menopause and menopausal symptoms occurring after the age of 46. This ensures that all women who experienced early menopause had reached it before the cutoff age, enabling us to examine the causal relationship between menopause and labor outcomes.

The analysis does not find statistically significant effects for any of the labor outcomes studied. However, results for monthly income indicate that early menopause is associated with a reduction of $77.60 MXN in women's earnings, consistent with findings from prior studies such as Conti et al. (2024). The mentioned author also found that menopause effects on employment and worked hours grow over time, which, again, align with our results that the outcomes interacted with age increasingly turn negative. This suggest that, as women age, having experienced early menopause adversely affects their likelihood of employment and the number of weekly work hours.

When exploring the impact of menopausal symptoms on the same labor outcomes, results suggest that experiencing six or more physiological symptoms reduces monthly income by $434.16 MXN and weekly work hours by 3.2 hours per week. Conversely, emotional symptoms have the expected negative signs—although they lack statistical significance- reducing the likelihood of employment, following the results of Bryson et al. (2022). Additionally, experiencing six or more symptoms of any type is associated with a 5.21 percentage point reduction in the likelihood of employment.

In examining the relationship between early menopause and chronic illnesses, interacting early menopause with higher education reveals that early menopause

increases the likelihood of diabetes by 15 percentage points, while the probability decreases by 21 percentage points for highly educated women.

Regarding the lack of statistically significant results for early menopause, two explanations arise. First, at 46 years old, women may be too young to exit or reduce their participation in the labor market, regardless of the discomfort caused by early menopausal symptoms. However, as women age, the effects appear to turn negative and more pronounced. For highly educated women, the results may suggest that they have the financial or social ability to leave work force if needed.

The findings appear to indicate that early menopause increases the likelihood of developing chronic illnesses associated with menopause. Once again, highly educated women seem less likely to develop these illnesses, possibly due to better access to information and healthcare services.

The second explanation for the lack of statistically significant results of early menopause as an explicatory variable lies in the gaps present in Mexican surveys regarding women's reproductive health. To further investigate women's health issues, we strongly recommend the inclusion of a dedicated section on reproductive health in national public surveys. This section should specifically address the menopause stage, asking whether women have experienced menopause, when it was diagnosed, any treatments they have received, as well as the symptoms they experience and their intensity. Such valuable information would allow future research to be more precise and deepen our understanding of women's experiences with menopause.

Overall, menopause is a complex and understudied process, and its full consequences on labor and health outcomes remain unknown. However, it is clear that menopause marks an important stage of women's lives. The results suggest that women experiencing physio- logical symptoms related to menopause face strong negative effects on their participation in the labor market. The lack of significance regarding emotional symptoms may indicate the weight Mexican women assign to those experiences. This is not to say that they do not experience these symptoms, but rather that they do not have a strong influence on their decision to exit or reduce their participation in the labor market.

The results suggests that menopause may have a negative impact in women's work and health. More research is needed on this topic, particularly in the Mexican context. Women are an important part of the Mexican labor force and the issues impacting their participation is worthy of being studied. Closely examining women's

biological processes would then allow appropriate policies to be implemented to help mitigate the possible negative effects of transitioning into menopause. Academic, policy and social spheres must continue and expand the discussion about all conditions specific to women, but specially about menopause. Recognizing the relevance of women's health beyond their reproductive life is of most vitality.

# 8 Appendix

Table 9: OLS Estimates of the Impact of Early Menopause on Labor Outcomes for the 46-55 Age Sample

| | Employment | Monthly income | Work hours/week |
|---|---|---|---|
| Early menopause | 0.0511 | -102.1 | 1.354 |
| | (0.0604) | (344.4) | (2.517) |
| Age | -0.0089** | -37.30 | -0.444*** |
| | (0.00349) | (30.50) | (0.163) |
| Education | 0.0234*** | 299.1*** | 0.949*** |
| | (0.0022) | (34.53) | (0.0975) |
| 2005 Round | 0.0206 | 457.9*** | 1.408 |
| | (0.0287) | (149.4) | (1.259) |
| 2009 Round | 0.0546* | 594.0*** | 2.299 |
| | (0.0314) | (167.3) | (1.399) |
| Underage child(ren) | 0.0454 | 29.30 | 1.324 |
| | (0.0334) | (142.3) | (1.495) |
| Married | -0.309*** | -1,166*** | -13.48*** |
| | (0.0243) | (291.5) | (1.253) |
| Constant | 1.372*** | 6,796*** | 59.03*** |
| | (0.158) | (1,385) | (7.266) |
| Observations | 3,233 | 2,546 | 3,203 |
| R-squared | 0.127 | 0.160 | 0.110 |

Notes: Robust standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. Source: Author's own elaboration. This table shows the OLS Estimates of the Impact of Early Menopause in the 46-55 age sample.

Table 10: OLS Estimates of the Impact of Early Menopause on Labor Outcomes for the Reduced Sample

| | Employment | Monthly income | Work hours/week |
|---|---|---|---|
| Early menopause | 0.0311 | -4,007 | -1.728 |
| | (0.0609) | (4,994) | (4.755) |
| Age | -0.0060 | -165.7 | -0.913** |
| | (0.0058) | (151.6) | (0.415) |
| Education | 0.0220*** | 392.7*** | 0.314 |
| | (0.00479) | (119.4) | (0.246) |
| 2005 Round | -0.00370 | 832.7 | -0.214 |
| | (0.0519) | (946.8) | (4.051) |
| 2009 Round | 0.0673 | 1,676* | 0.763 |
| | (0.0576) | (953.8) | (4.042) |
| Underage child(ren) | 0.0773 | -531.2 | -0.979 |
| | (0.0619) | (884.6) | (4.467) |
| Married | -0.313*** | 770.6 | -5.075* |
| | (0.0456) | (1,208) | (2.658) |
| Constant | 1.222*** | 11,878* | 83.08*** |
| | (0.260) | (6,908) | (18.87) |
| Observations | 933 | 143 | 337 |
| R-squared | 0.145 | 0.267 | 0.053 |

Notes: Robust standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. Source: Author's own elaboration. This table shows the OLS Estimates of the Impact of Early Menopause in a Reduced Sample

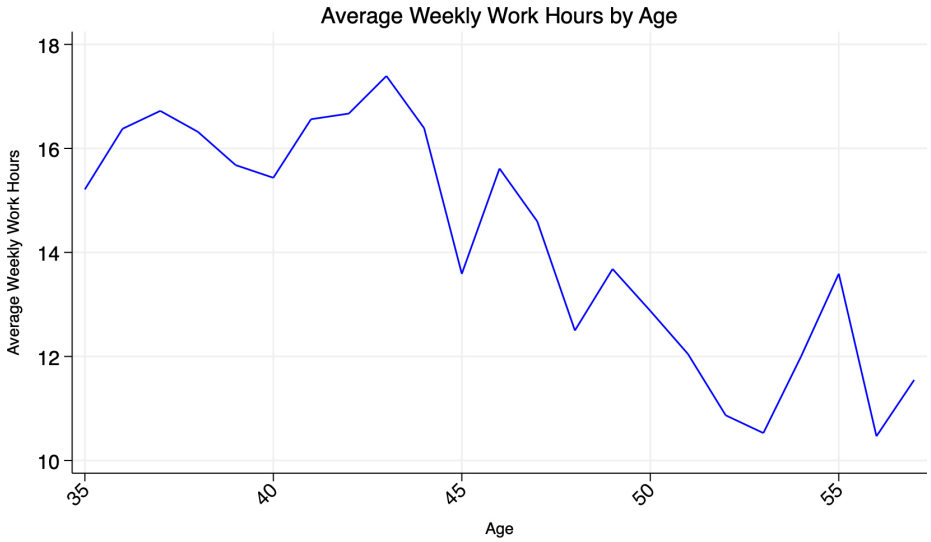
Figure 2: Average Employment Rate by Age


Source: Author's own elaboration. This graph shows the evolution of the employment mean by age.

Figure 3: Average Monthly Income by Age


Source: Author's own elaboration. This graph shows the evolution of mean monthly income by age.

Figure 4: Average Weekly Work Hours by Age




Source: Author's own elaboration. This graph shows the evolution of mean weekly work hours by age

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# List of Tables



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