Créditos fotografía: https://cutt.ly/Le1dYrjJ

Effects of Depressive Disorder on Employment Income in Brazil

Efectos del trastorno depresivo sobre los ingresos laborales en Brasil

Bianca Vieira Benedicto[1]
Universidade de Aveiro, Aveiro, Portugal
✉ bianca_benedicto@ua.pt
🆔 https://orcid.org/0000-0001-8385-2134

Laís de Sousa Abreu Soares[2]
Universidade Federal de Viçosa, Viçosa, Brasil
✉ lais.abreu@ufv.br
🆔 https://orcid.org/0000-0002-1869-6259

Evandro Camargos Teixeira[3]
Universidade Federal de Viçosa, Viçosa, Brasil
✉ evandro.teixeira@ufv.br
🆔 https://orcid.org/0000-0002-6470-2103

1   Master's in Applied Economics.
2   Master's in Economics.
3   PhD in Applied Economics.

Bianca Vieira Benedicto, Laís de Sousa Abreu Soares y Evandro Camargos Teixeira

2

Abstract

Introduction

Depressive disorder is prevalent worldwide, with a particularly high impact in Brazil, where it mainly affects women. While most research on depression focuses on its clinical aspects, there is a scarcity of studies exploring the economic consequences of the disorder.

Objective

This study aims to analyze the effect of depressive disorder on income from work in Brazil in 2008, considering both men and women and how the illness affects them differently.

Methodology

Two dummy endogenous variable models were estimated to assess the impact of depressive disorder on labor income. These models account for the distinct effects of the disorder on men and women, reflecting the varying characteristics of the illness's impact.

Results

The findings indicate that depressive disorder reduces labor income by approximately 32.6% for women and 29.8% for men. This decrease in revenue is attributed to a reduction in individual productivity. Additionally, the illness can reduce labor supply, with some individuals leaving the labor market entirely.

Conclusions

The results highlight the significant economic impact of depressive disorder on labor income in Brazil. The findings suggest the need to incorporate mental health care into primary care public policies to mitigate the financial consequences of the illness.

Keywords:

depressive disorder; income from work; health economics; economic and social development; Brazil; mental health; labor market; gender differences.

Resumen

Introducción

El trastorno depresivo es prevalente en todo el mundo, con un impacto particularmente alto en Brasil, donde afecta principalmente a las mujeres. Mientras que la mayoría de las investigaciones sobre la depresión se centran en sus aspectos clí-nicos, existe una escasez de estudios que exploren las consecuencias económicas del trastorno.

Objetivo

Este estudio tiene como objetivo analizar el efecto del trastorno depresivo sobre los ingresos laborales en Brasil en 2008, considerando tanto a hombres como a mujeres y cómo la enfermedad los afecta de manera diferente.

Metodología

Se estimaron dos modelos con variables endógenas dicotómicas para evaluar el impacto del trastorno depresivo sobre los ingresos laborales. Estos modelos consideran los efectos diferenciados del trastorno en hombres y mujeres, reflejando las distintas características del impacto de la enfermedad.

Resultados

Los resultados indican que el trastorno depresivo reduce los ingresos laborales en aproximadamente un 32,6 % en las mujeres y un 29,8 % en los hombres. Esta disminución en los ingresos se atribuye a una reducción en la productividad individual. Además, la enfermedad puede reducir la oferta laboral, llevando a algunas personas a abandonar completamente el mercado de trabajo.

Conclusiones

Los resultados evidencian el importante impacto económico del trastorno depresivo sobre los ingresos laborales en Brasil. Los hallazgos sugieren la necesidad de incorporar el cuidado de la salud mental en las políticas públicas de atención primaria para mitigar las consecuencias financieras de la enfermedad.

Palabras clave:

trastorno depresivo; ingresos laborales; economía de la salud; desarrollo económico y social; Brasil; salud mental; mercado laboral; diferencias de género.

1. Introduction

Depressive disorder[4] presents a high and ever-growing prevalence in postmodern society. Since 1990, according to the World Health Organization, this illness has occupied a prominent position in the context of public health problems (WHO, 2001). Concurring with the latest data, approximately 280 million people, about 3.8% of the world's population, suffer from mental depressive disorder worldwide (WHO, 2023).

According to the WHO (2017), of the developing countries in the region, Brazil ranks highest in terms of prevalence of mental depression, with about 5.8% of its population suffering from or will suffer from depressive disorder during their lifetime. Given its high prevalence, the study of depression goes beyond the scope of the Health Sciences.

In general terms, the contribution of Economic Sciences to public health is related to two fields: the optimization and allocation of health resources and the reduction of disease costs. The latter field of research seeks to obtain a better understanding of the economic costs of mental depression or, in other words, the financial impact of the disease. According to Wang et al. (2003), the economic costs of depression are divided into direct and indirect costs. Direct costs include public and private expenditures on medical, therapeutic, and pharmacological services. Apropos of indirect costs, the consequences of the illness in the work environment of the person affected by depression stand out. These include absenteeism and reduced productivity, negatively affecting employees, employers, and the economy.

Illnesses involve a considerable economic burden, especially regarding the labor mar-

ket. A person's illness can influence the behavior of economic agents, causing a reduction in hours worked and productivity, thereby reducing income rates and even people leaving the labor market (Peng et al., 2013).

Considering all these aspects, this study analyzes the economic implications of depression, specifically on hourly wages from primary work. In this case, economic theory suggests that the state of health can impact the incomes of economic agents in two ways. Firstly, Alves and Andrade (2003) state that health status can reduce earnings, as sick employees have a smaller stock of human capital and, consequently, tend to be less productive. Secondly, it can affect the participation of individuals in the workforce by influencing not only their decision to work but also the time they spend in the labor market (Alves & Andrade, 2003). So, considering mental health as a determinant of hourly wages from primary work could reduce the negative effects of depressive disorder on productivity and the labor market.

Depression as a factor that can influence economic aspects, in general, has already been addressed in the empirical literature. However, its specific relationship with people's hourly wages from their primary work is underexplored, especially at the national level. Therefore, the results of this study could provide a better understanding of the topic. In addition to this introduction, the article is divided into six more sections. The following two sections present the theoretical framework and the empirical evidence related to the topic. Following that is the methodological section, which is succeeded by presenting results, their discussion, and final considerations.

2. Theoretical framework

Grossman (1972) proposed the foundational model most commonly referenced in the literature to examine the impact of adverse health conditions on earnings. In this model, health is conceptualized as a production

---

4 According to IBGE (1998), depressive disorder is responsible for the reduction in habitual activities because of a person's emotional state, with feelings of apathy, moral despondency, and lethargy, discouragement, or lack of strength to face life.

Bianca Vieira Benedicto, Laís de Sousa Abreu Soares y Evandro Camargos Teixeira

4

process, where inputs such as medical care, diet, exercise, and time contribute to the output, which is an improved physical and mental health status.

In addition to treating health as a production process, the model also treats it as stock, subject to depreciation, as a consumer good because it gives people satisfaction, and as an investment good, as it reduces the days of incapacity for work and increases people's productivity, thereby allowing for higher levels of income.

Therefore, a better health status entails more time available for work and greater productivity, which positively affects earnings. At the same time, higher wages proportionately raise the marginal returns from health. Thus, according to Grossman's (1972) model, two conclusions are of interest to the present study: a deterioration in health status negatively affects income, and income level affects health status or, in other words, there is simultaneity between health and income level.

According to Berndt et al. (1998), depressive disorder presents symptoms that affect work performance to a considerable degree. These include an inability to concentrate, low energy levels, exaggerated insecurity, indecision, and disturbed sleep. The disease substantially affects cognitive ability and the faculty to maintain social relationships.

Thus, depressive disorder is associated with a reduction in the affected person's job functionality because of the severity of their symptoms or because they may be more frequently absent from work to treat their illness. In addition, their work could be less productive, as their performance is affected by the specific symptoms of the disease, as pointed out by Berndt et al. (1998), and, finally, there is the extreme case of a worker losing their ability to hold down a job.

In addition to the issues already highlighted, another key issue was raised by Weehuizen (2008). She points out that, in the current economic situation, which is driven by innova-

tion and is knowledge-based, the workforce is increasingly more dependent on mental efforts to the detriment of physical efforts. This means that because of changes in the nature of the economy, the problem of deteriorating mental health is much more significant now than it was in the past. In this regard, a century ago, workers carried out tasks that required physical more than mental health, such as in industry and agriculture. The current workforce is primarily defined as knowledge-based and more dependent on people's cognitive, social, and emotional capacity, which is directly affected by depression.

3. Empirical evidence

In terms of empirical literature, some experimental studies in the health field also show the consequences of depression for work. Lerner et al. (2004), for example, carried out a study in which separate groups of workers, diagnosed and undiagnosed with depression, were accompanied for six months. After that period, the group of people with depression presented a higher rate of unemployment, higher turnover in the labor market, more absenteeism, and lower productivity than those not diagnosed with the disease.

Evans-Lacko and Knapp (2016) conducted a study to examine the impact of depression on labor productivity in eight countries. The results indicated that of the eight countries, Brazil presented the highest rate of average costs of lost productivity caused by depression, namely 0.7% of its GDP. Brazil also presented the highest cost per person in terms of productivity loss because of depression ($5,788).

In addition to showing the effect of depression on the labor market, some empirical studies also present the expected inverse relationship with people's levels of income. According to Araya et al. (2003), the empirical literature shows that economic disadvantages, especially the lack of material resources, low-income levels, and financial inequality, are associated with the presence of mental illness. Germinario et al. (2022) found a similar result more recently.

Furthermore, Wang et al. (2022) analyzed how the depressive disorder experienced in early adulthood impacts subsequent results in the labor market. The authors found that individuals in their 50s who were diagnosed with depression between the ages of 27 and 35 have lower salaries. Part of this penalty is because depressive disorder is a chronic illness. However, a substantial part of the reduction in income is related to the decrease in the level of human capital in early adulthood, which conditions individuals to be occupied in professions with less potential for wage growth.

Based on the above discussion, certain points must be highlighted. First, as shown in the empirical literature, the quality of human capital is a decisive factor in greater productivity. In turn, health conditions are one of its main determinants. Mental health affects people's cognitive, social, and emotional capacity and can affect their work performance, including increased absenteeism, reduced productivity, and leave-taking. In addition, income level also affects an individual's mental health; in other words, there is an endogenous relationship between the variables.

Secondly, it has been highlighted that the workforce in the current economy is increasingly dependent on its mental health, as it has become knowledge-based. Accordingly, mental health disorders play an ever-greater role in determining an individual's productive capacity and, consequently, their level of income. Finally, the empirical literature has highlighted the negative consequences of depression for the workforce, both at individual and macroeconomic levels. However, the specific relationship between illness and income from work is underexplored.

4. Methodology

Data on individuals extracted from the 2008 National Household Sample Survey (PNAD), carried out by the Brazilian Institute of Geography and Statistics (IBGE), was used to carry out this study. The 2008 PNAD included the Supplementary Health Survey, designed to generate information on the state of health and access to and use of health services. This Supplement also provides individual information on whether a person has been diagnosed with depression, thereby enabling the proposed analysis of the relationship between depression and hourly wage for an individual's primary job.

It is important to note that the PNAD incorporates all the aspects that define a complex sampling plan: stratification of sampling units, conglomeration, i.e., selection of samples at different stages, unequal probabilities of selection at one or more stages, and adjustments to sampling weights.

As the main objective of this study was to analyze the effect of depressive disorder on people's hourly wage from their primary job, an income equation was estimated based on the econometric regression model of the Mincer equation type with more controls inserted (Mincer, 1974). The literature on the topic was the criteria used to select the explanatory variables. In addition, the regression has a log-level format, as denoted by Equation [1].

$$lnhourlywage = \alpha + \beta_{1i}depression + \beta_{2i}experience + \beta_{3i}experience^2 + \beta_{4i}schooling2 + \beta_{5i}schooling3 + \beta_{6i}schooling4 + \beta_{7i}schooling5 + \beta_{8i}schooling6 + \beta_{9i}color + \beta_{10i}urban + \beta_{11i}formal + \beta_{12i}unionized + \beta_{13i} south + \beta_{14i}southeast + \beta_{15i} north + \beta_{16i}midwest + u_i \qquad [1]$$

The selected data sample included individuals ranging from 15 to 65 years of age, in other words, the economically active population. As the aim was to analyze the effect of the illness on earnings from their primary job, only the employees were included. Table 1 describes the variables presented in Equation [1].

Bianca Vieira Benedicto, Laís de Sousa Abreu Soares y Evandro Camargos Teixeira

6

Table 1. Description of variables	
Variable	**Description**
lnhourlywage	Logarithm of monthly wage from primary job* divided by the number of monthly hours usually worked in the main job.
depression	*Dummy* which is given a value of 1 if a doctor or health professional diagnosed the individual with depression and 0, otherwise.
experience	age –years of schooling –6**.
experience^2	Experience squared.
schooling1 (reference)	*Dummy* which is given a value of 1 if the individual has no schooling or less than one year schooling and 0, otherwise.
schooling2	*Dummy* which is given a value of 1 if the individual has 1 to 3 years' schooling and 0, otherwise.
schooling3	*Dummy* which is given a value of 1 if the individual has 4 to 7 years' schooling and 0, otherwise.
schooling4	*Dummy* which is given a value of 1 if the individual has 8 to 10 years' schooling and 0, otherwise.
schooling5	*Dummy* which is given a value of 1 if the individual has 11 to 14 years' schooling and 0, otherwise.
schooling6	*Dummy* which is given a value of 1 if the individual has 15 years or more of schooling and 0, otherwise.
color	*Dummy* which is given a value of 1 if the individual is white, and 0, if they are black, brown, yellow or indigenous.
urban	*Dummy* which is given a value of 1 if the individual lives in an urban area and 0 if they live in a rural area.
formal	*Dummy* which is given a value of 1 if the individual works under contract and 0, otherwise.
unionized	*Dummy* which receives a value of 1 if the individual is a member of an union and 0, otherwise.
northeast (reference)	*Dummy* which is given a value of 1 for residents of the Northeast region and 0, otherwise.
south	*Dummy* which is given a value of 1 for residents of the South region and 0, otherwise.
southeast	*Dummy* which is given a value of 1 for residents of the Southeast region and 0, otherwise.
north	*Dummy* which is given a value of 1 for residents of the North region and 0, otherwise.
midwest	*Dummy* which is given a value of 1 for residents of the Midwest region and 0, otherwise.

Notes:

* According to Barros et al. (2006), monetary income from one's primary job corresponds to approximately 72.7% of the total monthly mass of individual incomes. It is, therefore, an adequate proxy for individual wages from work.

** The present study constructed the 'experience' variable based on the international literature (Garen, 1984): Experience = age *minus* years of schooling *minus* 6, where schooling is a continuous variable, and the subtraction of six years is due to the minimum age for starting school.

Source: drawn up by the authors.

It should also be noted that Santos and Kassouf (2007) show that women are more vulnerable to depression than men. Therefore, the results are presented by sex to capture the specific effects for men and women.

When estimating the Mincer equation [1], it should be considered that the relationship between depressive disorder and income level could be endogenous, or in other words, they can be mutually determined.

In this respect, when there are endogenous regressors, the problem of simultaneity arises, which means that such regressors are correlated with the error term. The Hausman (1978) specification test, which defines whether a regressor is correlated with the error term, was undertaken to test for the existence of endogeneity. If the problem of simultaneity exists, then it needs to be corrected. Such correction is performed by using instrumental variables to obtain consistent estimators.

The use of instruments to correct the simultaneity between mental depression and earnings has been widely discussed in international studies[5]. Such research usually uses panel data, which facilitates using the lagged variable as an alternative instrument. However, this procedure could not be applied because the present study uses a cross-section referring to 2008. In addition, it should be considered that the possibly endogenous regressor is a dummy, where:

$$D = \begin{cases} 1, \text{if the individual has been diagnosed with depressive disorders,} \\ 0, \text{otherwise.} \end{cases} \qquad [2]$$

In that case, the estimation must be based on the endogenous dummy variable model (Heckman, 1978). The endogenous dummy variable model is carried out in two stages. Initially, a Probit model for determining the endogenous binary regressor is estimated. In the case of this study, the first stage consisted of estimating a linear probability equation in which the dependent variable corresponded to the presence of a diagnosis of depression (D). The instruments are included in the explanatory variables. Equation [3] below presents the model which was estimated in the first stage:

$$\begin{aligned} depression = \alpha &+ \beta_{1i}experience + \beta_{2i}experience^2 + \beta_{3i}schooling2 + \beta_{4i}\,schooling3 + \beta_{5i}schooling4 \\ &+ \beta_{6i}schooling5 + \beta_{7i}schooling6 \;\; + \beta_{8i}color + \beta_{9i}urban + \beta_{10i}formal + \beta_{11i}unionized + \beta_{12i}\,south + \\ &\beta_{13i}southeast + \beta_{14i}\,north + \beta_{15i}midwest + u_i \; + \beta_{16i}illness\_arthritis \; + \beta_{17i}illness\_bronchitis + u_i \end{aligned} \qquad [3]$$

According to Equation [3], certain chronic illnesses[6] were included as instruments because the prevalence of mental depression is significantly higher among individuals with such illnesses[7]. According to Boing et al. (2012), people with chronic illness may have limitations in mobility, nutrition, physical activity, and daily tasks, which restrict their personal, social, or work lives. Such restrictions can lead to mood disorders and depression. Hence, two chronic illnesses, arthritis and bronchitis, were used as instruments in the first stage.

If the instruments are to be valid, they must be correlated with the endogenous variable in question. However, as Stock and Yogo (2005) pointed out, it is not enough to reject the null hypothesis of the coefficients of instrumental variables in the first-stage estimation. The most significant concern is that the instrumental variables could be directly correlated with earnings, in addition to the indirect effect via the correlation with depression (Bago et al., 2020).

Thus, a 2SLS model was estimated using the instrumental variables. From it, the Sargan test, or overidentification restrictions test, was performed, with the null hypothesis that the instruments were not correlated with the term of error in the equation for determining the principal earnings; in other words, they are valid.

Subsequently, the earnings equations presented in [1] were estimated using the Ordinary Least Squares (OLS) method, where the probabilities estimated in the first stage were used instead of the

....

5   See Peng et al. (2013), among others.

6   According to IBGE (1998), chronic illness is understood as one that accompanies a person for a long period of time and may or may not be cured.

7   There are several studies associating mental depression with chronic illness, such as Boing et al. (2012).

Bianca Vieira Benedicto, Laís de Sousa Abreu Soares y Evandro Camargos Teixeira

depression variable. According to Wooldridge (2010), the OLS model is a parameter estimation procedure that aims to minimize the sum of the squares of the differences between the observed values of the response variable and its values predicted by the model. The structure of the regression analysis is based on the linearity of the parameters, although it may be non-linear in the variables. It can also be seen that in the class of unbiased linear estimators, the least squares estimators present minimal variance. In summary, they are the best unbiased linear estimators (BLUE).

5. Results

Given the restrictions that were imposed, the sample comprised 163,141 individuals, of whom 5,994 were diagnosed with depressive disorder, approximately 3.7% of the sample.

Table 2 shows the main characteristics of the depressed individuals in the sample.

Of those with depression, 54.5% were white, and 63.39% were female. Apropos of the prevalence of depression according to color, whites presented a higher risk of developing a depressive disorder when compared to non-whites. Santos and Kassouf (2007) had a similar finding for 2003, which suggested that whites were more affected by depression than those of other races.

Regarding sex, Santos and Kassouf (2007) state that most mental and behavioral disorders affect men and women similarly, but mental depression is one of the few exceptions. Teng et al. (2005) found that women were more vulnerable to the illness because of their genetic predisposition to hormonal variation,

Table 2. Descriptive analysis of depressive disorder in accordance with individual characteristics

Characteristics of individuals		Individuals with depressive disorder	
		Observations	Mean
Total number of individuals		5,994	-
Color	White	3,266	54.49%
	Non-White	2,728	45.51%
Sex	Male	1,895	31.61%
	Female	4,099	68.39%
Schooling	No schooling (schooling1)	435	7.26%
	schooling2	529	8.83%
	schooling3	1,549	25.84%
	schooling4	985	16.43%
	schooling5	1,786	29.80%
	schooling6	710	11.85%
Census area	Urban	5,440	90.76%
	Rural	554	9.24%
Region	Southeast	2,107	35.15%
	South	1,588	26.49%
	Midwest	779	13.00%
	Northeast	1,183	19.74%
	North	337	5.62%
Chronic illness	Arthritis	1,059	17.67%
	Bronchitis	601	10.03%

Source: drawn up by the authors based on IBGE (2008).

which leads to greater mood sensitivity. To prove that there is a difference between the occurrence of depression in men and women, Table 3 shows the test values of the mean difference between males and females and the respective prevalence of depression for each sex.

From the values obtained through the comparison of the means test, it could be seen that the null hypothesis of the difference between the means being equal to zero was rejected, which is in line with findings in the literature; in other words, depression affects men and women differently.

Returning to the analysis of Table 2, there was no well-defined relationship between depressive individuals and their schooling levels. In this respect, the majority of those diagnosed with depressive disorders were found in the groups of people with 4 to 7 and 10 to 14 years' schooling, while on the other hand, the least proportion of those who had been diagnosed with depressive disorder was in the group of individuals with no schooling.

Regarding region of residence, the majority (90.76%) of those diagnosed with depression in the sample lived in urban areas. This result is influenced by the predominance of the country's urban population over its rural population. In addition, Alves and Rodrigues (2010) point to an association between living in large cities and susceptibility to mental illness and that such an association could be explained by factors such as stress, weakening of family ties, overcrowding, difficulty in accessing essential goods, less healthy lifestyles, and less social support.

As in the case of the census area, the Southeast region, the most populous in the country, pres-

ents the most significant number of people diagnosed with depression in the sample. In addition to the disparity in terms of population size, cultural, socioeconomic, and institutional factors in each region can influence the probability of its residents being affected by illness.

Finally, of those diagnosed with depressive disorder, 17.67% were also diagnosed with arthritis and 10.03% with bronchitis. As previously discussed, the instruments' validity depends on their correlation with the endogenous variable, which in this case is depression. Although descriptive statistics provide evidence, such a correlation can only be confirmed through econometric analysis.

As far as the econometric results are concerned, as already mentioned, two estimations were performed to analyze the effect of depressive disorder on individuals' hourly wages from their primary job: one for females and the other for males. The explanation for this option lies in the fact that there are extremely distinct symptoms of depression between men and women, as mentioned above.

To specify the causal effect of depressive disorder on hourly wages from one's main job, the statistical plausibility of the endogeneity hypothesis, the fundamental premise for applying the endogenous dummy variable model, must be evaluated. Accordingly, a 2SLS model was estimated using the previously discussed instrumental variables, and the Durbin-Wu-Hausman (DWH) test was performed, with the null hypothesis corresponding to the fact that the variables are exogenous and, therefore, not correlated with error. Given this, the non-rejection of H0 indicates that there is no endogeneity.

Table 3. Differences in prevalence of depression in males and females

Mean prevalence in females	Mean prevalence in males	$H_0: \overline{X}_F - \overline{X}_M = 0 \; H_1: \overline{X}_F$ $-\overline{X}_M \neq 0$	$H_0: \overline{X}_F - \overline{X}_M = 0 \; H_1: \overline{X}_F$ $-\overline{X}_M > 0$
0.062 (0.00009)	0.019 (0.0004)	$\Pr(|T| > |t|) = 0.000$	$\Pr(T > t) = 0.000$
$\overline{X}_F - \overline{X}_M$	0.043 (0.0009)	$t = 46.7830$	

Source: drawn up by the authors based on IBGE (2008).

Bianca Vieira Benedicto, Laís de Sousa Abreu Soares y Evandro Camargos Teixeira

For both females and males, the DWH test rejected the null hypothesis, thereby corroborating the assumption that mental depression is an endogenous variable and that estimates using instrumental variables are more adequate, as shown in Table 4. After estimating the 2SLS model, the Sargan test was also performed, with the null hypothesis being that the instruments are valid. Thus, if the validity of the models is to be confirmed, the null hypothesis cannot be rejected. Table 5 presents the results.

The null hypothesis was not rejected for either males or females; in other words, the instruments were valid. Thus, the two estimates performed, for males and females, were based on the endogenous dummy model, where being affected by the chronic diseases of arthritis and bronchitis were used as instruments. Table 6 presents the first stage of the model. At this stage, the risk factors associated with mental depression are described using a Pro-

Table 4. Results of the endogeneity test for males and females

Sex	Durbin – Wu –Hausman
Female	$F_{(1.67257)} = 5.62708$ (p = 0.0078)
Male	$F_{(1.95848)} = 8.31956$ (p = 0.0039)

Source: drawn up by the authors based on IBGE (2008).

Table 5. Results of the instrument validity test for males and females

Sex	Sargan
Female	$chi2(1) = 0.774176$ (p = 0.3789)
Male	$chi2(1) = 0.574401$ (p = 0.4485)

Source: drawn up by the authors based on IBGE (2008).

bit model. It is important to point out that in all estimations undertaken in this subsection, the robust standard errors were considered to correct the problem of heteroscedasticity detected using the White test.

Table 6. Determinants of depressive disorder in Brazil in 2008

Depression	Female		Male	
	Coefficient	Marginal Effects	Coefficient	Marginal Effects
No. of observations	76,096		100,827	
R^2	0.0849		0.0706	
experience	0.044*** (0.002)	0.004*** (0.0002)	0.034*** (0.003)	0.001*** (0.0001)
experience^2	-0.0005*** (0.00004)	-0.00005*** (0.00000)	-0.0004*** (0.00005)	-0.00001*** (0.00000)
schooling2	0.037[NS] (0.046)	0.004[NS] (0.00481)	-0.058[NS] (0.045)	-0.002[NS] (0.001)
schooling3	0.033[NS] (0.039)	0.003[NS] (0.004)	0.029[NS] (0.039)	0.001[NS] (0.001)
schooling4	0.0297[NS] (0.043)	0.003[NS] (0.004)	0.049[NS] (0.044)	0.002[NS] (0.002)
schooling5	0.019[NS] (0.042)	0.002[NS] (0.004)	0.088[NS] (0.043)	0.003[NS] (0.002)
schooling6	0.0451[NS] (0.046)	0.005[NS] (0.005)	0.067[NS] (0.052)	0.003[NS] (0.002)
color	0.039** (0.018)	0.004** (0.002)	0.053** (0.022)	0.002** (0.0008)
urban	0.055* (0.031)	0.005* (0.003)	0.097** (0.031)	0.003** (0.001)
formal	-0.120*** (0.018)	-0.012*** (0.002)	-0.064*** (0.021)	-0.002*** (0.0008)

Table 6. Determinants of depressive disorder in Brazil in 2008 (continuation)

Depression	Female		Male	
	Coefficient	**Marginal Effects**	**Coefficient**	**Marginal Effects**
unionized	0.095*** (0.023)	0.009*** (0.002)	0.099*** (0.024)	0.004*** (0.001)
south	0.436*** (0.026)	0.055*** (0.004)	0.328*** (0.031)	0.016*** (0.002)
southeast	0.231*** (0.022)	0.025*** (0.002)	0.214*** (0.028)	0.009*** (0.001)
north	-0.152*** (0.034)	-0.014*** (0.003)	-0.187*** (0.042)	-0.006*** (0.001)
midwest	0.266*** (0.028)	0.031*** (0.004)	0.152*** (0.035)	0.006*** (0.002)
illness_arthritis	0.590*** (0.026)	0.089*** (0.005)	0.654*** (0.035)	0.048*** (0.004)
illness_bronchitis	0.529*** (0.031)	0.078*** (0.006)	0.481*** (0.042)	0.030*** (0.004)
Constant	-2.513*** (0.055)		-2.961*** (0.057)	

Note: robust standard deviation in parenthesis; * denotes significance at 10%, ** at 5%, and *** at 1%.

Source: drawn up by the authors based on IBGE (2008).

From the results presented in Table 6, the chronic illnesses used as instruments are correlated with depressive disorder in both models. In general, the results indicate a positive relationship between chronic illness and being affected by depression. However, this association is more pronounced among women, as expected.

Continuing with the analysis of the results, Table 7 presents the main results of the estimations of the endogenous dummy models, using the probabilities estimated in the first stage as an instrument for depression. The results of the corresponding OLS model are also presented. As for the results obtained, the estimations indicate that the fact that both sexes were diagnosed with mental depression considerably reduced the hourly wages from their primary job. More specifically, the diagnosis of depressive disorder is associated with a decrease of approximately 32.6% and 29.8% in the work income of women and men, respectively.

Continuing with the analysis of the other control variables, it was seen that individuals with a formal contract earn higher salaries in the labor market. Working with a formal contract increases women's hourly wages from their primary job by approximately 21.9%, while for men, it is 24.6%. Ulyssea (2006) states that the wage differential favoring formal workers suggests that the labor market could be segmented or, in other words, it is based on the hypothesis that formal contract work is scarce or that there are barriers to entry. Given this situation, it can be said that equally productive individuals can earn different wages depending on the sector in which they find themselves.

Another major factor involving income had to do with people's experience. In this regard, the coefficient of the variable, which denotes experience, was positive for both sexes, which indicates that for women, one extra year of experience raises their incomes by 2.7 percentage points, while for men, that percentage is 4.1. That shows that additional years of experience are related to higher wages.

In turn, the negative signal of the experience variable squared is associated with concavity. Therefore, depreciation of human capital occurs as a worker ages. Senna (1976) confirms these results and states that earnings tend to grow at the beginning of one's working life be-

Bianca Vieira Benedicto, Laís de Sousa Abreu Soares y Evandro Camargos Teixeira

Table 7. Effects of depression on hourly wages from the primary employment of males and females using the 2SLS model and endogenous *dummy*

Inhourlywage	Female		Male	
	Endogenous *dummy* model	OLS	Endogenous *dummy* model	OLS
No. of observations	67,275	67,275	95,866	95,866
R²	0.4227	0.4229	0.4444	0.4444
depression	-0.326*** (0.073)	-0.085*** (0.011)	-0.298*** (0.147)	-0.075*** (0.016)
experience	0.027*** (0.0007)	0.026*** (0.0007)	0.041*** (0.0006)	0.040*** (0.0006)
experience^2	-0.0003*** (0.00001)	-0.0003*** (0.00001)	-0.0005*** (0.00001)	-0.0005*** (0.00001)
schooling2	0.079*** (0.017)	0.076*** (0.017)	0.138*** (0.010)	0.138*** (0.010)
schooling3	0.263*** (0.0145)	0.259*** (0.014)	0.345*** (0.009)	0.344*** (0.009)
schooling4	0.443*** (0.0153)	0.440*** (0.015)	0.560*** (0.010)	0.559*** (0.010)
schooling5	0.799*** (0.015)	0.797*** (0.015)	0.914*** (0.010)	0.913*** (0.010)
schooling6	1.675*** (0.016)	1.671*** (0.016)	1.827*** (0.012)	1.826*** (0.012)
color	0.124*** (0.006)	0.123*** (0.006)	0.143*** (0.005)	0.143*** (0.005)
urban	0.192*** (0.010)	0.190*** (0.010)	0.241*** (0.006)	0.240*** (0.006)
formal	0.219*** (0.006)	0.223*** (0.006)	0.246*** (0.005)	0.247*** (0.005)
unionized	0.153*** (0.008)	0.150*** (0.008)	0.090*** (0.006)	0.089*** (0.006)
south	0.319*** (0.009)	0.305*** (0.009)	0.348*** (0.008)	0.344*** (0.007)
southeast	0.289*** (0.007)	0.283*** (0.007)	0.312*** (0.006)	0.310*** (0.006)
north	0.241*** (0.009)	0.242*** (0.009)	0.258*** (0.007)	0.259*** (0.007)
midwest	0.360*** (0.009)	0.354*** (0.009)	0.410*** (0.008)	0.408*** (0.008)
Constant	-0.417*** (0.018)	-0.408*** (0.017)	-0.495*** (0.012)	-0.492*** (0.011)

Note: robust standard deviation in parenthesis; * denotes significance at 10%, ** at 5%, and *** at 1%.

Source: drawn up by the authors based on IBGE (2008).

cause of the productivity gains associated with accumulating experience in the labor market. However, over the years, the stock of human capital has grown obsolete and resulted in lower incomes.

The results also show the importance of schooling to increase income. In the case of women, compared to those who did not have any schooling or schooling of less than a year, those who had from 1 to 3 years' schooling earned 7.9% higher hourly wages from their primary job, on average. For those who had from 4 to 7 years' schooling, this went to 26.3%, and to 44.3% for those who had from 8 to 10 years' schooling, to 79.9% for those who had from 11 to 14 years, and to 167.5% for those who had 15 years' schooling or more.

In the case of men, compared to those who had no schooling or schooling of less than a year, those who had from 1 to 3 years' schooling earned an average of 13.8% higher hourly wages from their primary job. For those who had from 4 to 7 years' schooling, the wage increase reached 34.5%, 56.1% for those who had from 8 to 10 years' schooling, 91.5% for those who had from 11 to 14 years' schooling, and 182.2% for those who had 15 years' schooling or more. Thus, schooling, like health conditions, is shown by Grossman (1972) to be a factor that determines the human capital of individuals or, in other words, allows it to increase productivity.

Furthermore, the results confirm the wage differentiation in favor of whites. In this case, white women earned approximately 12.4% higher hourly wages from their primary jobs. In the case of men, the disparity is quite similar, as white men's hourly wages from their primary job were about 14.3% higher than those of non-white men.

A person's unionization also increased their hourly wages from their primary job. According to the literature, although unions are a key element of modern capitalism, their impact varies across countries. In relation to Brazil, particularly, Arbache (2002) conducted a study to discover how unionism affected wage bargaining processes, income distribution, and the rigidity of the labor market. The author found results that indicated that unions contribute to wage formation by increasing the bargaining power of unionized workers and consequently increasing their average wage. That result corroborates the result of the present study, which indicates that, on average, a worker involved in a union earns higher wages from their primary work than their counterparts.

Residents of an urban area earned higher hourly wages from their primary work compared to their rural counterparts. This result can be explained by the fact that there are more employment opportunities in urban areas than in rural areas. Also, the fact that inequality of access to services, such as health and schooling, among residents of the different census areas works against the formation of human capital for the inhabitants of rural areas.

Considering the hourly earnings from the primary job related to regional variables, it was seen that living in the Northeast region, compared to other Brazilian macro-regions, yielded lower incomes, irrespective of gender. This result can also be explained by the fact that the concentration of human capital differs for different regions. That determines different productivity levels and, consequently, different hourly wages from primary work (Guimarães, 2013).

6. Discussion

As evidenced in the Results section through the endogenous dummy model, a diagnosis of depression is associated with a reduction in work income for both men and women. Thus, it is essential to discuss this finding, which is the most significant of this research. First, it is important to emphasize that the hypothesis that depressive disorder affects people's hourly wages from their main job is proven. In this regard, as the theoretical literature points out, for example, in the case of Grossman's model (1972) and the study by Bloom and Canning (2003), physical and psychological health is considered a good investment that can increase people's productivity. In addition, healthy people can expand the benefits of schooling and work experience. Thus, the authors claim that health can be an input to produce other forms of human capital.

In relation to depression specifically, the mechanism that denotes the fact that the disease impacts the hourly income of one's main job is related to and reflects the reduction in productivity, as Germinario et al. (2022) pointed out. According to Del Porto (1999), depression as a syndrome includes mood swings (sadness, irritability, inability to feel pleasure, apathy), cognitive alterations (memory deficit, attention deficit), psychomotor alterations (agitation or motor retardation), and vegetative alterations (sleep, appetite, and circadian rhythm disorders). So, the symptoms of the disease include the loss of cognitive, social, and emotional capacity, which affects people's work perfor-

Bianca Vieira Benedicto, Laís de Sousa Abreu Soares y Evandro Camargos Teixeira

mance and, consequently, their income level. Thus, symptoms related to depression reduce people's ability to carry out their tasks, whether personal, social or work-related.

However, it is not just productivity that is compromised by neuropsychic health. Participation in the labor market can also be affected by an altered state of mental health. According to Cai and Kalb (2006), sick people, including those with mental disorders, are 60% less likely to be part of the workforce, are even less likely to work full-time, and are more likely to be unemployed. In line with that, Garcia (2016) states that health is essential to explaining participation in the labor market. In this respect, the author also claims that the health effect is like a higher level of schooling. Although the relationship between participation in the labor market and depression was not analyzed in the present study, it is important to remember that, like productivity, it is also affected by the disease in a way that reduces the hourly wages from the primary job.

Furthermore, as pointed out by Weehuizen (2008), due to the changes in the nature of the economy in recent decades, making it knowledge, innovation, and technology-based, people's mental health is even more crucial to their functionality at work. Just as the knowledge-based economy is more dependent on the mental health of workers, work increasingly affects people's mental health due to pressures from the innovative economy. According to Weehuizen (2008), statistics show a significant increase in work-related stress in recent years. In other words, work has become more important as a determinant of mental health, just as mental health has become more relevant as a determinant of work.

Wang et al. (2022) highlight a mechanism related to the passage of time. The authors point out that a diagnosis of depressive disorder in early adulthood can penalize individuals in two ways in the future. First, the penalty arises from the fact that depression is a chronic illness whose effects tend to persist over time. Additionally, there would be a reduction in the level of human capital among individuals affected by the illness due to their allocation to professions with lower growth potential when diagnosed.

It should also be noted that the effect of depressive disorder on individuals' hourly wages from their primary job was more intense for women than for men, as seen in Table 6. Justo and Calil (2006) claim that biological aspects are the most important factors in the literature that explain this fact. These include hormonal functioning and psychosocial aspects, such as the difference in family roles played by men and women, the level of women's participation in politics, and the greater likelihood of women suffering traumatic events.

In addition to that (see Table 8 and Table 9), estimates of the earnings equation were made for both males and females according to groups of hourly wages from primary work. That was done to prove the results' robustness and the instruments' validity. In both cases, income equations were estimated for certain groups, according to the level of household income per capita, broken down into the following levels: up to one minimum wage (R$415.00 per year), from one to three minimum wages, from three to five minimum wages, from five to ten minimum wages and more than ten minimum wages.

The results, in general, confirm those previously presented, particularly in the case of women, where depression presented a negative and statistically significant coefficient in all groups. In the case of men, the diagnosis of depression was statistically significant only in determining hourly wages from their primary work for groups with lower incomes or, in other words, for those with a household income per capita of up to three minimum wages.

In this respect, as pointed out by Baptista and Baptista (1999), the prevalence of depression is affected by several psychological, biological, and social factors. In general, women present a higher prevalence than men for rea-

Table 8. Effects of depression on females' hourly wages from primary work, according to household income per capita

Inhourlywages	Household income up to 1 minimum salary per capita	Household income per capita between 1 and 3 minimum wages	Household income per capita between 3 and 5 minimum wages	Household income per capita between 5 and 10 minimum wages	Household income per capita of 10 or more minimum wages
No. of observations	28,781	27,510	5,179	3,219	2,586
R^2	0.2023	0.2367	0.2529	0.2427	0.5535
depression	-0.298***	-0.319***	-0.521**	-0.698**	-0.868*
	(0.108)	(0.090)	(0.245)	(0.345)	(0.493)
experience	0.025***	0.026***	0.046***	0.043***	0.045***
	(0.001)	(0.0009)	(0.003)	(0.004)	(0.005)
experience^2	-0.0003***	-0.0004***	-0.0007***	-0.0006***	-0.0005***
	(0.00002)	(0.00002)	(0.00006)	(0.00009)	(0.0001)
schooling2	0.044***	0.049*	-0.306**	-0.305^{NS}	0.179^{NS}
	(0.018)	(0.027)	(0.135)	(0.250)	(0.156)
schooling3	0.192***	0.127***	-0.173^{NS}	0.198^{NS}	0.383***
	(0.017)	(0.023)	(0.112)	(0.171)	(0.134)
schooling4	0.289***	0.243***	-0.147^{NS}	0.439***	0.683***
	(0.018)	(0.024)	(0.111)	(0.168)	(0.138)
schooling5	0.493***	0.482***	0.174^{NS}	0.842***	1.232***
	(0.018)	(0.023)	(0.108)	(0.157)	(0.131)
schooling6	0.823***	1.014***	0.600***	1.306***	2.317***
	(0.030)	(0.025)	(0.108)	(0.158)	(0.133)
color	0.019***	0.061***	0.090***	0.079**	0.283***
	(0.008)	(0.007)	(0.020)	(0.031)	(0.039)
urban	0.117***	0.094***	0.096^{NS}	0.055^{NS}	0.394***
	(0.011)	(0.015)	(0.062)	(0.095)	(0.094)
formal	0.306***	0.064***	0.074***	0.116***	0.246***
	(0.008)	(0.007)	(0.021)	(0.030)	(0.039)
unionized	0.005***	0.146***	0.159***	0.152***	0.210***
	(0.013)	(0.009)	(0.021)	(0.029)	(0.043)
south	0.348***	0.137***	-0.004^{NS}	0.099**	0.210***
	(0.015)	(0.012)	(0.032)	(0.046)	(0.063)
southeast	0.277***	0.125***	0.020^{NS}	0.096**	0.175***
	(0.010)	(0.009)	(0.026)	(0.038)	(0.049)
north	0.269***	0.155***	0.089**	0.143**	0.141**
	(0.011)	(0.013)	(0.037)	(0.058)	(0.070)
midwest	0.314***	0.132***	0.164***	0.205***	0.470***
	(0.013)	(0.012)	(0.032)	(0.043)	(0.059)
Constant	-0.249***	0.330***	1.011***	0.633***	-0.863***
	(0.022)	(0.028)	(0.126)	(0.184)	(0.156)

Note: robust standard deviation in parenthesis; * denotes significance at 10%, ** at 5%, and *** at 1%.

Source: drawn up by the authors based on IBGE (2008).

Bianca Vieira Benedicto, Laís de Sousa Abreu Soares y Evandro Camargos Teixeira

Table 9. Effects of depression on hourly wages from males' primary work, according to household income per capita

Inhourlywages	Household income per capita of up to 1 minimum wage	Household income per capita between 1 and 3 minimum wages	Household income per capita between 3 and 5 minimum wages	Household income per capita between 5 and 10 minimum wages	Household income per capita of 10 or more minimum wages
No. of observations	47,087	35,832	6,272	3,735	2,937
R²	0.2655	0.2410	0.2582	0.2809	0.5783
depression	-0.860***	-0.528***	-0.111^{NS}	-0.017^{NS}	-0.012^{NS}
	(0.191)	(0.189)	(0.482)	(0.669)	(1.038)
experience	0.031***	0.045***	0.064***	0.072***	0.059***
	(0.0007)	(0.0008)	(0.002)	(0.003)	(0.005)
experience^2	-0.0004***	-0.0007***	-0.001***	-0.001***	-0.0007***
	(0.00001)	(0.00001)	(0.00004)	(0.00007)	(0.00009)
schooling2	0.082***	0.075***	0.099^{NS}	-0.242^{NS}	0.219*
	(0.010)	(0.019)	(0.092)	(0.190)	(0.125)
schooling3	0.219***	0.194***	0.013^{NS}	-0.213^{NS}	0.521***
	(0.009)	(0.016)	(0.079)	(0.165)	(0.105)
schooling4	0.349***	0.335***	-0.084^{NS}	-0.285*	0.959***
	(0.011)	(0.017)	(0.080)	(0.164)	(0.108)
schooling5	0.501***	0.567***	0.178**	-0.123^{NS}	1.533***
	(0.011)	(0.017)	(0.078)	(0.159)	(0.103)
schooling6	0.618***	1.007***	0.556***	0.231^{NS}	2.520***
	(0.027)	(0.020)	(0.079)	(0.159)	(0.103)
color	0.037***	0.083***	0.080***	0.100***	0.332***
	(0.006)	(0.006)	(0.018)	(0.026)	(0.039)
urban	0.173***	0.121***	0.033^{NS}	0.013^{NS}	0.235***
	(0.007)	(0.011)	(0.042)	(0.066)	(0.071)
formal	0.303***	0.095***	0.127***	0.196***	0.298***
	(0.006)	(0.006)	(0.018)	(0.025)	(0.038)
unionized	-0.0005^{NS}	0.104***	0.071***	0.099***	0.093**
	(0.007)	(0.008)	(0.019)	(0.025)	(0.039)
south	0.342***	0.153***	-0.016^{NS}	-0.005^{NS}	0.095^{NS}
	(0.010)	(0.010)	(0.028)	(0.038)	(0.060)
southeast	0.299***	0.130***	-0.006^{NS}	0.012^{NS}	0.027^{NS}
	(0.007)	(0.009)	(0.024)	(0.033)	(0.048)
north	0.269***	0.142***	0.069**	0.062^{NS}	0.106^{NS}
	(0.008)	(0.011)	(0.033)	(0.048)	(0.067)
midwest	0.326***	0.191***	0.110***	0.196***	0.334***
	(0.009)	(0.011)	(0.029)	(0.038)	(0.055)
Constant	-0.231****	0.245***	1.180***	1.695***	-0.746***
	(0.013)	(0.021)	(0.088)	(0.173)	(0.1185)

Note: robust standard deviation in parenthesis; * denotes significance at 10%, ** at 5%, and *** at 1%.

Source: drawn up by the authors based on IBGE (2008).

sons that include hormonal changes and the role of women in society, as previously highlighted. Moreover, as highlighted by Ferreira et al. (2022), these results can be explained by the burden of the double work shift faced by women, which remains closely tied to domestic work, where patriarchal stereotypes still prevail. These recent changes in the job market may increase the workload for women, leading to fatigue, stress, and a higher likelihood of developing depression. In turn, Cunha et al. (2012), in an experimental study, concluded that there is a strong link between depression and low levels of income.

7. Final Comments

The present study fills a yawning gap in the scientific discussion by addressing the relationship between depressive disorder and hourly wages from primary work. In this respect, the first conclusion was that economic theory could be a handy tool for understanding the socioeconomic effects of mental depression.

Endogeneity was found between the onset of depressive disorder and the hourly wages from one's primary work in the estimation of the econometric model for both sexes. Based on that, the endogenous dummy variable model was used. The results, in general, suggest that the incomes of both men and women with depressive symptoms are negatively affected.

According to the literature, the main mechanism that represents the effects of depressive disorder on hourly wages from one's primary job is concretized in the reduction in people's levels of productivity, given their mood swings, cognitive and psychomotor changes, and vegetative alterations, seen from the prevalence of the disease, and which directly affect their ability and efficiency in performing tasks, including work-related tasks.

It is also worth noting that this analysis broadens the understanding of economic problems arising from depressive disorder by analyzing its consequences in terms of work productivity. In this respect, efforts must be made to implement mental health policies that seek to reduce the incidence of illness and the economic burden arising from it.

Finally, it is important to emphasize that the main limitation of the study is the underestimation of the diagnosis of depressive disorder, as well as other chronic illnesses used as instruments, given that they are based on the self-reporting of individuals. In addition, there could be specific unobservable effects in relation to hourly wages from one's primary job, such as people's innate abilities, which were not considered in most studies, nor the case of the present study.

Author Contributions

Bianca Vieira Benedicto: data curation, formal analysis, methodology, writing (original draft).

Laís de Sousa Abreu Soares: data curation, formal analysis, writing (original draft).

Evandro Camargos Teixeira: conceptualization, project administration, supervision, writing (draft review and revision/editing).

Funding

Conflict of Interest

The authors declare that they have no conflicts of interest regarding the publication of this article.

Ethical Implications

The authors have no ethical implications to declare concerning the writing and publication of this article.

References

Alves, A. A. M., & Rodrigues, N. F. R. (2010). Determinantes sociais e econômicos da saúde mental. *Revista Portuguesa de Saúde Pública, 28*(2), 127-131. https://doi.org/10.1016/S0870-9025(10)70003-1

Alves, L. F., & Andrade, M. V. (2003). Impactos do estado de saúde sobre os rendimentos individuais no Brasil e em Minas Gerais. *Economia Aplicada, 7*(2), 359-388. https://doi.org/10.11606/1413-8050/ea220106

Araya, R., Rojas, G., Fritsch, R., Gaete, J., Rojas, M., Simon, G., & Peters, T. J. (2003). Treating depression in primary care in low-income women in Santiago, Chile: A randomized controlled trial. *The Lancet, 361*(9362), 995-1000. https://doi.org/10.1016/S0140-6736(03)12825-5

Arbache, J. S. (2002). *Unions and the labour market in Brazil.* The World Bank. https://doi.org/10.2139/ssrn.308564

Bago, J. L., Ouédraogo, M., Akakpo, K., Lompo, M. L., Soutatié, W. M., & Ouédraogo, E. (2020). Early childhood education and child development: New evidence from Ghana. *Children and Youth Services Review, 108,* 104620. https://doi.org/10.1016/j.childyouth.2019.104620

Baptista, M. N., & Baptista, A. S. D. (1999). Depressão e gênero: Por que as mulheres deprimem mais que os homens? *Temas em Psicologia, 7*(2), 143-156. https://pepsic.bvsalud.org/pdf/tp/v7n2/v7n2a05.pdf

Barros, R. P., Foguel, M. N., & Ulyssea, G. (2006). D*esigualdade de renda no Brasil: Uma análise da queda recente* (Vol. 1). IPEA. https://repositorio.ipea.gov.br/bitstream/11058/3249/1/Desigualdade%20de%20renda%20no%20Brasil%20-%20v.%201.pdf

Berndt, E. R., Finkelstein, S. T., Greenberg, P. E., Howland, R. H., Keith, A., Rush, A. J., Russel, J., & Keller, M. B. (1998). Workplace performance effects from chronic depression and its treatment. J*ournal of Health Economics, 17*(5), 511-535. https://doi.org/10.1016/S0167-6296(97)00043-X

Bloom, E. D., & Canning, D. (2003). The health and poverty of nations: From theory to practice. J*ournal of Human Development, 4*(1), 47-71. https://doi.org/10.1080/1464988032000051487

Boing, A. F., Melo, G. R., Boing, A. C., Moretti-Pires, R. O., Peres, K. G., & Peres, M. A. (2012). Associação entre depressão e doenças crônicas: Um estudo populacional. *Revista de Saúde Pública, 46*(4), 617-623. https://doi.org/10.1590/S0034-89102012005000044

Cai, L., & Kalb, G. (2006). Health status and labour force participation: Evidence from Australia. *Health Economics, 15*(3), 241-261. https://doi.org/10.1002/hec.1053

Cunha, R. V., Bastos, G. A. N., & Duca, G. F. (2012). Prevalência de depressão e fatores associados em comunidade de baixa renda de Porto Alegre, Rio Grande do Sul. *Revista Brasileira de Epidemiologia, 15*(2), 346-354. https://doi.org/10.1590/S1415-790X2012000200012

Del Porto, J. A. (1999). Conceito e diagnóstico. *Revista Brasileira de Psiquiatria, 21,* 6-11. https://doi.org/10.1590/S1516-44461999000500003

Evans-Lacko, S., & Knapp, M. (2016). Global patterns of workplace productivity for people with depression: Absenteeism and presenteeism costs across eight diverse countries. *Social Psychiatry and Psychiatric Epidemiology, 51*(11), 1525-1537. https://doi.org/10.1007/s00127-016-1278-4

Ferreira, S. N. D., Oliveira, J. B. de, Manoel, A. C. N. M., & Teixeira, E. C. (2022). Efeito do transtorno depressivo no acesso feminino ao ensino superior brasileiro. *Economia & Região, 10*(1), 5-25. https://doi.org/10.5433/2317-627X.2022v10n1p5

Garcia, E. G. (2016). *Estado de saúde e seus efeitos sobre rendimentos do trabalho* (master's thesis). Universidade Federal de Juiz de Fora, Juiz de Fora, Brasil. https://repositorio.ufjf.br/jspui/bitstream/ufjf/2236/1/esthergrizendegarcia.pdf

Garen, J. (1984). The returns to schooling: A selectivity bias approach with a continuous choice variable. *Econometrica, 52*(5), 1199-1218. https://doi.org/10.2307/1910996

Germinario, G., Amin, V., Flores, C. A., & Flores-Lagunes, A. (2022). What can we learn about the effect of mental health on labor market outcomes under weak assumptions? Evidence from the NLSY79. L*abour Economics, 79,* 102258. https://doi.org/10.1016/j.labeco.2022.102258

Grossman, M. (1972). On the concept of health capital and the demand for health. *Journal of Political Economy, 80*(2), 223-255. https://doi.org/10.1086/259880

Guimarães, P. S. (2013). *Características dos trabalhadores e seus retornos salariais: Um estudo do mercado de trabalho brasileiro para o ano de 2011* (undergraduate thesis). Universidade de Brasília, Brasília, Brasil.

Hausman, J. A. (1978). Specification tests in econometrics. *Econometrica, 46*(6), 1251-1271. https://doi.org/10.2307/1913827

Heckman, J. J. (1978). Dummy endogenous variables in a simultaneous equation system. E*conometrica, 46*(4), 931-959. https://doi.org/10.2307/1909757

IBGE –Instituto Brasileiro de Geografia e Estatística–. (1998). *Pesquisa nacional por amostra e domicilio (PNAD).* https://www.ibge.gov.br/estatisticas/sociais/populacao/9127-pesquisa-nacional-por-amostra-de-domicilios.html?edicao=18338&t=microdados

IBGE –Instituto Brasileiro de Geografia e Estatística–. (2008). *Pesquisa nacional por amostra e domicilio (PNAD).* https://www.ibge.gov.br/estatisticas/sociais/populacao/9127-pesquisa-nacional-por-amostra-de-domicilios.html?edicao=18338&t=microdados

Justo, L. P., & Calil, H. M. (2006). Depressão: O mesmo acometimento para homens e mulheres? *Revista de Psiquiatría Clínica, 33*(2), 74-79. https://doi.org/10.1590/S0101-60832006000200007

Lerner, D., Adler, D. A., Chang, H., Lapitsky, L., Hood, M. Y., Perissinotto, C., Reed, J., Mclaughlin, T. J., Berndt, E. R., & Rogers, W. H. (2004). Unemployment, job retention and productivity loss among employees with depression. *Psychiatric Services, 55*(12), 1371-1378. https://doi.org/10.1176/appi.ps.55.12.1371

Mincer, J. A. (1974). *Schooling, experience, and earnings*. NBER. https://www.nber.org/system/files/chapters/c1765/c1765.pdf

Peng, L., Meyerhoefer, D. C., & Zuvekas, H. S. (2013). *The effect of depression on labor market outcomes.* NBER. https://doi.org/10.3386/w19451

Santos, M. J., & Kassouf, A. L. (2007). Uma investigação dos determinantes socioeconômicos da depressão mental no Brasil com ênfase nos efeitos da educação. *Economia Aplicada, 11*(1), 5-26. https://doi.org/10.1590/S1413-80502007000100001

Senna, J. J. (1976). Escolaridade, experiência no trabalho e salários no Brasil. *Revista Brasileira de Economia, 30,* 163-194.

Stock, J. H., & Yogo, M. (2005). Testing for weak instruments in linear IV regression. In D. W. K. Andrews & J. H. Stock (Eds.), *Identification and inference for econometric models* (pp. 80-108). Cambridge University Press. https://doi.org/10.1017/CBO9780511614491.006

Teng, T. C., Humes, C. E., & Demetrio, N. F. (2005). Depressão e comorbidades clínicas. *Archives of Clinical Psychiatry, 32*(3), 149-159. https://doi.org/10.1590/S0101-60832005000300007

Ulyssea, G. (2006). Informalidade no mercado de trabalho brasileiro: Uma resenha da literatura. *Revista de Economia Política, 26*(4), 596-618. https://doi.org/10.1590/S0101-31572006000400008

Wang, B., Frank, R. G., & Glied, S. A. (2022). *Lasting scars: The impact of depression in early adulthood on subsequent labor markets outcomes.* NBER. https://doi.org/10.3386/w30776

Bianca Vieira Benedicto, Laís de Sousa Abreu Soares y Evandro Camargos Teixeira

Wang, P. S., Simon, G., & Kessler, R. C. (2003). The economic burden of depression and the cost-effectiveness of treatment. *International Journal of Methods in Psychiatric Research, 12*(1), 22-33. https://doi.org/10.1002/mpr.139

Weehuizen, R. M. (2008). *Mental capital: The economic significance of mental health* (doctoral thesis). Maastricht University, Maastricht, Netherlands. https://doi.org/10.26481/dis.20080627rw

WHO –World Health Organization–. (2001). *Relatório mundial da saúde 2001*. https://iris.who.int/bitstream/handle/10665/42390/WHR_2001_por.pdf?sequence=4&isAllowed=y

WHO –World Health Organization–. (2017). *Depression and other common mental disorders: Global health estimates.* WHO.

WHO –World Health Organization–. (2023). *Depressive disorder (depression).* https://www.who.int/news-room/fact-sheets/detail/depression

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data.* MIT Press.

¿Cómo citar este artículo?

Benedicto, B. V., Soares, L. de S. A., & Teixeira, E. C. (2024). Effects of Depressive Disorder on Employment Income in Brazil. *Sociedad y Economía*, (53), e10713098. https://doi.org/10.25100/sye.v0i53.13098