Labor Cost of Mental Health: Evidence from Chile

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Individuals' labor market performance can be affected directly by their mental health through labor market participation and productivity. Moreover, poor mental health of workers limits labor mobility and hence efficiency and economic growth. Although there is some empirical evidence linking mental health and labor market performance in high-income countries, few papers provide evidence from developing countries, despite the fact that health support is typically weak. We investigate the effects of poor mental health on labor market in Chile, where depression rate reaches 17%. We build a mental health status index and control confounding effects by using a large set of individual and household socio-economic, labor and health characteristics. We address causality identification by using instrumental variables at the individual level (number of relatives that passed away, relatives diagnosed with depression), and at the municipality level (life expectancy, intra-family violence rate). Our results indicate that poor mental health could reduce labor market participation by 20%. Additionally, we find that poor mental health could reduce wages by 60% for women and 50% for men. We also find heterogeneous effects among workers due to economic sector, were private sector workers with poor mental health suffer larger impacts on wages than public sector workers. Keywords: Mental health, employment, salary, psychological stress index, depression index, diagnosed depression. JEL Codes: J22, I12, I19.

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1 Introduction

Issues related to mental health have become very important in recent times in developed countries and just as much so in developing countries as well. This is due to the great increase of diseases that are related to mental health like stress, depression, and anxiety, among others. In the case of Chile, the National Health Survey (ENS) from 2009 shows a nationwide depression rate of 17.2% when examining depressive symptoms of the last year and 21.1% when looking at a depressive episode in ones life. International evidence shows that mental health varies by gender, educational level, and other demographic variables. For Chile, according to ENS, women at all levels of education, on average have a higher rate of depression than men, and subjects with a higher educational level have, on average, a lower rate of depression than individuals with a lower educational level.

As important as the effects of a disease on the health of an individual is, it's of equal importance to consider the impacts the disease can have on results at work. For example, studies in Australia have found that poor mental health has a significant negative effect on the probability of being actively involved in the labor market (Frijters et al., 2010)[4]. The impact of mental health on the labor market is manifested through several channels. The first would be through emotional states and productivity exhibitied (Ettner et al., 1997). The second channel, could be the labor mobility, that would be provoked by a worse state of health.There is no empirical evidence of either of these channels in Chile.

However, the empirical analysis of the relationship between mental health and work presents challenges related to endogeneity. Mental health can be considered an endogenous variable to work performance, and for this reason it is necessary to look for a form of estimation that takes into account this complexity. For example, instrumental variables can be used, as such it is necessary to find an instrument that affects the labor result via its relation with the mental health of the individual. Some instruments used in the literature are the history of problems among parents (Ettner et al., 1997; Marcotte et al., 2000)., mental disorders of relatives, and number of mental disorders in childhood (Ettner et al., 1997), among others.

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[4] There is also evidence for Denmark that a loss of work has important effects on the probability of hospitalization for mental health problems in the short and long term (Browning & Heisesen, 2012).

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The principal contribution of this work is that it is the first exploration of how mental health affects results in the workplace in Chile. With a focus on certain inequalities in the impact of the disease on labor outcomes (employment and wages) as well as on a disease-related variable such as treatment.

This inequality of impact of mental health on labor issues constitutes one more element of socioeconomic inequality and research for this field in Chile is lacking. Moreover, apart from the instruments commonly used in the literature this work explores the index of domestic violence (FIV) and the expected lifespan of the population with basic education. Both variables are at the community level.

For the empirical analysis, the Social Protection Survey (EPS) of the year 2009 will be used. This survey was drawn up by the Microdata Center of the Department of Economics of the University of Chile for the Ministry of Labor and Social Security of Chile. The EPS provides information on income, debts, socioeconomic characteristics and other variables related to health shocks, income, history labor, preferences and, also, it contains a depression variable that is diagnosed as well as a self-reported variable that is constructed from binary questions about the existence of certain symptoms of the disease. Each version of the survery is representative of the Chilean population that is over 18 years of age.[5]

The results show that having poor mental health leads to a 20% reduction in the probability of being employed. For men, this effect reaches 47%. In addition to this, poor mental health also produces a decrease of 60% in the hourly wage of women and 50% for men. Finally, it is found that among wage earners, private sector workers are more affected by depression than their peers in the public sector.

The following section shows a brief summary of the background information and related literature. Section 3 describes the database and introduces the measurements of depression to be used. In section 4, an analysis of the depression rates in Chile and its characteristics is carried out. In section 5, the empirical strategy is developed. Section 6 shows the results of this estimation. Finally section 7 concludes the paper.

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[5] With the exception of 2002, which is representative of the universe of members of the pension system, both individual capitalization and the pay-as-you-go system. For that year the information was provided by the Superintendency of Pension Funds Administrators and by the Institute for Pension Standardization.

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2   Background and literature

Next is presented the background information and literature related to mental health and work outcomes. For this, every possible direction of causality was analyzed in a differentiated way. This paper then reviews the main instruments used in the international literature in order to correct this bi-causality between mental health and work outcome. Finally, the treatment literature and medical licenses for depression are examined.

2.1   The Relationship between Mental Health and Workers' Work Results

During the last few years, the study of depression has received considerable attention in international literature, not only because of the harmful effects on health but also because of its consequences on the productivity of the individual in the labor market. Chile has not been left out of this concern for the effects of the disease. This is why policymakers have sought to contribute to this area. For example, reforms have been developed for depression to provide access to care and treatment for such a disease. In 2001, The National Program for Diagnosis and Treatment of Depression was launched by the Ministry of Health, which increased the coverage of the disease. In addition, depression was included in the Explicit Health Guarantee System (GES) in 2006 ensuring care, quality and timeliness of treatment and maximum co-payment by the user.

There exists some evidence in Chile about the impact of depression on the health of individuals. According to the Disease Burden Study of the Chilean Ministry of Health, depression is the second highest cause of healthy years of life lost by Disability and premature death (ADL) in women. On the other hand, depression is responsible for one-third of workdays lost, constituting more than 40% of medical licenses and representing at least 25% of general practitioners' consultations in Primary Care (Concha et al., 1996).

The channel by which depression would affect labor results would be through mental absenteeism, that is to say, the individual goes to the work but does not complete his or her corresponding activities. Results are also affected by physical absenteeism, (absenteeism) That is, the individual is not going to work (Peng et al., 2013). Both

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manifestations generate a loss of productivity in the worker. In the worst case, this situation can lead to a dismissal, or it can also lead to a reduction of wages through the reduction of hours worked or by declines in performance bonds.

The impact of each of these effects could be different for particular groups of the population. For example, the difference in impact between men and women. This is due to the fact that the labor supply of women is much more restricted, a result of motherly roles in caring of children and pregnancy. On the other hand, the age group to which a worker belongs may affect the intensity of the symptoms of the disease on account of the different possibilities of recovering employment and also, in the prevalence rates of depression. In addition, educational level could also be a key factor in the diversity regarding the effects of depression. This is not only concerning the different impacts of employment but also for the dissimilar probabilities of diagnosis and treatment. Finally, the amount of impact on labor outcomes may depend on the type of employment to which the workers belong. This is because of how different the labor characteristics of salaried and independent workers may be. Even within workers who have salaries, those who work in the public and private sector may show differences as well. This is due to differences in labor mobility and the employment of performance related bonuses among those workers.

For these reasons, there is interest in reviewing heterogeneous effects for certain groups of the populations but additionally it is important to see how the effects of depression could be reflected in various results in the workplace. These results could be labor participation, and employment as well as labor supply and wage. In this respect, there is international evidence that in individuals with worse mental health this has a significant negative effect on the probability of participating in the workforce. Frijters et al. (2010) uses various models of estimation, utilizing the instrumental variable of the death of a close friend, finding robust evidence that a presence of depression has a 17% effect on the probability of being involved in the labor force.

There are investigations which have found that having a psyciatric disorder reduces employement for men and women by 11% (Ettner et al., 1997). In addition, productivity losses vary by occupation and educational background of affected individuals; professionals and people involved in sales show the highest productivity losses measured as absenteeism, (Kessler, Frank, 1997).

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Continuing with the subject of employment, the probability of being employed for individuals without depression is equal to that of people where their last episode of depression occurred in previous 8 years (Marcotte et al., 1999). Not only the effects of depression itself could affect labor outcomes, for example, children of depressed parents have an increased risk of depressive symptoms, and later in their lifetime a higher risk of suicidal thoughts. In the long run, consequences of depressive symptoms in children include poor school performance, problems with friends, and disruptive behaviors (Humensky et al., 2010), which could lead to poorer work outcomes than peers.

In addition to the effects on participation and employment, there exists evidence about the effect of depression on hours worked by individuals. For Mexico there is evidence that a worse state of mental health decreases the individual labor supply significantly for men, but not for women. (Michaelsen, 2012). In the same way Ettner et al. (1997) find that psychiatric disorders (stress, depression, among others) produce small reductions in the conditional working hours for men.

Literature has also focused on the effects of declinging mental health in the falls of individuals' income. The effect of poor mental health varies greatly throughout the distribution. However, having a mental illness most likely imposes income losses for the lower tail of the distribution, especially for women (Marcotte, Wilcox-Gok, 2003). Psychiatric disorders also produce a substantial drop in the conditional income of men by 13% and 18% in women. According to the authors, the larger reduction in conditional income than in hours worked suggests that psychiatric disorders affect workers' earnings primarily through the wage effect, (Ettner et al., 1997).

2.2   The Effect of Work Results on Mental Health of Individuals

Evidence of the causality between depression and labor outcomes could also be affected by the inverse relationship. For example, being unemployed for an extended period of time could affect the mental health of the individual. For this, we show the main related studies that investigate the causal relationship from the work result to the mental health of the individual.

2.2.1   Effects of Unexpected Unemployment on Individuals Close to Retirement

There is literature from the United States that has investigated the effect of a (exogenous) dismissal on the mental health of the worker. This was done using a sample consisting of individuals who were close to retirement. The results revealed that unemployed individuals have worse mental health than employees (Salm, 2009). The author did not find a causal effect of the (exogenous) loss of work on the mental health of the individual. This would suggest that the lower mental health of the unemployed compared to employees could be explained by the inverse relationship. Also, by using individuals close to retirement (Mandal & Roe, 2008) shows that involuntary job losses worsen mental health and reemployment recaptures previous mental status. In addition, the same study notes that re-entry into the workforce is beneficial for retirees. It was also noted that women suffer higher levels of impact than men after losing work by closing companies or mass layoffs. However, women also exhibit better psychological well-being than men after retirement.

Workers close to retirement present a significant increase in depressive symptoms associated with an initial loss of work, and in addition, an additional involuntary separation of work causes an effect not as great as the first, confirming that successive losses of work produce positive but weaker effects in depressive symptoms (Gallo et al., 2000). This effect might indicate some form of adaptation (Hallsten et al., 1999). Another explanation could be if macroeconomic changes make job losses more common and workers accept layoffs as part of a new labor contract, this could mean that in this new context job losses are lacking the necessary stress to trigger negative changes in psychological well-being (Gallo et al., 2006).

The relationship between individual unemployment and labor market conditions is unclear, on the one hand, a high unemployment rate makes it harder to find work again but, on the other hand, the stigma associated with being unemployed may be less severe. The evidence indicates that the negative effects of an individual's dismissal on depression and physical health are stronger when the local unemployment rate is low (Turner, 1995); furthermore, some studies show no effect on the relationship between individual unemployment, perceived health and local unemployment (Beland et al., 2002).

2.2.2   Expectations of Unemployment and Instability, and its Effects on Mental Health

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Individuals with higher expectations of losing work exhibit twice as many depressive symptoms as those who have low expectations of such an outcome. Individuals who lose their jobs show four times more symptoms than those who keep working. These results indicate that expectations are important to study the mental health effects of individuals who lose work among workers close to retirement (Mandal et al., 2010)

Job instability has been associated with poorer mental health (Ferri et al., 1998; Kivimaki et al., 2000). In addition, it has been observed that workers with contracts of limited duration have even more health problems (Benavides et al., 2000). Older workers who are likely facing their pensions could experience substantial economic hardship during unemployment (Kesslet et al., 1987) as well as limited options for re-employment and also lower wages when they do regain employment (Hipple, 1999). This is why the evidence of the relationship between unemployment and mental health aims to economically and psychologically secure new jobs (Dooley & Catalano, 1999).

2.3   Causality between Labor Result and Mental Health

To control for this possible bi-causality between depression and labor outcomes, the literature has used the tool known as the instrumental variable. Given the possibility that the variable depression is not exogenous, we proceeded to look for an instrument that is related to labor outcomes through its relation to the mental health of the individual. Some instruments used are the history of mental problems of relatives (Etnner et al., 1997;Marcotte et al., 2000), the number of mental disorders in childhood (Etnner et al., 1997), and the frequency of physical activity and stressful events in the participant's life (Hamilton et al., 1997). The more current studies incorporate religiosity (French, Alexandre, 2001; Chatterji et al., 2007), and finally the number of intentional homicides per thousand inhabitants in the state of residence and the presence of armed groups in the neighborhood for the case of participants who live in Mexico (Michaelsen, 2002).

There are also household characteristics related to poor mental health including overpopulation, household costs and lack of control over the home (Dunn, 2012). Furthermore home location (accessibility to services), neighborhood constructions (parks, recreation) and social connection to the community may have an indirect effect on health (Shawn, 2004). In the same area, there is a significant and negative

relationship between higher levels of green spaces and stress levels, indicating that living in areas with a high percentage of green spaces is associated with low levels of stress (Roe et al ., 2013).

2.4   Treatment and Leave: Other Factors Surrounding Depression

The treatment of depression is as important as its diagnosis. It would be expected that individuals undergoing treatment should have better work outcomes than those who do not. However, it has been observed that individuals who use health services more intensively are often those individuals who more sick, therefore, data would tend to show a relationship between treatment and poor work outcomes (Frank & Koss, 2005). According to a study carried out by the faculty of medicine of the University of Chile, 65% of individuals who present some type of depression realize a complete treatment. The remaining percentage is irregular in treatment, quits it, or simply rejects it. Presumably, this 65% of the individuals are those who present greater difficulties due to the disease (Retamal et al., 2004).

Once the depression has been diagnosed and depending on the complication of that diagnosis the individual could receive a medical license to be absent from work for the days stipulated therein. In Chile, it has been estimated the percentage of accepted, rejected and reduced medical leaves for a number of diseases. The results show that for the specific case of depression, 49% of the licenses are accepted, 18% are reduced and 33% are rejected (Dworsky & Duarte, 2013). In the same study, the short-term net loss of income due to the rejection of leave for the individual is estimated, and it has focused upon the first three months after rejection. The calculation shows that, for mental health illnesses the value of the loss will be approximately US$150 for the year 2017.

3   Data and Depression Measures

For the purposes of this article, data are used mainly from the Social Protection Survey (EPS) of 2009[6]. The EPS is a longitudinal household survey that attempts to characterize individuals for the purpose of social protection and identify Chilean labor market conditions. EPS provides information on income, debts, socioeconomic

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[6] This survey was developed the Microdatos Center of the Department of Economics of the University of Chile for the Ministry of Labor and Social Security of Chile.

characteristics and other variables related to health shocks, income, employment history, preferences and it also contains a diagnosed depression variable as well as a self-reported[7] variable that is constructed from binary questions about the existence of certain symptoms of the disease. The base contains 14,463 individuals and is representative of the Chilean population that is older than 18 years.

3.1 Measures of Depression

Given the availability of information in the EPS, two measures of depression will be used. The first is "Diagnosed Depression," and the second is an index generated from questions related to the symptoms of the individual's mental health. This variable is called the "Depression Index."

3.1.1 Diagnosed Depression

The EPS of 2009 has information on whether the individual has been diagnosed with depression. The related question is: *Have you been diagnosed with any of the following medical conditions, by a doctor? Does any diagnoses include depression?*

Apart from this information, the individual is asked if he or she has had treatment, if the answer is negative, he or she is asked about the main reason for not being treated. In addition, the individual is asked if they have applied for medical leave for their illness- asking for the cause of such absences and if any of these were rejected.

3.1.2 Depression Index

The index of depression that will be used in this work is based on a set of eight questions that seeks to capture some aspects of the depressive symptoms of the individual. The questionnaire coincides with "Short Form of the Center for epidemiological Studies Depression Scale" (CES-D-SF)[8] and has been used in other studies to measure the effect of debt on mental health (Hojman et al., 2013) and the effect of retirement on mental health (Calvo et al., 2013; Steffick, 2000). The questions used are as follows:

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[7] Working with self-reported variables in health issues could be related to measurement biases. For more detail, see Butler et al (1987).

[8] For more details see Randolf (1972).

1. Have you felt depressed?

2. Have you felt that everything you do is a struggle?

3. Have you felt that you feel unsettled during rest?

4. Have you felt happy?

5. Have you felt lonely?

6. Have you felt that you enjoy life?

7. Have you felt sad?

8. Have you felt tired?

Using the answers to these questions generates a psychological stress index. For each individual i and each response j a variable d_{ij} is created and takes the value of one when it indicates the presence of any symptom. For example, if you answer yes in 1, 2, 3, 5, 7 and 8 you will get $d_{ij} = 1 \ \forall j = 1,2,3,5,7,8.$ On the contrary, for questions 4 and 6 the variable $d_{ij} = 1$ when individuals respond negatively[9]. Once this is conducted and the numbers are found, the psychological stress index is generated as follows:

$$d_i = \sum_{j=1}^{8} d_{ij} \tag{1}$$

So d_i is the sum of the 8 questions and can take values between 0 and 8. Once this is done, we proceed to generate a binary index of psychological stress, which we will call "The Depression Index"[10], which takes the value one if it is above threshold $\bar{d}$ and zero if it is not, as shown below:

$$D_i = \begin{cases} 1 \ if \ d_i \geq \bar{d} \\ 0 \ if \ d_i < \bar{d}. \end{cases} \tag{2}$$

This binary index of depression will attempt to reflect the percentage of the population that presents the necessary symptoms sufficiently so that in their opinion

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[9] For more details see Hojman et al (2013).

[10] It will be called depression index, making it clear that stands apart from depression, allowing it to be a parameter that can capture a wider range of mental health illnesses of the individual.

they have such a disease, complementing our diagnosed depression variable already analyzed.

The choice[11] of $\bar{d}$ is of paramount importance to catalog an individual in each group. In this way, it follows (Hojman et al., 2013) and is chosen $\bar{d} = 6$ so as to approach the ENS depression rate for the year 2017. With $\bar{d} = 6$, the prevalence rate is 26%, compared to 17.2% in the ENS. Finally, we note that the correlation between the psychological stress index and the diagnosed depression variable is 0.32, while the correlation between the binary index of psychological stress and the diagnosed depression is 0.30.

3.2 Other controls

The EPS 2009 has very significant information for our study. In addition to the depression variables already analyzed, this database includes data of personal characteristics, and family, among others. The descriptive statistics of the main variables are shown below. These were grouped according to Socio-Demographic, Family Characteristics, Health and Labor Characteristics.

HERE TABLE (1)

As mentioned above, the EPS contains information about 14,463 individuals. Due to the non-response by some individuals on questions relevant to this study, we work with a subsample of 11,129 individuals which is representative of people between 18 and 65 years. Of this sub-sample, women represent 51%. The average number of years of education is 10.3 years where 35% have basic K-8 education, 44% have high school education and the remaining 21% have tertiary education. 63% are married and 23% are single. 74% do not play sports and 9% have been hospitalized during the last two years. Of the sample, only 7,313 individuals work, which represents 65.7%. Of the individuals who work, 65% have a work contract and only 17% belong to a union. In addition, 23% work under their own provisions. Finally, 9% of the population during the last 2 years

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[11] For example, in the United States (Steffclick 2000) one can choose $\bar{d} = 4$ for a population of individuals close to retirement.

has at least one deceased relative and 7% have at least one relative with depression. Both variables will be very relevant, given their use in the estimation using instrumental variables.

4   Depression in Chile

Within the hypotheses of work we are seeking to understand the heterogeneity of impacts such as gender, schooling, and age, principally in employment and wages. Therefore, it is necessary to review the percentage of the population that presents depression according to certain characteristics. In regard to these topics Table 2 is shown, containing data on the prevalence[12] of depression in Chile using EPS for 2009 for men and women under 65 years.

HERE TABLE (2)

The prevalence in the general population corresponds to 9.1% under diagnosed depression and 26.2% using the binary index of psychological stress (depression index). This last figure tries to characterize the 21% of the population that has had some depressive episode over the course of their lives according to the national survey of health of the year 2009[13].

Women have a rate of 14.7% versus 3.3% of men using diagnosed depression, whereas for our depression index, the values are 34.2% and 17.7% respectively for women and men. It is also observed that women at all educational levels and ages have a higher prevalence rate than men.

The higher prevalence of mental illness in women coincides with almost all related research. According to studies, the explanation that has been suggested for gender difference lies in the way symptoms are perceived, evaluated and acted upon. It is assumed that women have greater tendencies to verbalize their health disorders and seek health care (Cortès et al 2004). However, the literature does not find gender differences in the verbalization of health disorders, which would suggest that gender differences in health are real and are explained by less favorable living conditions for women

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[12] Prevalence shall be understood as the probability of presenting the disease with respect to all individuals in the sample.

[13] For more details on the results of the ENS of the year 2009 see Hojman 2013.

(Macintyre et al., 1999). In addition, there is a negative relationship between educational level and prevalence of depression, which is observable for women in both of the utilized measures of depression.

In conclusion, it is clear that there exist significant gender differences in prevalence rates, and that the prevalence rate of women is significantly higher than that of men. In addition to gender heterogeneity, the prevalence rate presented gradients by educational level and by age. Specifically, the prevalence rate is declining at the educational level for both measures of depression in the case of women but only under depression index for men. For the case of age, the prevalence rate is increasing for women and also for men when following the diagnosed depression.

There are significant differences in employment for individuals with depression and those without it in another area as well. The average employment rate for individuals with poor mental health is significantly lower for both men and women[14]. Table 3 shows the occupational situation of individuals less than 65 years of age.

HERE TABLE (3)

Disaggregating employment by educational level is shown, showing the differences for individuals with and without depression. Gaps in employment are maintained for all educational levels, 20% for individuals of primary, 25.3% of secondary and 11.9% of higher education for diagnosed depression. For the depression index, the percentages are 19.5%, 15.2% and 8.3% for primary, secondary and tertiary education, respectively.

Therefore, an individual with depression would have a lower probability of being employed than a healthy person; this effect would be in the range of 18.6% and 22%. This pattern is also true for all educational levels. It is also worth noting that an individual with poor mental health is more likely to be unemployed and out of workforce than a healthy subject.

Another important feature of depression is that it has great effects on wages. In this research, it's been found that there are significant differences in wages for individuals who have depression and those who do not. The average salary for individuals with poor mental health is significantly lower and in this regard it's the same for both men

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[14] In annexes the same analysis is found for men and women separately.

and women. Table 4 shows the average wage for individuals in the sample with and without depression.[15]

HERE TABLE (4)

The average hourly wage for those with the disease is significantly lower than their healthy counterparts for both measures of depression. Also, we show the disaggregating wage by educational level, stating that the income gap is lower for the first two education cycles (under both measures). However, for those with higher education, individuals without depression gain 27% more than those with poorer mental health. It is important to note that the wage gaps in the first two educational stages may reflect the selection of the most and/or those who managed to maintain their work, due to the low rates of employability (Table 3) for individuals with depression with education basic or average education.

In the same area, there are differentiated gaps in wages for individuals with depression, depending on the type of employment. The average wage for individuals with depression is significantly lower if they work as an independent employee with respect to wage-earning workers. On the contrary, the loss of income from poor mental health in the public sector is not significant, as is the case in the private sector. This can be seen in Table 5. In this table, the wage gaps between independent and dependent workers are outlined, and within the latter the sample is subdivided to analyze the public and private sector workers as well. In the annexes the same analysis is found for both men and women separately.

HERE TABLE (5)

Individuals with poor mental health have lower income when working independently under both definitions of depression. For individuals with diagnosed depression, it is shown that there is a lower average salary if one works as an independent, which reaches $ 334 per hour. When we use our depression index, the losses of working independently reach an average of $ 263 per hour. For individuals with good mental

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[15] In annexes the same analysis is found for men and women separately.

health, there are no benefits of working as a dependent in comparison to working as an independent. In conclusion, an individual who is depressed earns more income when working as a dependent, which corresponds with the conclusion that independent individuals are more affected by lower productivity and mood. Similar to the explanation of (Kessler & Frank 1997).

In a different sphere, when looking at individuals with or without depression in the public sector, we realize that wage gaps are not significant and may be due to the rigidity in these types of work in Chile. In the private sector, individuals with depression have an average fall in income of 24% for both definitions of the disease.

Another aspect related to depression is the treatment of the disease. In this paper we have cited evidence that the treatment does not have a positive correlation to wages[16]. This is for both measures of depression in men and women. In Table 6, it is possible to see the differences in wages for individuals undergoing treatment and those who do not. In the annexes the same analysis is shown separately for men and women.

HERE TABLE (6)

The most significant result would indicate that there are no notable gains between individuals with poor mental health who are under treatment and those who are not, for both measures of depression. The same result occurs when men and women are analyzed separately in the Annexes. This result, which assigns a negative relationship between treatment and labor outcomes, is in line with the literature that proposes that the individuals most affected by the disease are those who access treatment[17] (Frank & Koss, 2005). In order to affirm this hypothesis, Figure 1 shows the distribution of the individuals treated according to the psychological stress index and the proportion of those treated for each index value.

HERE FIGURE (1)

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[16] Additionally, the impact of treatment of depression in the workplace was analyzed, finding no significant effects.

[17] It is important to emphasize that only the individuals who have been diagnosed with depression are asked if they are under treatment. This is why under the displayed measure, there is no counterfactual group.

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Two conclusions can be drawn from Figure 1. The first is that there appears a clear non-randomness in the participation of treatment among the different segments of our index, i.e., the probability of being treated is much greater for individuals with a higher psychological stress index, reaching 10% for individuals with $d_i = 6$ and 24.7% for subjects with $d_i = 8$. This result is not surprising, given the evidence mentioned by Frank and Koss (2005). Second, the bulk of the individuals treated are women, conforming to the existing information that shows women as having worse mental health and / or being likely to verbalize their health disorders and seek health care, (Cortès et al., 2004).

5   Empirical Strategy

The variable of labor outcome in the workplace y can be determined by multiple factors such as educational level, experience, gender, and training among others. Given the previous statement, y can be represented as the function of demographic variables $h_1(.)$ represented by vector X_1 and mental health of the individual, which we will call D as shown in (3)

$$y = h_1(X_1, D) \tag{3}$$

Another assertion is that the dependence between employment and mental health can also be due to the inverse relation to what is exposed in (3), that is, that their employment situation can affect the mental health of the individual. In this way, depression can be the function $h_2(.)$ of demographic variables represented by the vector X_2 and of the labor situation.

$$D = h_2(X_2, y) \tag{4}$$

Given this, a good empirical approximation to estimate equations (3) and (4) may be found by using a deterministic function for each one, which depends upon certain characteristics of the individual and upon a random component. Therefore (3) and (4) are estimated by the following equations, where $u_{1,i}$ is an error term.

$$y_i = f_1(X_{1,i}, D_i) + u_{1,i} \tag{5}$$

$$D_i = f_2(X_{2,i}) + u_{2,i} \tag{6}$$

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It should be noted that, in order to measure the causality of the depression to the labor result, it is necessary to take note of the endogeneity of the variable D. This is why, in the equation (6), $X_{2,i}$ includes the common demographic variables (level of education, gender, among others) as well as the instruments needed to solve the problem of endogeneity. This procedure is known as least squares in two stages. Once it has been verified that the instruments are not weak and that they are exogenous, $\hat{D}_i$ is estimated using the parameters estimated in (6). The variable $\hat{D}_i$ corresponds to the exogenous part of the depression variable once it is corrected by instrumental variables.

The variable y_i that symbolizes a general result may simply represent participation in the labor market as employment or unemployment. In addition, if the objective is to go further and measure the impact of poor mental health on wages, it is necessary first to determine the coefficient values of equations (5) and (6) using employment e_i, as variable y_i. Once this is done, the equation we have to estimate is (7) for the salary logarithm per hour w_i.

$$w_i = f_3(X_{3,i}, \hat{D}_i \mid e_i = 1) + (u_{3,i} \mid e_i = 1) \tag{7}$$

In this way, it is possible to recover the parameters related to the mental health variable in order to quantify the effect that it has on employment and wages[18]. However, it is necessary to have instruments that are sufficiently related to the potentially endogenous variable and which in turn are exogenous to the labor performance. On the other hand, in order to estimate the parameters in (7) in an unbiased manner, the selection bias should be corrected is order to account for that fact that there is only a positive income for those individuals who work. This procedure is carried out using the Heckman method.

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[18] We know that in our analysis we could be omitting certain variables relevant to the variable of participation as for the salary variable and which, in turn, could be related to depression (effort, ability, among others). That is why in X_2 and X_2 we control for the largest number of variables that are theoretically related to the variable to be analyzed to mitigate this possible problem.

6   Results

Below, we show the estimates between the ratio of poor mental health and labor outcomes. To do this, in the first instance, the correlation between mental health and different labor outcomes (employment and wages) is reviewed. Then, we try to identify causality of depression to employment and wages through the use of instrumental variables.

6.1   Correlation between Mental Health and Labor Result

This section provides evidence of the correlation between the mental health measure used and work outcomes. For this, we estimated the probability of being employed by using linear models, providing a control for the vector of socio-demographic (SD) and family characteristics (CF)[19], as shown below:

$$e_i = \alpha + \beta_1 \cdot D_i + \beta_2 \cdot Age_i + \beta_3 \cdot Age_i^2 + \beta_4 \cdot Female_i + \beta_5 \cdot Secondary\ Education_i + \beta_6 \cdot Terciary\ Education_i$$
$$+ \beta_7 \cdot Study_i + \beta_8 \cdot Training_i + \beta_9 \cdot Household_i + \beta_{10} \cdot Quintile\ of\ non\text{-}labor\ Income_i$$
$$+ \beta_{11} \cdot Numbers\ of\ children\ from\ 0\ to\ 1\ years_i + \beta_{12} \cdot Numbers\ of\ children\ from\ 2\ to\ 4\ years_i$$
$$+ \beta_{13} \cdot Numbers\ of\ children\ from\ 5\ to\ 13\ years_i + \beta_{14} \cdot Numbers\ of\ children\ from\ 14\ to\ 18\ years_i + u_i.$$

The results are shown in Table 7, using our depression index[20] and the controls already indicated for the whole sample:

HERE TABLE (7)

The negative correlation between our measure of depression and employment is 9.6%. In addition, the controls show the expected signs. For example, an additional year of age has a significant positive sign, whereas the parameter of age squared is significantly negative. Women are less likely to be employed. Having a secondary education increases the probability of being employed by 11%, while individuals with higher education are 23% more likely to be employed. There is a negative correlation between the non-working income quintile and the probability of being employed. Finally, the

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[19] Grouped as in Table 1

[20] The results for diagnosed depression and the psychological stress index are shown in Table 17 in annexes. It is important to note that the conclusions do not depend on the measure of depression to be used.

number of children per segment has a negative impact on the probability of employment. Table 8 below shows the correlation between the index of depression and employment for different sub-samples.

HERE TABLE (8)

The model measures the direct correlation between depression and employment, this result corresponds to the information given in Table 7. On their behalf, models (2) and (3) measure gender-differentiated effects. Model (4) measures the correlation only for individuals with basic education. In addition, models (5) and (6) measure for subjects with a high school education and/or higher education, respectively. Finally, models (7), (8), and (9) analyze age-differentiated effects.

When the entire sample is taken into consideration, the correlation between the depression and employment indexes is negative and significant, reaching a 9.5% lower probability of employment for individuals with poor mental health, as the model shows. Models (2) and (3) find evidence that the correlation with employment is lower for women than for men, reaching 5.3% for women in (2) and 14.3% for men in (3).

When then looked for differentiated effects by educational level in the models (4), (5), and (6). For individuals with basic education in (4) there is a negative correlation of 9.8% while subjects with a secondary education are found to have a negative correlation of 8.4% as shown in the model (5). For individuals with higher education in (6), there is only a negative correlation of 5.2%. In the case of age-differentiated effects, the highest correlation is shown for individuals between 50 and 65 years old in (9). It is also found[21] that being under treatment has a significantly negative correlation with employment. An individual undergoing depression treatment has a lower expectation of employment, which is in line with Frank and Koss (2005) who mention that individuals with worse mental health are the ones who access the most treatment, and is also in line with what is analyzed in Figure 1.

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[21] Results that can be obtained upon request to the author

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Once the estimation for employment is made, the correlation between our depression index[22] and wages is shown, which is displayed in Table 9. In order to do this, we corrected for the possible selection bias that occurs when observing a positive wage only among Individuals who work. This is done by using the correction known as the Heckman method. This procedure requires exclusion variables in order to be able to identify the effect of bias[23] on the estimate. The exclusion variables chosen are the non-labor income quintile, the number of children for participants of each age bracket and the binary variable that takes the value of one only if the individual is head of household. All of these variables are related to the probability of being employed but not to the salary that the individuals receive, which is a necessary condition in order to quantify the impact of selection bias.

HERE TABLE (9)

Model (1) measures the direct correlation between depression and wages. For their part, models (2) and (3) measure the correlation for women and men, respectively. Model (4) measures the correlation between mental health and wages, only taking into consideration individuals with basic education. Models (5) and (6) measure the correlation for subjects with secondary and higher education, respectively. The models (7), (8), (9) and (10) measure the correlation for different groups according to their type of work, whether independent or salaried. Within this group, the sample is subdivided into those working in the public or private sector.

It can be seen that when the whole sample is analyzed, the correlation between our index and wages is both negative and significant, reaching a 12% lower salary for people with poor mental health. When we observe the effects for women and men separately in the models (2) and (3) respectively the magnitude of this correlation is maintained. It shows that there are different effects in regards to educational level. Individuals with basic education in (4) have a negative and non-significant correlation; however, in model (5), workers with a secondary education have a negative correlation

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[22] The results, for the diagnosed depression and psychological stress index, shown in annexes of Table 18 and Table 19 respectively
[23] For more details see Heckman (1974)

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of 11.8% and those of higher education in (6) reach a magnitude of 18.2% lower wage per hour, both significant correlations.

The model (7) shows the significant negative effect for individuals with poor mental health working independently, the magnitude is a 19% lower salary, stronger than the average decline. This is in correspondence with the exposition by Kessler and Frank (1997) on the important role of absenteeism given the disease. The salaried individuals with depression obtain a 9.8% lower salary, as shown in (8). Finally, there is a negative and significant correlation for individuals in the public and private sector as in (9) and (10) respectively[24].

6.2   Identifying a Causal Effect in Labor Results: Instrumental Variables

In the next section, an attempt is made to identify a causal effect of depression on labor outcomes. Instrumental variable will be used in an attempt to capture differences in personal and communal shocks that might be related to the onset of depression. The main features of our instruments are detailed below.

6.2.1   Instrumental Variables

In order to be able to identify the causal effect, the procedure of instrumental variables will be used. For this, in our case it is necessary to find variables that are related to depression, and that are not related to the work result. To this end, the following potential instruments were chosen. First, the number of deceased relatives in the last two years is used as a variable. A similar variable is used in the literature as Frijters et al. (2010) used as an instrument the death of a close friend. Unlike this variable, our instrument is more related to the home which could clearly affect the individual's work decision. For example, if the death of a family member was due to a disease that would have restricted the kind of work the individual could access in the past. Because of this, the death of any family member is taken into consideration, not

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[24] Differentiated effects on wages by age group were also analyzed. Finding that the correlation is 15% and is similar between different age groups.

just the nearby nucleus[25], in order to minimize this possible relationship with the individual's labor decision.

Also, the number of family members with diagnosed depression is used, similar to what was done by Ettener (1997). All the family members are counted in the home, to minimize the possible relationship of the access of the diagnosis of the nucleus of the home to better possibilities of care. This is due, for example, to better paid employment of the head of household.

In order to build instruments, two variables were added at the communal level[26]. The first instrument corresponds to the Intrafamily Violence Rate (VIF) from 2008. This is measured by the rate of complaints of domestic violence per 100,000 inhabitants. These data are provided by the Ministry of the Interior through the Public Security Division for the vast majority of communes. Intuition would say that a higher VIF rate would be related to a greater number of individuals with depression. In support of this idea is the information that there is a positive correlation between regions with a higher VIF rate and the number of individuals who have depression using EPS 2009. Additionally, this variable has also been used in the literature because of its correlation with the mental health of the individual (Golding, 1999; Dutton et al., 2006).

However, the VIF rate could be also related to labor outcomes in the community. In other words, communities with greater cases of domestic violence could generate less employment opportunities and lower wages. One argument against this criticism is to take into consideration that the search for employment not only focuses on the comminuty of residence. Although there are cases of victims who see their employment possibilities diminish by the violence that they live in their home, many may also seek refuge in work so as to evade their reality. For example, according to a National Women's Service[27] (SERNAM) survey of 553 women victims of domestic violence, 75% have experienced violence during the past 12 months. Even so, 59.3% of women are currently working, 31.3% worked for some prior period and only 9.4% do not work and never have done so. This rate of 59% of working women is above the average of

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[25] Within a household there may be more than one family. Each family is called a nucleus. Therefore in the same home, there can be more than one family.

[26] Chile is made up of 15 regions, each region being divided by provinces. The number of provinces is 53, and each province is subdivided by communes, which now reach a total of 345.

[27] Estimation of the cost of violence against women in the intrafamiliar context in Chile. DOMOs Women's Development Center (Nov. 2010).

50% participation among women in Chile. It is important to add that although this is a fact to consider, it is not conclusive evidence on the possible relation between intra-family violence and employment.

The second communal instrument corresponds to the life expectancy calculated for 20 year olds who have between 0 and 8 years of schooling, that is, those who have basic education. This variable is generated from information from the years 1997 to 2006 by the Ministry of Health based on data from the Department of Health Statistics and Information (DEIS). Our hypothesis is that life expectancy at the community level could reflect the different realities faced by individuals, not only referring to the prevalence of diseases in the community, but also to access to timely diagnosis and treatment. In support of this idea is data that shows that there is a negative correlation between the life expectancy in a region and the number of individuals who show with depression using the EPS of 2009. In addition there are also studies that have found a relationship between the life expectancy of individuals and the presence of mental health illnesses (Chang et al., 2011).

Like the VIF rate, this instrument could be criticized for its possible relationship with labor outcomes. That is to say, low-income communes would have lower life expectancies. This comment, although plausible does not take into account that deaths by accidents are equally valued by individuals of 20 years who have the same educational level and live in communes of different socioeconomic levels. It is important to add that although the previous counterargument may be feasible, it is not conclusive evidence on the possible relationship between life expectancy and employment. In addition, the results obtained in the estimation by instrumental variables that will be presented in the next section are not altered by eliminating this instrument (Table 20), which removes the arbitrariness from the inclusion of this variable in the estimation. Finally, Table 10, which summarizes the information of the instruments by region, is shown.

HERE TABLE (10)

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As can be seen from Table 10, there is significant variability of our potential instruments across regions. This, in turn, is even more notable among the communes. This dispersion, would allow us to identify the causality between mental health and labor outcomes.

6.2.2 Estimation with Instrumental Variables

Using the instruments already analyzed, all possible combinations[28] were estimated by first using one variable at a time and then subsets of the variables. This was done because the estimate using the number of deceased families individually was the only to deliver significant effects on employment, even when all the instruments delivered effects in the expected direction. After this, we began to evaluate the estimate by using more than one instrument at a time through analyzing whether the instruments were sufficiently correlated with the mental health variable. In addition, it should be noted that the instruments were not endogenous. The first procedure was carried out using the F test of the first stage, which must be greater than 10, and also using the partial F test between the variable in question and the instrument to be used. For the second procedure, the overidentification J test was used, which is distributed in a chi-square and its null hypothesis is that the instruments are non-endogenous. Therefore, if the null is rejected, there is evidence that a subset of the instruments is endogenous. Finally, it was decided to use the four instruments for estimation. Table 11 shows the estimates for the probability of employment for different samples once the binary variable of psychological stress has been applied.[29]

HERE TABLE (11)

As shown in (1), individuals with poor mental health have on average a 21% lower probability of being employed. When this effect is only estimated among women in (2) the impact reaches 16% chance of being not significant. On the other hand, for men in column (3) the impact of lower probability is 47%. In line with what as previously seen, there was a greater negative correlation for males than females. Then, different effects

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[28] For more detail see Table 20 in the annexes.

[29] Estimates for the likelihood of working using alternative mental health measures are given in table 21 in annexes. In this table, we can also see the binary index of psychological stress when a threshold d = 7 is chosen. This is done in order to show that the choice of threshold does not make a difference in the results obtained.

are sought by educational level and by age, finding no significant evidence. However, when the average effect of depression on employment is estimated, eliminating those over 50 and under 65, the impact rises to 25%. This may be because these individuals are less likely to be affected by their depression due to the likelihood that they will soon leave the workforce. The estimation of the first stage is in annexes, but as said before, we used estimation using all the instruments and the choice to eliminate some instruments does not modify to a great extent the magnitude of the effect. This generates the loss of significance of the parameter of interest only in some cases.

This increase in the magnitude of the impact of poor mental health on employment, 21% compared to the 9.5% correlation obtained in Table 7, is mainly due to the fact that the causality obtained is a weighted average of local effects on individuals, which has some relation to the analyzed instruments. For example, Michaelsen (2012), using instrumental variables when analyzing Mexico, finds that poor mental health has a 26% impact on lower probability of employment.

Finally, we proceed to estimate the effect of poor mental health on wages. In order to do this, the instrumentalized variable[30] and socio-demographic controls and family characteristics are used. The results are shown in Table 12, where different effects are sought by gender, educational level and type of work. The exclusion variables are the same as those that were previously used to identify the correlation between depression and mental health.

HERE TABLE (12)

The impact of poor mental health is reflected in a 56% reduction in hourly wages as shown in (1). The negative impact for women is significant, reaching 60% whie it sits at 50% for men. When we seek differentiated effects by educational level, we do not find a significant effect of poor mental health for individuals with basic and tertiary education. However, there is a significant effect that reaches 62% for individuals with a secondary education.

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[30] The estimation, using all possible combinations of instruments and their effect on wages, can be seen in table 20 in the annexes.

Finally, we analyze the differential effects of depression by type of employment on the hourly wage. Among independent workers, there is no significant effect of depression. However, for salaried workers, having poor mental health produces a 54% reduction in hourly wages. Among wage earners, the group of those who are in the private sector is affected by a 51% reduction in their wages due to depression. The public sector clerks do not see their salary affected by poor mental health. We also sought age-differentiated effects, finding no significant evidence. However, when the impact of depression on wages is estimated after eliminating the group of individuals between 18 years and 30 years, the average effect remains constant. That is, the biggest loss of income due to poor mental health is between the ages of 30 and 65. At this stage, the wage may be affected in greater proportion by the accumulated experience and the work history of the individual.

7   Conclusions

Mental health has important effects not only on the health of the individual but also on the results obtained in their work. The characteristics of depression in Chile were explored in search of a relationship between both variables. The definition of diagnostic depression created from the definition of mental health in the first measure, and subsequently an index of depression, which is constructed from some symptoms reported by individuals. It is found that the prevalence rate of women is higher in both mental health measures than that of men. Additionally, women with higher schooling have a lower prevalence rate, which also occurs for men when using the depression index. In the same area, the prevalence rate increases with respect to age for men and women when using the depression index.

With all this information, we measure the impact of mental health on employment and wages. For this, the tool of instrumental variables is used, in order to control for the possible bi-causality between the variables. Using the index of depression the results tell us that poor mental health would produce an average reduction of 21% in the probability of being employed. For men, this impact would reach a 47% lower probability rate. Differences are estimated by educational level and by age groups, with no significant effects found.

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As previously mentioned, women have the highest prevalence rate of 34% compared to 17% for men under the depression index. Despite this, the greatest impact on employment is for men. Possibly this occurs because the lower rate of employment of women is not produced primarily by mental health. For example, the employment rate among all women is measured at 49%. The rate for those with depression is 44% and for those who do not present depression it is 54.2%. In turn, for all men the employment rate is 81%, but for those with depression it is only 67.9% (see Table 13 in Annexes). That shows that, if there is causality between depression and employment, the magnitude of this effect should be greater for men.

On the other hand, the impact on wages would reach an average decrease of 56%, with women falling by 60%, compared to a 50% reduction for men. Different effects on wages according to educational level, age and type of employment were also explored. Workers with middle and higher education are more affected by having poor mental health than individuals with basic education, although the effect on individuals with a high school education is the only one that is significant. This could be due to the specialization and / or positions that individuals with more education and without depression can access that would be very difficult to have for subjects with the same years of schooling but with depression. For example, a sales manager who is empathic with salespeople and self-reliant compared to a sales manager who manifests insecurity to his workers because of problems with his own mental health. This explanation is not demonstrated empirically in this work, remaining as a challenge for the future. In addition, we also sought differentiated impacts by age groups and did not find significant effects.

It was found that individuals working in the private sector see their wages reduced by 51%, while the impact of poor mental health on public sector works was not significant. This difference could be due to the wage rigidities presented by public works in Chile (Muñoz, 2013) regarding commissions or performance bonuses in some private sector jobs. Because no information is available if the individual receives a performance bonus in addition to his salary, it is not possible to verify this mechanism to explain the results obtained.

The results obtained are robust to the definition of mental health used. This becomes clear, when using the psychological stress index instead of the depression index. This

also occurs when the threshold of $\bar{d} = 6$ to $\bar{d} = 7$ is changed in the elaboration of the depression index. On the other hand, the choice of which subset of instruments to use does not modify to a larger extent the obtained results. This is related to the choice to include the estimation of the impacts on workplace results of the communal life expectancy, variable with a greater probability of being correlated with the labor results.

Treatment of depression is also a variable of interest in this research. We look for differences in employment and wages between individuals who were treated for depression and those who did not receive treatment. The results show that there were no significant gaps between both groups of individuals. Therefore, we analyzed the causality of entering a treatment using Figure 1, verifying what has been stated in the literature, which is mainly that the individuals most affected by the disease are those who access a treatment. In conclusion, access to treatment would be of paramount importance among individuals who are affected by a mental health illness. However, since it is not a completely exogenous variable, its implementation in the regression analysis is beyond the scope of this work.

This research gives the first indications of the real effects of mental problems in the Chilean labor market. The decrease in the probability of employment and the reduction of the salary are particularly noteworthy. The channel through which this disease can produce these effects is through a mental absenteeism or an increase in absenteeism, producing a reduction in worker productivity. This can trigger, in some cases, dismissal or reduction of wages where the decrease in wages may be due to a drop in hours worked or a decrease in performance bonuses.

Although there is no empirical evidence on the treatment of depression in this work, it is important to take into account that the losses related to the disease could be compensated for to a certain extent by a timely diagnosis and then an effective treatment. It is for this reason that policies aimed at facilitating diagnosis and treatment by the State could be cost effective investments. This situation would generate greater concern on the part of the citizenship by the disease and would prevent that people do not accede to the treatment by availability of resources.

The implementation of a similar strategy that is followed by adding the treatment of depression to the estimate remains a challenge for the future. This could give insights into the relevance of public policy to the implementation of projects such as the one

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made by GES in 2006. Additionally, a future challenge is to quantify the long-term impacts due to the income that a country like Chile no longer receives by not having a massive policy of treating depression. In another area, it is possible to use information from the data panel of the EPS for different years, in order to capture how the impact of mental health varies as the individual's time and work situation changes. Finally, the inclusion of other instruments that are less likely to be correlated with labor results could confirm the results presented in this paper.

REFERENCES

Alexandre PK., and French MT. (2001). Labor supply of poor residents in Metropolitan Miami, Florida: The role of depression and the co-morbid effects of substance use. *Journal of Mental Health Policy Economics*, 4, pp. 161–173.

Béland, F., Birch, S., Stoddart, G., (2002). Unemployment and health: contextual-level influences on the production of health in populations. Social Science & Medicine 55, 2033–2052.

Bartel, A. and Taubman, P. (1979). Health and labor market success: The role of various diseases. *Review of Economics and Statistics*, 61, pp. 1-8.

Black,S., Devereux,P., Salvanes,K (2012). Losing heart? .The effect of job displacement on health. *NBER Working Paper No. 18660*

Benavides FG, Benach J, Diez- Roux AV, Román C (2000). How do types of employment relate to health indicators? Findings from the second Eurpean Survey on Working Conditions. *J Epidemiol Community Health 2000; 54:494-501*

Butler, J. S., Burkhauser, R. V., Mitchell, J. M., & Pincus, T. P. (1987). Measurement error in self-reported health variables. *The Review of Economics and Statistics, 644-650.*

Browning, M and Heinesen, E. (2012). "Effect of job loss due to plant closure on mortality and hospitalization," *Journal of Health Economics*, Elsevier, vol. 31(4), pages 599-616.

Card, D 1991. "Intertemporal Labor Supply: An Assessment," *NBER Working Papers* 3602, National Bureau of Economic Research, Inc.

Chatterji, P., Alegria, M., Lu, M. and Takeuchi D. (2007). Psychiatric disorders and labor market outcomes: Evidence from the National Latino and Asian American

Study. *Health Economics*, 16, pp. 1069-1090.

Clark AE., Oswald AJ. (1994). Unhappiness and unemployment. *Economic Journal*, 104, pp. 648-659.

Concha, M., Aguilera, X., Salas, J. (1996). Estudio de Carga de Enfermedad, Informe Final. Ministerio de Salud de Chile.

Duarte., F & Dworsky., M. (2013) "Claim Rejections in Chile's Private Sickness Insurance System: Are Large Disparities Across Health Conditions Optimal?".

Dunn JR. Housing and inequalities in health: A study of socioeconomic dimensión of housing and self reported health from a survey of Vancouver residents. J Epidemiol Community Health. 2002.

Cornwell, K., Forbes, C., Inder, B. and Meadows, G. (2009). Mental illness and its effects on labour market outcomes. *Journal of Mental Health Policy and Economics*, 12, pp. 107- 118.

Cortès I, Artazcoz L, Rodríguez M, Borrell C (2004). Desigualdades en la salud mental de la población ocupada y factores laborales asociados. Gac Sanit; 18: 304-9.

Dockery AM. (2005). Mental health and labour force status in Australia. *Curtin University of Technology, Working Paper Series, 5/18.*

Ettner, S., Frank, R. and Kessler, R. (1997). The impact of psychiatric disorders on labor market outcomes. *Industrial and Labor Relations Review*, 51, pp. 64–81.

Ferrie JE, Shipley MJ, Marmot MG, Stansfeld SA, Smith GD (1998). An uncertain future: the health effects of threats to employment secutiry in White-collar men and womer. Am J public health 1998; 88:1030-6 y

Flatau, P., Galea, J. and Petridis, R. (2000). Mental Health and wellbeing and unemployment. *Australian Economic Review*, 33, pp. 161-181.

Frank and Koss (2005). Mental Health and Labor Markets Productivity Loss and Restoration.

Frijters,P., Johnston,D., Shields, A (2010). Mental Health and Labour Market Participation: Evidence from IV Panel Data Models. *IZA DP No. 4883.*

Gallo W, Bradley E, Siegel M, Kasl S (2010). Health effects of involuntary job loss among older workers: findings from Health and Retirement Study. The Journals of Gerontology: Psychological Sciences and Social Sciences 2000; 55: S131-140.

Ghatak, A (2010). Health, labour supply and wages: a critical review of literature. *The*

Indian economic journal. - New Delhi: Academic Foundation, ISSN 0019-4662, ZDB-ID 2182282. - Vol. 57. 2010, 4, p. 118-143

Hamilton, VH., Merrigan, P. and Dufresne, E. (1997). Down and out: Estimating the relationship between mental health and unemployment. *HealthEconomics*, 6, pp. 397–406.

Hallsten LG, Grossi G, Westerlund H (1999) Unemployment, labour market policy and health in Sweden during years of crisis in the 1990's. Int Arch Occup Environ Health 72(Suppl):s28–s30

Hipple, S (1999). "Worker Displacement in the Mid- 1990s." *Monthly Labor Review 122 (July): 15–32.*

Johnston, D., Lee, W-S. (2012). Extra Status and Extra Stress: Are Promotions Good for Us?. *IZA DP No. 6675*

Kessler, R. C., House, J. S., & Turner, J. B. (1987). Unemployment and health in a community sample. *Journal of Health and Social Behavior, 28,51–59*

Kessler RC and Frank RG. (1997). The impact of psychiatric disorders on work loss days. *Psychological Medicine*, 27, pp. 861-873.

Kessler, RC. (1997). The effect of stress ful life event son depression. *Annual Review of Psychology*, 48, pp. 191-214.

Kivimaki M, Vahtera J, Pentti J, Ferrie JE (2000). Factors underlying the effect of organisational downsizing on health of employees: longitudinal cohort study. BMJ 2000; 320: 971-5.

Kirson, N (2007). Work, Stress and Health: Some Adverse Effects of Female Labor Force Participation. *Harvard University; JEL Classification: I10, I18, J10, J21*

Lourex, Justin, John Rizzo, and robin Sickles (2003). Health, Mental health, and Labour Productivity: The Role of Self-Reporting Bias. www.ruf.rice.edu/~rsickles.

Macintyre S, Ford G, Hunt K (1999). Do women «over-report» morbidity? Men's and women's responses to structured prompting on a standard question on long standing illness. Soc Sci Med 48:89-98

Mandal ,B., & Roe, B.(2008). Job loss, retirement and the mental health of older Americans. The Journal of Ment Health Policy and Economics. 2008 December; 11(4): 167–176.

Mandal ,B., & Gallo,.W & Ayyagari, P. (2010). Job loss and depression: The role of

subjective expectations. Social Science & Medicine.

Marcotte DE, Wilcox-Gök V, Redmon P (1999). Prevalence and Patterns of Major Depressive Disorder in the United States Labor Force. Jounal of Mental Health Policy and Economics 2(3): 123-132.

Marcotte DE., Wilcox-Gok V. and Redmon DP. (2000). The labor market effects of mental illness: The case of affective disorders. In The Economics of Disability, D. Salkever and Sorkin, A. (Greenwich, CT: JAI Press), 181-210.

Marcotte DE. and Wilcox-Gok, V. (2001). Estimating the employment and earnings costs of mental illness: Recent developments in the United States. *Social Science and Medicine*, 53, pp. 21–27.

Marcotte, D., V, Wilcox-Go¨k. (2003). Estimating Earnings Losses due to Mental Illness: A Quantile Regression Approach. *The Journal of Mental Health Policy and Economics.*

Michaelsen, M (2012). Health and Labour Supply Evidence from Mexico's Ongoing Violent Conflicts. *Ruhr University Bochum, Department of Economics.*

Ojeda, VD., Frank, RG., McGuire, TG. and Giler, TP. (2010). Mental illness, nativity, gender and labor supply. *Health Economics*, 19, pp. 396-421.

Parsons, D (1982). The Male Labour Force Participation Decision: Health, Reported Health, and Economic Incentives. *Economica, New Series, Vol. 49, No. 193 (Feb., 1982), pp. 81-91.*

Pérez, C., Ruiz-Tagle, J (2011). Movilidad Ocupacional y Sectorial en Chile. *Universidad de Chile. Working Paper.*

Roe, J., Ward, C., Aspinall, P., Brewer, M ., Duff, E., Miller, D., Mitchell, R., & Clow, A. (2013). Green space and stress: Evidence from Cortisol measure in Deprived Urban Communities. International Journals of Environmental Research and Public Health.

Salm, M. (2009). Does job loss cause ill health? *Health Economics*, 18, pp. 1975-1089.

Shaw M. Housing and public health. Annu Rev Public Health. 2004; 25: 397-418.

Stern, S (1989). Measuring the Effect of Disability on Labor Force Participation . *The Journal of Human Resources, Vol. 24, No. 3 (Summer, 1989),* pp. 361-395.

Theodossiou I. (1998). The effects of low-pay and unemployment on psychological well-being: A logistic regression approach. *Journal of Health Economics*, 17, pp. 85-

104.

Turner, J.B., (1995). Economic context and the health effects of unemployment. *Journal of Health and Social Behavior 36, 213–229.*

Table 1: Descriptive Statistics: Variables by category.

Category	Variable	Observations	Mean	Standar Dev	Min	Max
Occupational situation	Employed	11,129	0.66	0.47	0	1
	Unemployed	11,129	0.11	0.31	0	1
	Inactive	11,129	0.22	0.41	0	1
Socio-Demographic	Female	11,129	0.51	0.49	0	1
	Age	11,129	44.7	10.9	19	65
	Squared Age	11,129	2122	985	361	4225
	Years of schooling	11,129	10.3	3.9	0	27
	Primary Education	11,129	0.35	0.47	0	1
	Secondary Education	11,129	0.44	0.49	0	1
	Terciary Education	11,129	0.21	0.4	0	1
	Studying	11,129	0.03	0.17	0	1
	Training	11,129	0.07	0.26	0	1
Family	Married	11,129	0.63	0.48	0	1
characteristics	Divorced	11,129	0.10	0.30	0	1
	Widower	11,129	0.02	0.16	0	1
	Single	11,129	0.23	0.42	0	1
	Household	11,129	0.59	0.49	0	1
	Quintile of non-labor income	11,129	2.8	1.56	0	5
	N° of children from 0-1 years	11,129	0.04	0.21	0	2
	N° of children from 2-4 years	11,129	0.09	0.31	0	6
	N° of children from 5-13 years	11,129	0.43	0.69	0	5
	N° of children from 14-18 years	11,129	0.32	0.57	0	4
	N° of dead relatives	11,129	0.09	0.30	0	3
	N° of relatives with depression	11,129	0.07	0.29	0	4
Health	Not Sport	11,129	0.74	0.43	0	1
	Hospitalization 2 years prior	11,129	0.09	0.29	0	1
	Health System	11,129	1.31	0.72	0	4
	Treatment of depression	11,129	0.05	0.22	0	1
Job	Logarithm of Hourly Salary	7,313	7.11	0.75	2.29	11.5
characteristics	Self employed	7,313	0.23	0.42	0	1
	Public sector	5,595	0.16	0.37	0	1
	Contract	7,313	0.65	0.47	0	1
	Union	7,313	0.17	0.37	0	1

Source: Own elaboration based on EPS 2009

Table 2: Prevalence according to Diagnosed Depression and Depression Index by gender, educational level and age.

	Diagnosed Depression (% Prevalence)			Depression Index (% Prevalence)			
	Male	Female	Gap	Male	Female	Gap	Observations
Primary Education	4.1	18.5	14.4***	21.7	45.3	23.6***	3.869
Secondary Education	2.1	13.1	11.0***	16.6	31.9	15.3***	4.939
Terciary Education	4.6	11.8	7.2***	13.0	21.6	8.5***	2.321
Total	3.3	14.7	11.3***	17.7	34.2	16.5***	11.129
Younger than 24	1.2	6.4	5.2*	17.0	24.6	7.8	159
Between 25- 44	2.9	11.6	8.6***	16.2	29.9	13.7***	5.313
Between 45-65	3.7	17.8	13.9***	19.1	39.0	19.5***	5.657
Total	3.3	14.7	11.2***	17.7	34.2	16.5***	11.129
Total Prevalence	9.1			26.2			
Observations	5.431	5.698	11.129	5.431	5.698	11.129	

* Significant to 10%. ** Significant to 5%. *** Significant to 1%.

Source: Own elaboration based on EPS 2009

Table 3: Occupational Situation. Diagnosed Depression and Depression Index by educational level

		Employment (%)					
	Diagnosed Depression			Depression Index			Observations
	No	Yes	Gap	No	Yes	Gap	
Primary Education	55.4	35.4	-20.0***	59.7	40.2	-19.5***	3.869
Secondary Education	70.9	45.5	-25.3***	72.6	57.4	-15.2***	4.939
Terciary Education	80.6	68.6	-11.9***	81.0	72.7	-8.3***	2.321
Total	67.7	45.6	-22.0***	70.6	51.9	-18.6***	11.129
		Unemployment (%)					
	Diagnosed Depression			Depression Index			Observations
	No	Yes	Gap	No	Yes	Gap	
Primary Education	13.5	15.9	2.3***	12.4	16.4	4.0***	3.869
Secondary Education	10.7	17.8	7.1***	10.1	15.0	4.8***	4.939
Terciary Education	7.2	14.1	6.8***	7.3	9.9	2.5*	2.321
Total	10.9	16.3	5.3***	10.2	14.9	4.7***	11.129
		Inactive (%)					
	Diagnosed Depression			Depression Index			Observations
	No	Yes	Gap	No	Yes	Gap	
Primary Education	30.9	48.6	17.6***	27.7	43.3	15.5***	3.869
Secondary Education	18.2	36.5	18.2***	17.1	27.5	10.3***	4.939
Terciary Education	12.1	17.1	5.0**	11.5	17.2	5.7***	2.321
Total	21.2	38.0	16.7***	19.1	33.1	13.9***	11.129
Observations	10.111	1.018	11.129	8.212	2.917	11.129	

* Significant to 10%. ** Significant to 5%. *** Significant to 1%.

Source: Own elaboration based on EPS 2009

Table 4: Hourly Salary. Depression Diagnosed and Index of Depression by educational level

	Diagnosed Depression			Depression Index			Observations
	No	Yes	Gap	No	Yes	Gap	
Primary Education	1037	867	-169**	1060	917	-143***	2.059
Secondary Education	1443	1099	-343***	1490	1171	-318***	3.406
Terciary Education	3062	2238	-823**	3138	2291	-847***	1.848
Total	1735	1354	-380***	1816	1305	-511***	7.313
Observations	6.848	465	7.313	5.798	1.515	7.313	

Hourly Salary ($)

* Significant to 10%. ** Significant to 5%. *** Significant to 1%.

Source: Own elaboration based on EPS 2009

Table 5: Hourly Salary by type of job. Depression Diagnosed and Depression Index.

Hourly Salary ($)

	Diagnosed Depression			Depression Index			Observations
	No	Yes	Gap	No	Yes	Gap	
Total	1735	1354	-380***	1816	1305	-511***	7.313
Self employed	1689	1105	-583*	1809	1110	-699***	1.718
Salaried	1749	1440	-308**	1819	1374	-445***	5.595
Gap	-60	-334**		-9	-263**		7.313
Observations	6.848	465	7.313	5.798	1.515	7.313	
Public Sector	2332	2097	-234	2359	2114	-244	937
Private Sector	1633	1285	-347***	1706	1243	-463***	4.658
Gap	699***	812***		652***	871***		5.595
Observations	5.249	346	5.595	4.476	1.119	5.595	

* Significant to 10%. ** Significant to 5%. *** Significant to 1%.

Source: Own elaboration based on EPS 2009

Table 6: Hourly Salary by treatment. Diagnosed Depression and Depression Index

	Hourly Salary ($)						
	Diagnosed Depression			Depression Index			
	No	Yes	Gap	No	Yes	Gap	Observations
Total	1735	1354	-380***	1816	1305	-511***	7.313
Treatment		1380		1576	1290		270
No Treatment	1735	1318		1820	1307		7.043
Gap		62		-243	-16		7.313
Observations	6.848	465	7.313	5.798	1.515	7.313	

* Significant to 10%. ** Significant to 5%. *** Significant to 1%.

Source: Own elaboration based on EPS 2009

Figure 1: Treatment and psychological stress index
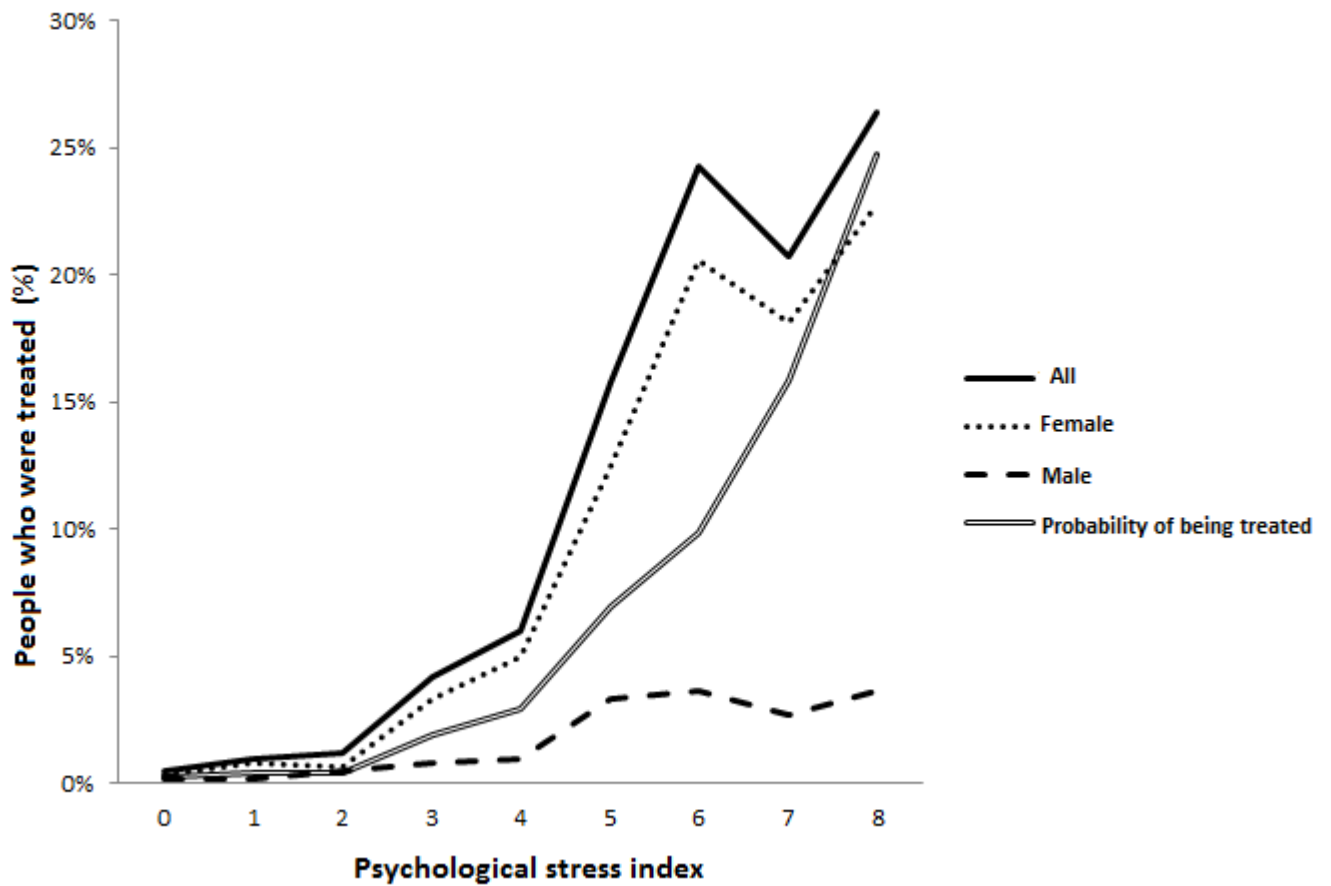
Table 7: Probability of being employed, Depression Index (OLS Regression)

Dep variable : Being employed

Depression Index	-0.0957***		
	(0.010)		
Socio-Demographic		Family characteristics	
Age	0.0328***	Household	0.162***
	(0.00334)		(0.00997)
Squared age	-0.000435***	Quintile of non-labor income	-0.0160***
	(3.71E-05)		(0.00259)
Female	-0.218***	N ° children from 0 to 1 years	-0.0366**
	(0.00946)		(0.0178)
Secondary Education	0.118***	N ° children from 2 to 4 years	-0.0366***
	(0.00981)		(0.0128)
Higher Education	0.232***	N ° children from 5 to 13 years	-0.0365***
	(0.0117)		(0.00616)
Studying	-0.0945***	N ° children from 14 to 18 years	-0.00348
	(0.0254)		(0.00731)
Training	0.142***	Constant	0.11
	(0.013)		(0.073)
Observations	11,129		
Squared-R	0.213		

* Significant to 10%. ** Significant to 5%. *** Significant to 1%.

Source: Own elaboration based on EPS 2009

Table 8: Probability of being employed, different Samples. Depression Index (OLS regression).

Dep variable: Being employed	All	Female	Male	Primary Education	Secondary Education	Higher Education	Age 18-30	Age 31-50	Age 51-65
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Depression Index	-0.095***	-0.053***	-0.143***	-0.098***	-0.084***	-0.052***	-0.061*	-0.070***	-0.140***
	(0.010)	(0.013)	(0.015)	(0.016)	(0.015)	(0.023)	(0.033)	(0.013)	(0.017)
Socio-Demographic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Family characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,129	5,698	5,431	3,869	4,939	2,321	1,299	6,212	3,618
Squared-R	0.21	0.15	0.10	0.21	0.18	0.11	0.14	0.19	0.24

* Significant to 10%. ** Significant to 5%. *** Significant to 1%.

Source: Own elaboration based on EPS 2009

**Table 9: Logarithm of HourlySalary , different Samples. Depression Index.**

Dep variable: Logarithm of Hourly Wage	All	Female	Male	Primary Education	Secondary Education	Higher Education	Self employed	Salaried	Public Sector	Private Sector
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Depression Index	-0.123**	-0.124***	-0.111***	-0.019	-0.118***	-0.182***	-0.191***	-0.098***	-0.150***	-0.088***
	(0.019)	(0.026)	(0.026)	(0.033)	(0.024)	(0.045)	(0.047)	(0.018)	(0.050)	(0.019)
Socio-Demographic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Family characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Job characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,129	5,698	5,431	3,869	4,939	2,321	1,718	5,595	937	4,658

* Significant to 10%. ** Significant to 5%. *** Significant to 1%.

Source: Own elaboration based on EPS 2009

Table 10: Instrumental variables by Region

Region	Population	Family Violence	Life expectancy	Dead relatives (%)			Relatives with depression (%)		
		Rate x 100,000 inhabitants	Years	0	1 or more	Total	0	1 or more	Total
I	238,950	1,004	51.0	92.6	7.4	100	97.5	2.5	100
II	493,984	552	52.5	90.7	9.3	100	92.9	7.1	100
III	254,336	588	54.7	91.9	8.1	100	97.3	2.7	100
IV	603,210	579	56.1	90.9	9.1	100	97.0	3.0	100
V	1,539,852	694	54.0	90.6	9.4	100	93.9	6.1	100
VI	780,627	843	55.7	92.9	7.1	100	91.6	8.4	100
VII	908,097	697	55.5	91.6	8.4	100	91.1	8.9	100
VIII	1,865,650	785	53.6	92.8	7.2	100	92.8	7.2	100
IX	869,535	720	54.2	90.5	9.5	100	94.5	5.5	100
X	716,739	690	54.7	88.6	11.4	100	93.7	6.3	100
XI	91,492	884	50.0	93.5	6.5	100	98.4	1.6	100
XII	150,696	757	47.7	94.0	6.0	100	94.8	5.2	100
RM	6,061,185	591	54.0	91.2	8.8	100	92.8	7.2	100
XIV	356,396	890	54.7	94.9	5.1	100	96.0	4.0	100
XV	189,644	1,041	52.6	93.5	6.5	100	95.7	4.3	100
Total	15,120,393	677	53.4	91.4	8.6	100	93.3	6.7	100

Source: Own elaboration based on EPS 2009, Department of Health Statistics and Information and Ministry of Interior

Table 11: Probability of being employed, Instrumental depression. Different Samples.

Dep variable: Being employed	All	Female	Male	Primary Education	Secondary Education	Higher Education	Age 18-30	Age 31-50	Age 51-65
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Instrumental depression	-0.212*	-0.161	-0.479**	-0.152	-0.131	0.152	0.005	-0.223	-0.140
	(0.114)	(0.131)	(0.238)	(0.154)	(0.161)	(0.427)	(0.587)	(0.147)	(0.168)
Socio-Demographic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Family characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,129	5,698	5,431	3,869	4,939	2,321	1,299	6,212	3,618
Squared-R	0.2	0.15		0.214	0.18	0.11	0.13	0.17	0.24

* Significant to 10%. ** Significant to 5%. *** Significant to 1%.

Source: Own elaboration based on EPS 2009

Table 12: Logarithm of the Hourly Salary, Instrumental depression. Different Samples.

Dep variable: Logarithm of Hourly Wage	All	Female	Male	Primary Education	Secondary Education	Higher Education	Self employed	Salaried	Public Sector	Private Sector
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Instrumental depression	-0.561***	-0.601*	-0.501**	-0.072	-0.620**	-0.582	-0.507	-0.547***	-0.625	-0.514**
	(0.184)	(0.311)	(0.231)	(0.302)	(0.252)	(0.418)	(0.476)	(0.188)	(0.463)	(0.204)
Socio-Demographic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Family characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Job characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,129	5,698	5,431	3,869	4,939	2,321	1,718	5,595	937	4,658

* Significant to 10%. ** Significant to 5%. *** Significant to 1%.

Source: Own elaboration based on EPS 2009

Table 13: Occupational Situation by gender. Diagnosed Depression and Depression Index by educational level.

	Male							Female						
	Employment (%)							Employment (%)						
	Diagnosed Depression			Depression Index			Observations	Depression Diagnosed			Depression Index			Observations
	No	Yes	Gap	No	Yes	Gap		No	Yes	Gap	No	Yes	Gap	
Primary Education	73.7	48.1	-25.2***	77.1	56.4	-20.7***	1.925	34.2	32.6	-1.5	35.1	32.5	-2.5	1.944
Secondary Education	86.1	61.5	-24.6***	87.6	75.7	-11.8***	2.444	54.0	42.9	-11.0***	54.7	48.1	-6.6***	2.495
Terciary Education	88.3	71.4	-16.9***	88.7	79.8	-8.8***	1.062	73.6	67.7	-5.8	73.9	69.1	-4.8	1.259
Total	82.2	58.3	-23.8***	84.3	67.9	-16.3***	5.431	52.0	42.9	-9.1***	54.2	44.0	-10.2***	5.698
	Unemployment (%)							Unemployment (%)						
	Diagnosed Depression			Depression Index			Observations	Depression Diagnosed			Depression Index			Observations
	No	Yes	Gap	No	Yes	Gap		No	Yes	Gap	No	Yes	Gap	
Primary Education	12.7	18.9	6.2	11.4	18.8	7.4***	1.925	14.4	15.2	0.8	13.9	15.3	1.3	1.944
Secondary Education	9.2	15.3	6.1	8.6	12.9	4.2***	2.444	12.4	18.2	5.8***	11.9	16.0	4.1***	2.495
Terciary Education	5.6	16.3	10.6***	5.2	12.2	7.0***	1.062	8.7	13.4	4.6*	9.4	8.8	0.5	1.259
Total	9.9	17.2	7.4***	8.8	15.4	6.5***	5.431	12.2	16.1	3.8***	11.8	14.7	2.8***	5.698
	Inactive (%)							Inactive (%)						
	Diagnosed Depression			Depression Index			Observaciones	Depression Diagnosed			Depression Index			Observations
	No	Yes	Gap	No	Yes	Gap		No	Yes	Gap	No	Yes	Gap	
Primary Education	13.4	32.9	19.4***	11.4	24.6	13.2***	1.925	51.3	52.0	0.7	50.9	52.1	1.2	1.944
Secondary Education	4.5	23.0	18.5***	3.6	11.2	7.5***	2.444	33.4	38.7	5.2*	33.3	35.8	2.4	2.495
Terciary Education	6.0	12.2	6.2*	6.0	7.9	1.8	1.062	17.6	18.7	1.1	16.6	22.0	5.4**	1.259
Total	7.9	24.4	16.4***	6.7	16.5	9.7***	5.431	35.6	40.9	5.2***	33.9	41.2	7.3***	5.698
Observations	5.251	180	5.431	4.466	965	5.431		4.860	838	5.698	3.746	1.952	5.698	

* Significant to 10%. ** Significant to 5%. *** Significant to 1%.

Source: Own elaboration based on EPS 2009

Table 14: Hourly Pay by gender. Depression Diagnosed and Index Depression by educational level.

	Male							Female						
	Hourly Salary ($)							Hourly Salary ($)						
	Diagnosed Depression			Depression Index			Observations	Diagnosed Depression			Depression Index			Observations
	No	Yes	Gap	No	Yes	Gap		No	Yes	Gap	No	Yes	Gap	
Primary Education	1098	1174	-75	1120	1004	-116	1.399	882	768	-113	874	846	-28	660
Secondary Education	1599	1503	-95	1639	1363	-275**	2.093	1167	1007	-159*	1204	1017	-186***	1.313
Terciary Education	3457	2566	-891	3494	2908	-586	930	2629	2125	-504	2740	1927	-812***	918
Total	1827	1739	-88	1882	1495	-386***	4.422	1578	1242	-335***	1695	1159	-536***	2.891
Observations	4.317	105	4.422	3.766	656	4.422		2531	360	2.891	2.032	859	2.891	

* Significant to 10%. ** Significant to 5%. *** Significant to 1%.

Source: Own elaboration based on EPS 2009

Table 15: Hourly Pay by gender. Depression Diagnosed and Index Depression by type of work.

	Male							Female						
	Hourly Salary ($)							Hourly Salary ($)						
	Diagnosed Depression			Depression Index			Observations	Diagnosed Depression			Depression Index			Observations
	No	Yes	Gap	No	Yes	Gap		No	Yes	Gap	No	Yes	Gap	
Total	1827	1739	-88	1882	1495	386***	4.422	1578	1242	-335***	1695	1159	-536***	2.891
Self employed	1793	1665	-127	1929	1117	-812***	1.180	1424	890	-533**	1471	1102	-368**	538
Salaried	1839	1772	-66	1865	1665	-200*	3.242	1611	1353	-258*	1741	1176	-565***	2.353
Gap	-45	-107		63	-547**		4.422	-187	-462***		-270*	-73		2.891
Observations	4.317	105	4.422	3.766	656	4.422		2.531	360	2.891	2.032	859	2.891	
Public Sector	2595	2305	-290	2512	3091	-579	394	2122	2069	-53	2238	1664	-573***	543
Private Sector	1734	1706	-28	1775	1476	-299***	2.848	1456	1161	-295*	1572	1074	-498***	1.810
Gap	861***	599		736***	1615***		3.242	666***	908***		665***	590***		2.353
Observations	3.170	72	3.242	2.789	453	3.242		2.079	274	2.353	1.687	666	2.353	

* Significant to 10%. ** Significant to 5%. *** Significant to 1%.

Source: Own elaboration based on EPS 2009

Table 16: Hourly Pay by gender. Diagnosed Depression and Depression Index by Treatment

	Male							Female						
	Hourly Salary ($)							Hourly Salary ($)						
	Diagnosed Depression			Depression Index			Observations	Diagnosed Depression			Depression Index			Observations
	No	Yes	Gap	No	Yes	Gap		No	Yes	Gap	No	Yes	Gap	
Total	1827	1739	-88	1882	1495	-386***	4,422	1578	1242	-335***	1695	1159	-535***	2,891
Treatment		1647		1573	1691	118	61		1303		1578	1187	-390**	209
No Treatment	1827	1866		1884	1483	-400***	4,361	1578	1159		1699	1153	-545***	2,682
Gap		-219		-310	207		4,422		144		-121	-33		2,891
Observations	4,317	105	4,422	3,766	656	4,422		2,531	360	2,891	2,032	859	2,891	

* Significant to 10%. ** Significant to 5%. *** Significant to 1%.

Source: Own elaboration based on EPS 2009

Table 17: Probability of being employed, different Samples. Diagnosed depression and psychological stress index (d_i) (OLS regression).

Dep variable : Being employed	Diagnosed Depression						Psychological stress index					
	All	Female	Male	Primary Education	Secondary Education	Higher Education	All	Female	Male	Primary Education	Secondary Education	Higher Education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Depression Diagnosed	-0.104***	-0.063***	-0.216***	-0.051**	-0.130***	-0.098***						
	(0.015)	(0.017)	(0.035)	(0.024)	(0.025)	(0.033)						
Psychological stress index							-0.019***	-0.011***	-0.025***	-0.019***	-0.017***	-0.013***
							(0.001)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)
Socio-Demographic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Family characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,129	5,698	5,431	3,869	4,939	2,321	11,129	5,698	5,431	3,869	4,939	2,321
Squared-R	0.20	0.16	0.09	0.20	0.18	0.11	0.21	0.16	0.10	0.21	0.19	0.11

Significant to 10%. ** Significant to 5%. *** Significant to 1%.

Source: Own elaboration based on EPS 2009

Table 18: Logarithm of Hourly Wage, different Samples. Diagnosed depression

Dep variable : Logarithm of Hourly Wage	All	Female	Male	Primary Education	Secondary Education	Higher Education	Self employed	Salaried	Public Sector	Private Sector
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Diagnosed depression	**-0.108***	**-0.130***	**-0.026**	**-0.004**	**-0.121****	**-0.120****	**-0.176****	**-0.086***	**-0.098**	**-0.077****
	(0.032)	**(0.036)**	**(0.064)**	**(0.050)**	**(0.048)**	**(0.062)**	**(0.084)**	**(0.031)**	**(0.084)**	**(0.033)**
Socio-Demographic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Family characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Job characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,129	5,698	5,431	3,869	4,939	2,321	1,718	5,595	937	4,658

* Significant to 10%. ** Significant to 5%. *** Significant to 1%.

Source: Own elaboration based on EPS 2009

Table 19: Logarithm of Hourly Wage, different Samples. Psychological stress index

Dep variable : Logarithm of Hourly Wage	All	Female	Male	Primary Education	Secondary Education	Higher Education	Self employed	Salaried	Public Sector	Private Sector
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Psychological stress index	-0.026***	-0.029***	-0.022***	-0.013***	-0.023***	-0.031***	-0.044***	-0.021***	-0.030***	-0.019***
	(0.003)	(0.005)	(0.004)	(0.005)	(0.004)	(0.007)	(0.008)	(0.003)	(0.008)	(0.033)
Socio-Demographic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Family characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Job characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,129	5,698	5,431	3,869	4,939	2,321	1,718	5,595	937	4,658

* Significant to 10%. ** Significant to 5%. *** Significant to 1%.

Source: Own elaboration based on EPS 2009

Table 20: Estimation with instrumental variables. All combinations. Probability of being employed and logarithm of hourly wage

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(A)	(B)	(C)	(D) N° Relatives with depression	(A) & (B)	(A) & (C)	(A) & (D)	(B) & (C)
	N° of dead relatives	Family Violence	Life expectancy					
Depression Index	0.068***	0.00005***	-0.006***	0.083***	Significant to 1%	Significant to 1%	Significant to 1%	Significant to 1%
	(0.014)	(0.000001)	(0.001)	(0.014)				
F test	51***	50***	50***	52***	49***	49***	50***	47***
Partial F test	23***	9,5***	12,8***	31,7***	16,7***	18***	27.4***	9***
J test					0.16 (1)	0.02 (1)	1.7 (1)	0.3 (1)
Being employed	-0.362*	-0.524	-0.308*	-0.013	-0.403**	-0.345***	-0.160	-0.394
	(0.206)	(0.353)	(0.294)	(0.168)	(0.177)	(0.169)	(0.128)	(0.253)
Logarithm of Hourly Wage	-0.288	-0.295	0.230	-0.139	-0.646***	-0.327	-0.413**	-0.212
	(0.267)	(0.339)	(0.332)	(0.249)	(0.245)	(0.241)	(0.200)	(0.303)

Model	(9)	(10)	(11)	(12)	(13)	(14)	(15)	
	(B) & (D)	(C) & (D)	(A),(B) & (C)	(A), (B) & (D)	(A), (C) & (D)	(B), (C) & (D)	(A),(B),(C) & (D)	
Depression Index	Significant to 1%	Significant to 1%	Significant to 1%	Significant to 1%	Significant to 1%	Significant to 1%	Significant to 1%	
F test	49***	49***	46***	48***	48***	46***	45.7***	
Partial F test	20.4***	21.7***	13.9***	21.5***	22.2***	16.2***	18***	
J test	1.9 (1)	0.8 (1)	0.32 (2)	2.9 (2)	2.0 (2)	2.0 (2)	2.9 (3)	
Being employed	-0.113	-0.085	-0.376**	-0.208*	-0.185	-0.132	-0.212*	
	(0.149)	(0.145)	(0.160)	(0.120)	(0118)	(0.138)	(0.114)	
Logarithm of Hourly Wage	-0.449**	-0.198	-0.551**	-0.614***	-0.420**	-0.393*	-0.561***	
	(0.229)	(0.228)	(0.231)	(0.190)	(0.189)	(0.218)	(0.184)	

* Significant to 10%. ** Significant to 5%. *** Significant to 1%.

Test J is distributed chi-square with the degrees of freedom that appear between parentheses. Critical values at 10% are 2.7, 4.6 and 6.2 for n = 1, n = 2 and n = 3, respectively.

Source: Own elaboration based on EPS 2009

Table 21: Probability of being employed, instrumental variables. Alternative mental health measures

Dep variable: being employed	Depression Index (d=6)	Depression Index (d=7)	Psychological stress index	Diagnosed Depression
	(1)	(2)	(3)	(4)
Instrumental mental health	-0.212*	-0.316*	-0.027*	-0.065
	(0.114)	(0.170)	(0.016)	(0.104)
Socio-Demographic	Yes	Yes	Yes	Yes
Family characteristics	Yes	Yes	Yes	Yes
Observations	11,129	11,129	11,129	11,129
Squared-R	0.2	0.19	0.21	0.20

* Significant to 10%. ** Significant to 5%. *** Significant to 1%.

Source: Own elaboration based on EPS 2009

Table 22: Logarithm of Hourly Wage, instrumental variables. Alternative mental health measures

Dep variable : Logarithm of Hourly Wage	Depression Index (d=6)	Depression Index (d=7)	Psychological stress index	Depression Diagnosed
	(1)	(2)	(3)	(4)
Instrumental mental health	-0.561***	-0.707***	-0.077***	-0.208
	(0.184)	(0.248)	(0.025)	(0.186)
Socio-Demographic	Yes	Yes	Yes	Yes
Family characteristics	Yes	Yes	Yes	Yes
Job characteristics	Yes	Yes	Yes	Yes
Observations	11,129	11,129	11,129	11,129

* Significant to 10%. ** Significant to 5%. *** Significant to 1%.

Source: Own elaboration based on EPS 2009