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# DEPRESSIVE SYMPTOMS ARE NOT RELATED TO LABOR MARKET OUTCOMES IN INDONESIA*

KITAE SOHN

*Department of Economics, Konkuk University*
*Seoul 05029, South Korea*
ksohn@konkuk.ac.kr

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## *Abstract*

Depressive symptoms have emerged as a notable public health threat in developing countries, so it is urgent to understand their relation to labor market outcomes. We analyzed a panel dataset of Indonesians (N = 12,326 for men and N = 14,410 for women) by applying a fixed effects model. We derived five measures of depressive symptoms from the short CES-D scale and considered four labor market outcomes (i.e., any attempt at or sign of being employed vs. none, positive vs. no earnings, hours of work, and earnings in the past month). We found no economically meaningful relation between depressive symptoms and labor market outcomes.

*Keywords:* depression, labor market, panel data, Indonesia
*JEL Classification Codes:* I12, J24, O15, O53

## I. *Introduction*

No one would deny the importance of mental health in life. The global scale of its importance can be seen, to name only a few, in the World Health Organization's publications solely dedicated to mental health (e.g., World Health Organization 2005), the Lancet's global mental health series (e.g., Prince et al. 2007), and the Grand Challenge in Global Mental Health initiative (Collins et al. 2011).

The concept of disability-adjusted life years (DALYs), which encompasses both years of life lost from premature death and years lived with a disability, is useful for understanding the impact of mental illness. Whiteford et al. (2013) estimated that worldwide mental and substance use disorders accounted for 183.9 million DALYs or 7.4% of the total disease burden in 2010 and were the fifth leading disorder category of global DALYs. Prince et al. (2007) estimated that in 2005, noncommunicable diseases accounted for 48.9% of global DALYs, and neuropsychiatric conditions accounted for 27.5% of noncommunicable disease DALYs, followed by cancer at 11%. Since mental disorders interact with other health conditions (Prince

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et al. 2007), the burden of mental illness is likely to be greater. Almost all of this burden falls on low- and middle-income countries, with high-income countries accounting for only 6.1%. Resources for mental health in developing countries are scarce, unequal, and inefficient (Saxena et al. 2007), so the absolute majority of people with mental and substance use disorders in developing countries remain undiagnosed and untreated (Wang et al. 2007).

As the medical literature recognized the burden, a growing number of economists began to pay attention to the issue. Bartel and Taubman (1979) estimated the effect of psychoses and neuroses (along with other diseases) on earnings, and they subsequently focused solely on mental illness to estimate its economic and demographic consequences (Bartel and Taubman 1986). Although they and other researchers found that mental illness was related to adverse economic outcomes (e.g., lower likelihood of being employed, more work loss days, fewer hours of work, and lower earnings), economic outcomes affect mental health as well (Baird, De Hoop, and Özler 2013); for example, low earnings may cause depression. Bartel and Taubman (1979, 1986) were aware of the concern but only resorted to selection on observables. Other researchers attempted to address this issue by using instrumental variables (IVs) (summarized by Chatterji, Alegria, and Takeuchi 2011), but this approach is not plausible. For example, religion is likely to affect labor market outcomes independently of mental illness, as suggested by Max Weber's famous thesis on the protestant ethic. Parental and own past mental health affects the development of abilities in the past and consequently economic outcomes in the present. Therefore, Chatterji et al. (2007) and Chatterji, Alegria, and Takeuchi (2011) were reluctant to use such IVs. Peng, Meyerhoefer, and Zuvekas (2015) avoided the concerns by exploiting the longitudinal nature of a survey, as we did, but their follow-up period was a single year. Therefore, when they found a weaker relation between depressive symptoms and labor market outcomes after controlling for individual fixed effects, the reason for the reduction was unclear. Although they believed that the reduction was genuine, the period may have been too short for depressive symptoms to influence labor market outcomes. A longer period would have clarified any lingering doubt. Different methods notwithstanding, all the researchers agreed that mental illness exhibited a sizeable relation with adverse labor market outcomes. As we elaborate in the discussion, not everyone agreed with this position, but the tone of the literature indicates that it is favored.

Note that the US was the only country of interest in all the cited studies in the previous paragraph. The exclusive focus on the US is unfortunate considering the disproportionate burden imposed on people in developing countries. US results cannot be generalized to developing countries because of the differences in socioeconomic conditions and health systems between the two. For example, while the thinner are happier in developed countries, Sohn (2017a) found the opposite in Indonesia. Or while more educated people are healthier in developed countries, Sohn (in press) found no relation between the two in Indonesia. Hence, it is worth focusing on developing countries. Such studies are also important for public policy purposes. If mental illness in developing countries is at least as strongly related to labor market outcomes as in the US, more effort should be devoted to alleviating mental illness. This is true even when causality is not established given the potentially large adverse effects of mental illness. Even if the relation is weaker in developing countries than in developed countries, such a finding would remain relevant to public policy because policymakers can assign priority to other issues or prepare for a stronger relation. For example, if the weak relation is due to the importance of brawn relative to brain for most jobs in developing countries, policymakers can

anticipate that the relation would be stronger as the economy develops and brain gains importance vis-à-vis brawn.

Of course, we are not the first to investigate the relation for a developing country. Patel and Kleinman (2003) reviewed 11 community studies on the relation between poverty and common mental disorders in six low- and middle-income countries, but the studies did not focus particularly on labor market outcomes. Das et al. (2008) did consider labor market outcomes for five developing countries. But the outcomes were among many others, and they stopped at finding correlates of depression and at identifying commonality among the five countries. Because of their omnibus style, they did not apply rigorous empirical methods for any single country.

This study differs from previous ones in that we attempted to eliminate time-invariant individual characteristics by applying a fixed effects model, considered a seven-year follow-up period, and examined a developing country with the fourth largest population and ninth largest economy in the world, Indonesia. In each aspect, we are not the first, but in combination, we are the first.

Among many mental illnesses, we focused on depressive symptoms because depressive disorders accounted for more DALYs in 2010 than any other mental and substance use disorders at 40.5% (Whiteford et al. 2013). This consideration leads to another strength of this study. We used the short CES-D scale (Center for Epidemiologic Studies Short Depression Scale), which contains a series of 10 questions and is one of the major international scales of depressive symptoms. The seminal study by Radloff (1977) explained that across a wide variety of demographic characteristics, the CES-D scale exhibits very high internal consistency and adequate test-retest repeatability and validity. The same is true for the short version of the scale (Andresen et al. 1994). And the scale does not rely on self-reported clinical diagnosis. This feature of the scale is essential for this study because diagnoses of mental illnesses in developing countries are rare (Wang et al. 2007) and, if done, are mostly inaccurate (Saxena et al. 2007). Furthermore, the scale provides richer information on mental health than diagnoses. Diagnoses contain binary information (ill or healthy) and therefore ignore the fact that mental health is a continuous variable; people not meeting the diagnostic criteria could still have significant mental impairment that adversely affects their labor market outcomes (Banerjee, Chatterji, and Lahiri 2014). The scale provides a continuous indicator of mental health and thus contains richer information. Using this scale, we created five measures of depressive symptoms and related each of them to four labor market outcomes. We aimed to relate depressive symptoms to labor market outcomes with different (and possibly better) measures and methods for a developing country.

## II. *Methods*

### 1. Data

We analyzed the Indonesian Family Life Survey (IFLS), which is an ongoing longitudinal survey. The IFLS began to collect information on more than 22,000 individuals in 7,224 households from 13 provinces in 1993 (IFLS1); the provinces' population represented 83% of the Indonesian population in 1993. The IFLS first stratified the sample by provinces and

randomly selected 321 enumeration areas in the provinces and then households within each of the enumeration areas. A representative member of each of the households provided household-level demographic and economic information, and interviewers randomly selected household members and obtained detailed individual information. Five follow-ups ensued in 1997 (IFLS2), 1998 (IFLS2+), 2000 (IFLS3), 2007-8 (IFLS4), and 2014-5 (IFLS5).

We merged IFLS4 and IFLS5 because only these two follow-ups contained the short CES-D scale. We restricted ages to 25-60 to allow time to finish a college education while minimizing survival bias. Our sample size was 12,326 for men and 14,410 for women. Of respondents with valid values of the variables in IFLS4, 25.7% were lost in IFLS5. Regression of being lost on basic demographics indicated that attrition was systematic (Table A-1 in the appendix). Therefore, our sample was a selected group, and care should be taken when relating our results to other environments. However, if attrition was driven by time-invariant individual characteristics, our fixed effects model could alleviate attrition bias. We later checked whether attrition substantially affected our main results.

## 2. Variables

Eight questions in the short CES-D scale concerned negative mood, and two positive mood. The reference period was the past week, and the frequency intervals were presented as follows: rarely or none ($\leq$ 1 day), some days (1-2 days), occasionally (3-4 days), and most of the time (5-7 days). As typically done in psychiatry (Andresen et al. 1994), we assigned zero to the answer "rarely or none," one to "some days," two to "occasionally," and three to "most of the time" for negative mood and reversed the points for positive mood. The sum of the points for all 10 questions is referred to as the depression score in this study. We considered an individual with a score $\geq$ 10 to be depressed (Björgvinsson et al. 2013) and created a dummy variable to indicate this status; slightly changing the cutoff point hardly affected our main results (not shown). The two measures provided continuous and binary information on mental health, respectively, and comparisons of results derived from them are of interest. To be comprehensive, we constructed three more measures of depressive symptoms: 1) the number of negative (or reversed positive) symptoms lasting 1-2 days or longer, 2) the number of negative (or reversed positive) symptoms lasting 3-4 days or longer, and 3) the number of negative (or reversed positive) symptoms lasting 5-7 days. These additional variables reflect the varying number and severity of depressive symptoms.

We considered the following four labor market outcomes: employment in a broad sense, employment in a narrow sense, hours of work in the past week, and earnings in the past month. In a broad sense, we considered an individual to be employed if his or her primary activity during the past week was working/trying to work/helping to earn income, or during the past week he or she worked/tried to work/helped to earn income for pay for at least one hour, had a job/business but was temporarily not working, or worked at a family-owned business. According to this definition, almost all men were employed (Table 1), reflecting different labor market conditions in developing countries than those in developed countries. Although formal employment is a dominant form of employment in developed countries, informal employment is common in developing countries. We thus considered an alternative definition of employment: an individual with positive earnings was defined to be employed. Hours of work were derived from the answer to the following question: "What was the total number of hours you worked

TABLE 1. DESCRIPTIVE STATISTICS

| | Men | Women |
|---|---|---|
| Continuous Variable | Mean (Standard Deviation) | |
| Hours of work in the past week[a] | 41.1 (19.8) | 36.4 (24.3) |
| Ln(earnings in the past month)[b] | 13.8 (1.1) | 13.1 (1.2) |
| Depression score | 4.8 (4.1) | 5.0 (4.4) |
| # of at least weak symptoms (1-2 or more days in the past week) | 2.7 (2.2) | 2.8 (2.2) |
| # of at least medium symptoms (3-4 or more days in the past week) | 1.5 (1.6) | 1.6 (1.7) |
| # of strong symptoms (5-7 days in the past week) | 0.6 (1.0) | 0.6 (1.1) |
| Current age | 42.0 (10.2) | 41.5 (10.1) |
| Body mass index (kg/m$^2$) | 22.6 (3.6) | 24.5 (4.3) |
| Systolic blood pressure (mmHg) | 130.2 (17.5) | 128.8 (21.4) |
| Diastolic blood pressure (mmHg) | 80.8 (11.0) | 81.0 (11.3) |
| Lung capacity (L/min) | 416.6 (99.7) | 279.1 (67.5) |
| Hemoglobin (g/dL) | 14.6 (1.6) | 12.6 (1.4) |
| # of acute symptoms (out of 13) | 2.4 (2.2) | 2.6 (2.2) |
| Discrete variable | % | |
| Not employed (broad definition) | 4.2 | 32.2 |
| Employed | 95.9 | 67.8 |
| Not employed (no positive earnings) | 19.8 | 52.6 |
| Employed (positive earnings) | 80.2 | 47.5 |
| Not depressed (depression score $<$ 10) | 87.6 | 86.1 |
| Depressed (depression score $\geq$ 10) | 12.4 | 13.9 |
| Unmarried | 9.7 | 15.1 |
| Married | 90.3 | 84.9 |
| Rural residence | 46.0 | 44.8 |
| Urban residence | 54.0 | 55.3 |
| Somewhat unhealthy/unhealthy | 15.5 | 20.7 |
| Somewhat healthy | 68.1 | 66.2 |
| Very healthy | 15.4 | 13.1 |
| Nonsmoker | 30.5 | 97.5 |
| Smoker | 69.6 | 2.5 |
| No general check up in the last five years | 87.7 | 90.0 |
| Had a general check up in the last five years | 12.3 | 10.0 |
| No health insurance | 60.3 | 61.3 |
| Had health insurance | 39.7 | 38.7 |
| N | 12,326 | 14,410 |

*Notes:* a: the sample size was 11,768 for men and 9,727 for women. b: the sample size was 9,890 for men and 6,838 for women.

during the past week (on your job)?" In rare cases, the value was missing, and we substituted the respondent's normal hours of work during the past week. Excluding them, however, did not change our main results (not shown). Taking the natural log of hours of work made little difference in the results (not shown), so we presented the results derived from hours of work to ease interpretation. The IFLS did not provide information on weekly earnings, which would agree with the reference period for depressive symptoms. Instead, we used earnings from the primary job in the past month: salaries or wages (including the value of all benefits) for paid

employees and net profits (after taking out all business expenses) for the self-employed.

The IFLS provides objective and subjective health indicators. Because physical health could confound the relation between depressive symptoms and labor market outcomes (Emptage, Sturm, and Robinson 2005), we controlled for such health indicators, along with basic demographics and health behaviors: age, age squared, married (vs. not married), urban (vs. rural) residence, body mass index, systolic and diastolic blood pressure, lung capacity, hemoglobin level, self-reported health status (somewhat unhealthy/unhealthy, somewhat healthy, and very healthy), smoking status, number of acute symptoms, whether the respondent had a general check-up in the past five years, and whether the respondent was covered by health insurance.[1] However, it turned out that covariates other than age and age squared hardly changed the main results (not shown), suggesting that confounders did not pose a serious threat to the estimation.

## 3. Empirical Model

We estimated the following fixed effects model:

$$outcome_{it} = \beta_1 depress_{it} + X_{it}\beta_2 + u_i + \varepsilon_{it} \quad (1)$$

where $outcome_{it}$ refers to one of the four labor market outcomes of individual $i$ at time $t$, *depress*, one of the five indicators of depressive symptoms, $X$, the covariates listed above, $u$, individual fixed effects, $\varepsilon$, the error term, and $\beta_1$ and $\beta_2$, a coefficient and a coefficient vector, respectively, to estimate. Standard errors were clustered at the individual level.

Analysis of cross-sectional data does not control for $u$, which would bias $\beta_1$ if *depress* and $u$ are correlated. For example, an individual raised in an unhappy family may suffer depressive symptoms while having low abilities and experiencing adverse labor market outcomes. In this case, even if $\beta_1 = 0$, $\beta_1$ would be estimated to be negative. We illustrated the importance of controlling for $u$ by applying a fixed effects model and OLS to the same sample and comparing the two sets of results. For OLS estimation, we could enter time-invariant individual characteristics into the specification. Therefore, we ran two specifications. First, we controlled for the same covariates as those in the fixed effects model. We then added two important, time-invariant individual characteristics: the highest level of education (no school, primary school, junior high school, high school, and college or above) and ethnicity (Javanese, the majority ethnic group in Indonesia, vs. the rest). The latter results were presumably less confounded, but the two sets of results were similar (not shown). We thus present only the latter after analyzing IFLS5.

We continued to use OLS (referred to as a linear probability model) when the dependent variable was a dichotomous variable because there is no probit model with fixed effects. More important, OLS is often preferred because the assumptions for the model are weaker than those for probit and logit models. If the error in the nonlinear models does not behave as assumed (normal and log normal, respectively), probit and logit estimates can be more biased than OLS estimates. In addition, when the prevalence rate is very high or low, the probit and logit may fail to estimate the specification. If they do, the coefficients would be biased. Furthermore,

[1] The following variables were measured: body mass index, systolic and diastolic blood pressure, lung capacity, and hemoglobin level. The remaining were self-reported.

although OLS estimates are not constrained to the unit interval, this is not a serious issue if the main purpose is to estimate the partial effect of the independent variable on the response probability, and that is our purpose.

## III. *Results*

Table 1 reports descriptive statistics. To save space, we describe only the variables of interest. When the definition of employment is broad, 95.9% of men and 67.8% of women were employed. When the definition is narrow, 80.2% of men and 47.5% of women were employed, which is consistent with many unpaid workers in developing countries. Conditional on positive hours of work, the mean of hours of work was 41.1 for men and 36.4 for women. Regarding depressive symptoms, the mean depression scale was 4.8 for men and 5.0 for women, which is far smaller than the cutoff point of 10 to be considered depressed. Nevertheless, 12.4% of men and 13.9% of women exhibited scores equal to or greater than the cutoff point. Therefore, although most people experienced no or weak depressive symptoms, a non-negligible minority suffered serious depressive symptoms. A similar picture was found for the remaining measures. The mean number of depressive symptoms lasting 1-2 days or longer in the past week was 2.7 for men and 2.8 for women. The corresponding figures were 1.5 and 1.6 for symptoms lasting 3-4 days or longer and were 0.6 (for both sexes) for symptoms on 5-7 days.

Table 2 presents our main results. Each coefficient was obtained after running a fixed-effects model, and all covariates were controlled for but are not listed for brevity. The major finding is that depressive symptoms were generally unrelated to the labor market outcomes. For men, depression was related to employment in the broad definition, but the size of the relation was very small. For example, if the depression score increases from zero to ten, the probability of being employed would decrease only by 1.6% points. Given that almost all men were employed according to this definition, this magnitude calculated from an extreme change in the depression score is practically zero. The same applies to employment in the narrow definition: the same extreme change in the score would decrease the probability of employment only by 2.6% points, or being depressed was associated with a 3.3% point decrease in the probability of employment. Depressive symptoms were unrelated to hours of work. An additional symptom lasting 5-7 days was related to a 2.8% decrease in earnings, but the other four measures of depression were not statistically significantly related to earnings. Therefore, evidence of the negative relation between depression and earnings is weak at best. For women, no coefficients (save one) on the five measures of depression were related to any of the labor market outcomes.

Recall that attrition was systematic, so we attempted to alleviate any bias stemming from it by constructing the inverse probability of attrition weights: we ran the specification for attrition, namely, the specification used for Table A-1 in the appendix. Applying the weights, we gave less weight to respondents who were more likely to be lost (but not). When we re-ran specification (1) while applying the weights, the results turned out to be almost the same as before (Table 3). If anything, $\beta_1$ was less precisely estimated, reinforcing the argument of a null relation between depressive symptoms and labor market outcomes.

The statistically nonsignificant relations could be produced by a small variation in changes

TABLE 2. DEPRESSIVE SYMPTOMS AND LABOR MARKET OUTCOMES: FIXED EFFECTS MODEL

| | 1<br>Employed (broad definition) | 2<br>Employed (positive earnings) | 3<br>Hours of work per week | 4<br>Ln (earnings in the past month) |
|---|---|---|---|---|
| **Men** | | | | |
| Depression score (/10) | -0.016<br>(0.007)* | -0.026<br>(0.013)* | -0.036<br>(0.670) | -0.044<br>(0.033) |
| Depressed | -0.012<br>(0.008) | -0.033<br>(0.015)* | -0.034<br>(0.783) | -0.007<br>(0.039) |
| # of at least weak symptoms | -0.002<br>(0.001)* | -0.005<br>(0.002) | -0.061<br>(0.127) | -0.004<br>(0.006) |
| # of at least medium symptoms | -0.003<br>(0.002)* | -0.003<br>(0.003) | 0.051<br>(0.167) | -0.010<br>(0.008) |
| # of strong symptoms | -0.006<br>(0.003)* | -0.012<br>(0.005)* | 0.082<br>(0.278) | -0.028<br>(0.014)* |
| N | 12,326 | 12,326 | 11,768 | 9,890 |
| **Women** | | | | |
| Depression score (/10) | 0.017<br>(0.012) | 0.016<br>(0.013) | 1.323<br>(0.832) | -0.087<br>(0.045) |
| Depressed | 0.009<br>(0.014) | 0.012<br>(0.015) | 1.127<br>(1.013) | -0.077<br>(0.055) |
| # of at least weak symptoms | 0.004<br>(0.002) | 0.004<br>(0.002) | 0.222<br>(0.162) | -0.011<br>(0.009) |
| # of at least medium symptoms | 0.005<br>(0.003) | 0.005<br>(0.003) | 0.354<br>(0.209) | -0.024<br>(0.011)* |
| # of strong symptoms | -0.002<br>(0.005) | -0.003<br>(0.005) | 0.267<br>(0.317) | -0.033<br>(0.017) |
| N | 14,410 | 14,410 | 9,727 | 6,838 |

*Notes:* One fixed effects model was run for each cell. We did not list but controlled for the following covariates: married (vs. not married), urban (vs. rural) residence, body mass index, systolic and diastolic blood pressure, lung capacity, hemoglobin level, self-reported health (somewhat unhealthy/unhealthy, somewhat healthy, and very healthy) status, smoking status, number of acute symptoms, whether the respondent had a general check-up in the past five years, and whether the respondent was covered by health insurance. Standard errors clustered at the individual level are in parentheses. *: p-value$<$0.05.

in the dependent variables of interest between IFLS4 and IFLS5. However, this was not necessarily the case. When we subtracted the number of symptoms in IFLS4 from that in IFLS5, the mean depression score for men was 2.1 with a SD of 5.1; the corresponding figures were 0.14 and 0.43 for being depressed, 1.2 and 2.7 for symptoms lasting 1-2 days or longer, 0.7 and 2.0 for symptoms lasting 3-4 days or longer, and 0.1 and 1.3 for symptoms lasting 5-7 days. The corresponding figures for women were almost identical.

Our OLS results in Table 4 also exhibited no meaningful relation of depressive symptoms to employment and hours of work. However, depressive symptoms were strongly related to earnings. For example, a 4-point increase (slightly less than one SD) in the depression score was related to about a 7% decrease in earnings. Alternatively, being depressed was related to 11.8% lower earnings for men and 14.2% for women.

Comparisons of Tables 2-4 suggest that time-invariant individual characteristics could bias

TABLE 3. DEPRESSIVE SYMPTOMS AND LABOR MARKET OUTCOMES: FIXED EFFECTS MODEL USING INVERSE PROBABILITY OF ATTRITION WEIGHTS

| | 1<br>Employed (broad definition) | 2<br>Employed (positive earnings) | 3<br>Hours of work per week | 4<br>Ln (earnings in the past month) |
|---|---|---|---|---|
| **Men** | | | | |
| Depression score (/10) | -0.013 | -0.022 | -0.142 | -0.047 |
| | (0.006)* | (0.014) | (0.684) | (0.036) |
| Depressed | -0.009 | -0.027 | -0.200 | -0.011 |
| | (0.007) | (0.016) | (0.801) | (0.042) |
| # of at least weak symptoms | -0.002 | -0.003 | -0.080 | -0.004 |
| | (0.001) | (0.003) | (0.130) | (0.007) |
| # of at least medium symptoms | -0.003 | -0.003 | 0.020 | -0.012 |
| | (0.002) | (0.003) | (0.173) | (0.009) |
| # of strong symptoms | -0.006 | -0.013 | 0.077 | -0.029 |
| | (0.003)* | (0.006)* | (0.276) | (0.015)* |
| N | 12,326 | 12,326 | 11,768 | 9,890 |
| **Women** | | | | |
| Depression score (/10) | 0.010 | 0.016 | 0.851 | -0.083 |
| | (0.013) | (0.013) | (0.842) | (0.047) |
| Depressed | -0.001 | 0.013 | 0.844 | -0.081 |
| | (0.015) | (0.016) | (1.042) | (0.058) |
| # of at least weak symptoms | 0.002 | 0.003 | 0.090 | -0.010 |
| | (0.002) | (0.003) | (0.163) | (0.009) |
| # of at least medium symptoms | 0.003 | 0.006 | 0.223 | -0.024 |
| | (0.003) | (0.003) | (0.213) | (0.012)* |
| # of strong symptoms | -0.003 | -0.002 | 0.393 | -0.030 |
| | (0.005) | (0.005) | (0.323) | (0.018) |
| N | 14,410 | 14,410 | 9,727 | 6,838 |

*Notes:* One fixed effects model was run for each cell. We did not list but controlled for the following covariates: married (vs. not married), urban (vs. rural) residence, body mass index, systolic and diastolic blood pressure, lung capacity, hemoglobin level, self-reported health (somewhat unhealthy/unhealthy, somewhat healthy, and very healthy) status, smoking status, number of acute symptoms, whether the respondent had a general check-up in the past five years, and whether the respondent was covered by health insurance. Standard errors clustered at the individual level are in parentheses. *: p-value $<$ 0.05.

the relation between depressive symptoms and earnings. Therefore, it appears that individuals with lower-earning power tended to have more depressive symptoms while depressive symptoms per se did not affect earnings much. In addition, the negligible relation of depressive symptoms to employment status and hours of work for both sexes suggests that depressive symptoms did not deter anyone from working as long as he or she wished to.

TABLE 4. DEPRESSIVE SYMPTOMS AND LABOR MARKET OUTCOMES IN IFLS5: OLS

| | 1<br>Employed (broad definition) | 2<br>Employed (positive earnings) | 3<br>Hours of work per week | 4<br>Ln (earnings in the past month) |
|---|---|---|---|---|
| **Men** | | | | |
| Depression score (/10) | -0.011 | -0.025 | 0.009 | -0.177 |
| | (0.006) | (0.011)* | (0.615) | (0.033)* |
| Depressed | -0.009 | -0.022 | -0.036 | -0.118 |
| | (0.007) | (0.013) | (0.713) | (0.037)* |
| # of at least weak symptoms | -0.001 | -0.002 | -0.070 | -0.025 |
| | (0.001) | (0.002) | (0.113) | (0.006)* |
| # of at least medium symptoms | -0.003 | -0.005 | 0.030 | -0.048 |
| | (0.001) | (0.003) | (0.154) | (0.008)* |
| # of strong symptoms | -0.010 | -0.023 | 0.318 | -0.051 |
| | (0.003)* | (0.005)* | (0.281) | (0.015)* |
| N | 6,163 | 6,163 | 5,859 | 4,993 |
| **Women** | | | | |
| Depression score (/10) | 0.024 | 0.018 | -0.492 | -0.017 |
| | (0.011)* | (0.013) | (0.759) | (0.041)* |
| Depressed | 0.032 | 0.024 | -0.716 | -0.142 |
| | (0.013)* | (0.015) | (0.894) | (0.047)* |
| # of at least weak symptoms | 0.004 | 0.003 | -0.210 | -0.036 |
| | (0.002) | (0.002) | (0.147) | (0.008)* |
| # of at least medium symptoms | 0.009 | 0.006 | -0.037 | -0.041 |
| | (0.003)* | (0.003) | (0.193) | (0.010)* |
| # of strong symptoms | <-0.000 | -0.001 | 0.214 | -0.016 |
| | (0.005) | (0.005) | (0.303) | (0.018) |
| N | 7,205 | 7,205 | 5,058 | 3,744 |

*Notes:* OLS was run for each cell. We analyzed IFLS5. We did not list but controlled for the following covariates: education (no schooling, primary school, junior high school, senior high school, and college or above), Javanese (vs. others), married (vs. not married), urban (vs. rural) residence, body mass index, systolic and diastolic blood pressure, lung capacity, hemoglobin level, self-reported health status (somewhat unhealthy/unhealthy, somewhat healthy, and very healthy), smoking status, number of acute symptoms, whether the respondent had a general check-up in the past five years, and whether the respondent was covered by health insurance. We applied cross-sectional sampling weights. Robust standard errors are in parentheses. *: p-value$<$0.05.

## IV. *Discussion*

Although mental health is no less important than physical health and mental illness imposes a disproportionate burden on people in developing countries, the two issues have not been appropriately combined in economics. We analyzed a longitudinal survey of Indonesians in 2007 and 2014 by sex while eliminating time-invariant individual characteristics. Although we found a couple of statistically significant coefficients on measures of depressive symptoms, they were generally small or inconsistent with those on other measures. This main finding stands in contrast to the strong evidence reported in previous studies. Furthermore, comparisons

between Tables 2-4 demonstrate the importance of eliminating time-invariant individual characteristics. Because our follow-up period was seven years, the criticism of there being "too short time to influence" may not apply. We acknowledge that despite our utmost efforts, our results were not causal but correlational. Nevertheless, this limitation should not detract their importance. When causality implies correlation, its contrapositive, our claim, is true: no correlation implies no causality.

We do not have a definitive answer as to why our results differ from those in previous studies. It could be that our results were biased. For example, the use of a fixed effects model raises the issue of endogeneity. However, this issue is more serious when the main argument is $\beta_1 \neq 0$ while ours is $\beta_1 = 0$; despite the possibility of $\beta_1 \neq 0$, if $\beta_1 = 0$ were estimated, evidence for $\beta_1 = 0$ would only be strengthened. Furthermore, we adopted five measures of depressive symptoms, and all of them consistently showed a null or very weak relation. The large sample sizes suggest that a false negative was unlikely.

One can critique that we misinterpreted our results, saying that depressive symptoms were statistically significantly related to some labor outcomes. For example, four of the five measures of depressive symptoms were statistically significantly related to broadly defined employment status for men. However, we already said that statistical significance notwithstanding, the relation was economically negligible. And the relation was sensitive to the definition of employment and to the weighting schemes. One could insist that the relation between the number of strong symptoms and earnings in the past month for men was meaningful because an additional strong symptom was related to a 2.8% decrease in earnings and the figure remained the same with the inverse probability of attrition weights. However, the results for the other four measures of depressive symptoms did not agree. And the mean of the number of strong symptoms was 0.6, implying that having an additional stronger symptom was not common. The relation between the number of at least medium symptoms and earnings for women could be meaningful, but as for men, the results for the other four measures of depressive symptoms did not agree. It is also puzzling that women exhibited no dose-response relationship, which is well-known in the literature (Lerner and Henke 2008).

If our results were little biased, our interpretations are plausible, and the relation in the US was truly strong, what can explain our much weaker relation than that in the US? The question can be easily addressed if the relation is also weak in the US: our results are not much different from those for the US. In fact, it is easy to find studies reporting no meaningful relation in the US. For example, Tian and Sturm (2004) analyzed a nationally representative sample of US individuals aged 51-61 in 1992 (i.e., the Health and Retirement Study). They defined depression with a cutoff point of four symptoms in a short eight-item version of the CES-D scale and related its existence in 1994 to exit from employment by 1996. While more depressed women left employment than non-depressed women (odds ratio$=1.57$, $p=0.02$), men exhibited no economically or statistically significant difference. Emptage, Sturm, and Robinson (2005) analyzed the same survey and baseline year; however, they combined men and women, used the cutoff point of three, and extended the survey year to 2000. They found that compared to no depression, depression alone was not related to employment status. Instead, physical pain (with or without depression) was more strongly related to employment status, suggesting that the relation between depression and adverse labor market outcomes might be driven not by depression per se but by comorbid pain. Fletcher (2013) analyzed a nationally representative

sample of US students in grades seven through 12 in 1994-1995 and tracked the sample until 2007-2008 (i.e., the Add Health). He used 19 of the 20 items of the CES-D contained in the 1994-1995 survey to define depression. When he controlled for basic covariates, depression was economically and statistically significantly related to employment status and earnings in 2007-2008. However, once he added family fixed effects, the relation quickly lost statistical significance. Given the inconsistent results even for a single country, our results do not seem to stand in contrast to the literature.

The inconsistency for the US notwithstanding, what if the relation between depressive symptoms and adverse labor market outcomes is truly strong in developed countries but weak in developing countries? This is the position taken by Das et al. (2008). They analyzed datasets for five developing countries by using instruments similar to the CES-D. Two of their key conclusions are worth quoting: "The negative relation between psychological distress and labor force participation often observed in developed countries does not consistently translate to the developing countries (p. 45)." "Unlike studies in high-income countries, in low-income countries the correlation between mental health and levels of income or consumption is not strong (p. 33)." They, however, did not attempt to explain the differences between the two groups of countries.

We conjecture that two levels of causes are involved: at the country level or at a smaller level like individual or family. We believe that at the country level, the flexible nature of employment, especially in the informal sector, is important (Das et al. 2007). In IFLS5, among individuals aged 20-65, only 1.5% of men and 0.1% of women said that their primary activity in the past week was job searching. Unemployment is almost nonexistent there. Among the employed in the broad sense, 54.2% of men and 64.8% of women worked as self-employed (in almost all cases, alone or with unpaid family or temporary workers), casual, or unpaid family workers; informal jobs are the norm in Indonesia (Sohn and Kwon in press; Kwon and Sohn 2017; Sohn 2017b, 2015a, 2015b). If depressive symptoms prevent people from finding a job in the formal sector, they can do so in the informal sector. Furthermore, if most jobs even in the formal sector do not require high skills, depressive symptoms may not considerably reduce productivity and, consequently, earnings (Kessler and Frank 1997). Burton et al. (2004) concurred that the adverse effect of depression on work limitations is strongest for mental/interpersonal activities (e.g., concentration and teamwork) and weakest for physical work activities (e.g., repeating the same hand motions and using work equipment). Evidence of the routine nature of jobs in developing countries is provided by the fifth wave of the World Values Survey. In one question, respondents were asked whether their current (if not employed, past) tasks at work were routine or creative, with one meaning "mostly routine" and ten "mostly creative." 32.2% of Indonesians chose mostly routine while only 11.1% of Americans did so; 51.1% of Indonesians chose five or less while 33.7% of Americans did so. The mean score was 2.54 for Indonesia and 4.75 for the US.

At the individual or family level, our contrasting results with and without time-invariant individual characteristics suggest that such characteristics played an important role in causing the weaker relation. This conjecture is bolstered by Peng, Meyerhoefer, and Zuvekas (2015), who analyzed a nationally representative longitudinal US sample and found that controlling for individual fixed effects weakened the relation between depression and labor market outcomes. Furthermore, recall that when Fletcher (2013) controlled for family fixed effects (not even for individual fixed effects), the relation quickly lost statistical significance.

Before concluding this study, we add that the null relation does not mean that mental health in developing countries is unimportant for labor market outcomes. We considered only depressive symptoms. More severe, albeit rarer, mental illnesses (e.g., schizophrenia, bipolar disorder, pervasive developmental disorders, and idiopathic intellectual disability) would surely exert adverse effects on labor market outcomes. It could be that our null relation is limited to Indonesia, and replication studies can determine whether this is true. If our conjecture is correct, as developing countries develop over time and more workers perform jobs requiring more sophisticated skills, depressive symptoms will begin to exert an adverse influence on labor market outcomes. Given the lack of resources for mental health, long duration of accruing such resources (Saxena et al. 2007), and strong barriers to improving mental services in developing countries (Saraceno et al. 2007), developing countries and donor countries may start now to eliminate the barriers[2] and build up resources for mental health, such as mental health services, community resources, human resources, and financial resources. We also recommend addressing inequities in access to mental health care, stigma, discrimination, and human right violations. A delay in this endeavor is inexcusable given the existence of effective, locally feasible, and affordable treatments for some major mental illnesses, including depression and schizophrenia (Patel et al. 2007).

[2] Examples include insufficient funding for mental health services, mental health resources centralized in and near large cities and in large institutions, complexities of integrating mental health care effectively in primary-care services, low numbers of limited types of health workers trained and supervised in mental health care, and metal health leaders often deficient in public health skills and experience.

## *Appendix*

Table A-1. Factors Related to Attrition

| Independent variable | Coefficient |
|---|---|
| Depression score (/10) | 0.041<br>(0.010)* |
| Female | -0.066<br>(0.007)* |
| Javanese | -0.020<br>(0.007)* |
| Age | -0.019<br>(0.003)* |
| Age squared (/1000) | 0.241<br>(0.037)* |
| Married | -0.086<br>(0.010)* |
| Primary school | -0.090<br>(0.015)* |
| Junior high school | -0.059<br>(0.017)* |
| Senior high school | -0.057<br>(0.017)* |
| College or above | -0.001<br>(0.019) |
| Urban residence | 0.075<br>(0.007)* |
| Constant | 0.715<br>(0.060)* |
| N | 17,982 |
| R squared | 0.031 |

*Notes:* Of respondents with valid values of variables in IFLS4, 25.7% were lost in IFLS5. Robust standard errors are in parentheses. *: p-value $<$ 0.05.

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