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Addressing the unemployment–mortality conundrum: Non-linearity is the answer

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ABSTRACT

The effect of unemployment on mortality is the object of a lively literature. However, this literature is characterized by sharply conflicting results. We revisit this issue and suggest that the relationship might be non-linear. We use data for 265 territorial units (regions) within 23 European countries over the period 2000–2012 to estimate a multivariate regression of mortality. The estimating equation allows for a quadratic relationship between unemployment and mortality. We control for various other determinants of mortality at regional and national level and we include region-specific and time-specific fixed effects. The model is also extended to account for the dynamic adjustment of mortality and possible lagged effects of unemployment. We find that the relationship between mortality and unemployment is U shaped. In the benchmark regression, when the unemployment rate is low, at 3%, an increase by one percentage point decreases average mortality by 0.7%. As unemployment increases, the effect decays: when the unemployment rate is 8% (sample average) a further increase by one percentage point decreases average mortality by 0.4%. The effect changes sign, turning from negative to positive, when unemployment is around 17%. When the unemployment rate is 25%, a further increase by one percentage point raises average mortality by 0.4%. Results hold for different causes of death and across different specifications of the estimating equation. We argue that the non-linearity arises because the level of unemployment affects the psychological and behavioural response of individuals to worsening economic conditions.

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1. Introduction

What is the effect of unemployment on mortality? The interest in this question is twofold. At a more general level, exploring the linkages between economic activity and health is central to the analysis of human well-being and development. More specifically, the ongoing financial and economic turmoil requires policymakers to have a comprehensive understanding of the broad non-monetary consequences of raising unemployment rates. This is particularly true for several European countries, where the crisis has been more severe and the implementation of austerity programmes has strongly limited the ability of governments to spend on social welfare and to support the unemployed. It is therefore unsurprising to find a large and lively literature on this topic. The fundamental problem, however, is that the existing voluminous body of research seems to be unable to provide a consensual answer to the question. As discussed further below, some papers report that higher unemployment reduces mortality, others find the exact opposite, and a few more studies conclude that the relationship is not statistically significant.

A possible way to make sense of conflicting findings is to attribute them to differences in the methodologies used. Some evidence, in fact, does point out that empirical results are quite sensitive to changes in model specification and method of estimation (Neumayer, 2004; Tapia Granados and Ionides, 2011). This explanation, however, cannot be fully satisfactory since it implies that the answer to the question of how unemployment affects mortality is necessarily ambiguous. Our paper takes a different route: our hypothesis is that differences in reported findings are indicative of a possible non-linearity in the effect of unemployment. More precisely, we posit that the relationship between unemployment and mortality is U-shaped. This implies that the effect of an increase in unemployment can be positive, negative, or

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insignificant depending on the level of unemployment itself. This non-linearity would occur because of the way in which the level of unemployment affects individuals' perception of the possible duration of unemployment spells and therefore of the risk associated with being (or becoming) unemployed. Our hypothesis turns out to be supported by consistent and robust econometric results.

To illustrate our thinking in more detail, it is convenient to start from the two opposing views that have emerged in the literature on the health implications of unemployment. One view is that in time of economic hardship and rising unemployment, individuals tend to be more stressed, depressed, and likely to undertake unhealthy behaviours (e.g. heavy drinking, smoking, and poor diets). Furthermore, tighter household budget constraints might imply cuts in health related expenditures such as preventive screening or routine medical check-ups. The quality of the public health system and its coverage might also decline because of the adverse effect that economic downturns have on the spending capacity of the government. The consequence is then a positive association between unemployment and mortality, especially for causes of deaths with high stress-related attributable fraction like cardiovascular diseases, mental and behavioural disorders, suicide, and other illnesses related to alcohol and tobacco consumption. The evidence in support of this view is voluminous (Backhans and Hemmingsson, 2011; Lundin et al., 2014; Garcy and Vagero, 2012; Browning and Heinesen, 2012; Montgomery et al., 2013; Davalos et al., 2012; Deb et al., 2011; Strully, 2009). The counter view emphasizes how individual's health can deteriorate in time of economic expansion because of job-related stress (and associated risk of cardiovascular diseases and unhealthy behaviours), fatigue and physical exertion of employment, and accidents due to increased traffic. Moreover the increase in the opportunity cost of leisure reduces the time available for health preserving activities such as sport and general exercise. Since economic expansions are typically characterized by declining unemployment, the prediction in this case is that lower unemployment is associated with higher mortality or, equivalently, that the relationship between unemployment and mortality is negative. Starting with the seminal work of Ruhm (Rhum, 2000) this prediction has also received some considerable empirical support (Tapia Granados, 2005; Rhum, 2005; Neumayer, 2004; Tapia Granados and Ionides, 2011). Somewhere in between these two views lies a group of papers that substantially find no evidence of a robust and systematic effect of unemployment on mortality (Gerdtham and Johannesson, 2005; Svensson, 2007, 2010; Stuckler et al., 2009).

For a given level of per-capita income and government expenditure on health and social welfare, the fundamental difference between the two views rests with individuals' psychological and behavioural response to economic downturns and worsening labour market conditions. If this response is “negative”, meaning that individuals suffer from increased stress and develop unhealthy behaviours, then the mortality risk increases and the aggregate relationship between unemployment and mortality rate is upward sloping. Conversely, if the response is “positive”, meaning that individuals benefit from reduced job-related stress and fatigue and use the extra leisure time to undertake health-producing activities, then unemployment reduces mortality risks and the aggregate relationship between unemployment and mortality rate is downward sloping. Both responses can co-exist in the same sample and the observed sign of the empirical relationship depends on which of the two responses dominates. Our hypothesis is that the negative response is likely to dominate at higher levels of unemployment, while the positive response dominates at lower levels of unemployment. This is because in a situation of high unemployment, slimmer chances to find a new job and a longer expected duration of the unemployment spell make it more difficult for individuals to cope with the unemployment status (if already unemployed) or with the risk of becoming unemployed (if currently employed). The implication is higher levels of anxiety and stress among both the employed and the unemployed. There is indeed some evidence that the duration of unemployment rather than the job loss itself is an important health risk factor (Classen and Dunn, 2012). On the other hand, when unemployment is low, re-employment prospects are less negative and the expected duration of unemployment is shorter. These circumstances alleviate the strain of being or becoming unemployed and hence encourage individuals to invest time in healthier activities. If our hypothesis is correct, then at aggregate level we should observe a U shaped relationship: when the initial level of unemployment is low, then an increase in unemployment will reduce mortality; but when the level of unemployment is sufficiently high, then a further increase in unemployment will increase mortality. To the best of our knowledge, no previous paper has considered this potential non-linearity in estimating the relationship between unemployment and mortality at macro level.

2. Method

2.1. Data collection

In our analysis we use a panel of annual observations for 265 territorial units within 23 European countries over the period 2000–2012. Data are sourced from Eurostat (Eurostat, 2013), which defines territorial units as “basic regions for the application of regional policies”. We focus on European countries because in Europe more than elsewhere the economic crisis of these last few years has resulted in a sharp increase in unemployment rates. At the same time, excessive debt in many countries has led to the implementation of fiscal austerity programmes that have resulted in significant public budget cuts, thus triggering a sharp change in social welfare models. In this context, the question of how unemployment relates to mortality appears to be particularly important. The use of regional data serves three purposes. First, with regional data, we can exploit the significant variation in unemployment distribution within countries to increase the precision of our estimates. Second, given the low degree of labour mobility in Europe compared to the US, local labour market conditions are likely to be a relevant determinant of individual's health status. Third, by setting the unit of observation at the regional level, we obtain a much larger number of observations, and hence degrees of freedom, to be used for estimation. We use standard definitions for both the dependent variables and the regressors. Mortality is expressed in number of deaths per 100,000 population and separately computed for twelve causes of death. The unemployment rate is defined as the number of unemployed persons in percentage of the labour force.

2.2. Statistical model

Our empirical model is written as:

$$y_{it} = \alpha + \beta_1 x_{it} + \beta_2 x_{it}^2 + \sum_{j=1}^{n} \gamma_j z_{j,it} + \eta_t + \mu_i + \varepsilon_{it}$$

where i denotes a generic region, t is a generic year, y is mortality, x is the unemployment rate, z_j is a generic control variable, n is the total number of control variables in the model, η_t is a time fixed effect, μ_i is a region-specific fixed effect, ε is a purely stochastic disturbance, and α, β_1, β_2, $\gamma_1 \ldots \gamma_n$ are all coefficients to be estimated. The key difference with respect to the equation estimated in

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