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Recessions, healthy no more?

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ABSTRACT

Over the 1976–2010 period, total mortality shifted from strongly procyclical to being weakly or unrelated to macroeconomic conditions. The association is likely to be poorly measured when using short (less than 15 year) analysis periods. Deaths from cardiovascular disease and transport accidents continue to be procyclical; however, countercyclical patterns have emerged for fatalities from cancer mortality and external causes. Among the latter, non-transport accidents, particularly accidental poisonings, play an important role.

1. Introduction

Health is usually thought to worsen when the economy weakens, but substantial recent research suggests that mortality actually *declines* during such periods. Following Ruhm (2000), most recent studies utilize longitudinal data and panel techniques to control for many confounding factors, including time-invariant area-specific determinants and characteristics that vary over time in a uniform manner across locations[1]. Using data from a variety of countries and time periods, these investigations provide strong evidence of procyclical fluctuations in total mortality and several specific causes of death[2]. In Ruhm's (2000) analysis of the U.S., covering 1972–1991, a one percentage point increase in the state unemployment rate was estimated to decrease total mortality by 0.5% and motor vehicle and cardiovascular disease (CVD) deaths by 3.0% and 0.5%, with reductions also observed for fatalities from influenza/pneumonia, liver disease, non-vehicle accidents and homicides. By contrast, cancer mortality was unaffected and suicides were estimated to rise by 1.3%[3]. Using similar empirical methods, the procyclicality of total mortality has been confirmed for Germany (Neumayer, 2004), Spain (Tapia Granados, 2005), France (Buchmueller et al., 2007), Mexico (Gonzalez and Quast, 2011), Canada (Ariizumi and Schirle, 2012), OECD countries (Gerdtham and Ruhm, 2006), and Pacific-Asian nations (Lin, 2009)[4]. Motor vehicle and CVD fatalities are procyclical in almost all studies, with more variation in mortality from other causes[5].

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[1] Earlier investigations (e.g. Brenner, 1971, 1979) typically used time series data for a single geographic location. This research has been criticized on methodological grounds (e.g. Kasl, 1979; Gravelle et al., 1981) and suffers from the fundamental problem that any lengthy time-series may contain omitted confounding factors that are spuriously correlated with health. Ruhm (2012) provides a detailed discussion of these issues.

[2] Mortality rates are the most common proxy for health: they represent the most severe negative health outcome, are well measured and diagnosis generally does not depend on access to the medical system. However, changes in non-life-threatening health conditions are not accounted for. Due to limited data availability, few analyses examine how macroeconomic conditions affect morbidity. Exceptions include Ruhm (2003) and Charles and DeCicca (2008).

[3] Thus, mental health and physical health may move in the opposite direction.

[4] Economou et al. (2008) find that total mortality is negatively but insignificantly related to unemployment rates for 13 EU countries but that the unemployment coefficient reverses sign when controlling health behaviors (smoking, drinking, calorie consumption) and other potential mechanisms (like pollution rates).

[5] Stuckler et al. (2009) obtain evidence from 26 EU countries of positive, negative and neutral relationships between unemployment rates and suicides, deaths from transport accidents, and total mortality; however, the statistical methods focus on rates of changes in mortality and unemployment, making it difficult to compare the results with other related research. Analyses undertaken as early as the 1920s uncovered positive relationships between economic activity, total mortality and several specific causes of death (Ogburn and Thomas, 1922; Thomas, 1927; Eyer, 1977), as have some recent analyses using different methods (e.g. Fishback et al., 2007; Tapia Granados and Diez Roux, 2009).

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Some investigations suggest that mortality has become less procyclical or countercyclical in recent years. Using methods and data similar to Ruhm (2000), Stevens et al. (2011) find that a one percentage point increase in the state unemployment rate was associated with a 0.40% reduction in total mortality from 1978 to 1991, but a smaller 0.19% decrease when extending the analysis through 2006[6]. McInerney and Mellor (2012) estimate that a one-point rise in joblessness lowered the mortality rates of persons 65 and over by 0.27% during 1976–1991, but raised them 0.49% from 1994 to 2008. Svensson (2007) uncovers a positive relationship between Swedish unemployment rates and heart attack deaths from 1987 to 2003[7].

Changes in health behaviors provide a potential mechanism for the mortality response. Consistent with this, reductions in drinking, obesity, smoking and physical inactivity during bad economic times have been demonstrated (Ruhm and Black, 2002; Ruhm, 2005; Gruber and Frakes, 2006; Freeman, 1999; Xu, 2013), and Edwards (2011) shows that individuals spend more time socializing and caring for relatives during such periods. However, research using recent data again raises questions about the strength and direction of these relationships. Charles and DeCicca (2008) indicate that male obesity is countercyclical; Arkes (2009) obtains a similar result for teenage girls (but not boys); Arkes (2007) shows that teenage drug use increases in bad times; Dávlos et al. (2012) uncover a countercyclical pattern for some types of alcohol abuse and dependence; Colman and Dave (2013) suggest that increased leisure-time exercise during periods of economic weakness is more than offset by reductions in work-related physical exertion. Such findings are provocative although, as shown below, they should be viewed with skepticism because the analysis periods are too short (eight years or less) to provide definitive results.

Using U.S. data covering 1976–2010, the present study examines whether the relationship between macroeconomic conditions and mortality has changed over time. Comparability with previous investigations is maximized by using empirical methods that conform closely to that research[8]. Three primary results emerge. First, total mortality has shifted from being strongly procyclical to being weakly related or unrelated to macroeconomic conditions. Evidence from prior research that deaths decline when the economy deteriorates largely reflects the inclusion of early sample years, when this was the case. Second, the results obtained using relatively short (less than 15 year) periods show considerable instability and should probably be viewed as unreliable. Third, fatalities due to cardiovascular disease and, to a smaller degree, transport accidents continue to be procyclical, whereas strong countercyclical patterns for cancer and some external sources of death (particularly accidental poisonings) have emerged.

2. Research design

This analysis uses variations of previously employed panel data methods (e.g. by Ruhm, 2000) to analyze the relationship between macroeconomic conditions and mortality rates. The estimating equation is:

$$\ln\left(M_{kjt}\right) = \alpha_{kj} + X_{jt}\beta + U_{jt}\gamma + \lambda_{kt} + T_{jkt} + \varepsilon_{kjt} \quad (1)$$

where M_{kjt} is the mortality rate from source k in state j at year t, U is the state unemployment rate, X a vector of covariates, α a state fixed-effect, λ a general time effect, T a state-specific linear time trend, ε is the error term, and $\hat{\gamma}$ provides the estimated macroeconomic effect of key interest[9].

The year effects (λ_{kt}) hold constant determinants of death that vary uniformly across locations over time (e.g. advances in widely used medical technologies or behavioral norms); the location fixed-effects (α_{kj}) account for those that differ across states but are time-invariant (such as persistent lifestyle disparities between residents of Nevada and Utah). Since the supplementary time-varying state characteristics (X_{jt}) do not necessarily control for all time-varying determinants of death, the models also include state-specific trends (T_{jkt})[10]. The 1976–2010 analysis period reflects the availability of consistent data on state unemployment and mortality rates. The macroeconomic impact is then identified from within-location variations in mortality rates, relative to changes in other states and after controlling for demographic characteristics and state-trends. Since the impact of national business cycles is absorbed by the time effects, discussions of macroeconomic effects refer to changes within-states rather than at the national level.

One way of investigating whether the impact of macroeconomic conditions on mortality has changed is to compare predicted effects differ across sub-periods. However, since such estimates are often sensitive to the choice of starting or ending years, two alternative strategies are employed. First, models for total mortality are estimated with differing starting and ending dates, and with varying lengths of the analysis period. The second, and main, method specifies analysis periods of fixed duration and then sequentially estimates models for *all* alternative sample windows permitted by the data. Most commonly, 20-year periods are used with results obtained for 16-windows ranging from 1976–1995 to 1991–2010.

Figures are frequently provided with point estimates (and sometimes confidence intervals) on the unemployment rate coefficient presented for each analysis window. Tables are also supplied showing unemployment coefficients and standard errors for the first and last of the 20-year periods (1976–1995 and 1991–2010), denoted by $\hat{\gamma}_\tau$ and $\hat{s}_\tau$, respectively, where τ equals 1 (2) in the first (last) period. I test whether the macroeconomic effect has changed by providing estimates for $\Delta\hat{\gamma} = \hat{\gamma}_2 - \hat{\gamma}_1$.

Using Eq. (1), $(e^{\hat{\gamma}k} - 1) \times 100\%$ provides the predicted percentage change in mortality from source k resulting from a one percentage point increase in the unemployment rate. While these estimates show the *relative* size of the macroeconomic effect, they do not directly indicate changes in the *absolute* number of predicted fatalities because, for example, large relative effects may imply small absolute changes for sources that are responsible for few deaths. These relative effect sizes are translated into absolute numbers through estimates of:

$$\left(e\Delta^{\hat{\gamma}k} - 1\right) \times \pi_k D \quad (2)$$

where $\Delta\hat{\gamma} = \hat{\gamma}_{2k} - \hat{\gamma}_{1k}$, D is the average annual number of deaths (2222,313) and π_k is the share of deaths due to source k over the 1976–2010 period.

[6] The estimated reduction rises to 0.33% over the 1978–2006 period when using age-adjusted mortality rates.

[7] Using time-series methods for the U.S. from 1961 to 2010, Lam and Piérard (2014) also argue that total and cardiovascular mortality have become less procyclical over time, while motor vehicle fatalities remain strongly procyclical.

[8] One exception is the use of an uncommonly detailed set of age controls.

[9] Unemployment rates are used to *proxy* macroeconomic conditions; however, a procyclical variation in mortality does not imply that the loss of a job improves health. To the contrary, Sullivan and von Wachter (2009) show that job loss is associated with increases in individual mortality rates.

[10] Mortality trends vary considerably across sources of death, with large secular reductions for total mortality and that from cardiovascular disease and external sources, a relatively flat trend for cancer, and an increase for other disease deaths. State-year population weights were also sometimes incorporated but unweighted estimates are generally preferred (Wooldridge, 1999; Butler, 2000; Solon et al., 2015) and so are focused upon below.