Economic cycles and heart disease in Mexico

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ABSTRACT

While a considerable literature has emerged regarding the relationship between the business cycles and mortality rates, relatively little is known regarding how economic fluctuations are related to morbidity. We investigate the relationship between business cycles and heart disease in Mexico using a unique state-level dataset of 512 observations consisting of real GDP and heart disease incidence rates (overall and by age group) from 1995 to 2010. Our study is one of the first to use a state-level panel approach to analyze the relationship between the business cycle and morbidity. Further, the state and year fixed effects employed in our econometric specification reduce possible omitted variable bias. We find a general procyclical, although largely statistically insignificant, contemporaneous relationship. However, an increase in GDP per capita sustained over five years is associated with considerable increases in the incidence rates of ischemic heart disease and hypertension. This procyclical relationship appears strongest in the states with the lowest levels of development and for the oldest age groups. Our results suggest that economic fluctuations may have important lagged effects on heart disease in developing countries.

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1. Introduction

Economists have long investigated the effects of macroeconomic fluctuations on health outcomes, particularly mortality and life expectancy. However, there is a dearth of research about the relationship between morbidity and economic fluctuations due largely to the lack of available data (Ruhm, 2012, pp. 10). A better understanding of this relationship is important because macroeconomic fluctuations may be correlated with health conditions that do not necessarily result in death, yet represent an important cost to society. Moreover, policymakers may be able to use this information to mitigate the negative effects of conditions correlated with economic fluctuations.

In this paper, we contribute to the literature by providing a unique analysis of the relationship between macroeconomic fluctuations and morbidity using state-level data. We focus on heart disease in Mexico and employ an econometric panel approach with state and year fixed effects to account for possible omitted variable bias. Prior studies analyze the relationship between economic fluctuations and mortality. Examples of this literature include Ruhm (2000), Tapia Granados and Ionides (2011), Neumayer (2004), and Gonzalez and Quast (2011). To the best of our knowledge, our analysis is the first to use a panel of state real Gross Domestic Product (GDP) and actual incidence rates (overall and by age group).

We study Mexico for three primary reasons. First, Mexico is a middle-income country with a wide range of development across states. For many years, the northern states and Mexico City have been the most developed regions of the country while the southern states have been the least developed. For example, the richest state in 2010 was the Federal District (Mexico City) with a GDP per capita roughly six times as large as that of Chiapas, the poorest state. Moreover, evidence by Esquivel et al. (2002) and Messmacher (2000) show that the opening of the Mexican economy (which culminated with the North American Free Trade Agreement in 1995) has not reduced these inequalities. This persistent variation across states allows us to examine whether the relationship between the economy and morbidity varies by level of development. Second, Mexico has high quality state-level data over a considerable period of time. Third, by analyzing Mexico we better understand the relationship between macroeconomic fluctuations and health outcomes in developing countries. We investigate heart disease because it is the top cause of death in Mexico and worldwide (WHO, 2011) and it allows us to compare our morbidity results to the mortality results for the U.S. in Ruhm (2007) and for Mexico in Gonzalez and Quast (2010).

We find that while the contemporaneous relationship between GDP per capita and incidence rates for ischemic heart disease and hypertension is generally procyclical (where the incidence rate rises during economic expansions and vice versa), it is largely statistically insignificant. However, an increase in GDP per capita sustained over five years is associated with a considerable increase in the incidence rate over the period. Further, we find large

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differences in the relationship across states. Specifically, the procyclical relationship appears strongest in states at the lowest levels of development. Our results suggest that economic fluctuations may have important long-term effects on heart disease in developing countries.

Our paper is organized as follows. The next section describes the conceptual relationship between macroeconomic fluctuations and heart disease. The third section presents the data and the economic specification. The fourth section details the results, first for the contemporaneous model and then for the lagged model. The paper concludes with a discussion of the results and limitations and offers suggestions for future research.

2. Economic fluctuations and heart disease

Macroeconomic fluctuations can affect the incidence of heart disease through a multitude of pathways. Some are procyclical while the others are countercyclical. Several important procyclical pathways are air pollution, hours worked and work-related stress, the consumption of saturated fats, alcohol, and tobacco, and declines in physical activity. Countercyclical pathways include the improved affordability of health care and defensive expenditures.

The Mexican context of our study has important implications for these pathways. For example, during economic expansions road traffic, commercial transportation (including airplanes and railroads), and industrial activity increase, producing an increase in air pollution leading to higher heart disease. The procyclical relationship between economic activity and air pollution has been documented in Davis et al. (2010) and Davis (2012). A large number of previous studies has found a positive relationship between increases in air pollution exposure and heart disease. Brunekreef and Holgate (2002), Pope (2000), Brook et al. (2003, 2010), and HEI (2010) provide a good overview of this literature. Many of these studies show that short-term and long-term increases in air pollution have a detrimental effect on heart health. Specifically, particulate matter (PM) is considered one of the most harmful air pollutants for heart disease. For example, Riojas-Rodriguez et al. (2006) show a malignant effect from higher exposure to from a specific type of PM (PM2.5) and carbon monoxide in populations with ischemic heart disease in Mexico City. This PM pathway is likely to be especially important in the case of Mexico because a sizable contribution to those emissions comes from heavy commercial transportation on dirt roads (SEMARNAT, 2007). This type of transportation tends to be significantly affected by macroeconomic fluctuations. A possibly less important impact of higher road traffic is the adverse effect of noise pollution on heart disease. Babisch (2006), Mead (2007), and Hugh and Van Kemp (2012) provide a comprehensive overview of these findings.

Macroeconomic expansions can also increase the number of hours worked and work-related stress that can lead to higher heart disease. Firms may address short-term increases in demand by increasing hours worked rather than hiring additional workers, particularly in inflexible labor markets. Cuadra (2008) finds that the numbers of hours worked per worker in the manufacturing industry in Mexico are positively correlated with GDP. A lack of data prevents him from investigating this relationship in other sectors, but other correlations in his work suggest this relationship may be present throughout the economy. Moreover, Mexican workers have the highest number of average annual hours worked per worker in the Organization for Economic Co-operation and Development (OECD, 2013). Thus, economic expansions in Mexico tend to increase the hours worked on workers who already have long working days. Studies by Johnson and Hall (1988) and Belkic et al. (2004), among others, have documented a positive association between being overworked and work-related stress and cardiovascular disease.

Economic fluctuations may also affect cardiovascular health due to changes in food, alcohol, and tobacco consumption and decreases in physical activity. Reddy-Jacobs et al. (2006) finds that for young Mexicans having a paid job is an important determinant in the transition from experimentation to habitual tobacco consumption. This suggests that macroeconomic expansions could increase the prevalence of tobacco consumption among young people. Rivera et al. (2002) and Rivera et al. (2004) document an association between obesity and economic growth in Mexico. These studies also indicate that economic development in Mexico is associated with a nutritional transition into a "degenerative disease" phase with higher consumption of sugars, saturated fats, refined carbohydrates and processed foods along with a decrease in physical activity. However, Mexico is a country with large income disparities and these nutritional transitions are not homogenous across the country. Barquera et al. (2009) show that the least developed states are in an earlier phase of the nutritional transition and may be most susceptible to its effects. Thus, economic expansions in Mexico, particularly in the poorer states, may lead to increases in the consumption of sugars, saturated fats, and processed food, along with decreases in physical activity. These changes may lead to higher incidence rates of heart disease.

Nevertheless, economic expansions can also have positive effects on heart health. For instance, higher incomes may lead to the consumption of more and better preventive medical treatments. Also, defensive expenditures (residential air filters and noise proofing measures) that can potentially reducing the onset of heart disease may become more feasible during periods of economic growth.

Income inequality has also been studied as another potential factor that can affect the relationship between macroeconomic fluctuations and heart disease. There is little evidence that income inequality per se affects health outcomes. However, studies reviewed in Lynch and Kaplan (1997), Wagstaff and van Doorslaer (2000), and Veesntra (2002) argue that income inequality can be a signal of public policies (most likely at the state level) that are detrimental to health, particularly of low-income groups. These policies include less generous welfare programs with minimal investments in public education, health services, affordable housing, and environmental protection. High levels of inequality are also often associated with high crime rates, low social cohesion, and discrimination. This suggests that economic expansions in states with increases in income inequality could be associated with higher heart disease.

3. Data and empirical specification

3.1. Data

Our sample period is 1995–2010 and the unit of observation is state-year. Mexico has 32 states, which yields a full sample of 512 observations. We follow Gonzalez and Quast (2010) and use the 2001 state-level human development index produced by the National Population Council (CONAPO, 2001) to group states into three development categories: top ten, middle twelve, and bottom ten. Given our data consist of publicly available state-level data, ethical approval was not needed for this study.

The dependent variables are the overall and age-specific incidence rates of ischemic heart disease (IHD) and hypertension. The rates come from the National Epidemiological Surveillance System (SINAVE) which receives reports from approximately 96% of the public and private primary care clinics and hospitals in Mexico (Chowell et al., 2009). New and recurring cases are reported at the doctor's office, hospital, or clinic using the same format across the country. These data are later sent to the local health authority to be entered electronically in the national database. Local and state authorities validate the information. The data entered at the