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Improving health in an advanced economy: An economywide analysis for Australia

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ABSTRACT

We project the economy wide effects of changes in the health of the Australian workforce associated with a reduction in chronic disease prevalence. Our analysis is based on a dynamic, computable general equilibrium model that incorporates a detailed representation of demographic and health trends of the Australian labour force. Our results show that health improvements for older workers have a much greater effect than similar improvements for younger workers, due to the sensitivity of workforce participation to health for older workers relative to younger workers. We observe an expansion in GDP, employment and capital from the health improvements, but a fall in the capital–labour ratio. Traded sectors benefit much more than nontraded sectors with a consequent improvement in the trade balance and an associated real depreciation of the exchange rate.

1. Introduction

Chronic diseases, such as heart disease, stroke, cancer, chronic respiratory diseases and diabetes, are the leading cause of mortality in the world representing 63% of all deaths. Of the 36 million people who died from chronic diseases in 2008, nine million were under 60 and 90% of these premature deaths occurred in low- and middle-income countries (WHO, 2011). It is clear that chronic illness reduces individual welfare and increases direct health care costs, but recent studies have argued that chronic illness also causes indirect costs that act to reduce economic growth (e.g., Bloom and Canning, 2000; Sachs and Malaney, 2002). Recent cross-country studies examining the effect of health on economic growth have found that the impact ranges from benign to positive. WHO (2011) estimate that mortality and morbidity associated with chronic diseases reduce GDP by up to 6.8% in low- and middle-income countries experiencing rapid economic growth, as many people die prematurely. Weil (2007) estimates the income gain for poor countries if there was an improvement in the health of their population; he finds that reducing health differences across countries to zero would reduce the variance of log GDP per worker by 9.9%. Acemoglu and Johnson (2007) estimate the effect of improved health (via increased life expectancy) on GDP, population and other economic variables. In contrast to Weil (2007), Acemoglu and Johnson (2007) find that past health improvements in poorer countries had no effect on GDP per capita; however, they qualify their conclusions by noting that the nature of diseases causing early death in poorer countries has changed over the last 65 years such that their results may not fully apply to the disease profile in poor countries today.

In high-income countries, chronic diseases are not only the leading cause of death but also of disability, and are associated with high morbidity and the use of health services. In this work, we illustrate the effect of chronic illness on the wider economy by focussing on the impact of changes in ill health associated with chronic disease on the macroeconomy of a high-income country. We use the example of Australia, where the main causes of death in 25–64 year olds are coronary heart disease for males (14% of deaths) and breast cancer for females (12%), and fair or poor health is reported by 36% of those with hypertension or cardiovascular disease, 42% of those with diabetes and 58% of those with angina (ABS, 2010). As such, programmes that can prevent chronic disease have the potential to have a major impact on those with poor health, particularly in older age groups.

To illustrate the effect of chronic illness on the wider economy, we develop a dynamic, computable general equilibrium (CGE) model of the macroeconomic impact of chronic disease. Our model captures the major conduit through which the indirect costs of disease manifest: the labour market (Gershberg et al., 2000). Thus, we explicitly model the links between health and labour supply and analyse the effects of permanent reductions in the rate of health decline of workers that are comparable to reductions in the population prevalence of chronic disease. Our findings indicate that health improvements for 10% of the unhealthiest older workers can have strong macroeconomic effects.

Most of the empirical literature on the effects of chronic disease on labour market outcomes is based on the canonical model of Grossman (1972). Within this literature, studies of how adverse labour market outcomes, due to chronic disease or ill health, affect the general economy fall into two main categories. One category is macroeconomic

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growth models that treat health either as a production input in its own right, or as labour-augmenting: Agénor (2008) is a recent example. These studies tend to be applied-theoretic in nature and represent the economy with two or three sectors at most. Such studies can only provide qualitative results, usually via closed-form solutions, and give scant detail on sectoral effects. A second category of studies apply CGE models that indirectly incorporate a proxy for health via the effects of a given disease (or diseases) or health issue. One recent example is Smith et al. (2005), which examines the impact of antimicrobial disease resistance in the UK. Another recent example is Bosello et al. (2006), which studies the regional impacts of climate-change-induced change in human health. These two examples are typical of this category of studies in that they are based on economywide models that are calibrated on national accounts and input–output data. Thus, they contain policy-relevant sectoral detail and provide quantitative estimates of economic impacts.

Until recently, of the category of studies that apply CGE models to analyse health issues, none directly incorporated labour productivity or labour supply as an endogenous function of population-wide health (or health proxy). As far as we are aware, Rutten and Reed (2009) is the first study that develops such a link. They apply a comparative-static CGE model for the UK that makes health a function of health care provision. Health then determines effective labour supply. Rutten and Reed (2009) show that an increase in the national health budget will increase health and, thus, effective labour supply, which in turn raises national welfare via higher incomes and well-being. Like Rutten and Reed (2009), we apply a CGE model to simulate the effect of a change in health on effective labour supply and macroeconomic outcomes; but unlike Rutten and Reed we focus on the health status–labour supply nexus exclusively, and use a highly detailed multisectoral dynamic CGE model that allows for inertia and lags in market responses. In our framework, population health follows existing trends and is a function of non-health care factors, e.g., lifestyle, demographic trends. Our labour market specification identifies age- and health-specific participation rates for labour market participants and allows us to evaluate the macroeconomic effects of disease prevention, improvements in health technology and health promotion programmes that target particular sub-groups of the population. We analyse the economywide effects of permanent reductions in the rate of health decline of younger and older workers. Our approach demonstrates the importance of representing the age and health characteristics of labour market participants in order to properly evaluate disease prevention and health promotion programmes of different population sub-groups.

2. Health and human capital: the empirical literature

Intuition and casual observation suggest that health affects labour market outcomes (participation, employment, hours, productivity and wages); the empirical literature supports this view showing a positive relationship between health and labour market outcomes. Deterioration in health results in lower hours worked in the short term and a reduction in employment in the longer term. There are a number of reasons why we may observe a correlation between health, wages and offers of employment:

- an increase in health leads directly to an increase in productivity that would lead to an increase in offers of employment and in the wage rate offered;
- an employer may perceive health to be correlated with unobservable attributes that affect productivity and hence may be more likely to make an offer of employment and a higher wage offer to a healthier individual;
- an individual may be discriminated against because they are unhealthy irrespective of their productivity and may receive less offers of employment and lower wage offers (Contoyannis and Rice, 2001).

In general, the econometric literature has found a positive relationship between health, wage rates and hours of employment (Bartel and Taubman, 1979; Contoyannis and Rice, 2001; Grossman and Benham, 1973; Luft, 1975). Some of the literature takes a more dynamic approach and uses lagged health as a determinant of the current labour supply. In an early example of this, Haveman et al. (1994) estimated a simultaneous equation model for working hours, wages, and health with longitudinal data on 613 white males observed over 8 years from the US Panel Study of Income Dynamics. They found that lagged ill-health (measured by health related work-limitations) reduces wages of men by 54% compared to no limitations. In a joint discrete intertemporal model of health and employment risks, Haan and Myck (2009) use lagged variables to simulate the employment experience of a 29 year old employed German man. Between the ages of 30 and 50 the initial health status only marginally affects the employment risk, but in the last 10 years the risk of not being employed increases for those with initial poor health. At the age of 55 the difference in the median employment rate by health status amounts to 7 percentage points and increases to nearly 20 percentage points at the age of 59. Pelkowski and Berger (2004), using the longitudinal US Health and Retirement Study, find that a reduction in total earnings associated with a permanent health condition for a random worker is 52% for males and 52.4% for females. By far, the largest portion of this total effect is on the probability of working, with much smaller effects on wages. In other words, permanent health conditions reduce wages and hours worked, but have far greater effects on the likelihood that an individual works in the first place. This literature is consistent with the approach that we take here and with other evidence that better health increases both the probability that an individual will be employed and the number of hours worked (Cai and Kalb, 2006; Lechner and Vazquez-Alvarez, 2004), and that poor health increases the likelihood of early retirement.

Another strand of this literature, and one that is also consistent with the approach we take here, uses changes in past health (health shocks) to identify the health -work relationship. For example, Riphahn (1999) finds that a drop in a self-reported measure of health satisfaction has significant effects on employment in Germany. Using waves of the U.S. Health and Retirement Study, Bound et al. (1999) find that both changes in health and the long-term level of health influence labour supply decisions, and that the rate of retirement of men by age 62 were five times as great for those in poor health than for those in average health (Bound et al., 2010). Disney et al. (2006) apply the method to the first eight waves of the British Household Panel Survey (BHPS), and find that health shocks are an important determinant of retirement behaviour in the UK. These results are confirmed by Roberts et al. (2006) and Garcia-Gomez et al. (2008) using the BHPS, by Hagan et al. (2006) using the European Community Household Panel, and by Zucchelli et al. (2010) using the Australian HILDA data.

3. Age- and health-specific labour supply

The labour market theory we apply here was initially developed in Dixon and Rimmer (2003) and was first applied to a specific disease (AIDS/HIV) in Roos (2012). In our approach the supply side of the labour market is represented by decisions that reflect age and health status. We identify 5 age groups (the set AGE), 5 health statuses (the set HEALTH), 8 occupations (the set WORK) and 3 non-employment categories (short-run unemployed, long-run unemployed and new entrants: the set NWORK).[1]

There are six key ingredients in our approach; the first three ingredients are presented in Fig. 1. The six ingredients are:

- the specification of *categories by age*, *health status and work status*, determined at the *start* of each year;

[1] Short-run unemployed is defined as being unemployed in year $t-1$ but employed or not in the labour force in year $t-2$. Long-run unemployed is defined as being unemployed in years $t-1$ and $t-2$.