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THE ECONOMIC CONSEQUENCES OF HOSPITALIZATIONS FOR OLDER WORKERS ACROSS COUNTRIES

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JEL Classification: E21, H53, I13, I18

Keywords: Health shocks, medical spending, healthcare system, social insurance program, labor market protection, cross-country differences

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The Economic Consequences of Hospitalizations for Older Workers across Countries

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April 29, 2019

Abstract

This paper estimates the effect of hospital admissions among older workers on economic outcomes across countries. We use harmonized longitudinal survey data from the United States, China, and 13 countries in Europe, and follow the event study design of Dobkin et al. (2018) to estimate dynamic effects of a hospitalization on out-of-pocket health expenditures, labor market outcomes, social insurance payments, and household income. We find distinctly different patterns across countries. In contrast to the United States, where hospitalizations lead to large health expenditures and decreases in earnings, individuals in Northern and Southern Europe are largely protected from negative economic outcomes. Hospitalizations in China lead to even larger out-of-pocket expenditures as a percent of prior income, but do not negatively affect labor market outcomes. Our results largely align with the differences in generosity across countries in social protection institutions that include health systems, social security programs and labor market regulations.

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1 Introduction

Work in later life is often a crucial period for building retirement savings. Fresh evidence on life-cycle wage growth across countries shows that wages peak around the age of 50 across many countries, though life-cycle wage growth is steeper in rich than in poor countries (Lagakos et al., 2018). This period of working life is also much more susceptible to health shocks. For example, 45-64 year olds are 33% more likely to have an overnight hospitalization than 20-44 year olds (U.S. Department of Health and Human Services, 2015). Health shocks not only pose immediate medical expenditure risk, but also have a wide range of economic consequences on jobs, earnings, and household finances. In the United States, for example, Dobkin et al. (2018) document that the latter economic costs associated with hospital admission can overshadow the immediate cost of out-of-pocket medical spending. While health insurance provides protection against medical expenditure risk, protection against downstream labor market consequences rests with other types of insurance programs, including disability, sick pay, and retirement programs. As many countries around the world grapple with how to design these programs, it is particularly important to understand the economic consequences of shocks late in life under various institutional settings.

In this paper, we document the economic consequences of health shocks among older workers across countries using micro-level data to gain insights into how institutional and policy factors affect economic outcomes. To do this, we use the Harmonized Health and Retirement Study family of surveys consolidated by the Gateway to Global Ageing Data. Our core sample includes the United States between 2000-2014 from the Health and Retirement Study (HRS), 13 European countries between 2007-2015 from the Survey of Health, Ageing, and Retirement in Europe (SHARE), which we group into Northern Europe, Southern Europe, and Western Europe, and China between 2010-2014 from the China Health and Retirement Survey (CHARLS). This set of countries provides an interesting comparison set because, one, as we will discuss shortly, major types of health systems are represented by the countries in our sample; and two, our sample covers countries of different income levels and at different stages of development.

Our empirical strategy uses an event study approach around discrete health shocks. Following Dobkin et al. (2018), we examine the effects of six economic outcomes, including out-of-pocket medical expenditures, respondent earnings, spousal earnings, work status, social insurance payments, and total household income, for older workers aged between 50 and 59 who have health insurance coverage. We exploit the panel nature of each dataset to estimate these effects for several years after the hospitalization relative to a pre-trend in these outcomes prior to hospitalization.

We find distinctly different patterns around the world. In Northern and Southern Europe, out-of-pocket medical expenses do not rise significantly upon a hospital admission, suggesting that the (universal) healthcare systems in these countries insure individuals well against typical medical costs associated with a hospital admission. Moreover, while there is a gradual decline in income that begins several years before the hospitalization event, there is no significant drop in total income after the hospitalization from this trend. In contrast, hospitalizations in Western Europe and the United States lead to significant and persistent out-of-pocket medical costs and significant declines in earnings and employment. Social insurance payments significantly increase, and while it is enough to offset the earnings decline in Western Europe, it is not in the United States and thus total income significantly declines in the years following a hospitalization (as shown in Dobkin et al., 2018). In China, out-of-pocket medical expenses increase substantially after a hospitalization, but earnings do not fall.

To understand whether some of these estimated effects are driven by differential admission to hospitals that may be correlated with later economic outcomes, we also examine the effects of hospitalization on health outcomes. Indeed, we find that self-reported work limitations and health status appear to be worse in the United States and Western Europe following a hospitalization, which may help explain the more pronounced negative labor market effects in these countries.

These patterns can also be interpreted to some degree in light of the institutional differences across countries. For medical costs, Northern and Southern Europe have relatively generous social health insurance programs that protect individuals from most of the cost of a hospitalization, unlike in the United States and in China where health insurance programs have lower coverage rates. Analogously, European countries typically have more generous disability and sick pay programs and stronger labor market protection that may help cushion potential difficulties in returning to work after a hospitalization. Using country-wide data on the social protections for health, disability, and work, we find evidence that in countries where the government plays a larger and more active role in these protections, the effects of hospitalizations on out-of-pocket health expenditures are smaller, and in countries with stronger employment protections the negative effect on earnings is also dampened. These results largely align with the cross-regional differences in our main analysis and the institutional details characterizing these regions.

Our results add to a growing empirical literature on the link between health and economic activities over the life-cycle (see Prinz et al. (2018) and Currie and Madrian (1999) for reviews). Earlier work in this area measured effects of changes in a variety of health measures on consumption, earnings, and medical costs in the United States (e.g., Cochrane (1991); Smith (2005)), while more recent studies often focus on sharper health "shocks" such as hospitalizations, use rich structural models, incorporate administrative data, and evaluate effects in other countries (Dobkin et al. (2018) and De Nardi et al. (2018) in the United States, García-Gómez et al. (2017) in the Netherlands, Parro and Pohl (2018) in Chile). Much of this work finds large effects of hospitalization on earnings. We contribute to this literature by examining the effects of hospitalizations on economic outcomes in a variety of countries using harmonized data and methods.[1]

This paper also contributes to the literature on international comparisons of health (see Banks and Smith (2011) for a review). As argued in Kapteyn (2010), cross-country comparisons can be a useful way to evaluate the effects of institutions and policies, which can vary dramatically across countries but less so within countries. However, many previous studies making international comparisons rely on datasets and/or identification strategies that are only loosely comparable. This makes credible comparisons across countries difficult because variation across countries may simply be due to different econometric assumptions, sampling frames, or question wording. Using the Gateway to Global Ageing Data allows us to use the same estimation strategy on datasets that were specifically designed to mirror the HRS in the United States, though of course such a design cannot completely eliminate concerns over comparability. This hopefully provides more confidence that differences in results across countries are due to economic, institutional, and cultural differences between countries rather than data or methodological differences.

The rest of the paper is organized as follows. Section 2 provides an overview of the health and social insurance systems in the United States, Europe, and China. Section 3 presents our data and methodology, and Section 4 reports our main results and investigates potential mechanisms. Section 5 explores interaction effects with country-wide measures of social protections, and Section

[1] García-Gómez (2011) and Trevisan and Zantomio (2016) have similar aims, though they only study European countries and do not focus on hospitalizations. Gupta et al. (2015) compares Denmark to the United States, but focuses on a narrow set of health shocks and non-harmonized data.

6 concludes.

2 Institutional Background in the United States, Europe, and China

The economic consequences of hospitalizations may hinge to a large extent on the institutions in place to combat adverse health shocks. Around the world, the scope of these institutions varies widely, even between countries at similar levels of development. In this section, we review *social health protections* across the countries in our study from both a qualitative and quantitative perspective.[2] In particular, the set of institutions we review include healthcare systems (which determine how healthcare is financed), disability and sickness benefits provisions (which determine how negative income impacts from illness are mitigated), and more generally the strictness of labor market protection (which determine how jobs are protected after an illness). We use country-level data on health systems, disability and sickness benefits, and labor market protections from the World Health Organization (WHO) and the Organization for Economic Cooperation and Development (OECD) as measures of the various institutional regimes for the countries in our sample during our sample period (see Section 5 for more details). This section also provides some motivation for how we group the countries in our sample into larger regions in the econometric analysis in Section 4.

2.1 Health Care Systems Around the World

Health care systems often fall under four broad models: the "Beveridge" model, the "Bismark" model, the "national health insurance" model, and the "out-of-pocket" model (Reid, 2010). In the "Beveridge" model, healthcare is financed by the government through taxes. The government, as the single payer for medical bills, employs most of the health staff, has power to control costs, and ensures that healthcare is approximately free at the point of service. This type of healthcare system is emblematic of the systems in the United Kingdom, most of Scandinavia (i.e. largely in

[2]The International Labor Organization (ILO) defines *social health protection* as "*a series of public or publicly organized and mandated private measures against social distress and economic loss caused by the reduction of productivity, stoppage or reduction of earnings, or the cost of necessary treatment that can result from ill health*" and achieving universal social health protection coverage, defined as effective access to affordable quality health care and financial protection in case of sickness, is a central objective for the ILO (International Labor Organization, 2008).

our Northern Europe sample), as well as Greece, Italy, and Spain (i.e. largely in our Southern Europe sample).

In contrast, the "Bismark" model is a multi-payer social insurance model. Under this model, employers and employees contribute to a "sickness fund" through payroll deductions which are managed by one or more insurers, and health providers are generally private. Patients pay for their medical bills with the help of their insurer. Insurers and health providers are, however, subject to tight government regulations to ensure broad access to healthcare, relatively low healthcare costs, and low profit margins for insurers. This model is widely used in Belgium, Germany, France, Switzerland (i.e. largely in our Western Europe sample) and perhaps to a lesser extent in urban China.

The "national health insurance" model has elements of the aforementioned two models in that it features a single payer (i.e. the government) for health services, as in the "Beveridge" model, but has many private health providers, as in the "Bismark" model. The most prominent example of this model is Canada. Lastly, the "out-of-pocket" model is essentially market-driven healthcare, observed primarily in less developed countries where the government does not have the resources or political power to run or oversee a healthcare system. Rural China fell squarely into this category before the launch of the New Rural Cooperative Medical System (NRCMS) in 2003. However, despite near universal coverage of the rural population by the NRCMS, rural households still face out-of-pocket rates of over 50% (Mattke et al., 2014).

The United States healthcare system is unique in that households are exposed to different healthcare models depending on their age, occupation, income, etc. For example, the Veterans Health Administration is a government-run healthcare system, funded primarily through general taxes, that provides healthcare to American veterans (i.e., the "Beveridge" model). In contrast, working Americans often have employer-sponsored health insurance and receive care from private health providers (i.e., the "Bismark" model), while the elderly and the impoverished are covered by Medicare and Medicaid, respectively, which contain both private and public elements (i.e., the "national health insurance" model), and the uninsured population is subject to the "out-of-pocket" model.

To visualize these different healthcare models, we make use of the health financing data from the WHO.[3] One would expect that the out-of-pocket model (e.g., China) entails low government spending on health and the Beveridge model (e.g., Northern and Southern Europe) entails high government spending, while the Bismark model (e.g., Western Europe) lies somewhere in between. Panel (a) of Figure 1 shows the domestic general government health expenditures as a percentage of current health expenditures for all countries in our sample averaged from 2000 to 2015 on the vertical axis. The Chinese government shoulders just over 40% of all health expenditures (red circle), while at 50% the US government's expenditure on health is the second lowest in our sample (black circle). All European countries have more substantial government involvement in the health financing: the governments of Luxembourg and Belgium in Western Europe (the top two blue circles) as well as Denmark and Sweden in Northern Europe (the top two green circles) contribute over 80% of health expenditures. The European countries with the lowest government health expenditure shares are Switzerland and Greece, which are just above 60%. This is consistent with the general perception that government is more important in healthcare provision in Europe than in the United States or China, though within Europe there is no simple mapping between a country's healthcare model and the level of government financing.

These differences in healthcare systems may help explain differences in out-of-pocket expenditures as a result of a hospital admission. To understand institutional factors that may help explain differences in labor market outcomes, we turn to social security programs such as sick pay leave and benefit schemes, disability insurance, and labor market protection against dismissals.

2.2 Sick Pay, Disability, and Labor Market Protections

Sick pay schemes often provide job protection as well as income replacement during an absence due to illness, and thus may affect short-term earnings and labor force status. Like healthcare systems, there are also wide disparities across countries in the generosity of these schemes. For example, Heymann et al. (2009) finds that among the 22 OECD nations, the United States is the only country that does not legally require employers to offer paid sick leave to workers undergoing

[3] We use the domestic general government health expenditure (GGHE-D) as a percentage of current health expenditures (CHE) as the main measure of government health financing. Alternatively, using the percentage of CHE spent by compulsory financing arrangements (CFA), which includes government financing arrangements, compulsory health insurance, and social health insurance, gives very similar results.

a 50-day hospitalization.[4] In contrast, Luxembourg and Norway provide 50 days of paid sick leave at 100% replacement rate of wage, while Austria provides 46 full-time equivalent working days' pay, Germany 44, Belgium 39, Sweden 38, Denmark 36, Netherlands 35, Spain 32, Italy 29, Greece 29, France 24, Ireland 17, and Switzerland 15. China also requires employers to offer sick leave of at least 30 days at a replacement rate of 60% (Ministry of Labor, 1994).

The vertical axis of Panel (b) of Figure 1 shows public expenditures on sickness and disability benefits as a percentage of GDP, as measured by the OECD, for all of the countries in our sample except China. The United States spends 1.27% of GDP on disability and sickness benefits, the lowest among the OECD countries in our sample. At the other end, the Northern European countries – Denmark (4.50%) and Sweden (4.73%) – are among the countries that spend the most on disability and sickness benefits. Western and Southern European countries spend between 1.6% and 3% of their GDP on such benefits. As we examine in Section 4.5, disability insurance may play a strong role in the economic outcomes following a hospital admission, particularly if hospitalizations are correlated with disability. It may also have larger effects on longer-term outcomes than healthcare and sick pay programs, which are targeted to shorter-term relief.

Finally, to investigate how labor market protections differ across countries in our sample, we use the OECD's indicator of the strictness of employment protections, which measures on a scale of 1 to 4 how strictly individual and collective dismissals are regulated and enforced. The horizontal axes in Figure 1 display the indices averaged from 2000 to 2015 for our sample countries. The United States has the lowest index (1) for employment protection in our sample, while the majority of countries have an index of around 3. Markedly, Southern European countries tend to have stricter employment protection, with Portugal (3.75) and Italy (3.14) having the highest index.

In sum, Figure 1 pieces together a picture of the institutions in various regions represented in our sample. The United States stands out as the country with relatively low levels of government involvement in healthcare financing, public spending on disability and sickness benefits, and employment protection, suggesting that the United States provides very little in social protections in comparison to the other countries in our sample. China is similarly low on the health expenditure measure, while being above average on employment protections. Broadly speaking, Europe

[4] In the last decade, a handful of municipalities have passed paid sick leave policies (Pichler and Ziebarth, 2017), but there are currently no mandates at either the state or federal level.

has stronger protections, but there is heterogeneity between regions: Northern Europe has higher government spending on healthcare, disability and sickness, but average employment protection. Southern Europe has higher employment protections, but average spending on health and disability. Finally, Western Europe is close to average for all three measures, suggesting a moderate institutional setup along multiple dimensions. These findings largely align with the regional breakdown of Europe in our empirical microeconometric analysis, which we turn to next. There we examine the direct and indirect consequences of a particular interaction with healthcare systems around the world: a hospitalization.

3 Data and the Econometric Models

To examine the economic consequences of hospitalizations across countries, we use harmonized data from countries around the world included in the Gateway to Global Ageing Data and follow the event study design of Dobkin et al. (2018). We begin with a discussion of our data and sample restrictions, and then describe our event study design and a model to correct our estimates for timing differences across surveys.

3.1 Data

Our data come from three datasets in the Gateway to Global Ageing Data, which provides harmonized survey data on aging around the world. We use the most recent eight biennial surveys of the Health and Retirement Study (HRS) from the United States from 2000 to 2014, five biennial surveys of the Survey of Health, Aging, and Retirement in Europe (SHARE) from 2007 to 2015, and three biennial surveys of the China Health and Retirement Survey (CHARLS) from 2010 to 2014. Each of these datasets is a panel of individual-level and household-level data on health and health services, employment, income and wealth, family connections, and other aspects relevant for the study of aging, for a nationally representative sample of adults aged 50 and over.

3.1.1 Sample Selection

From these datasets, we make sample restrictions in order to isolate the appropriate sample as well as to construct as harmonized a sample across countries as possible.[5] For the HRS sample, we restrict our sample to the years 2000 and onward despite survey data dating back to 1992. This is because SHARE and CHARLS report after-tax earnings, and after-tax earnings in the HRS are only systematically available beginning in 2000 from RAND. For SHARE, we restrict our sample to the years 2007 and onward, because the survey in the wave prior to 2007 was conducted more than two years earlier for many respondents and hence did not align with the biennial structure of the other datasets. Moreover, instead of constructing separate samples for all countries in SHARE, we construct samples of three broader geographical regions: Western Europe (Austria, Belgium, France, Germany, Luxembourg 2013 onwards, the Netherlands through 2013, and Switzerland), Northern Europe (Denmark and Sweden), and Southern Europe (Greece 2007 and 2015, Italy, Portugal 2011 and 2015, and Spain). These definitions conform to the geographical definition constructed by United Nations Geoscheme for Europe, and align well with the grouping suggested in Esping-Andersen (2013) and our country-level analysis in Section 2.[6] As a robustness check, we also consider alternative groupings of the European countries in Section 4.4.

Across all five samples, we keep individuals who are interviewed during the calendar year of the survey year.[7] We then restrict our sample to individuals who report a hospitalization at least once during the sample period and index the first reported hospitalization as event time zero. Finally, for the HRS and and CHARLS samples, we further restrict our sample to individuals who are insured at the time of the indexed admission.[8] We assume all individuals in our SHARE sample are insured.[9] Focusing on the insured populations narrows the comparison down to individuals

[5]Appendix A reports the effect on the sample size at each step of the sample selection process and the distribution of individuals over event times in the analysis sample.

[6]These definitions exclude the following countries that are included in SHARE but do not fall into any of the three sample definitions or do not contain more than one wave of data: Croatia, the Czech Republic, Estonia, Hungary, Ireland, Israel, Poland, and Slovenia.

[7]This restriction is useful for the identification of implied effects for earnings outcomes, as will become clear in Section 3.2.

[8]In the HRS, an individual is insured if s/he reports having private insurance, Medicaid, Medicare, or other public insurance at the time of indexed admission. In CHARLS, an individual is insured if s/he reports having private, public, or other insurance at the time of indexed admission.

[9]SHARE only surveyed whether respondents and spouses had government health insurance in the first wave. And even then, a number of countries including Sweden, Spain, Italy, Denmark, Greece and Switzerland, did not include this question in the survey. Given the very high levels of coverage (about 90%) in the countries that were surveyed in the first wave of SHARE, we do not select the SHARE sample based on the limited health insurance information.

who supposedly have similar health insurance protections across countries, and yet as we will see, there are still substantial differences in the cost of a health shock to individuals residing in different countries.

3.1.2 Summary Statistics

Our final analysis sample includes 4,070 individuals in the United States, 3,088 individuals in Western Europe, 564 individuals in Northern Europe, 915 individuals in Southern Europe, and 1,607 individuals in China. All of these individuals have a reported hospitalization during the sample period, and we observe their health, health-related expenses, labor market outcomes, spousal labor market outcomes, social insurance payments, and household income, before and after the indexed admission.

Panel A of Table 1 provides an overview of the demographics of the analysis sample. The average age at admission is around 55, which does not visibly differ across regions. The indexed hospital admission occurs on average in the middle of the sample period for each sample, which is important for estimating both pre-trends as well as post-hospitalization effects. In China, 86% of the individuals have a spouse in the wave preceding the hospitalization, while only 54% in Northern Europe do. Panel B reports subsequent hospitalizations following the indexed admission. Individuals in the United States had the highest readmission rate within 12 and 36 months of the index hospitalization (31% and 53%), while Northern Europe had the lowest rates (22% and 41% for Northern Europe).

Panel C reports summary statistics of the outcome variables over the course of the sample, including out-of-pocket medical expenses, respondent earnings, whether they work (full-time or part-time), household social insurance payments, spouse earnings, and total household income. All monetary values are annualized and converted to 2005 US dollars to ensure comparability. Detailed variable construction is documented in Appendix B. There are wide disparities across regions. Average out-of-pocket medical expenses are highest in the United States ($1,852), in contrast to average medical expenditures below $500 in the other samples. For employment, Northern Europe reports the highest percent of individuals working either full-time or part-time at 71%, followed by China (68%), Western Europe (60%), the United States (57%), and Southern Europe (48%). The United States has the highest annual total household income ($56,290), followed by Northern

Europe ($44,547), Western Europe ($34,839), Southern Europe ($19,440), and China ($1,981). It is noteworthy that even though the mean household income in our Chinese sample is only 3.5% of that in the US sample, the mean out-of-pocket medical expenses in the Chinese sample is 15% of its US counterpart.

One important point is that our variable and sample definitions for the HRS sample vary slightly from those used in Dobkin et al. (2018) in order to better match it to the SHARE and CHARLS samples. These differences include: (a) converting earnings and income to post-tax values, (b) starting with wave 5 (year 2000) for tax calculation purposes, (c) converting out-of-pocket medical expenses to an annual measure, (d) not conditioning on no prior hospitalization in the previous wave. The decision not to condition on prior hospitalization in previous wave is driven by two data availability issues. First, the European and Chinese panels are much shorter relative to the US panel, and therefore conditioning on the lack of a prior hospitalization in the previous wave results in losing 48% of the sample across all countries. Second, we observe hospitalizations only in the 12 months prior to the survey date in SHARE and CHARLS, while we observe hospitalizations over the course of the entire 24 months between two survey dates in the HRS. In other words, we do not even observe all potential hospitalizations in the European and Chinese samples, and thus what we identify as the first hospital admission for a European or Chinese respondent might actually follow a previous hospitalization that occurred in an unreported time window during the sample period. Restricting the sample to individuals with no observable hospitalization in the prior wave could further exacerbate this problem because we can condition on no prior hospitalizations in the last two to four years for the US sample, but it is possible that we miss a prior hospitalization in the last 1-2 or 3-4 years in the other samples. This could potentially make our European and Chinese analysis samples a mixture of unanticipated hospital admissions and anticipated hospital readmissions, which tend to bias our results toward finding no effect if individuals can effectively plan ahead for hospital readmissions. On the other hand, it could also bias our results toward stronger effects if multiple hospitalizations signify more serious health problems. This is an important caveat to our results, but it is reassuring that the broad patterns for the United States that emerge from our study are similar to the findings in Dobkin et al. (2018) that condition on no hospitalization in the prior wave.

3.2 Econometric Models

We estimate both nonparametric and parametric event study models for each country/region in our sample, following Dobkin et al. (2018). For each outcome y_{ict} (i.e., out-of-pocket medical expenditures, respondent earnings, work status, social insurance payments, spouse earnings, and total household income) for individual i in cohort c and time t, the nonparametric event study specifies:

$$y_{ict} = \gamma_{ct} + \sum_{r=-S}^{-2} \mu_r + \sum_{r=0}^{S} \mu_r + \varepsilon_{ict}, \tag{1}$$

where γ_{ct} are coefficients on cohort-by-year fixed effects and μ_r are coefficients on indicators for waves relative to the wave in which the first hospitalization is reported.[10] The wave in which the hospitalization is first observed for an individual is defined as event time zero, or $r = 0$, and the omitted category is the wave prior to the hospitalization (μ_{-1}). The number of event periods is $S = 3$ for the United States and Europe, while the shorter time span of the CHARLS only allows $S = 2$ for China.[11] For all samples, we use survey weights and cluster standard errors at the individual level.

One concern with a causal interpretation of event study coefficients is that the identifying assumption is that, conditional on a hospitalization and controls, the timing of the hospitalization is uncorrelated with outcomes. The nonparametric specification allows us to examine this by estimating the pre-event outcomes. Given the presence of pre-trends for some variables, we then additionally estimate a parametric event study specification that allows us to interpret the post-hospitalization effects as causal under the assumption that the timing of the admission is not correlated with *deviations* in outcomes from the pre-hospitalization trend in the outcomes. The parametric event study specification is:

$$y_{ict} = \gamma'_{ct} + \delta r + \sum_{r=0}^{S} \mu'_r + \varepsilon'_{ict}. \tag{2}$$

The only difference from the nonparametric specification is the linear time trend r, whose coefficient

[10] Cohort refers to the original age cohorts by which households were originally selected in the sampling frame.

[11] Due to the relatively low number of observations for event time -3 and 3 in the European sample (Table A-1 in Appendix A), we also implement an estimation with $S = 2$ for both the United States and Europe as a robustness check (see Section 4.4).

δ captures a linear pre-trend in lieu of wave-specific effects. The parameter of interest, μ'_r, then expresses the change in a post-hospitalization outcome relative to its linear pre-event trend.

3.3 Implied Effects

Because the hospitalization could have taken place over a range of time (one or two years prior to the event time zero interview, depending on the survey), it is difficult to interpret the persistence of effects from the wave effects (i.e. the μ_r and μ'_r). To pinpoint the effect of a hospital admission after a certain amount of time has passed, we calculate "implied" effects. We follow the methodology in Dobkin et al. (2018), but modify it for the SHARE and CHARLS samples to match the timing assumptions in those surveys. We therefore describe the methodology for the SHARE and CHARLS samples below, and refer the reader to Dobkin et al. (2018) for the derivations in the HRS sample.

In the SHARE and CHARLS samples, at event time zero a respondent reports that she was admitted to a hospital in the past 12 months. To calculate the effect of the hospitalization on an outcome e months later, such as work status or annual out-of-pocket medical expenses, we ideally would know in what month the hospitalization occurred. Because the survey does not collect this information, we assume that hospitalizations occur uniformly throughout the year, and hence each observation has a $1/12^{th}$ chance of the hospitalization occurring in each month of the past year. Thus, the wave effect at event time zero, μ_0, is a weighted average of implied effects β_e for $e \in \{1,..,12\}$, and a similar logic holds for μ_1 and μ_2:

$$\mu_0 = \sum_{e=1}^{12} \omega_e \beta_e, \quad \mu_1 = \sum_{e=25}^{36} \omega_e \beta_e, \quad \mu_2 = \sum_{e=49}^{60} \omega_e \beta_e, \tag{3}$$

where ω_e is the probability of the hospitalization taking place e months prior to the survey (i.e., 1/12). Of course, we cannot identify all β_e's from the three wave effects, so we assume that β_e is a linear spline in e, with nodes at the 12th and 36th months:

$$\beta_e = \alpha_0(e > 0)e + \alpha_1(e > 12)(e - 12) + \alpha_2(e > 36)(e - 36). \tag{4}$$

Substituting the β_e's from equation (4) into the equations in (3), we have three equations (one for each μ_r) and three unknowns (α_0, α_1, and α_2), and thus we can recover the implied effects for any

β_e.[12]

4 Results

To understand the full economic consequences from a hospital admission, we include in the outcomes not only the direct cost of ensuing medical expenses, but also the indirect cost of lost work opportunities and earnings. To understand the potential insurance mechanisms available to our economic agents, we also examine changes in social insurance payments received by the household after the hospitalization and the changes in spousal earnings. Finally, to investigate whether health outcomes vary across countries both before and after a hospitalization, we examine doctor diagnoses, self-reported health, and health-related work limitations. We begin with estimates from equations (1) and (2), then move to implied effects and robustness checks, and close with an exploration of health conditions.

4.1 Wave Effects

We visualize the estimation results from the nonparametric specification (1) and the parametric specification (2) in one figure, where the estimated coefficients from the nonparametric specification, μ_r, are plotted against a dashed line representing the linear pre-trend δ from the parametric specification (normalized to run through $\mu_{-1} = 0$). Figures 2 to 7 show the results for all six main outcomes from each set of countries.

Before discussing the results, it is important to note that the look-back period for the hospitalization period differed across datasets. In the HRS, respondents are asked if they were hospitalized since the last survey (i.e., the last two years), while in SHARE and CHARLS the look-back period is only one year. Thus, relative to event time zero, hospitalizations on average occur further in the past in the United States sample than the European and Chinese samples. These differences across datasets will be explicitly taken into account when we calculate implied effects in Section 4.2.

In terms of out-of-pocket medical expenses, the United States, Western Europe, and China all see a visible jump upon the indexed hospital admission, whereas in Northern and Southern Europe

[12] Due to differences in the wording of the earnings and income survey questions, the calculation of implied effects for these variables differ somewhat from the description above but follows the same logic. A complete description of the derivation of the implied effects from the estimates of μ_r from the parametric specification are found in Appendix C.

the effect sizes do not differ significantly from the pre-admission trend or even zero (Figure 2), though the effect sizes in Southern Europe are somewhat noisy. The effect in the United States is particularly persistent, remaining significantly above the pre-trend line even five to six years after the hospital admission. We also observe a significant and persistent drop in post-tax earnings after a hospitalization for the United States and Western Europe samples, while the difference is not quite significant in Northern Europe, and there is a significant and persistent *increase* in post-tax earnings in Southern Europe and China compared to the trend line (Figure 3).[13] This somewhat puzzling finding in Southern Europe and China is driven by the downward sloping pre-trends in respondent earnings prior to the hospitalization. In fact, while respondent earnings are significantly higher than the *trend*, they are not significantly different from earnings in the wave prior to the hospitalization. A possible interpretation of this finding is that the illness underlying a hospitalization is less debilitating in these regions than in the United States or Western Europe, and hence once treated, workers are able to return to work (as we will show in Section 4.5). Consistent with the earnings patterns, there is a significant and persistent drop in employment in the United States and Western Europe (Figure 4). While there is no significant difference from trend in Southern Europe and China, Northern Europe displays a visible drop in work status without a significant accompanying drop in earnings after the indexed admission. This could suggest strong labor protection in Northern European countries, where workers are entitled to generous disability and sickness benefits, as is confirmed in Panel (b) of Figure 1.

The next set of figures provide insight into potential insurance mechanisms available after a hospitalization. Figure 5 shows the effect of a hospitalization on social insurance payments, which include disability insurance, unemployment insurance, workplace injury compensation, retirement pensions, and other government transfers such as food stamps and welfare assistance. Consistent with realizing higher medical expenses and lower employment and earnings, individuals in the United States and Western Europe receive significantly more social insurance payments after a hospital admission. In the other regions, social insurance payments do not deviate significantly from the pre-admission trend, although there are strong pre-trends in Northern and Southern Europe. Figure 6 shows estimates of the effect of a hospitalization on spousal earnings and there is

[13] One potential concern is how well is income measured in China. For that purpose, we re-conduct the analysis using consumption expenditures surveyed in CHARLS as a robustness chek (Section 4.4).

no clear evidence that spousal earnings are substitutes (i.e., added worker effects) or complements (which could occur if the hospitalized individual needs care from their spouse). In the United States and China, for instance, spouses earn significantly more relative to pre-trend, but only several waves after the hospitalization, while the opposite is true in Western Europe. Finally, Figure 7 reports estimates for total household income. Consistent with the other outcomes for the United States, individuals in the United States experience a similar decrease in total income. Income does not deviate from trend in Northern Europe and Western Europe, while in Southern Europe and China income marginally *increases* after a hospitalization. In China, this is perhaps in response to the need to pay for high out-of-pocket medical expenses.

Since we do not observe the exact timing of hospital admissions, the "wave" effects in Figures 2 through 7 are averages over individuals who are admitted to a hospital at different dates within a one-year (Europe and China) or two-year (United States) period prior to event time zero. In the next two subsections, we explicitly take into account this window and report "implied effects" of hospitalizations on outcomes 6 months and 24 months after the admission.

4.2 Implied Effects for Medical Expenses and Earnings

Table 2 reports the effects of a hospital admission on outcomes 6 months and 24 months post-admission. It is worth stressing that despite different look-back periods across surveys, the implied effects methodology adjusts for these differences and thus makes the effect sizes directly comparable across regions. This comes, however, at the expense of strong assumptions on the (spline) linearity of effects over time and thus also precision.

For both the United States and Western Europe, a hospital admission leads to both direct and indirect economic consequences. For the United States, the direct cost is an increase in annual out-of-pocket medical expenses of $772, or 2.9% of the pre-admission annual earnings, after 6 months and it persists to $933, or 3.5% of the pre-admission earnings, after 24 months. The indirect cost in terms of lost annual earnings is much larger and amplifies over time, at $3,093, or 11.7% of the pre-admission earnings, after 6 months and $5,177 or 19.5% of the pre-admission earnings. For Western Europe, the direct cost amounts to a significant 1.5% of pre-admission earnings, but unfortunately the indirect effects are too noisy to discern.

In Northern and Southern Europe, none of the implied effects are significant, suggesting weak but inconclusive evidence of economic costs from a hospital admission. This could be due to their well-functioning universal health insurance systems, which essentially provide healthcare free of charge to everyone, as well as strong labor protections that provide generous paid sick leave and shield sick workers from job loss (Figure 1).

The pattern of effects in China is distinct from the other countries. The direct out-of-pocket medical costs amount to a staggering 93% of the pre-admission earnings 6 months post-admission, and this cost is persistent: by the 24th month, the effect is 82% of pre-admission earnings. This is consistent with a medical insurance system in China that struggles to keep up with the rapidly increasing medical bills charged by the increasingly privatized hospitals and clinics. Meanwhile, there is no evidence of significant loss (either in magnitudes or statistically) in earnings following hospitalization either in the short or the long run. One interpretation is that households cannot afford to decrease their labor supply in response to a hospital admission.

The findings in this section suggest that, at least in some countries, hospitalizations lead not only to direct medical expenditures, but also to negative labor market consequences. While *health insurance* can combat the risk of costly medical care, it does not help with the indirect consequences of hospitalizations. Other insurance mechanisms, such as spousal earnings and various social insurance programs, are meant to target these risks. We next turn to an examination of these mechanisms.

4.3 Implied Effects for Potential Sources of Insurance

Individuals who incur direct medical costs and labor market costs as a consequence of hospitalizations may be insured against these costs through other mechanisms. While some insurance mechanisms are already incorporated into our measured outcomes (for example, progressive taxation), others are not. Here, we examine two potential sources of additional insurance: government transfers (social insurance) and spousal earnings (informal insurance).

In columns (4)-(6) of Table 2, we report the implied effects on household social insurance payments, spousal earnings, and total household income from a hospital admission. The impacts on social insurance payments are unfortunately very noisy for Northern and Southern Europe, but there is a significant increase for households in the United States (albeit small in magnitude) and Western Europe: a United States household on average receives $1,537 additional social insurance payments 24 months after the hospital admission, which is roughly 2.6% of the household's pre-admission total income. For Western Europe, the value is $5,356, or 14.6% of pre-admission total household income. Figure 5 indicates that in Northern Europe there may also be a significant increase in social insurance payments that emerges beyond 24 months post hospital admission, though it is does not appear in the implied effects. Given that the mean age of hospital admission in our samples is around 55, one possible reason for this later uptick is that individuals become eligible for pension income once they reach the minimum retirement age.[14]

In terms of informal insurance, we do not find evidence that spouses increase their earnings in most regions within 24 months post hospital admission, although these estimates are also quite noisy. However, Figure 6 does suggest that spousal earnings rise above the pre-admission trend beyond 24 months post-admission for the United States and China. This could reflect the possibility that people remain in employment longer than they otherwise would after their spouse has a health shock in their 50s. On the other hand, informal insurance could also take a non-pecuniary form, such as caring for a spouse that needs help with day to day activities. If some spouses are reducing their labor market activities to care for a sick partner (and saving on professional home care costs), this would dilute the spousal earnings channel yet not show up as insurance unless we had time use data or examined other health costs. Overall, there may well be insurance beyond those institutionalized in the medical insurance system, the labor protection of sick employees, and government transfers in each country. The effect of these other informal insurance mechanisms may take a few years to surface, but may nevertheless be relevant for the long-run well-being of individuals who have a major health shock towards the end of their work life.

4.4 Robustness Checks

We run a battery of additional specifications to check the robustness of our results, including 1) running the analysis on an alternative definition of Northern Europe and pooling all countries in Europe, 2) shortening the event time window to $S = 2$, and 3) using consumption measures as outcomes in the Chinese data. We describe our findings briefly here. For detailed results, please refer to our online Supplementary Material.

Our regional groupings of Europe in Section 3 were motivated by the United Nations Geoscheme

[14] Indeed, Dobkin et al. (2018) find evidence of pension income increases for their 60-64 year old sample.

for Europe and Esping-Andersen (2013), but as Côté-Sergent et al. (2018) show, healthcare utilisation and health behavior can be different across geographically close countries. We investigate how robust our results are when we vary the group membership in the European sample. We start from treating Europe as a whole, where we find significant and positive effects on out-of-pocket medical spending and insignificant and negative effects on earnings 6 and 24 months post-hospitalization. The magnitudes of the estimates fall in the range of the estimates we obtain from the main specification. Then, we re-conduct our analysis on an alternative definition of Northern Europe that includes Estonia and the Netherlands and find very similar results, and similarly for an alternative definition of Southern Europe that adds Slovenia.

We also check the robustness of our results to the sampling window. In our main results, the sampling window spans event time -3 through $+3$ ($S = 3$) for the United States and European samples, while the Chinese sample spans -2 through $+2$. Longer windows allows for longer pre-trend analysis as well as longer downstream effects, but the sample sizes are relatively small at event time -3 for some regions. To check that the effects are not driven by these small sample sizes in the event time tails, we run all regions using event time windows of -2 through $+2$, and find similar results in terms of wave effects as well as implied effects.

Finally, one concern with the results from China is that the income and earnings measures may be relatively noisy in comparison with the other datasets, and this may be driving some of our results. To examine this further, we use measures of food consumption over the past week and non-food nondurable consumption over the past month as alternative measures of total resources. Similarly to the labor market effects in China, we find that hospitalizations have a negligible effect on food and non-food consumption upon a hospital admission.

4.5 Health Outcomes

One potential reason behind the differences in economic outcomes across countries is that individuals may go to a hospital for systematically different reasons across countries that may be correlated with economic outcomes. The pre-trends estimated in Figures 2 through 7 provide some sense of the predictability of hospitalizations, but do not provide any measures of the health conditions that trigger a hospitalization. To examine this, Table 3 calculates the average prevalence of seven doctor-diagnosed health conditions the wave prior to the hospital admission and the wave of the hospital admission. Overall, hospitalized individuals in the United States are more likely to have at least one condition both in the wave prior to hospitalization and in the wave of hospitalization. This could be due to over-diagnosing of American physicians (or under-diagnosing in the other countries), or it could mean that hospitalized individuals are, to some extent, sicker in the United States than the other countries. If the latter interpretation is true, this could help explain the higher direct and indirect costs of hospitalizations in the United States. On the other hand, by this metric Chinese individuals are the next sickest, and while they also incur large medical costs, they do not experience an income decline. Northern and Southern Europeans who are hospitalized are least likely to have at least one diagnosis, consistent with small economic consequences of their hospitalizations.

In terms of individual conditions, hospitalized Americans are much more likely to have high blood pressure, diabetes, heart disease, and arthritis following a hospital admission. To the extent that these conditions interfere with the ability to work, a hospitalization related to these conditions could help explain the large labor market effects for the United States sample. Again, however, these rates are also relatively high among the Chinese sample.

To investigate the direct effects of a hospitalization on health and its interaction with the labor market, we estimate two additional event studies: Figure 8 estimates the effect of a hospitalization on the probability that health limits the ability to work, and Figure 9 estimates the effect on the probability that the individual's self-reported health status is "poor."[15] The patterns are similar for the two outcomes: individuals in the United States and Western Europe are much more likely to have a work-limiting health condition and to report being in poor health relative to trend. The results for the other samples are less conclusive, and Southern Europe and China show strong pre-trends, mirroring the pre-trends in respondent earnings in Figure 3 and suggesting that hospitalizations are less of an unanticipated shock in these regions. The fact that individuals in the United States and Western Europe report worse health and work ability after a hospitalization and that they suffer in the labor market as a consequence suggests that their underlying health conditions that triggered hospitalizations were more debilitating, hospitals provide lower quality care, or that self-reports on health status may be endogenous to eligibility requirements for

[15]Self-reported health status is ascertained by the respondent choosing either (1) excellent, (2) very good, (3) good, (4) fair, or (5) poor.

incapacity-related programs.

Overall, evidence on the mechanisms for the observed differences in direct and indirect economic costs of hospitalizations is mixed. Social insurance payments play a large role in the United States and Western Europe in response to a hospitalization, meanwhile social insurance payments in Northern and Southern Europe were on a steady upward trend prior to a hospitalization. There is no clear pattern of spousal earnings as an insurance channel, though they do increase relative to the pre-trend in the United States and China after the first couple of waves. Finally, work limitations and health appear to be worse in the United States and Western Europe following a hospitalization, which may help explain the labor market effects in these countries.

5 Impact of Social Protections

To test whether the makeup of a country's social protection institutions is an important mechanism for the effects we find in Section 4, this section uses a regression framework to examine how different measures of social protections impact the sensitivity of out-of-pocket expenditures and respondent earnings to hospitalizations. To do this, we collect annual, country-level data from the World Health Organization (WHO) and the Organization for Economic Cooperation and Development (OECD) for each country available in our sample from 2001-2015. Our country-specific measures of health systems include current health expenditures as a percentage of GDP, government health expenditures as a percentage of current health expenditures, private health expenditures as a percentage of current health expenditures, compulsory financing as a percentage of health expenditures, and voluntary financing as a percentage of health expenditures. In addition to characteristics of health systems, we also collect country-specific measures of disability and labor market protection, which include disability and sickness benefits as a percentage of GDP, the unemployment replacement rate at 12 months, collective bargaining coverage, and the OECD indicator of strictness of employment protections.[16]

To examine how these measures impact the exposure of out-of-pocket medical expenditures and

[16] The unemployment replace rate refers to the replacement salary of a worker who has a family with two children and whose partner earns the average wage 12 months into unemployment. The collective bargaining coverage rate corresponds to the ratio of employees covered by collective agreements, divided by all wage earners with right to bargain. We use version 2 of the strictness of employment protection indicator, as it matches better with our sample period. It is the weighted sum of sub-indicators concerning the regulations for individual dismissals and additional provisions for collective dismissals.

respondent earnings to hospitalizations, we isolate the two waves prior to and after a hospitalization in our sample, and run separate regressions of out-of-pocket medical expenditures and respondent earnings on a "post hospitalization" indicator of the two waves following a hospitalization, as well as a level and interaction term with a particular social protection measure. We normalize the measure to have mean zero and standard deviation one to facilitate interpretation. We additionally include cohort-wave fixed effects and country fixed effects, and cluster the standard errors at the country level.

The results are in Tables 4 for country-specific measures of health systems and Table 5 for country-specific measures of disability and employment protections. Table 4 shows that both the level and composition of health expenditures in a country can have a significant effect on the out-of-pocket expenses following a hospitalization. Concentrating on the interaction term between a hospitalization and a country-level measure, the more a country spends on health in general (column 1), and especially the more a country's health expenditures are private health expenditures (column 3) or raised through voluntary financing (column 5), the higher the effect of a hospitalization on out-of-pocket expenditures. On the other hand, the more a country's health expenditures are spent by the government (column 2) or provided through compulsory financing (column 4), the less a hospitalization impacts out-of-pocket health expenditures. In contrast to out-of-pocket spending, respondent earnings are largely unaffected by these country-level healthcare measures. These results are consistent with our findings that in the United States and China, a hospitalization leads to much higher out-of-pocket expenses than in the European regions.

Table 5 reports the impact of the provision of disability and sickness benefits and various measures of work protections. Higher public expenditures on disability and sickness benefits (column 1), higher bargaining coverage rate (column 3), and stricter employment protection (column 4) decrease the impact of a hospitalization on out-of-pocket expenditures, while the generosity of the unemployment insurance program (in terms of the replacement rate) has no effect (column 2). For respondent earnings, however, only the strictness of employment protections has a significantly positive effect on earnings: a one standard deviation increase in the strictness mitigates the decrease in earnings after a hospitalization by over $1,000. While the other variables are not statistically significant, disability and sickness expenditures and unemployment insurance generosity have similarly large coefficients. These results echo our findings that in countries with high (low) levels of employment protection such as the Southern European countries (the United States), the labor market consequences from a hospitalization are mild (severe).

These findings underscore the differences we find across countries in the impacts of hospitalization on ensuing health expenditures and downstream labor market effects, and suggest that both the health systems and the labor protections of countries are fundamentally related to these outcomes.

6 Conclusion

Economic risks that individuals face later in life can play a key role in the financial preparedness for retirement and the overall wellbeing of older workers. Some risks can entail multiple sources of loss; for example, adverse health shocks may lead to both medical costs (a direct loss) as well as lost labor market earnings. While health insurance protects individuals from medical costs, insurance against the negative labor market effects of adverse health shocks falls on other sources of protection, such as disability, sick pay and benefits and labor market regulations.

This paper, through a micro-level examination of the effects of hospital admissions, documents the economic consequences of such adverse health shocks across the world. By leveraging harmonized data across many countries and executing the same estimation strategy across datasets, we are able to provide careful and consistent comparisons across countries, allowing us to interpret differences in effects as due to economic, institutional, and cultural differences rather than data or methodological differences.

We find that the economic effects of hospitalizations vary substantially across the world. In Northern and Southern Europe, hospitalized individuals face very little exposure to the direct health costs associated with a hospitalization as well as the indirect labor market consequences. In contrast, individuals in the Western Europe and the United States (as Dobkin et al. (2018) has shown) are exposed to more direct health costs and negative labor market effects, though individuals in Western Europe are better protected by social insurance. Individuals in China face the largest direct costs (relative to prior earnings), yet do not have adverse labor market outcomes, perhaps as a response to the need to pay for medical costs and the absence of strong social insurance programs.

The pattern of direct medical costs across countries can be explained to some degree by differences in health insurance programs: Northern and Southern Europe have very generous social health insurance programs relative to the other countries in our sample. To help explain the labor market patterns, we find analagous patterns that disability and sickness benefits are generally more generous and labor market regulations are generally stricter in Northern and Southern Europe. Furthermore, we find that in countries where the government plays a large role in health expenditures, disability expenditures, and employment protections, the effects of hospitalizations on out-of-pocket health expenditures are dampened, and employment protections also dampen the effect on earnings. It may also be true that some of these differential patterns may be due to differences in the severity of conditions with which individuals either enter or exit a hospital admission. Indeed, individuals in the United States and Western Europe report more health-related work limitations following a hospitalization, and Americans report more doctor-diagnosed diseases prior to a hospitalization. Whether these are true health differences or are affected by eligibility standards of various social programs (like disability), is an open question.

While this paper is an important step in understanding how adverse shocks interact with labor markets and social protections, its scope is limited to the *average* effects of *hospital admissions*. Adverse shocks may differentially impact individuals based on the resources at their disposal, and thus an interesting direction for future research is to quantify the distributional impacts and link them to measures of economic inequality across countries. In addition, individuals nearing or in retirement face a host of other risks besides hospitalizations, including work-limiting disability, long-term care needs, and other medical risks (Mommaerts, 2016). Future work that analyzes the effects of these other risks on the wellbeing of older workers and retirees would be a fruitful direction towards understanding the role of risk and social protections in household behavior and welfare.

References

Banks, J. and Smith, J. P. (2011). International comparisons in health economics: Evidence from aging studies. *Annual Reviews of Economics*, 4:57–81.

Cochrane, J. H. (1991). A simple test of consumption insurance. *Journal of Political Economy*, 99(5):957–976.

Côté-Sergent, A., Fonseca, R., and Strumpf, E. (2018). Comparing the education gradient in chronic disease incidence among the elderly in six OECD countries. CEDIA Working Paper.

Currie, J. and Madrian, B. C. (1999). Health, health insurance and the labor market. *Handbook of Labor Economics*, 3:3309–3416.

De Nardi, M., Pashchenko, S., and Porapakkarm, P. (2018). The lifetime costs of bad health. NBER Working Paper.

Dobkin, C., Finkelstein, A., Kluender, R., and Notowidigdo, M. J. (2018). The economic consequences of hospital admissions. *American Economic Review*, 108(2):308–352.

Esping-Andersen, G. (2013). *The Three Worlds of Welfare Capitalism*. John Wiley & Sons.

García-Gómez, P. (2011). Institutions, health shocks and labour market outcomes across Europe. *Journal of Health Economics*, 30(1):200–213.

García-Gómez, P., Galama, T. J., Van Doorslaer, E., and López Nicolás, Á. (2017). Interactions between financial incentives and health in the early retirement decision. CESR-Schaeffer Working Paper No. 2017-004.

Gupta, N. D., Kleinjans, K. J., and Larsen, M. (2015). The effect of a severe health shock on work behavior: Evidence from different health care regimes. *Social Science & Medicine*, 136:44–51.

Heymann, J., Rho, H. J., Schmitt, J., and Earle, A. (2009). Contagion nation: A comparison of paid sick day policies in 22 countries. Technical report, Center for Economic and Policy Research.

International Labor Organization (2008). Social health protection: An ILO strategy towards universal access to health care. Social Security Policy Briefings Paper 1.

Kapteyn, A. (2010). What can we learn from (and about) global aging? *Demography*, 47(1):S191–S209.

Lagakos, D., Moll, B., Porzio, T., Qian, N., and Schoellman, T. (2018). Life cycle wage growth across countries. *Journal of Political Economy*, 126(2):797–849.

Mattke, S., Liu, H., Hunter, L. E., Gu, K., and Newberry, S. (2014). The policy argument for rethinking health care in China. In *The Role of Health Care Transformation for the Chinese Dream*. RAND Corporation.

Ministry of Labor (1994). Circular of the Ministry of Labour on the Issuance of the Provisions on the Period of Medical Treatment for Diseases or Non-work-related Injuries of the Staff and Workers in Enterprises. *LMI No. 479 of 1994*.

Mommaerts, C. (2016). Long-term care insurance and the family. Working Paper.

Parro, F. and Pohl, R. V. (2018). Health shocks, human capital, and labor market outcomes. Upjohn Institute Working Paper 18-290.

Pichler, S. and Ziebarth, N. R. (2017). The pros and cons of sick pay schemes: Testing for contagious presenteeism and noncontagious absenteeism behavior. *Journal of Public Economics*, 156:14–33.

Prinz, D., Chernew, M., Cutler, D., and Frakt, A. (2018). Health and economic activity over the lifecycle: Literature review. Technical report, National Bureau of Economic Research.

Reid, T. R. (2010). *The Healing of America: A Global Quest for Better, Cheaper, and Fairer Health Care*. Penguin Books.

Smith, J. (2005). Consequences and predictors of new health events. In *Analyses in the Economics of Aging*, pages 213–240. University of Chicago Press.

Trevisan, E. and Zantomio, F. (2016). The impact of acute health shocks on the labour supply of older workers: Evidence from sixteen European countries. *Labour Economics*, 43:171–185.

U.S. Department of Health and Human Services (2015). Summary Health Statistics: National Health Interview Survey.

Tables and Figures

Table 1: Summary statistics

	United States	Western Europe	Northern Europe	Southern Europe	China
Panel A: Demographics					
Age at admission	54.4	54.5	54.7	54.3	55.0
Male	45.8	51.1	44.9	48.5	46.8
Has spouse in wave prior to hospitalization	67.9	61.9	54.0	70.6	86.0
Year of admission	2006.0	2011.3	2010.7	2010.8	2011.9
Panel B: Subsequent outcomes					
Readmitted within 12 months	30.5	27.5	21.5	24.2	21.5
Readmitted within 36 months	52.7	52.7	41.0	46.1	49.2
Panel C: Economic Outcomes					
Out-of-pocket medical expenses	1,852	414	482	468	285
	(2,857)	(772)	(575)	(966)	(504)
Respondent earnings	22,830	15,486	21,547	7,804	452
	(27,737)	(19,014)	(18,273)	(11,188)	(1,112)
Working	57.0	59.7	71.4	48.2	68.0
	(49.5)	(49.0)	(45.2)	(50.0)	(46.7)
Social insurance payments	4,927	6,673	6,094	4,489	163
	(8,330)	(15,030)	(8,722)	(7,722)	(442)
Spousal earnings	19,354	9,929	14,392	5,707	422
	(26,820)	(15,963)	(18,289)	(9,751)	(1,033)
Total household income	56,290	34,839	44,547	19,440	1,981
	(50,301)	(30,328)	(28,138)	(16,767)	(2,736)
Individuals	4070	3088	564	915	1607

Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). All binary variables are multiplied by 100. Monetary outcomes are in 2005 US dollars. All means are weighted by survey sampling weights. Readmission rates within 12 months include observations with multiple hospitalizations at the wave of admission, while readmission rates within 36 months include admissions reported in the following wave (2 years later) as well as readmissions from within 12 months (Europe and China are missing readmissions between 12-24 months, however).

Table 2: Implied effects of hospitalization for the non-elderly insured (*ages 50-59*)

	Out-of-pocket medical spending (1)	Respondent earnings (2)	Working part- or full-time (3)	Household social insurance payments (4)	Spousal earnings (5)	Total household income (6)
6 month effect						
United States	772	-3,093	-3.8	924	1,371	-3,285
	(85)	(1,338)	(1.3)	(315)	(1,304)	(2,793)
Western Europe	283	-6,976	-10.0	5,747	-4,769	-665
	(89)	(5,334)	(6.2)	(2,847)	(5,182)	(9,163)
Northern Europe	141	-15,896	-18.7	7,928	2,898	526
	(156)	(11,637)	(11.0)	(4,640)	(8,423)	(15,373)
Southern Europe	456	6,708	2.5	-2,438	3,133	11,375
	(313)	(4,451)	(8.9)	(2,236)	(3,774)	(6,951)
China	443	867	-7.2	206	514	1,985
	(24)	(559)	(3.4)	(163)	(512)	(1,459)
24 month effect						
United States	933	-5,177	-6.1	1,537	2,460	-5,607
	(162)	(2,223)	(2.9)	(520)	(2,168)	(4,574)
Western Europe	335	-5,754	-17.4	5,356	-3,250	-420
	(142)	(4,274)	(10.4)	(2,351)	(4,156)	(7,569)
Northern Europe	136	-8,416	-28.8	3,614	-2,112	-4,792
	(257)	(8,051)	(17.2)	(3,206)	(6,474)	(10,763)
Southern Europe	475	5,801	9.0	-1,346	2,571	9,801
	(459)	(4,069)	(15.0)	(2,057)	(3,493)	(6,442)
China	392	62	-8.5	-16	126	-64
	(43)	(79)	(6.3)	(33)	(79)	(271)

Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). Each outcome-country pair report the implied effect and the standard error in parentheses. See Section 3.3 for details on the calculation of implied effects.

Table 3: Percent of sample with health diagnoses prior to and wave of hospital admission

	United States	Western Europe	Northern Europe	Southern Europe	China
Wave prior to hospital admission					
High blood pressure	47.5	38.9	25.9	27.7	30.7
Diabetes	17.3	15.0	7.4	12.2	11.8
Cancer	6.6	8.3	6.9	2.7	1.8
Lung disease	8.1	6.1	2.2	9.8	12.6
Heart disease	14.0	8.3	7.5	14.6	16.8
Stroke	4.3	2.1	4.8	3.5	2.6
Arthritis	49.5	22.4	20.3	22.3	41.4
Any condition	79.7	64.0	56.8	59.0	68.8
Wave of hospital admission					
High blood pressure	53.2	41.9	34.0	35.3	34.5
Diabetes	21.0	16.3	11.6	13.9	16.8
Cancer	13.7	14.4	10.4	13.2	3.5
Lung disease	10.4	12.5	12.3	9.3	17.2
Heart disease	25.2	16.4	16.3	14.7	21.9
Stroke	7.7	4.9	6.7	2.2	5.6
Arthritis	54.5	27.8	27.8	28.3	44.2
Any condition	86.0	75.1	70.1	69.1	76.4

Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). Each diagnosis is a binary variable indicating whether a doctor ever told the individual they had the condition. "Any condition" is whether they report any of the seven diagnoses. The wave prior to hospital admission is event time -1, and the wave of hospital admission is event time 0.

Table 4: Effect of hospitalizations on out-of-pocket health expenditures and respondent earnings, by country health system characteristics

	Panel A: Out-of-pocket expenditures				
	(1)	(2)	(3)	(4)	(5)
Post hospitalization	396.1***	135.8	134.0	132.1	131.5
	(20.6)	(132.9)	(133.3)	(131.8)	(132.2)
Current health exp as % of GDP	-755.8***				
	(206.0)				
... x post hospitalization	180.7***				
	(5.5)				
Govt health exp as % of health exp		430.3***			
		(85.9)			
... x post hospitalization		-359.7***			
		(89.2)			
Private health exp as % of health exp			-431.8***		
			(86.2)		
... x post hospitalization			361.0***		
			(89.5)		
Compulsory financing as % of health exp				445.4***	
				(88.1)	
... x post hospitalization				-361.4***	
				(89.8)	
Voluntary financing as % of health exp					-448.7***
					(89.1)
... x post hospitalization					364.3***
					(90.7)
Observations	11991	11991	11991	11991	11965
	Panel B: Respondent earnings				
	(1)	(2)	(3)	(4)	(5)
Post hospitalization	-2599.2***	-2846.7**	-2846.0**	-2895.7**	-2896.2**
	(491.7)	(1207.1)	(1210.3)	(1209.6)	(1213.3)
Current health exp as % of GDP	2685.6				
	(5115.6)				
... x post hospitalization	-863.1				
	(525.4)				
Govt health exp as % of health exp		1550.5			
		(1815.7)			
... x post hospitalization		-55.3			
		(1112.9)			
Private health exp as % of health exp			-1553.4		
			(1821.2)		
... x post hospitalization			54.3		
			(1116.9)		
Compulsory financing as % of health exp				2190.5	
				(1612.1)	
... x post hospitalization				-118.5	
				(1034.9)	
Voluntary financing as % of health exp					-2210.1
					(1629.7)
... x post hospitalization					119.9
					(1045.6)
Observations	13226	13226	13226	13226	13204

Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized. "Post hospitalization" includes the first two waves after the hospitalization, and is otherwise the two waves prior to the hospitalization. Interaction terms are annual country-specific measures from the WHO and OECD, normalized. Specifications include cohort x wave fixed effects and country fixed effects. Standard errors, clustered by country, are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Effect of hospitalizations on out-of-pocket health expenditures and respondent earnings, by country work protections

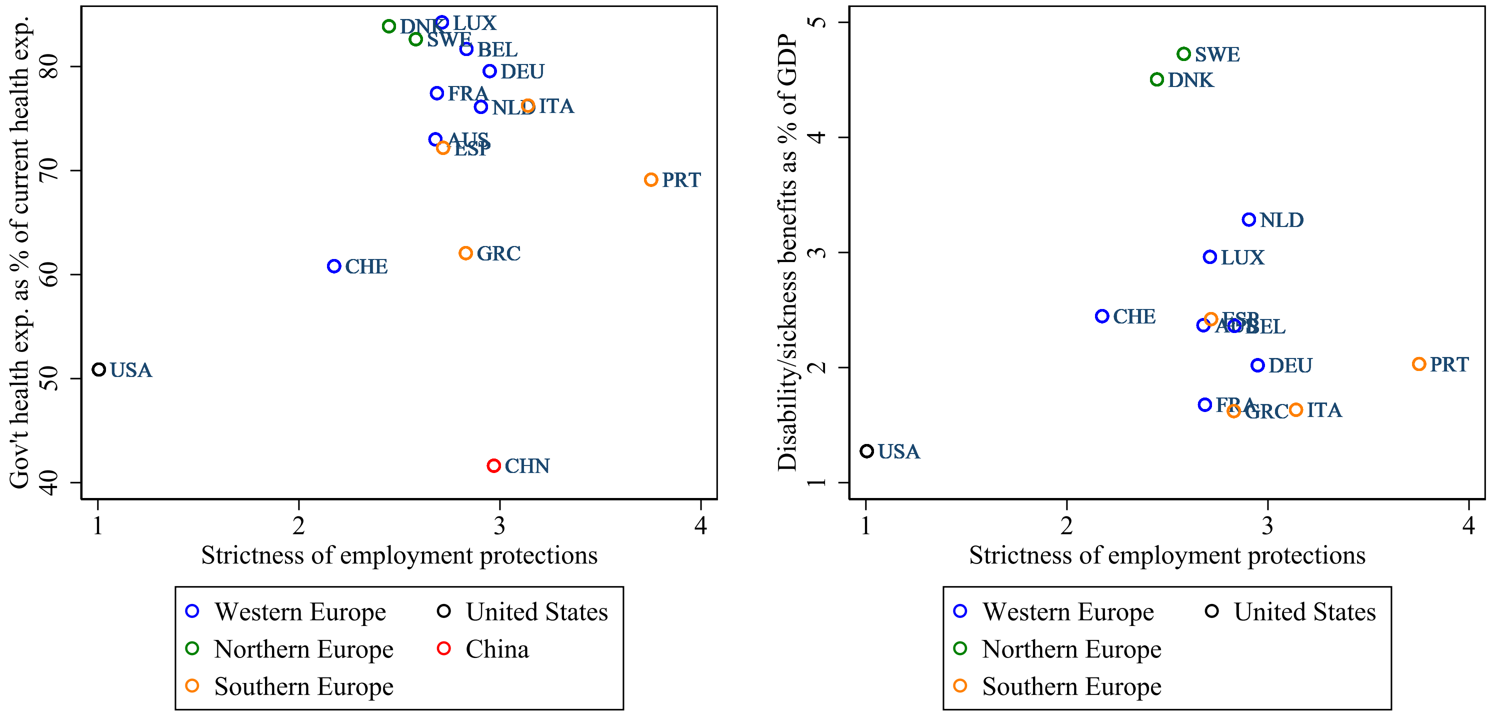
	Panel A: Out-of-pocket expenditures			
	(1)	(2)	(3)	(4)
Post hospitalization	434.8***	586.1***	439.6***	355.0***
	(50.0)	(79.2)	(12.9)	(7.0)
Disability and sickness exp as % of GDP	-30.8			
	(151.0)			
... x post hospitalization	-198.9***			
	(47.4)			
Unemployment replacement rate at 12 months		63.6		
		(43.7)		
... x post hospitalization		1.6		
		(55.1)		
Bargaining coverage			-678.0	
			(410.6)	
... x post hospitalization			-212.2***	
			(14.1)	
Strictness of employment protection				1991.9***
				(551.8)
... x post hospitalization				-231.1***
				(5.7)
Observations	10083	10083	8515	9966
	Panel B: Respondent earnings			
	(1)	(2)	(3)	(4)
Post hospitalization	-3307.2***	-3403.5***	-3919.7***	-2464.8***
	(1060.6)	(903.3)	(645.9)	(551.2)
Disability and sickness exp as % of GDP	-1293.0			
	(3729.8)			
... x post hospitalization	809.5			
	(1157.0)			
Unemployment replacement rate at 12 months		1441.8		
		(921.8)		
... x post hospitalization		951.4		
		(1075.3)		
Bargaining coverage			4230.8	
			(3934.9)	
... x post hospitalization			-255.9	
			(712.4)	
Strictness of employment protection				21896.0*
				(12134.5)
... x post hospitalization				1076.9**
				(470.2)
Observations	11322	11322	9227	11201

Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized. "Post hospitalization" includes the first two waves after the hospitalization, and is otherwise the two waves prior to the hospitalization. Interaction terms are annual country-specific measures from the WHO and OECD, normalized. Specifications include cohort x wave fixed effects and country fixed effects. Standard errors, clustered by country, are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 1: Relationship between social protection measures, by country

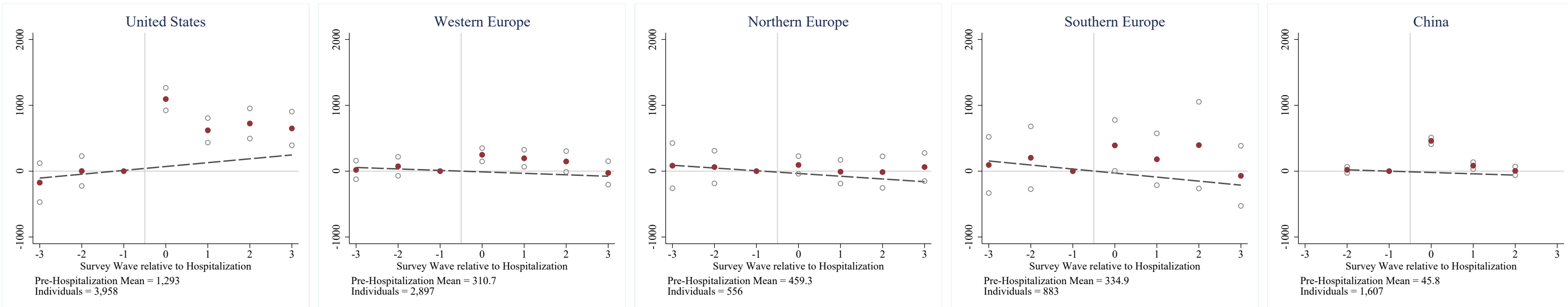
(a) Public health expenditures and employment protections

(b) Disability/sickness benefits and employment protections



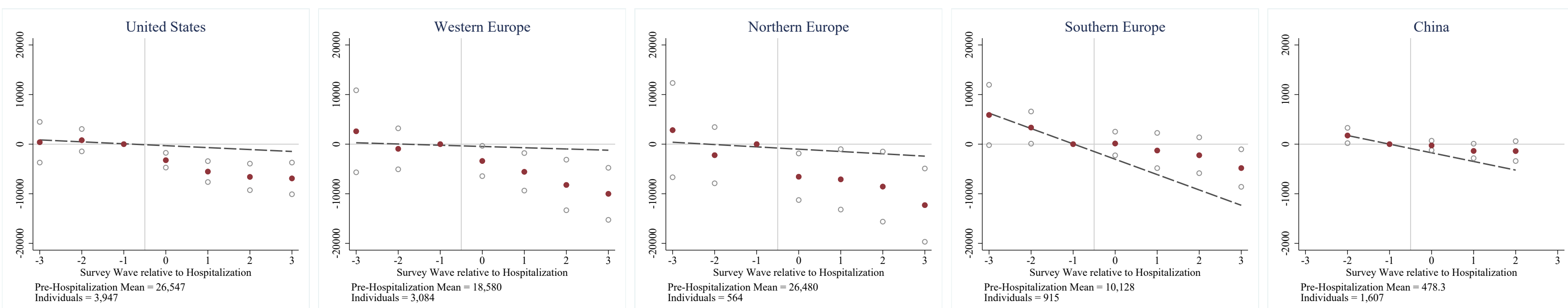
Note: Data from WHO and OECD, 2000-2015, normalized within the sample. Strictness of employment protections is the weighted sum of sub-indicators concerning the regulations for individual dismissals and additional provisions for collective dismissals (version 2). The country codes stand for: AUS=Austria, BEL=Belgium, DNK=Denmark, FRA=France, DEU=Germany, GRC=Greece, ITA=Italy, LUX=Luxembourg, NLD=the Netherlands, PRT=Portugal, ESP=Spain, SWE=Sweden, CHE=Switzerland, USA=the United States, CHN=China.

Figure 2: Impact of hospitalization on out-of-pocket medical expenditures for the non-elderly insured (*ages 50-59*)



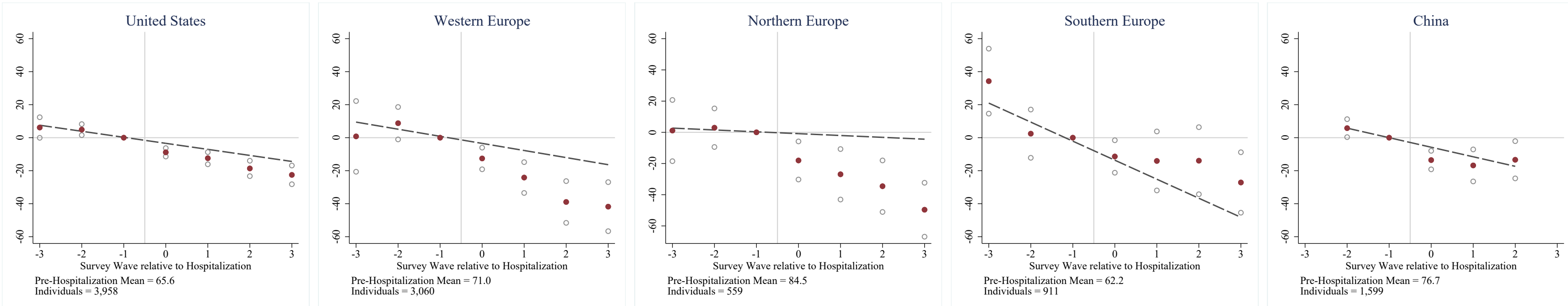
Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). The figure plots the μ_r terms from equation (1) in red and the 95% confidence intervals in gray. The dashed line is the estimated pre-trend (δ) from equation (2), normalized to zero at event time -1. The regression controls for wave-cohort-country fixed effects, and is weighted using person weights provided by the respective survey. Standard errors are clustered at the household level.

Figure 3: Impact of hospitalization on respondent earnings for the non-elderly insured (*ages 50-59*)



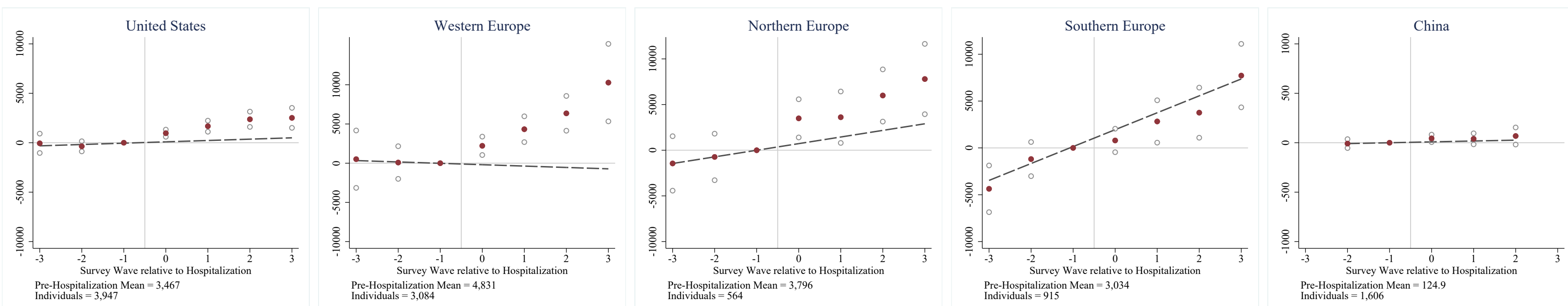
Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). The figure plots the μ_r terms from equation (1) in red and the 95% confidence intervals in gray. The dashed line is the estimated pre-trend (δ) from equation (2), normalized to zero at event time -1. The regression controls for wave-cohort-country fixed effects, and is weighted using person weights provided by the respective survey. Standard errors are clustered at the household level.

Figure 4: Impact of hospitalization on work status for the non-elderly insured (*ages 50-59*)



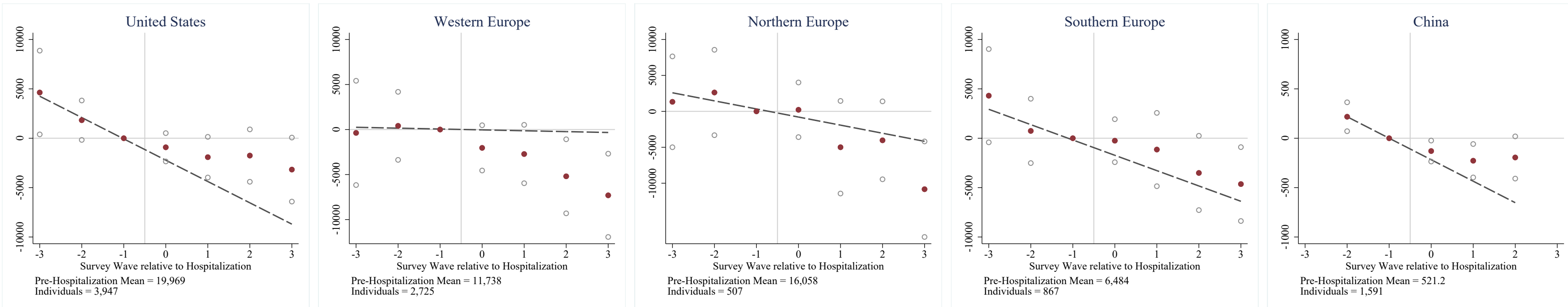
Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). The figure plots the μ_r terms from equation (1) in red and the 95% confidence intervals in gray. The dashed line is the estimated pre-trend (δ) from equation (2), normalized to zero at event time -1. The regression controls for wave-cohort-country fixed effects, and is weighted using person weights provided by the respective survey. Standard errors are clustered at the household level.

Figure 5: Impact of hospitalization on social insurance payments for the non-elderly insured (*ages 50-59*)



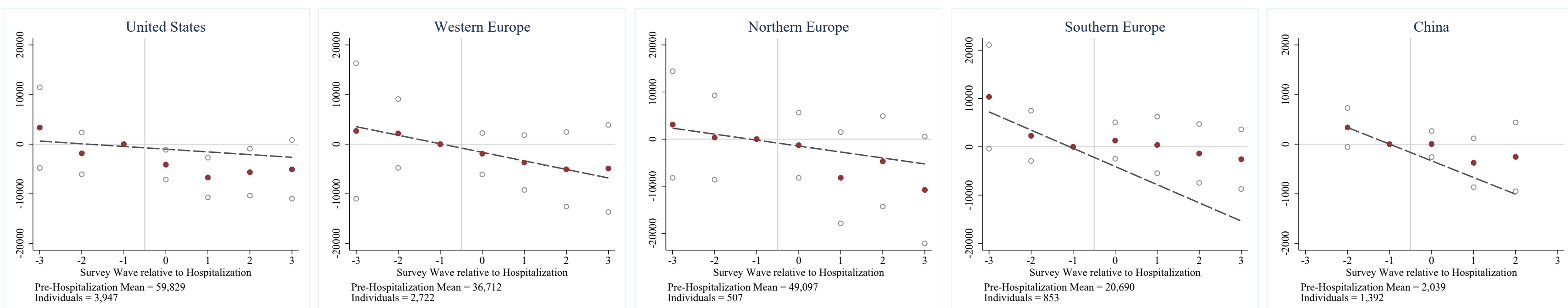
Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). The figure plots the μ_r terms from equation (1) in red and the 95% confidence intervals in gray. The dashed line is the estimated pre-trend (δ) from equation (2), normalized to zero at event time -1. The regression controls for wave-cohort-country fixed effects, and is weighted using person weights provided by the respective survey. Standard errors are clustered at the household level.

Figure 6: Impact of hospitalization on spousal earnings for the non-elderly insured (*ages 50-59*)



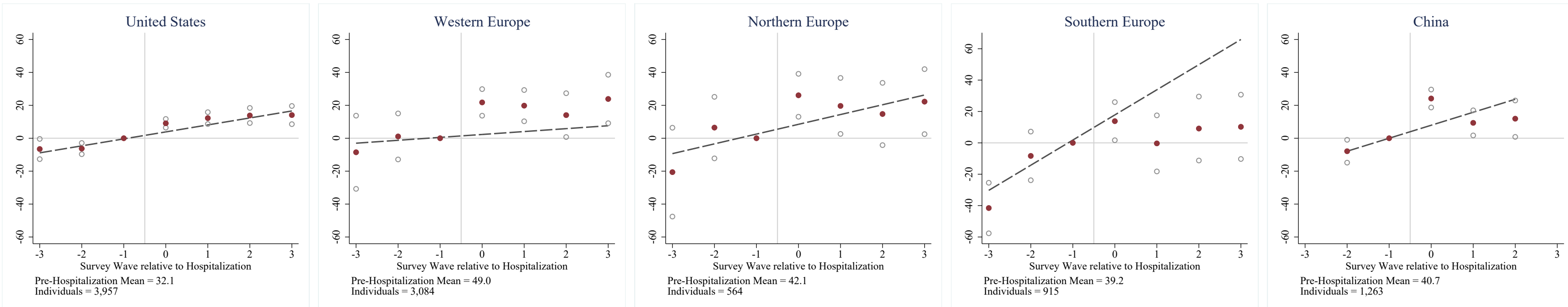
Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). The figure plots the μ_r terms from equation (1) in red and the 95% confidence intervals in gray. The dashed line is the estimated pre-trend (δ) from equation (2), normalized to zero at event time -1. The regression controls for wave-cohort-country fixed effects, and is weighted using person weights provided by the respective survey. Standard errors are clustered at the household level.

Figure 7: Impact of hospitalization on total household income for the non-elderly insured (*ages 50-59*)



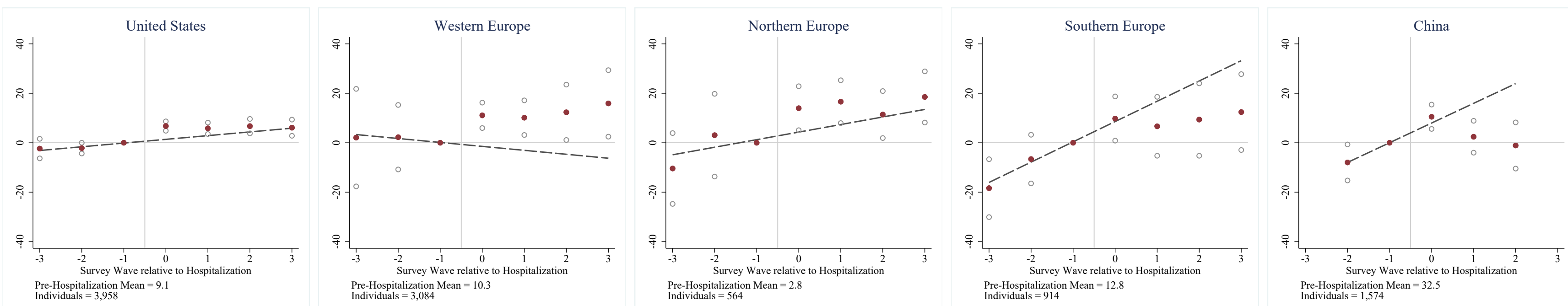
Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). The figure plots the μ_r terms from equation (1) in red and the 95% confidence intervals in gray. The dashed line is the estimated pre-trend (δ) from equation (2), normalized to zero at event time -1. The regression controls for wave-cohort-country fixed effects, and is weighted using person weights provided by the respective survey. Standard errors are clustered at the household level.

Figure 8: Impact of hospitalization on whether health limits work for the non-elderly insured (*ages 50-59*)



Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). The figure plots the μ_r terms from equation (1) in red and the 95% confidence intervals in gray. The dashed line is the estimated pre-trend (δ) from equation (2), normalized to zero at event time -1. The regression controls for wave-cohort-country fixed effects, and is weighted using person weights provided by the respective survey. Standard errors are clustered at the household level.

Figure 9: Impact of hospitalization on self-reported poor health for the non-elderly insured (*ages 50-59*)



Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). The figure plots the μ_r terms from equation (1) in red and the 95% confidence intervals in gray. The dashed line is the estimated pre-trend (δ) from equation (2), normalized to zero at event time -1. The regression controls for wave-cohort-country fixed effects, and is weighted using person weights provided by the respective survey. Standard errors are clustered at the household level.

Appendix

A Sample Selection

Table A-1: Sample selection and event time sample sizes

	United States	Western Europe	Northern Euorpe	Southern Europe	China
Panel A. Raw Data to Analysis Sample					
Total # of individuals, all years	22753	19891	5153	10192	10443
Total # of individuals, relevant waves	15209	17405	4359	9081	10443
Total # of individuals, survey years	14751	16469	4069	9015	10395
Individuals with hospitalization	4706	3088	564	915	1727
Individuals with hospitalization and insurance	4070	3088	564	915	1607
Panel B. Observations per event time					
Event time: -3	498	74	37	30	0
Event time: -2	1072	405	91	131	449
Event time: -1	1976	949	161	192	1001
Event time: 0	4070	3088	564	915	1607
Event time: 1	3172	1464	239	272	948
Event time: 2	2565	841	170	273	388
Event time: 3	1887	221	96	118	0

Note: The first row of Panel A contains all individuals in all years of the surveys (United States: HRS; Europe: SHARE; China: CHARLS). The second row limits the sample to waves 5-11 of the HRS (years 2000-2014), waves 2 and 4-6 of SHARE (years 2007-2015), and waves 1-3 of CHARLS (years 2011-2015). The third row further limits the sample to observations for which the interview fell during the calendar year of the survey, and the remaining rows further limit the sample to individuals who experienced a hospitalization (fourth row) and additionally were insured during the wave of hospitalization (fifth row). This last sample is our analysis sample, and event time zero is the wave during which the hospitalization was reported.

B Variable Definitions

We document how we construct and harmonize the key variables from different surveys. The Harmonized Studies in the Gateway to Global Aging Data has conveniently facilitated the comparison. We fine tune our data on based on their structure. We convert all nominal monetary values to real 2005 US dollars. For SHARE, we first use the Consumer Price Index (CPI, all-items) for the Euro area to convert the nominal values to real 2005 Euro and use the Euro-USD exchange rate in 2005 to convert them to 2005 US dollars. For CHARLS, we follow the same procedure using the CPI for China and the CNY-USD exchange rate in 2005. We additionally topcode and bottomcode all continuous variables to their 99th and 1st percentile values, respectively.

Recent hospitalization. We define a hospitalization as one occurring within the previous one or two years, depending on the survey. In the HRS, the variable *RwHOSP* indicates the respondent's overnight hospital stay in previous two years. In SHARE and CHARLS, the variable *RwHOSP* indicates the respondent's overnight hospital stay in the previous 12 months. We focus on the first hospital stay reported in our analysis sample.

Out-of-pocket medical expenses. We define out-of-pocket medical expenses as the amount of money spent over the previous 12 months on medical expenses. In the HRS, the variable *RwOOPMD* contains the out-of-pocket medical expenses since last survey (i.e. for two years). We divide the value by 2 to convert it to an annual measure, to be consistent with the counterparts in SHARE and CHARLS. The expenditures captured are hospital costs, nursing home costs, doctor visits costs, dental costs, outpatient surgery costs, average monthly prescription drug costs, home health care costs, and special facilities costs. In SHARE, the variable *RwOOPMD1Y* contains the out-of-pocket medical expenditures in the previous year. They capture hospital costs, doctor and outpatient costs, drugs costs, home care/nursing home costs, and dental costs, the last of which is available only since wave 5. In CHARLS, there is no single variable that gives the total out-of-pocket medical expenditures. We construct a CHARLS analog of out-of-pocket medical expenses by summing three relevant variables, *RwOOPHOS1Y*, *RwOOPDOC1M*, and *RwOOPDEN1Y*. The three variables contain out-of-pocket hospital costs last year, doctor visits costs last month, and dental costs last year, the last of which is available only since wave 2.

Current work status. We define the working variable as a binary variable that takes the value of one if the respondent is "working," which varies slightly by survey. In the HRS, variable *RwLBRF* indicates the current labor force status of a respondent in each wave. *RwLBRF* summarizes whether the respondent is working full-time, working part-time, unemployed, partly retired, retired, disabled, or not in the labor force. We count an individual as "working" if they are working full-time or part-time. In SHARE, the variable *RwLBRF_S* captures whether the respondent is employed/self-employed, retired, permanently sick/disable, or a homemaker. Unlike *RwLBRF* in the HRS, *RwLBRF_S* does not feature the status of partly retired and not in labor force. We count an individual as "working" if they are employed or self-employed. In CHARLS, the variable *RwLBRF_C* includes finer categories of labor market activities, including different types of agriculture work, non-agriculture employed, non-agriculture self-employed, unemployed, retired, and never work. We count an individual as "working" if they are employed or self-employed in the agricultural or non-agricultural sector.

Social insurance payments. In HRS, we use various variables to construct household social insurance payments in a previous calendar year. It is the sum of respondent's income from Social Security Disability (SDI) and Supplemental Security Income (SSI) (*RwISSDI*), spouse's income from SDI and SSI (*SwISSDI*), respondent's individual income from unemployment and worker compensation (*RwIUNWC*), spouse's individual income from unemployment and worker compensation (*SwIUNWC*), respondent's individual income from Social Security retirement, spouse or widow benefits (*RwISRET*), spouse's individual income from Social Security retirement, spouse or widow benefits (*SwISRET*), respondent's income from veteran's benefits, welfare, and food stamps (*RwIGXFR*), and spouse's income from veteran's benefits, welfare, and food stamps (*SwIGXFR*).

In SHARE, we construct household social insurance payments in the previous year by summing up respondent's public disability pension (*RwITSSDI*), spouse's public disability pension (*SwITSSDI*), respondent's public old age and early retirement pension (*RwITSRET*), spouse's public old age and early retirement pension (*SwITSRET*), respondent's individual income from other government transfers (*RwITGXFR*), and spouse's individual income from other government transfers (*SwITGXFR*).

In CHARLS, the household social insurance payments in the previous year is the sum of the respondent's public pension income (*RwIPUBPEN*), the spouse's public pension income (*SwIPUBPEN*), and total household government/public transfer income (*HHwIGXFR*). More specifically, the variable *HHwIGXFR* is the sum of *HHwIGXFRI*, *HHwIGXFRH*, and *HHwIGXFRT*. This variable includes annual household government transfer income (unemployment compensation, pension subsidy, worker's compensation from industrial accident compensation insurance, elderly family planning subsidies, medical aid, social assistance and others) as captured by *HHwIGXFRI*; annual other government transfer income (minimum income guarantee (*dibao*), subsidy from reforestation, agricultural subsidies, rural five guarantee (*wubao*), poverty relief (*tekun*), work injury subsidies to the immediate family members, emergency or disaster relief (*jiujikuan, jiucaikuan*) and others) as captured by *HHwIGXFRH*; and annual household other public transfer income (donation from the society, compensation for land seizure, compensation to pulling down house or apartment) as captured by *HHwIGXFRT*.

Household total income. In HRS, the variable *HwITOT* is the sum of all income in a household from the previous calendar year. That is, it is the sum of respondent's earnings (*RwIEARN*), spouse's earnings (*SwIEARN*), household's capital income (*HwICAP*), respondent's income from pensions and annuities (*RwIPENA*), spouse's income from pensions and annuities (*SwIPENA*), respondent's income from SDI and SSI (*RwISSDI*), spouse's income from SDI and SSI (*SwISSDI*), respondent's income from Social Security retirement, spouse or widow benefits (*RwISRET*), spouse's income from Social Security retirement, spouse or widow benefits (*SwISRET*), respondent's income from unemployment and worker's compensation (*RwIUNWC*), spouse's income from unemployment and worker's compensation (*SwIUNWC*), respondent's income from veteran's benefits, welfare, and food stamps (*RwIGXFR*), spouse's income from veteran's benefits, welfare, and food stamps (*SwIGXFR*), and other household income such as alimony, lump sums from insurance, pension, and inheritance (*HwIOTHR*). Note that, by construction, the household income refers to a household of two members, the respondent and the spouse, no reference to other potential household members.

In SHARE, the variable *HwITTOT* records the sum of all the after tax income of a household in a previous year. *HwITTOT* is the sum of respondent's earnings (*RwITEARN*), spouse's earnings (*SwITEARN*), respondent's income from employer old age pension or annuity (*RwITPENA*), spouse's income from employer old age pension or annuity (*SwITPENA*), respondent's income from public disability pension, old age pension, early retirement pension (*RwITPUBPEN*), spouse's income from public disability pension, old age pension, early retirement pension (*SwITPUBPEN*), respondent's income from government transfers such as public unemployment benefits/insurance and public long term care insurance (*RwITGXFR*), spouse's income from government transfers such as public unemployment benefits/insurance and public long term care insurance (*SwITGXFR*), respondent's other income from regular life insurance payments, regular private annuity/private personal pension payments, alimony, and regular payment from charities (*RwITOTHR*), and spouse's other income from regular life insurance payments, regular private annuity/private personal pension payments, alimony, and regular payment from charities (*SwITOTHR*). In the first wave of SHARE, we have before-tax household income (*HwITOT*), which is converted to after-tax household income (*HwITTOT*) by using an additional tax module provided by SHARE.

In CHARLS, the variable *HHwITOT* records the total household income in the last year. It is the sum of the following nine items: respondent's earnings after tax (*RwITEARN*), spouse's earnings after tax (*SwITEARN*), household's total capital income (*HHwICAP*), respondent's pension income (*RwIPEN*), spouse's pension income (*SwIPEN*), household's government/public transfer income (*HHwIGFR*), respondent's other income (*RwIOTHR*), spouse's other income (*SwIOTHR*).

Respondent earnings. In HRS, respondent earning is the sum of *RwIEARN* and *RwISEMP*, net of taxes. *RwIEARN* records the respondent's earnings in the last calendar year, which include wage/salary income, bonuses/overtime pay/commissions/tips, 2nd job or military reserve earnings, professional practice or trade income. *RwISEMP* consists of respondent's earnings from self-employment. Taxes are provided from year 2000 onward from RAND (*WwFED_TAX, WwSTA_TAX, WwFICA_TAX*). To calculate approximate taxes for earnings (since tax burden is calculated from total income, not only earnings), we divide the sum of these three variables by total household income to create an individual tax rate, and apply this tax rate to earnings.

In SHARE, respondent's earning is the sum of *RwITEARN* and *RwITSEMP*. *RwITEARN* records the respondent's post-tax earnings in the previous year, which include labor earnings, bonuses, commission, tips and income from professional practices. *RwITSEMP* consists of respondent's earnings from self-employment in the previous year. It is important to note that the first wave of SHARE provides pre-tax income, for which we use an additional tax module to estimate the after-tax income.

In CHARLS, we construct respondent's earnings by summing two variables *RwITEARN* and *RwITSEMP*. The latter variable is a sub component of household capital income (*HHwICAP*). The former variable *RwITEARN* records the respondent's after-tax earnings in the last year (wages and bonus income) and the *RwITSEMP* records the respondent's after-tax net income earned from self-employed activity in the last year. Note that if the self-employed activity is conducted at the household level, neither the respondent or the spouse reports income from household-level self-employment individually. Instead, income from household-level self-employment is recorded in *HHwITSEMP*, which is not included in the baseline measure of respondent's earnings.

Spousal earnings. In HRS, spousal earnings is the sum of *SwIEARN* and *SwISEMP*, net of taxes. *SwIEARN* records the spouse's earnings in the last calendar year, which include wage/salary income, bonuses/overtime pay/commissions/tips, 2nd job or military reserve earnings, professional practice or trade income. *SwISEMP* consists of spouse's earnings from self-employment. Taxes are calculated in the same way that respondent earnings taxes are calculated above.

In SHARE, spouse's earning is the sum of *SwITEARN* and *SwITSEMP*. *SwITEARN* records the spouse's earnings in the previous year, which include labor earnings, bonuses, commission, tips and income from professional practices. *SwITSEMP* consists of spouse's earnings from self-employment. It is important to note that the first wave of SHARE provides pre-tax income, for which we use an additional tax module to estimate the after-tax income.

In CHARLS, we construct spouse's earnings by summing two variables *SwITEARN* and *SwITSEMP*. The latter variable is a sub component of household capital income (*HHwICAP*). The former variable *SwITEARN* records spouse's after-tax earnings in the last year (wages and bonus income) and the *SwITSEMP* records spouse's after-tax net income earned from self-employed activity in the last year. Note that if the self-employed activity is conducted at the household level, neither the respondent or the spouse reports income from household-level self-employment individually. Instead, income from household-level self-employment is recorded in *HHwITSEMP*, which is not included in the baseline measure of spouse's earnings.

Whether health limits work. For all three surveys, we create a binary variable for whether a health condition limits the ability to work. However, there are differences in how the question is asked in each survey. In the HRS variable *RwHLTHLM*, respondents are asked: "Do you have any impairment or health problem that limits the kind or amount of paid work you can do?" In the SHARE variable *RwHLTHLMA*, instead of "paid work" it asks if a health condition limits "activities people usually do." In the CHARLS variable *RwHLTHLM_C*, the question asks how many days in the past year were missed, and a value above zero is coded as having a work limitation. An additional difference is that in the HRS and CHARLS, an alternative answer is "not working";

individuals who answered in this way are not captured.

Self-reported health status. For all three surveys, respondents are asked to self-report their general health status in *RwSHLT*, with options of 1 (excellent), 2 (very good), 3 (good), 4 (fair), and 5 (poor). Our measure of poor health is a binary variable that equals to one for everyone who rated their health as a 5 and equals zero for those who rated their health 1-4.

C Derivation of the Implied Effects

In the estimating equation, we estimate μ_r for $r = 0, 1, 2...$, where μ_r is the effect of a hospitalization within the 12 (24) months prior to event time 0 on the outcome in wave r in SHARE and CHARLS (in HRS). These are *wave effects*, but they are difficult to interpret because they imply different effect sizes based on when individuals were interviewed and when the hospitalization took place.

To translate these wave effects into "implied effects" such as "the effect of hospitalization on annual earnings 6 months after the hospitalization", we must account for the different timing of hospitalization in our sample. We present the calculation for the implied effects for HRS and the other two data sets separately, and for earnings variables and the other variables separately, since the framing the survey questions is different along these dimensions.

C.1 HRS

In HRS, respondents are asked if they had been admitted to a hospital since the last survey, which is effectively in the last 24 months. This is different than either SHARE or CHARLS, where respondents are asked if they have been admitted to a hospital in the last 12 months. For this reason, we present the derivation for HRS and the other data sets separately. When surveying about earnings, respondents are asked to recall the earnings of the last calendar year. When surveying about out-of-pocket medical expenses, respondents are asked to recall the total expenses in the last 12 months. To account for the differences in the framing, we present the calculation of the implied effects for earnings variables first and then for the other outcomes.

C.1.1 Earnings Outcome

Let β_e be effect of hospitalization on earnings (in the prior 12 months) at the eth month following hospitalization. We observe μ_0, which is the effect of a hospitalization in the past 12 months on the earnings in the previous calendar year, or

$$\mu_0 = \sum_{e=-11}^{23} \omega_e \beta_e = \sum_{e=0}^{23} \omega_e \beta_e,$$

where ω_e is the probability weight of observing someone who is admitted to hospital e months before interview. Assume that there is zero effect of hospitalization on the outcome prior to the hospitalization so that $\beta_e = 0, \forall e < 0$. We can calculate the weights ω_e by assuming that the timing of hospitalization is distributed uniformly over the 24 months before the interview. Assuming a linear spline with three knots at 0 month, 12th month and 36th month, we have β_e to follow the functional form:

$$\beta_e = \alpha_0(e > 0)e + \alpha_1(e > 12)(e - 12) + \alpha_2(e > 36)(e - 36).$$

Substituting the above to μ_0, we have

$$\mu_0 = \sum_{e=0}^{23} \omega_e \beta_e = \alpha_0 \sum_{e=0}^{23} \omega_e e + \alpha_1 \sum_{e=13}^{23} \omega_e (e - 12).$$

We can write out the formulae for μ_1 and μ_2 in a similar way:

$$\mu_1 = \sum_{e=13}^{47} \omega_e \beta_e = \alpha_0 \sum_{e=13}^{47} \omega_e e + \alpha_1 \sum_{e=13}^{47} \omega_e (e - 12) + \alpha_2 \sum_{e=37}^{47} \omega_e (e - 36)$$
$$\mu_2 = \sum_{e=37}^{71} \omega_e \beta_e = \alpha_0 \sum_{e=37}^{4} 7\omega_e e + \alpha_1 \sum_{e=13}^{71} \omega_e (e - 12) + \alpha_2 \sum_{e=37}^{71} \omega_e (e - 36).$$

Note that we have a system of three linear equations in three unknowns, α_0, α_1, and α_2:

$$\begin{pmatrix} \mu_0 \\ \mu_1 \\ \mu_2 \end{pmatrix} = \begin{pmatrix} \sum_{e=0}^{23} \omega_e e & \sum_{e=13}^{23} \omega_e (e-12) & 0 \\ \sum_{e=13}^{47} \omega_e e & \sum_{e=13}^{71} \omega_e (e-12) & \sum_{e=37}^{47} \omega_e (e-36) \\ \sum_{e=37}^{71} \omega_e e & \sum_{e=37}^{71} \omega_e (e-12) & \sum_{e=37}^{71} \omega_e (e-36) \end{pmatrix} \begin{pmatrix} \alpha_0 \\ \alpha_1 \\ \alpha_2 \end{pmatrix}.$$

Note that we have the wave effects μ_r's from the estimation and we can compute the coefficient matrix and hence we can solve for α's. Once we have the α's, it's straight-forward to compute β_e.

C.1.2 Out-of-Pocket Medical Expenses and Other Outcomes

Keep the assumption that the time of hospitalization is uniformly distributed over the 24 months before the interview. The weights ω_e are then all 1/24. We can write down the system of equations to solve for α's following the same logic:

$$\begin{pmatrix} \mu_0 \\ \mu_1 \\ \mu_2 \end{pmatrix} = \begin{pmatrix} \sum_{e=1}^{24} \omega_e e & \sum_{e=13}^{24} \omega_e (e-12) & 0 \\ \sum_{e=25}^{48} \omega_e e & \sum_{e=25}^{48} \omega_e (e-12) & \sum_{e=37}^{48} \omega_e (e-36) \\ \sum_{e=49}^{72} \omega_e e & \sum_{e=49}^{72} \omega_e (e-12) & \sum_{e=49}^{72} \omega_e (e-36) \end{pmatrix} \begin{pmatrix} \alpha_0 \\ \alpha_1 \\ \alpha_2 \end{pmatrix}.$$

C.2 SHARE and CHARLS

In SHARE and CHARLS, respondents are asked if they have been hospitalized in the last 12 month. The framing of outcome-related questions is similar to the HRS.

C.2.1 Earnings Outcome

We can derive the system of equations to solve for the α's as follows.

$$\begin{pmatrix} \mu_0 \\ \mu_1 \\ \mu_2 \end{pmatrix} = \begin{pmatrix} \sum_{e=-11}^{11} \omega_e \beta_e \\ \sum_{e=13}^{35} \omega_e \beta_e \\ \sum_{e=37}^{59} \omega_e \beta_e \end{pmatrix} = \begin{pmatrix} \sum_{e=1}^{11} \omega_e e & 0 & 0 \\ \sum_{e=13}^{35} \omega_e e & \sum_{e=13}^{35} \omega_e (e-12) & 0 \\ \sum_{e=37}^{59} \omega_e e & \sum_{e=37}^{59} \omega_e (e-12) & \sum_{e=37}^{59} \omega_e (e-36) \end{pmatrix} \begin{pmatrix} \alpha_0 \\ \alpha_1 \\ \alpha_2 \end{pmatrix}.$$

C.2.2 Out-of-Pocket Medical Expenses and Other Outcomes

The weights ω_e in this case are all 1/12. We can derive the system of equations to solve for the α's as follows.

$$\begin{pmatrix}\mu_0\\ \mu_1\\ \mu_2\end{pmatrix} = \begin{pmatrix}\sum_{e=1}^{12}\omega_e\beta_e\\ \sum_{e=25}^{36}\omega_e\beta_e\\ \sum_{e=49}^{60}\omega_e\beta_e\end{pmatrix} = \begin{pmatrix}\sum_{e=1}^{12}\omega_e e & 0 & 0\\ \sum_{e=25}^{36}\omega_e e & \sum_{e=25}^{36}\omega_e(e-12) & 0\\ \sum_{e=49}^{60}\omega_e e & \sum_{e=49}^{60}\omega_e(e-12) & \sum_{e=49}^{60}\omega_e(e-36)\end{pmatrix}\begin{pmatrix}\alpha_0\\ \alpha_1\\ \alpha_2\end{pmatrix}.$$

Online Supplemental Material for "The Economic Consequences of Hospitalizations for Older Workers across Countries" by Mommaerts, Raza, and Zheng

April 26, 2019

1 Pooled Europe results

In Table 1, we estimate the implied effects for the pooled sample of Europe, which contains all European countries in the analysis. Similar to Table 2 in the paper, we document the effects on the six main economic outcomes from a hospital admission 6 and 24 months ago. The estimates are in line with those we report for the three European regions separately. In principle, pooling all European countries in the sample tends to produce insignificant estimates. All our estimates here are insignificant, except the effects on out-of-pocket medical spending and the 24 months effect on household social insurance payments, which are marginally significant. It masks the fact that these significant effects are mostly driven by even stronger effects from the Western European sample, whereas for the Northern and Southern European samples, the effects are too noisy to be significant.

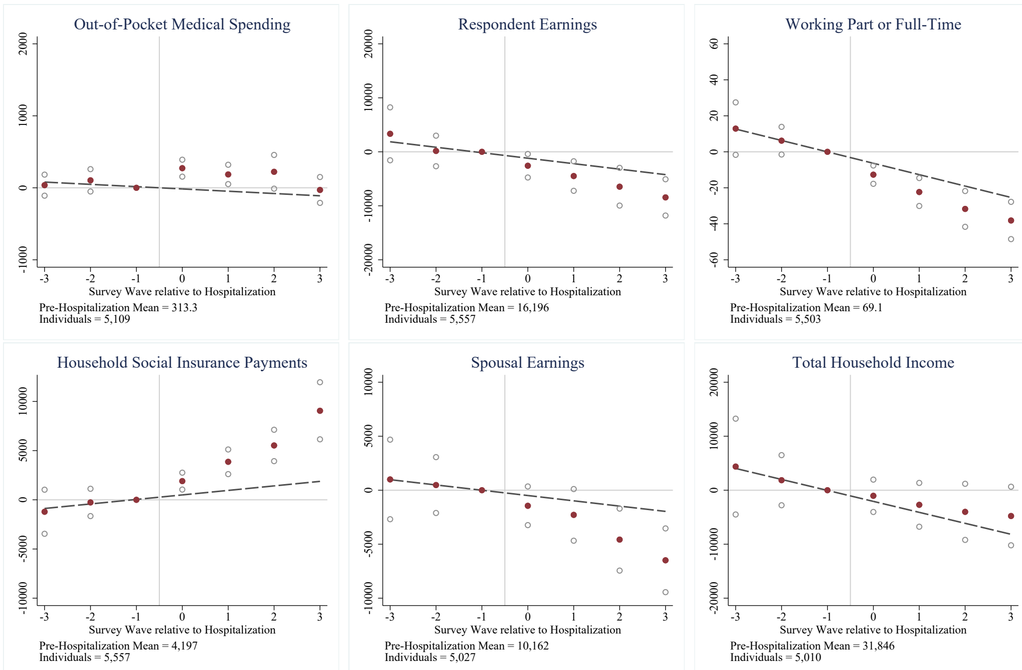
We visualize the wave effects for our pooled sample of Europe in Figure 1. As in Figures 2 to 7 of the paper, we combine estimates from both parametric and non-parametric specifications to plot the effects of hospitalization on all six outcomes relative to a pretrend for the non-elderly insured adults in Europe. The results are largely consistent with those we obtain by looking at the three sub-regions of Europe separately.

Table 1: Implied effects of hospitalization for the non-elderly insured in Europe (*ages 50-59*)

	Out-of-pocket medical spending (1)	Respondent earnings (2)	Working part- or full-time (3)	Household social insurance payments (4)	Spousal earnings (5)	Total household income (6)
6 month effect						
Europe	314	-3,185	-6.9	3,199	-2,165	2,351
	(100)	(3,638)	(4.7)	(1,858)	(3,418)	(6,065)
24 month effect						
Europe	358	-2,714	-11.0	3,260	-1,604	1,721
	(153)	(2,997)	(7.9)	(1,575)	(2,839)	(5,170)

Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). Each outcome-country pair report the implied effect and the standard error in parentheses.

Figure 1: Impact of hospitalization on various outcomes for the non-elderly insured in Europe (*ages 50-59*)



Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). The figure plots the μ_r terms from equation (1) in red and the 95% confidence intervals in gray. The dashed line is the estimated pre-trend (δ) from equation (2), normalized to zero at event time -1. The regression controls for wave-cohort-country fixed effects, and is weighted using person weights provided by the respective survey. Standard errors are clustered at the household level.

2 Alternative definition of Northern Europe (Denmark, Netherlands, Sweden, and Estonia)

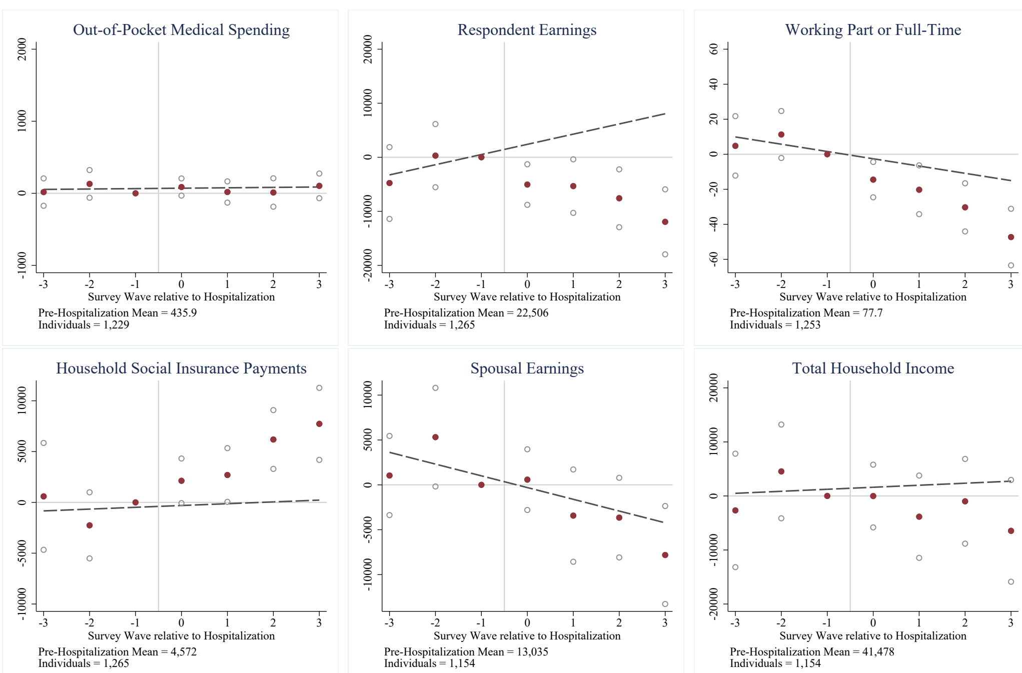
In Table 2, we outline the implied effects estimates by considering an alternative definition for Northern Europe. Following some suggestions made by participants at the Conference on Cross-Country Analysis of Retirement, Health and Well-being at the USC, we group Denmark, Netherlands, Sweden, and Estonia together as a Northern Europe region. Compare the estimates with those reported for Northern Europe in Table 2 of the paper, we observe that the results are largely similar.

Table 2: Implied effects of hospitalization for the non-elderly insured in Northern Europe (*ages 50-59*)

	Out-of-pocket medical spending (1)	Respondent earnings (2)	Working part- or full-time (3)	Household social insurance payments (4)	Spousal earnings (5)	Total household income (6)
6 month effect						
NorthernAlt Europe	16	-18,985	-13.1	6,229	2,196	-4,203
	(116)	(7,558)	(8.4)	(5,184)	(6,333)	(12,352)
24 month effect						
NorthernAlt Europe	-27	-12,248	-17.4	3,698	-1,158	-5,976
	(180)	(5,592)	(13.6)	(3,886)	(4,965)	(9,060)

Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). We report the implied effect and the standard error in parentheses.

Figure 2: Impact of hospitalization on various outcomes for the non-elderly insured in Northern Europe (*ages 50-59*)



Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). The figure plots the μ_r terms from equation (1) in red and the 95% confidence intervals in gray. The dashed line is the estimated pre-trend (δ) from equation (2), normalized to zero at event time -1. The regression controls for wave-cohort-country fixed effects, and is weighted using person weights provided by the respective survey. Standard errors are clustered at the household level.

3 Alternative definition of Southern Europe (Greece, Italy, Portugal, Spain, and Slovenia)

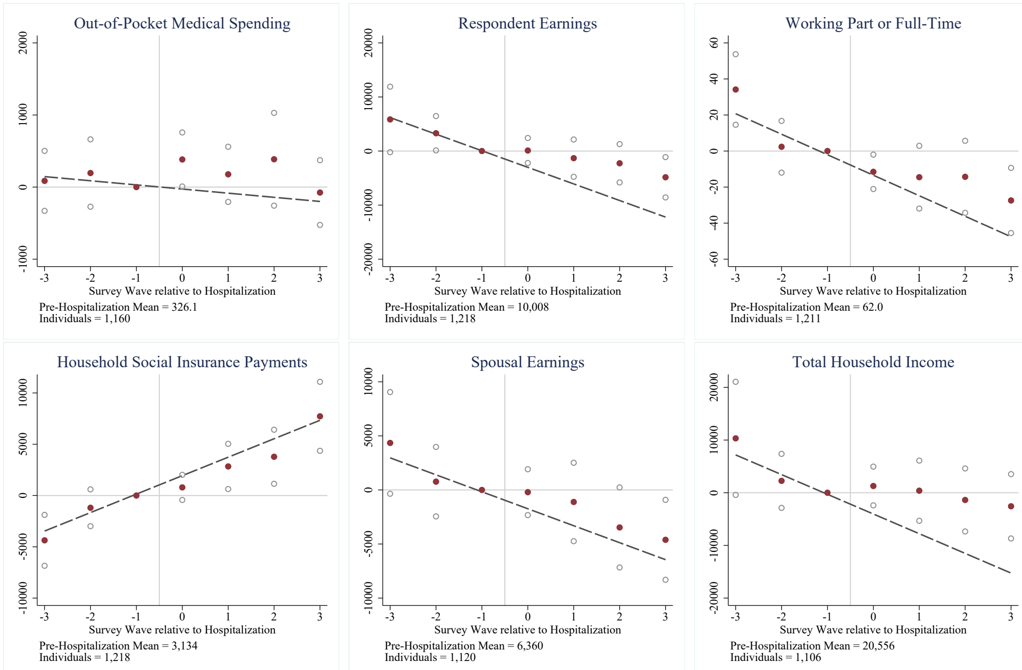
Similarly, we consider an alternative definition of Southern Europe that in addition includes Slovenia. The results remain largely similar to the baseline reported for Southern Europe in Table 2 in the paper.

Table 3: Implied effects of hospitalization for the non-elderly insured in Southern Europe (*ages 50-59*)

	Out-of-pocket medical spending (1)	Respondent earnings (2)	Working part- or full-time (3)	Household social insurance payments (4)	Spousal earnings (5)	Total household income (6)
6 month effect						
SouthernAlt Europe	445	6,617	2.1	-2,435	3,268	11,318
	(305)	(4,363)	(8.7)	(2,212)	(3,709)	(6,841)
24 month effect						
SouthernAlt Europe	461	5,718	8.2	-1,329	2,664	9,753
	(447)	(3,989)	(14.6)	(2,029)	(3,431)	(6,337)

Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). We report the implied effect and the standard error in parentheses.

Figure 3: Impact of hospitalization on various outcomes for the non-elderly insured in Southern Europe (*ages 50-59*)



Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). The figure plots the μ_r terms from equation (1) in red and the 95% confidence intervals in gray. The dashed line is the estimated pre-trend (δ) from equation (2), normalized to zero at event time -1. The regression controls for wave-cohort-country fixed effects, and is weighted using person weights provided by the respective survey. Standard errors are clustered at the household level.

4 Event time window from -2 to +2

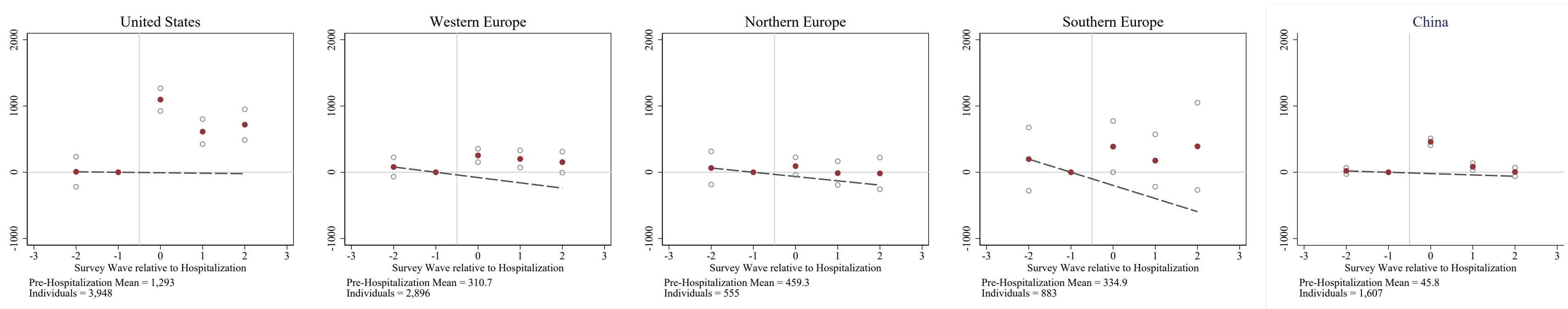
In Table 4 and Figures 5 to 9, as a robustness check, we reconduct our analysis, limiting the tracking window to 2 waves before and after hospitalization. This is to address the concern that the number of observations for event time -3 is quite small for some regions in our sample. Compare Figures 3 to 8 to Figures 1 to 6 of the paper, the dynamics of the wave effects and the direction of the pretrends are very similar whether the tracking window is 2 or 3. The resulting implied effects are largely consistent in sign and in significance whether the tracking window is 2 or 3.

Table 4: Implied effects of hospitalization for the non-elderly insured (*ages 50-59*)

	Out-of-pocket medical spending (1)	Respondent earnings (2)	Working part- or full-time (3)	Household social insurance payments (4)	Spousal earnings (5)	Total household income (6)
6 month effect						
United States	820	-2,572	-2.8	591	934	-6,338
	(105)	(1,532)	(1.4)	(354)	(1,388)	(3,203)
Western Europe	364	-10,106	-4.0	5,470	-3,821	890
	(127)	(8,037)	(7.8)	(3,443)	(6,969)	(12,011)
Northern Europe	171	-25,063	-16.8	8,012	8,083	-1,839
	(190)	(14,078)	(12.5)	(6,313)	(12,826)	(21,237)
Southern Europe	638	7,447	-9.8	-914	1,258	7,855
	(458)	(5,357)	(11.5)	(2,942)	(4,773)	(8,176)
China	443	867	-7.2	206	514	1,985
	(24)	(559)	(3.4)	(163)	(512)	(1,459)
24 month effect						
United States	1,047	-4,412	-3.8	974	1,621	-11,343
	(226)	(2,580)	(3.2)	(596)	(2,328)	(5,250)
Western Europe	477	-8,505	-6.9	5,090	-2,433	932
	(211)	(6,445)	(13.2)	(2,913)	(5,679)	(9,987)
Northern Europe	188	-15,461	-25.3	3,691	1,877	-6,493
	(329)	(9,933)	(20.1)	(4,450)	(9,751)	(15,312)
Southern Europe	794	6,506	-12.7	156	754	6,370
	(724)	(5,004)	(19.5)	(2,732)	(4,510)	(7,610)
China	392	62	-8.5	-16	126	-64
	(43)	(79)	(6.3)	(33)	(79)	(271)

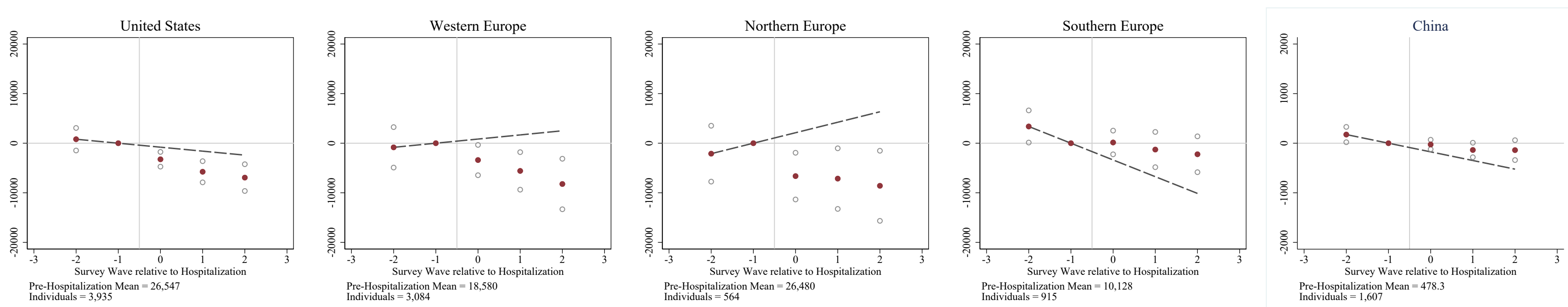
Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see main text for details). Each outcome-country pair report the implied effect and the standard error in parentheses.

Figure 4: Impact of hospitalization on out-of-pocket medical expenditures for the non-elderly insured (*ages 50-59*)



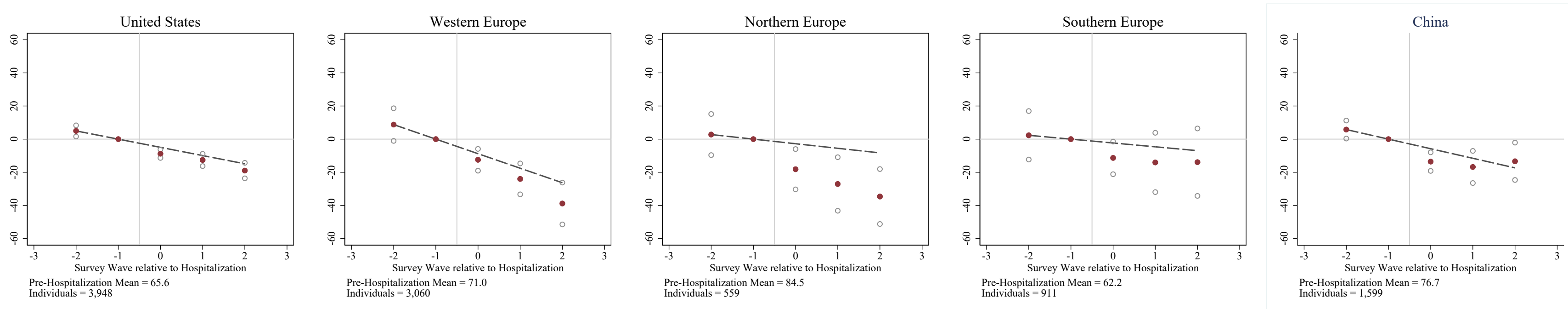
Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). The figure plots the μ_r terms from equation (1) in red and the 95% confidence intervals in gray. The dashed line is the estimated pre-trend (δ) from equation (2), normalized to zero at event time -1. The regression controls for wave-cohort-country fixed effects, and is weighted using person weights provided by the respective survey. Standard errors are clustered at the household level.

Figure 5: Impact of hospitalization on respondent earnings for the non-elderly insured (*ages 50-59*)



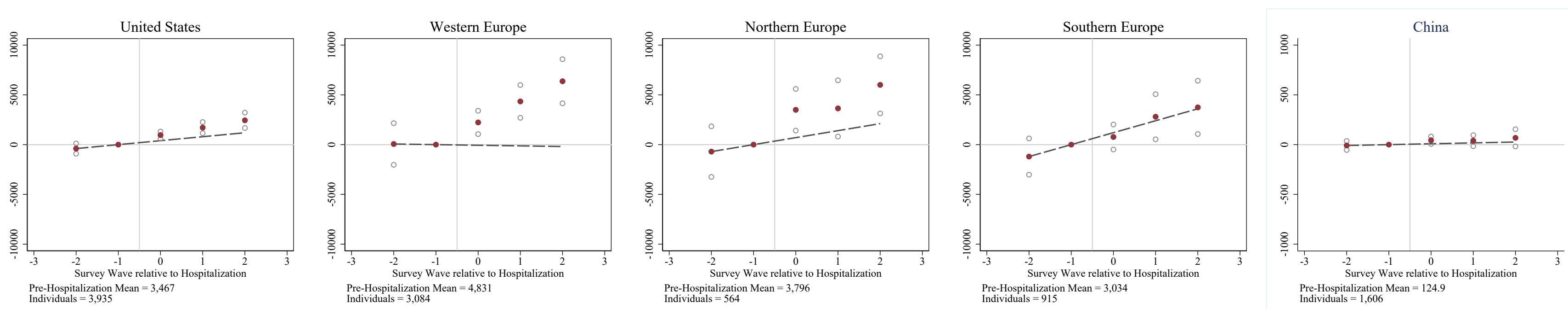
Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). The figure plots the μ_r terms from equation (1) in red and the 95% confidence intervals in gray. The dashed line is the estimated pre-trend (δ) from equation (2), normalized to zero at event time -1. The regression controls for wave-cohort-country fixed effects, and is weighted using person weights provided by the respective survey. Standard errors are clustered at the household level.

Figure 6: Impact of hospitalization on work status for the non-elderly insured (*ages 50-59*)



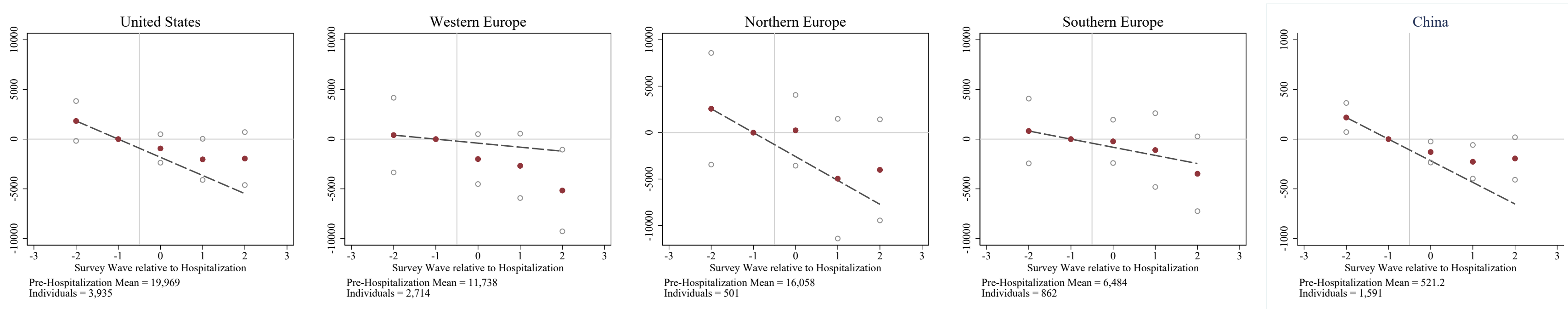
Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). The figure plots the μ_r terms from equation (1) in red and the 95% confidence intervals in gray. The dashed line is the estimated pre-trend (δ) from equation (2), normalized to zero at event time -1. The regression controls for wave-cohort-country fixed effects, and is weighted using person weights provided by the respective survey. Standard errors are clustered at the household level.

Figure 7: Impact of hospitalization on social insurance payments for the non-elderly insured (*ages 50-59*)



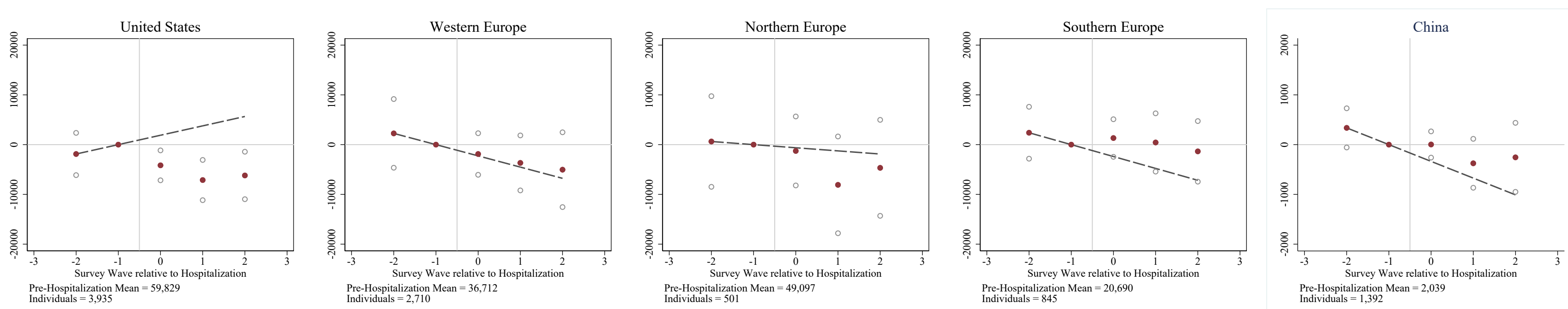
Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). The figure plots the μ_r terms from equation (1) in red and the 95% confidence intervals in gray. The dashed line is the estimated pre-trend (δ) from equation (2), normalized to zero at event time -1. The regression controls for wave-cohort-country fixed effects, and is weighted using person weights provided by the respective survey. Standard errors are clustered at the household level.

Figure 8: Impact of hospitalization on spousal earnings for the non-elderly insured (*ages 50-59*)



Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). The figure plots the μ_r terms from equation (1) in red and the 95% confidence intervals in gray. The dashed line is the estimated pre-trend (δ) from equation (2), normalized to zero at event time -1. The regression controls for wave-cohort-country fixed effects, and is weighted using person weights provided by the respective survey. Standard errors are clustered at the household level.

Figure 9: Impact of hospitalization on total household income for the non-elderly insured (*ages 50-59*)



Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). The figure plots the μ_r terms from equation (1) in red and the 95% confidence intervals in gray. The dashed line is the estimated pre-trend (δ) from equation (2), normalized to zero at event time -1. The regression controls for wave-cohort-country fixed effects, and is weighted using person weights provided by the respective survey. Standard errors are clustered at the household level.

5 Consumption Outcomes in China

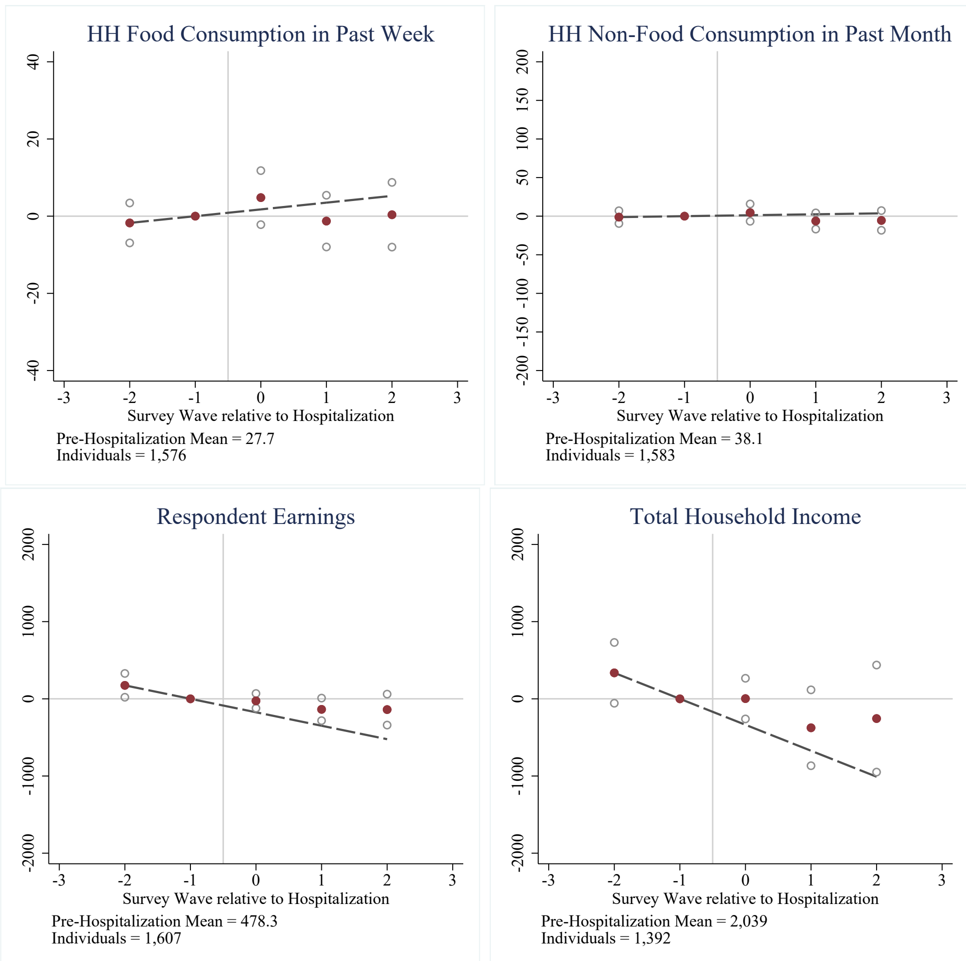
In Table 5 and Figure 10, we present the implied effects and wave effects of hospitalization on various consumption measures for our Chinese sample. This is to address the concern that income measures from China can be noisier than those from developed countries, and hence the lack of effect from hospitalization on earnings (as reported in Table 2 and Figure 3 in the paper) can potentially be driven by the measurement errors in income in the Chinese sample. Here we supplement our analysis by taking two measures of consumption as outcome, the household food consumption in the past week and the household non-food non-durable consumption in the past month. As is clear from Figure 10, the consumption measures respond little to the event of hospitalization, which suggests that the economic impact on total household resources from a hospitalization is not big enough to affect non-durable consumption. The implied effects in Table 5 reconfirm this result. We interpret it as evidence that lack of effect on earnings from hospitalization may well be genuine, supported by the evidence on consumption responses we present here.

Table 5: Implied effects of hospitalization on consumption and income for the non-elderly insured in China (*ages 50-59*)

	HH food consumption past week (1)	HH non-food consumption past month (2)	Respondent earnings (3)	Total household income (4)
6 month effect				
China	2.82	3.11	867	1,985
	(2.38)	(3.12)	(559)	(1,459)
24 month effect				
China	-1.12	-3.45	62	-64
	(3.86)	(4.85)	(79)	(271)

Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). Each outcome-country pair report the implied effect and the standard error in parentheses.

Figure 10: Impact of hospitalization on consumption and income for the non-elderly insured in China (*ages 50-59*)



Note: The sample is insured individuals aged 50-59 in each survey who were hospitalized between event time -1 and 0 (see text for details). The figure plots the μ_r terms from equation (1) in red and the 95% confidence intervals in gray. The dashed line is the estimated pre-trend (δ) from equation (2), normalized to zero at event time -1. The regression controls for wave-cohort-country fixed effects, and is weighted using person weights provided by the respective survey. Standard errors are clustered at the household level.