State-Dependent Utility and Insurance Purchase Decisions

by

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Abstract: A standard result of most economic models of insurance is that optimizing individuals will equate the marginal utility of consumption across various states of the world. Under certain stylized conditions – including state-independent preferences – a standard benchmark is that consumption smoothing via full insurance is optimal. With regard to health risks, however, it is occasionally posited (but infrequently modeled) that preferences might be state dependent. Although recent empirical evidence has suggested that preferences may differ with health state, there has been little empirical work correlating cross-sectional differences in state dependence with differences in insurance demand. In this paper, we use a novel survey-based measure to document substantial cross-sectional heterogeneity in the degree of state dependence with regard to health, and show that this heterogeneity is largely orthogonal to other observable individual characteristics. We further show that there are small but significant differences in state dependence with regard to mental and physical impairments. Finally, we show how our measures of state dependence are related to insurance purchase.

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1. Introduction

A significant risk that people face during their lifetimes is that of becoming disabled-- either early in life when the disability decreases one's earnings capacity, or later in life when chronic / custodial care in a nursing facility may be needed. Although many disabilities and/or long-term care episodes are of short duration, in both stages of life there is a very long right tail in spell length. For example, among retirees, it is estimated that 12 percent of men and 22 percent of women having nursing home stays of more than 3 years (Brown and Finkelstein 2008). The financial consequences of disability – through the loss of earnings, the need to pay for a nursing home or other care facility, or the burden imposed on family – can be enormous for those that lack adequate insurance coverage.

In the case of disabilities leading to work interruptions, the Social Security Disability Insurance (SSDI) program provides a valuable form of insurance against lost income.   In contrast to the important role played by SSDI, there is very little social insurance available to cover long-term care expenditures: Medicare covers only short stays following the release from a hospital and Medicaid provides means-tested coverage only to those who qualify under stringent asset and income requirements. Because public insurance in these cases is far from comprehensive, private insurance can play an important role. It is therefore, important to understand drivers of demand for private insurance and how various governmental policies may influence insurance coverage.

Standard economic models of insurance demand typically conclude that optimizing individuals will seek to smooth marginal utility of consumption across states of the world via full insurance. However, coverage for supplemental disability insurance and long-term care insurance is far from full. While some employers offer supplemental long-term disability

insurance to partially "top-up" what SSDI provides, estimates are that only 30 percent or so of civilian workers participated in these plans in 2011 (BLS 2011). Even lower rates of coverage exist for long-term care, with fewer than 1 in 5 elderly individuals holding private long-term care insurance and coverage at younger ages even lower. The reasons why so few people choose to insure against these substantial risks are still not fully-understood, and yet such an understanding is essential to designing and implementing appropriate policies and to ensuring adequate care for our disabled and aging populations.

A key assumption in many economic models of insurance demand is that preferences are not state dependent; in particular, the marginal utility of consumption does not differ based on the state of one's health. However, it is occasionally posited (but infrequently modeled) that preferences might be dependent on the state of one's health. Relaxing this assumption can change the optimal insurance amount. For instance, if the marginal utility of consumption is lower when in need of nursing home care (the sick state), one may not be willing to forgo consumption while healthy (in the form of premiums) in favor of consumption while disabled (in the form of insurance benefits) and may have a lower optimal level of insurance coverage.

It is not obvious *a priori* whether the marginal utility of consumption will be higher in the healthy or the disabled state. On the one hand, it may be that the marginal utility of an additional dollar of consumption is much lower while in a disabled state because the individual is unable to enjoy many of the leisure activities on which they would typically spend their money. On the other hand, when an individual faces a need for professional medical care, the marginal utility from being able to afford the care (or better care), may be extremely high. So too may be the utility from being able to afford amenities to compensate for the inability to participate in

activities undertaken when healthy—for example, taking taxicabs because one can no longer drive.

In this paper, we use a novel set of survey questions to assess whether there is state dependence, whether and how it varies across the population, and whether it can help explain insurance purchase decisions. These survey questions, which we field in the American Life Panel, essentially ask individuals to allocate a lump-sum of wealth across various health states. Like most economists, we acknowledge that stated preferences in response to hypothetical questions are not a perfect proxy for true underlying preferences, and thus may lead to a biased estimate of the relation of interest: as such, we urge caution in over-interpreting the magnitude of the effects we find. However, the use of such questions also has important advantages. The most important of which is that the use of hypothetical questions allows us to distinguish within-person allocations of wealth deriving from state dependence across health states from other potentially important confounding factors, such as the effect of resource shocks on marginal utility, something that is exceedingly difficult to do in a non-survey context.

We document significant heterogeneity in the extent of state dependence in the population, and that the degree of state dependence is largely orthogonal to other observable characteristics. Interestingly, we find some evidence of small differences in state dependence across physical and mental impairments, with individuals being somewhat less willing to allocate resources to mentally impaired states than to physically impaired states. To our knowledge, such differences have not previously been documented. We then examine the extent to which our measures of state dependence are correlated with insurance coverage for two particular important types of health risks: disabilities that result in work interruptions and disabilities that lead to a

need for long-term care. Below, we discuss how these effects vary across mental versus physical disabilities for each type of insurance.

The paper proceeds as follows. In the next section, we discuss the previous literature regarding state-dependence and its role in insurance decisions. Section 3 describes a simple model which provides intuition on the relationship between state-dependence and demand for insurance. Section 4 discusses our approach to examining these issues and focuses on the survey we develop for the American Life Panel (ALP). Section 5 outlines our results and a final section concludes.

2. Previous Literature

There is a long history of intellectual contributions relating to the possibility of preferences that vary across states (see Kremslehner and Muermann 2009 for a recent review). However, few empirical studies have attempted to measure the extent of state-dependence in the population. Notable exceptions include Viscusi and Evans (1990), who find evidence of state dependence using a survey related to compensation for risk-taking at work, and Finkelstein, Luttmer, and Notowidigdo (2008) who find that "the marginal utility of consumption declines as health deteriorates" with a central estimate that "a one-standard deviation increase in the number of chronic diseases is associated with an 11 percent decline in the marginal utility of consumption relative to this marginal utility when the individual has no chronic diseases." Although these papers provide important empirical evidence on the average level of state dependence, they do not explore the extent to which there is cross-sectional variation in its degree, nor do they correlate this variation with insurance purchase decisions. This paper seeks to fill this gap.

In earlier exploratory work (Brown, Goda, and McGarry 2012), we conducted a survey of various factors that might explain who does or does not purchase long-term care insurance. In that survey – which was an intentionally broad-based effort to identify promising future research opportunities – we asked a question about whether individuals would "find financial resources more valuable to you when you are in poor health, so that you can use the resources to provide for your care, or, when you are in good health, so that you can use the resources to pay for other goods and services that you enjoy?" Respondents were provided a 7-point scale in which 1 meant "Financial resources are most valuable to me when I am in poor health" and 7 meant "Financial resources are most valuable to me when I am in good health." We found significant heterogeneity in the population, with 38 percent of the sample preferring financial resources when sick, 24 percent having no preference, and the remaining 38 percent of the sample preferring financial resources when healthy. We also documented a correlation between this measure of state dependence and the purchase of long-term care insurance: those who prefer resources when sick had rates of long-term care insurance coverage of approximately 5 percentage points (or 25 percent) greater than those who prefer resources when healthy.

Although our prior results were suggestive of state-dependence, this paper addresses three methodological shortcomings inherent in the exploratory work, and also makes two additional advances. First, we take steps in this paper to address concerns about "justification bias." Specifically, individuals in the exploratory survey were first asked whether or not they owned long-term care insurance, and then immediately were asked a series of questions related to the purchase. Knowing that they had just reported that they did or did not own insurance, a natural concern is that they might attempt to rationalize their action by stating that they did or did not value consumption in that state. We address this concern a number of ways in this paper,

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including pulling information on insurance ownership from a separate survey (fielded at a different point in time) from the one in which we asked questions to elicit state dependence. Second, our prior question was not clear as to whether a certain minimum level of care was provided (such as through Medicaid) or whether one would need resources to pay for care. Thus, we were unable to distinguish pure state-dependence from wealth effects due to potentially different interpretations of how care would be provided and thus how wealth would be affected. We directly address this issue in the construction of the questions in our current paper. Third, our initial study did not distinguish types of disabilities. Introspection (and conversations with many of our colleagues) suggests that people feel differently about mental versus physical disabilities. If, for example, individuals value resources more highly when physically disabled than when healthy, but less highly when mentally disabled than when healthy, then our failure to distinguish these types of disability could bias our estimates toward zero.

In addition to these improvements, we expand on our study of long-term care by including an examination of disability during the work-life. The dramatic rise in the number of individuals applying for SSDI benefits and the discussion of further increases in the Social Security normal retirement age suggest that private disability insurance could play an increasingly important role. Finally, we use a new approach to eliciting state dependence by allowing individuals to allocate "balls to bins" representing alternative health states, thus providing a more continuous and dollar-denominated measure of state dependence.

3. State Dependence and Insurance Demand

To provide some context for our empirical work, we first describe a highly stylized model that allows for state dependence. Suppose an agent has wealth w and has a potential

exogenous loss of M with probability p. The agent chooses to purchase fraction $\alpha \in [0,1]$ units of insurance that each pay M at an actuarially fair price $\pi = pM$.

Now suppose her utility is given by:

$$V = pU^d(C^d) + (1-p)U^h(C^h)$$

Where $C^h = w - \alpha\pi$

$$C^d = w - \alpha\pi - M + \alpha M$$

U^q, C^q, and M^q represent the utility function, consumption, and utility-generating medical spending in state q (healthy or disabled). Specifically,

The agent chooses α to maximize her utility. The first-order condition is:

$$U^{d\prime}(C^d) = U^{h\prime}(C^h) \tag{1}$$

In the simplest case where utility is not state-dependent, the optimal solution is full insurance which equalizes consumption in the healthy and disabled states. Suppose that utility is state-dependent with state-dependence parameter $\emptyset$, i.e. $U^d(\cdot) = \emptyset U^h(\cdot)$. The parameter $\emptyset$ represents the degree to which individuals prefer consumption while disabled relative to consumption while healthy. Equation (1) now becomes:

$$\emptyset U'(C^d) - U'(C^h) = 0 \tag{2}$$

We can now use the implicit function theorem to determine how the optimal level of insurance varies with the state-dependence parameter. Define the function H as the left-hand side of Equation (2). By the implicit function theorem:

$$\frac{d\alpha}{d\emptyset} = -\left.\frac{dH/d\emptyset}{dH/d\alpha}\right|_{\alpha=\alpha^*} = -\left.\frac{U'(C^d)}{dH/d\alpha}\right|_{\alpha=\alpha^*} > 0 \tag{3}$$

Under standard assumptions of utility functions, Equation (3) implies *the optimal level of insurance is increasing with respect to the state-dependence parameter* $\emptyset$. Thus, in this model, and consistent with intuition, agents are more likely to purchase insurance if they place a greater value on medical spending in the sick state.

In our empirical work, we take a reduced form approach that involves devising survey questions that allow us to develop proxies for $\emptyset$ that would be predicted to have a similar relationship with insurance coverage.

4. Data and Sample Characteristics

4.1 Sample, Survey Construction and Response Rates

In June 2013, we fielded a series of surveys in the RAND-USC American Life Panel (ALP). The ALP is a sample of approximately 6,000 individuals age 18 and older who have agreed to participate in regular online surveys. Relative to most other Internet panels, the ALP is more representative because it is primarily based on a probability sample of the US population.[1] Respondents use their own internet connections or a WebTV connection to access the survey.[2] We used this framework to ask a series of questions, divided across three surveys, about insurance ownership and state-dependence.[3]

In our first survey (ALP Well Being 342), we asked individuals whether they own various types of insurance policies, how much they would be willing to pay for various types of

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[1] Details regarding the ALP sample construction are provided in Appendix A.
[2] Respondents from the Michigan monthly survey without Internet were provided with so-called WebTVs (http://www.webtv.com/pc/), which allows them to access the Internet using their television and a telephone line. The technology allows respondents who lacked Internet access to participate in the panel and furthermore use the WebTVs for browsing the Internet or email.
[3] We also fielded another survey in the weeks prior to these three that asked a series of questions about attitudes and believes toward various types of companies, including insurance companies. We intend to use this information in a related study on counter-party risk.

insurance benefits, and a set of questions to elicit self-reported health, risk preferences, household wealth, and related measures.

Two weeks later, we fielded two additional surveys. One (ALP Well Being 343) was limited to individuals under the age of 60 who were working full-time and focused on eliciting state dependence in the context of work-related disabilities. The other (ALP Well Being 344) was limited to individuals ages 50-80 and focused on questions related to disabilities that would require long-term care. We note that there is some overlap between the samples for the two surveys and we later exploit this feature to compare preferences for resources in different disability states.

The questions about insurance ownership were asked in a separate survey fielded two weeks earlier than the questions about state dependence in order to reduce any concerns about justification bias. No indication was provided to respondents that these surveys were related in any way. Additionally, the questions about insurance ownership in the first survey were not limited only to disability and long-term care, but included questions about annuities and health insurance. Taken together, these safeguards reduce any concerns about justification bias within a survey (i.e., individuals answer state-dependence questions in a way that rationalizes their insurance ownership response).

Although there are approximately 6,000 individuals participating in the ALP, as noted above our surveys were targeted based on age and, for the disability survey, working status. In the group working full-time and under age 60, there are 3,006 participants in the ALP, of which 1,301 completed both the insurance ownership survey and the state dependence survey.[4] In the age 50 – 80 group, there are 2,739 participants, of whom 1,486 completed both the insurance

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[4] 1,543 participants were offered the survey, for a response rate of 84%.

ownership and the state dependence survey. [5] Because there is overlap in these two samples (i.e., those age 50 – 60 who are employed full-time), we also have a sub-set of 449 respondents who completed all three surveys. This sub-group is of particular interest for exploring within-person consistency of responses across surveys and questions.

4.2 Basic Demographics of our Sample

Before delving in to the construction of our state dependence proxy, we first discuss the characteristics of our sample. Table 1 displays summary statistics for demographic characteristics used in the analysis for the sample of respondents to questions related to disabilities that prevent work (Panel A) and the sample of respondents to questions related to disabilities needing long-term care (Panel B). By construction, the sample in Panel A is significantly younger and healthier than the sample in Panel B. We also construct a measure of risk aversion from a question asking respondents to rate their willingness to take financial risks, on a scale of 0 to 10. Respondents reporting 0, 1, or 2 are categorized as risk averse.

Table 1 also includes responses to questions about insurance ownership asked in our initial survey. Thirty-three percent of the sample in Panel A reports having supplemental disability insurance, but the fraction that reports purchasing this insurance voluntarily rather than as a requirement from their employer is approximately two-thirds as large. Because involuntary purchases would not be expected to reflect individual demand, we analyze voluntary purchases of supplemental disability insurance in the analysis that follows. (We note, however, that those without employer mandated disability insurance are a selected group. To measure willingness to pay for coverage, we asked respondents to report how much they would pay for a supplemental disability insurance policy that would increase their income replacement rate from 40% of

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[5] 1,619 participants were offered the survey, for a response rate of 91%.

current income to 60%. The average response was $280 per month. With regards to long term care insurance (Panel B) approximately 15 percent of the sample reports owning such insurance, and the average willingness to pay for a long term care policy that would cover up to $200 per day of nursing home expenses is $375 per month.

4.3 Measuring State Dependence

One of the contributions of this paper is methodological: using a novel survey approach to measure state dependence. We do this separately for (i) work-related disabilities and (ii) long-term disabilities that would require a type of nursing home care. We also ask separate questions for (a) physical versus (b) mental impairments. Crossing these two dimensions, we have four distinct questions, the full texts of which are available in the Appendix. Here, we use the case of a physical disability requiring long-term care to illustrate the basic structure.

First, we introduce the survey by defining some key terms, e.g., "when we use the term 'long-term care,' we are referring to assistance with personal care such as dressing, bathing, getting in and out of bed, using the bathroom or eating." We then ask questions along these lines:

> *"Consider what your life may be like at age 80. Suppose there is a 50 percent chance that you will be healthy and able to live independently in your own home for the rest of your life and a 50 percent chance that your physical health will have deteriorated to the point where you will have to live in a nursing home for the rest of your life. Also assume that your basic nursing home costs are fully covered, so you need not pay anything for this basic level of care. Your physical health and lifespan will be the same whether or not you are in a nursing home at age 80 and additional spending on medical care will not change your lifespan."*

The question then goes on to ask:

> *"Now suppose that you are given the opportunity – at no cost to you - to have an additional $10,000 provided to you either if you are healthy and in your own home or if you are in a nursing home. Or, you can choose to divide up the money across these two possibilities, such as by having $5,000 if you are healthy and $5,000 if you are in a*

nursing home, or any other combination. In either state, you can spend the money any way that you wish. Using the balls and bins shown below, please allocate the $10,000 across these two options:

> *Money to spend on goods and services while physically disabled in a nursing home.*
> *Money to spend on any goods and services while healthy and living at home*

Each ball represents $500."

This question was designed specifically to isolate state dependence. Individuals are being asked to allocate $10,000 (in $500 increments) to consumption in the healthy state or to consumption in the disabled state.

Several features of the question ensure that we are measuring state dependence rather than other confounding factors. First, to ensure we are not inadvertently capturing differential income effects by state, we are clear that (i) there is no cost to allocating the money (i.e., no insurance loads), (ii) that basic nursing home costs are fully covered so that there is no wealth shock in the sick state, and (iii) spending more money on medical care does not change one's lifespan so that the individual is not allocating money to the sick state for health rather than consumption purposes. Also, to ensure that individuals are responding based on state dependence in the marginal utility of consumption rather than on differential expectations about life expectancy, the question is clear that health and lifespan are not affected by the state in which they find themselves.

We use the process of allocating balls to bins because it is an activity that ALP users are familiar with, as it has been used in prior ALP surveys on other topics. We also note that the probabilities were explicitly set at 50/50 in order to set a natural benchmark for full consumption smoothing of simply allocating wealth equally across both states—in effect biasing the results against finding evidence of state-dependence. This set-up also allows for symmetric

opportunities for deviating from perfect consumption smoothing in either direction (i.e., positive or negative state dependence).

As our empirical proxy for the state-dependence parameter Ø, we simply take the fraction of the $10,000 allocated to the disabled state.[6] Thus, individuals allocating all 20 balls to the health state will have a value of 0%, those engaging in perfect consumption smoothing will have a value of 50%, and those allocating all of their wealth to the disabled state will have a value of 100%. Of course, intermediate values, in increments of 0.05, are also possible. We explore the empirical distribution of these responses in the next section.

5. Results

5.1 The Distribution of State Dependence

We begin by examining the distribution of responses to our questions measuring state dependence in Figure 1. The top set of histograms show the distribution of responses for questions regarding disabilities that prevent work, while the bottom set shows the distribution for disabilities needing long-term care. For both types of disabilities we distinguish between physical disabilities in the left column and mental disabilities in the right column. In each case, we divide the sample into five bins – two for those that allocate 0% or 100% of the to the disabled state, one those who make an even 50/50 split, and two for those that give intermediate answer 5-45% or 55-95%, keeping in mind that because there were 20 balls, the answers are in 5 percentage point increments.

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[6] Estimating the parameter Ø directly is possible if a utility function is specified under the assumption of homothetic preferences and taking the allocation of balls into bins as optimal consumption levels in the sick and healthy state. However, using common utility functions like the CRRA class of utility functions, the parameter Ø is undefined for one who allocates $0 in the healthy state. Therefore, we prefer a non-parametric measure of state dependence rather than one that depends on any particular functional form for utility.

For working individuals under age 60 when asked about a physical disability, the mean division is to provide 49.1% of wealth to the disabled state, suggesting that the average individual is allocating wealth in a manner that is approximately what we would expect if utility is not state-dependent. However, this average masks considerable dispersion in responses, with close to 15 percent of the sample allocating wealth to one of the extreme states, about one-third of the sample choosing a 50-50 split, and the balance leaning more heavily towards allocations to the sick state than to the healthy state. This rightward skew of the distribution suggests that there are slightly more people who view physical health and consumption as substitutes rather than complements, contrary to the findings of Finkelstein, Luttmer and Notowidigdo (2009).

In the top right part of Figure 1, we show a similar histogram for a mental disability. Although there is still considerable dispersion, it is notable that the distribution shifts left-- toward the healthy state. The mean allocation falls to 44.7%, suggesting that for a *mental* disability, mental health and consumption are more often viewed as complements.

The bottom panel of Figure 1 repeats this exercise for individuals age 50 – 80 in the context of long-term care. Relative to the top panel, these distributions are shifted substantially to the left. The mean allocation to the disabled state is only 35.6% of wealth in the case of a physical disability, and only 31.9% of wealth for mental disability. This suggests that individuals are less interested in transferring money to sick states of the world when in need of long-term care than they are when dealing with disability that reduce earnings. Put differently, health and consumption exhibit more complementarity at older ages than at younger ages. We also again see that the willingness to transfer money to sick states is slightly lower for mental than for physical disabilities. We view these results as strong evidence that models which ignore state dependence are missing an important aspect of individual preferences.

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Our comparison of responses regarding disabilities that prevent work with long-term care disabilities (i.e., comparing the top panel of Figure 1 to the bottom panel) confounds the *type* of disability with different cohorts being sampled. We can decompose this, however, by taking advantage of the subset of 449 individuals age 50-59 who responded to both sets of disability questions. The distribution of responses for each type of disability among this subsample (not shown) are quite similar to those for the full sample, with the exception of a slightly lower weight in the "100% Disabled" category. We therefore conclude that the differences in the distributions shown in Figure 1 for the full sample are largely due to the type of disability rather than the differences in the samples.

In Table 2, we look directly at the correlations of the four measures for this sub-sample. As expected, the correlations are highest when comparing mental and physical disabilities, for the same age of onset, in the same survey (i.e., the correlation is 0.676 for mental and physical state dependence when asked about work disabilities, and 0.651 when asked about disabilities requiring long-term care). These questions are in the same survey and are thus answered within moments of one another and by the same group of individuals. When we examine the correlation *across surveys*, but hold the physical/mental nature of the disability fixed, the correlations are still high, although somewhat lower at 0.488 and 0.545. When we compare "unlike" instances on both margins, e.g., physical disability during working life to mental disability at older ages, we still find reasonably high correlations of 0.470 and 0.477. These similarities provide some assurance that respondents are providing thoughtful answers and not simply allocating balls to bins at random.

5.2 Who exhibits more state dependence?

In Table 3, we run regressions of our various measures of state dependence against a range of available characteristics, including age, sex, marital status, level of education, family income, financial wealth, race and ethnicity, and self-reported health status, to assess which individual characteristics might be associated with state-dependence. We also include an indicator variable equal to 1 if the individual answered the physical disability question first, and 0 if they saw the mental disability question first in order to control for possible contamination with respect to survey design.

Overall, we find very few consistently significant patterns with respect to most demographic characteristics. Exceptions include fewer balls allocated to sick states for higher income groups when asked about physical disabilities needing long-term care, and more balls allocated to sick states for African Americans when asked about any disabilities (physical or mental) needing long-term care. Finally, we note that the dummy variable indicating the order of the mental versus physical impairment question is significant in two specifications, with asking the physical disability question first increasing the allocation to the disabled state when examining physical disabilities with work-related issues, and decreasing the allocation for mental disabilities in the long term care state.

5.3 Is state dependence related to insurance purchase decisions?

We hypothesized earlier that state dependence could reduce the likelihood of full insurance coverage. In Figure2 we show the relationship between insurance coverage by our state-dependence proxies. The figure is similar in structure to Figure 1 with insurance coverage for each of our state-dependence categories reported for disability insurance (top row) and long-

term care insurance (bottom row). As before, physical disability state-dependence measures are on the left-hand side of the figure and mental disability state-dependence measures on the right-hand side. The figure suggests that rates of insurance coverage are related to state-dependence proxies, as insurance coverage rates tend to be higher when more balls are allocated into the "disabled" state of the world. The relationship is not always monotonic but the trend is clear. The most striking anomaly is that in the long-term care setting, those who choose a 50-50 split report a lower fraction of balls allocated to the disabled state that a monotonic relationship would predict. We speculate that those reporting a 50-50 split might have a substantial amount of uncertainty with regard to their response and are not too surprised by this pattern.

Tables 4 and 5 show the results of linear probability models for which the dependent variables are binary indicators of voluntary disability insurance (Table 4) or long-term care insurance (Table 5) coverage. The specifications shown include only a binary variable indicating the order of the mental versus physical impairment questions and thus are very similar to the graphs shown in Figure 2.[7]

The relationship between state dependence and insurance coverage appears particularly strong for long-term care insurance when physical disabilities are considered. Looking at Column (1) of Table 5, the results suggest that a 10 percentage point increase in the percent of balls allocated in the mentally disabled bin increases the probability of long-term care insurance coverage by a bit less than 1 percentage point. Because long-term care insurance is rare (held by just 15 percent of our sample) this difference corresponds to a 6 percent change in the likelihood of coverage. For supplemental disability insurance, we see a relationship between state

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[7] We have also run specifications that include controls for age, sex, marital status, education, income, wealth, race, ethnicity, health status and risk aversion. These results are very similar and are available upon request.

dependence with regards to mental disabilities and insurance ownership with a similar

magnitude.

6. Conclusions

We view this study as a next step in a continuing process of examining the role of state-

dependence in insurance demand. In future work, we intend to examine this relation in more

detail. In addition to the questions discussed here, our survey asks respondents to report their

subjective expectations of needing care and questions them about their experiences with disabled

family members. These measures will allow us to focus further on subgroups of the population

for whom the relationship between proxies for state dependence and insurance coverage may

differ further. In addition, we plan to explore further the observed differences in behavior among

the 50-50 group, and the somewhat smaller deviations from trend at the observed for those at

endpoints (e.g. 0 and 100 percent of balls allocated to the disabled state). These round number

responses may signal difficulties with the questions or other issues (e.g. not reading the question

carefully to taking the time to think about the response). We will test the sensitivity of removing

these individuals from our analysis, as well as endeavor to learn what might be behind the

responses.[8]

Although there are many additional avenues to explore, this current paper provides

substantial new evidence regarding state-dependence. Using an innovative survey approach, we

find mean estimates of state-dependence that are consistent with earlier studies showing that

individuals tend to value consumption in unhealthy states less than they value consumption in

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[8] For example, there are numerous subjective probability questions asked of the ALP respondents in surveys
fielded by other investigators at various times. We can thus identify a propensity to report a round number. We
can also use time-stamps to infer how long the individual took to answer parts of the survey and thus potentially
how much thought they invested in their answers.

healthy states. However, we show further that this average masks a substantial amount of heterogeneity both across people and across types of disability. State dependence appears to be more pronounced when considering disabilities that need long-term care, and more pronounced for mental disabilities rather than physical disabilities. Furthermore, little of the large amount of variation across individuals that we observe is related to standard socio-economic controls, suggesting that models that do not have a direct measure of state-dependence will have difficulty controlling adequately for its presence.

Finally, although still in preliminary stages, we find some weak evidence that individual-specific measures of state-dependence are correlated with insurance coverage; those who prefer to allocate resources to the sick state of the world, tend to have higher rates of insurance coverage. Future work will follow-up on these early results to estimate the relationships more precisely and to explore how state dependence affects various aspects of behavior.

Appendix A: ALP Respondent Recruitment

Respondents to the RAND-USC ALP study have been recruited in one of three ways. The majority of respondents were drawn from a sample of those ages 18 or older who participated in the Monthly Survey (MS) of the University of Michigan's Survey Research Center (SRC). The MS is the leading consumer sentiment survey that incorporates the long-standing Survey of Consumer Attitudes and used to produce well-known Index of Consumer Expectations. Each month, the MS interviews approximately 500 households, of which 300 households are a random-digit-dial (RDD) sample and 200 are re-interviewed from the RDD sample surveyed six months previously. Until August 2008, the SRC screened MS respondents by asking them if they would be willing to participate in a long-term research project (with approximate response categories "no, certainly not," "probably not," "maybe," "probably," "yes, definitely"). If the response category is other than "no, certainly not," respondents were told that the University of Michigan was undertaking a joint project with RAND. They were asked if they would object to SRC sharing their information about them with RAND so that they could be contacted later. When contacted, there were asked if they would be willing to participate in an Internet survey (the ALP). Respondents who did not have an Internet connection were told that RAND would provide them with free Internet. Many MS-respondents are interviewed twice. At the end of the second interview, an attempt was made to convert respondents who refused in the first round. This attempt includes the mention of the fact that participation in follow-up research carries a reward of $20 for each half-hour interview.

A second set of respondents (approximately 500) was recruited to the ALP through the use of snowball sampling; here respondents were given the opportunity to suggest friends or

acquaintances who might also want to participate in the ALP. Those friends were then contacted

and asked to join.   Recently, a third group of respondents (again, approximately 500) was

recruited after participating in the National Survey Project, run by Stanford University and SRBI.

This sample was recruited in person, and at the end of their one-year participation they were

asked whether they were interested in joining the ALP. Most of those in this group of

respondents were given a laptop and broadband Internet access. Finally, ALP has recently

begun recruiting respondents using a random mail and telephone sample based on the Dillman

method (see e.g. Dillman et al, 2008) with the goal of achieving a total of 5000 active panel

members (including a 1000 Spanish language subsample). As has been the policy throughout, if

these new participants do not have Internet access, they will be provided with a laptop and

broadband Internet access. This last group is not part of the sample used in this paper.

Appendix B: State Dependence Survey Questions

Disabilities that Prevent Work (MS 343)

Preamble:

In this survey, you are going to be asked questions about work disabilities that affect a person's ability to earn a living. Some disabilities are short-term (less than a year), which means that individuals with short-term disabilities will be able to return to work after they recover. Some examples of short-term disabilities are broken bones or temporary illnesses. Many people have some sort of coverage for short-term disabilities through their employment.

Other disabilities are long-term. If you have a long-term disability, you would not be able to continue working at your job, nor would you be able to resume working at any point in the foreseeable future. You also would not be able to hold any other job that is suitable for you based on your training, education, and experience.

What may be considered a disability for some occupations may not be a disability for others. For example, not having full use of one's hands may not permanently prevent someone working in an office from doing their job, but could permanently prevent a welder from doing his job.

For the following questions, when we refer to disabilities, we mean **long-term disabilities**, which may permanently prevent someone from earning an income through work. When you answer these questions, think about specific disabilities that would prevent you from performing your job, or any job suitable for you based on your training, education, and experience.

Question 1:

Consider what your life may be like in 5 years. Suppose there is a 50 percent chance that you will be healthy and expect to remain so for the rest of your life, and a 50 percent chance that you have a **physical disability** and can no longer perform in any job suitable for you based on your training, education, and experience. If you have a disability, it is a condition or injury that is permanent, but will not shorten your lifespan.

Also assume that you have sufficient disability insurance so that if you become disabled, your **monthly income remains the same** as it was when you were employed and your medical care is covered. The disability is such that no additional amount of medical spending will improve your condition.

Now suppose that you are given the opportunity – at no cost to you - to have an additional $10,000 provided to you either if you are healthy and working or if you have a physical disability. Or, you can choose to divide up the money across these two possibilities, such as by having $5,000 if you are healthy and $5,000 if you have a physical disability, or any other combination.

Using the balls and bins shown below, please allocate the $10,000 across these two options:

- Money to spend on goods and services while physically disabled
- Money to spend on any goods and services while healthy

Each ball represents $500.

Question 2:

We would now like to ask a related question, but note that the type of disability is different than in the prior question.

Consider what your life may be like in 5 years. Suppose that there is a 50 percent chance that you will be healthy and expect to remain so for the rest of your life, and a 50 percent chance that you have a **mental or cognitive disability** (e.g., intellectual disabilities, schizophrenic and psychotic disorders) and can no longer perform in any job suitable for you based on your training, education, and experience. If you have a disability, it is with a condition that is permanent, but will not shorten your lifespan.

Also assume that you have sufficient disability insurance so that if you become disabled, your **monthly income remains the same** as it was when you were employed and your medical care is covered. The disability is such that no additional amount of medical spending will improve your condition.

Now suppose that you are given the opportunity – at no cost to you - to have an additional $10,000 provided to you either if you are healthy and working or if you have a mental or cognitive disability. Or, you can choose to divide up the money across these two possibilities, such as by having $5,000 if you are healthy and $5,000 if you have a mental or cognitive disability, or any other combination.

Using the balls and bins shown below, please allocate the $10,000 across these two options:

- Money to spend on goods and services while mentally or cognitively disabled
- Money to spend on any goods and services while healthy

Each ball represents $500.

[Note: ordering of mental and physical disabilities was randomized.]

Disabilities Needing Long-Term Care (MS 344)

Preamble:

For purposes of this survey, when we use the term 'long-term care,' we are referring to assistance with personal care needs such as dressing, bathing, getting in and out of bed, using the bathroom or eating.

Question 1:

Consider what your life may be like at age 80. Suppose there is a 50 percent chance that you will be healthy and able to live independently in your own home for the rest of your life and a 50 percent chance that your **physical health** will have deteriorated to the point where you will have to live in a nursing home for the rest of your life (e.g., you have difficulties performing everyday tasks unassisted, such as eating, bathing, or walking).

Also assume that your **basic nursing home costs are fully covered**, so you need not pay anything for this basic level of care. Your mental and cognitive health and lifespan will be the same whether or not you are in a nursing home at age 80 and additional spending on medical care will not change your lifespan.

Now suppose that you are given the opportunity – at no cost to you - to have an additional $10,000 provided to you either if you are healthy and in your own home or if you are in a nursing home. Or, you can choose to divide up the money across these two possibilities, such as

by having $5,000 if you are healthy and $5,000 if you are in a nursing home, or any other combination. In either state, you can spend the money any way that you wish.

Using the balls and bins shown below, please allocate the $10,000 across these two options:

- Money to spend on goods and services while physically disabled in a nursing home
- Money to spend on any goods and services while healthy

Each ball represents $500.

Question 2:

Now, instead of your physical health, we would like to ask you about your mental or cognitive health.

Consider what your life may be like at age 80. Suppose there is a 50 percent chance that you will be healthy and able to live independently in your own home for the rest of your life and a 50 percent chance that your **mental or cognitive** health will have deteriorated to the point where you have to live in a nursing home (e.g., Alzheimer's disease, severe short term memory loss, or dementia).

Also assume that your **basic nursing home costs are fully covered**, so you need not pay anything for this basic level of care. Your physical health and lifespan will be the same whether or not you are in a nursing home at age 80 and additional spending on medical care will not change your lifespan.

Now suppose that you are given the opportunity – at no cost to you - to have an additional $10,000 provided to you either if you are healthy and in your own home or if you are in a nursing home. Or, you can choose to divide up the money across these two possibilities, such as by having $5,000 if you are healthy and $5,000 if you are in a nursing home, or any other combination. In either state, you can spend the money any way that you wish.

Using the balls and bins shown below, please allocate the $10,000 across these two options:

- Money to spend on goods and services while mentally or cognitively disabled in a nursing home
- Money to spend on goods and services while healthy

Each ball represents $500.

[Note: ordering of mental and physical disabilities was randomized.]

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Table 1: Sample Characteristics

Panel A: Sample for Disabilities that Prevent Work

	mean	sd	min	max
DI	0.334	0.472	0	1
DI (voluntary)	0.213	0.410	0	1
DI WTP	280.1	491.0	0	2000
Age	42.14	11.58	18	60
Female	0.565	0.496	0	1
Married	0.621	0.485	0	1
High School or Less	0.184	0.387	0	1
Some College	0.372	0.484	0	1
College Graduate	0.259	0.438	0	1
Graduate Degree	0.185	0.389	0	1
African American	0.105	0.306	0	1
Other Race	0.126	0.332	0	1
Hispanic	0.190	0.392	0	1
Fair or poor health	0.0976	0.297	0	1
Risk averse	0.217	0.412	0	1
Observations	1301			

Panel B: Sample for Disabilities Needing Long-Term Care

	mean	sd	min	max
LTCI	0.151	0.359	0	1
LTCI WTP	375.5	852.3	0	5000
Age	61.31	7.406	49	79
Female	0.534	0.499	0	1
Married	0.618	0.486	0	1
High School or Less	0.203	0.403	0	1
Some College	0.361	0.480	0	1
College Graduate	0.229	0.420	0	1
Graduate Degree	0.207	0.405	0	1
African American	0.0801	0.272	0	1
Other Race	0.0538	0.226	0	1
Hispanic	0.0956	0.294	0	1
Fair or poor health	0.186	0.389	0	1
Risk averse	0.271	0.445	0	1
Observations	1486			

Table 2: Correlation between State Dependence Parameter Proxies

	Physical Disabilities that Prevent Work	Mental Disabilities that Prevent Work	Physical Disabilities Needing LTC	Mental Disabilities Needing LTC
Physical Disabilities that Prevent Work	1			
Mental Disabilities that Prevent Work	0.676***	1		
Physical Disabilities Needing LTC	0.488***	0.470***	1	
Mental Disabilities Needing LTC	0.477***	0.545***	0.651***	1
Observations	454			

Table 3: Relationship between State-Dependence Proxies and Observable Characteristics

VARIABLES	(1) Physical	(2) Mental	(3) Physical	(4) Mental
	Disabilities that Prevent Work		Disabilities Needing LTC	
Age	0.00451	0.00708	0.00800	0.00390
	(0.00521)	(0.00577)	(0.0146)	(0.0156)
Age ^2	-5.71e-05	-8.66e-05	-7.51e-05	-3.82e-05
	(6.24e-05)	(6.92e-05)	(0.000116)	(0.000124)
Female	0.0145	0.0210	-0.00662	-0.00387
	(0.0142)	(0.0157)	(0.0136)	(0.0145)
Married	0.0167	0.0327*	-0.0126	0.00456
	(0.0157)	(0.0173)	(0.0157)	(0.0168)
Some College	-0.0388*	-0.0225	0.0228	-0.00835
	(0.0200)	(0.0222)	(0.0189)	(0.0203)
College Graduate	-0.00199	0.0138	0.0254	-0.000294
	(0.0222)	(0.0246)	(0.0218)	(0.0233)
Post Graduate	-0.0139	-0.0115	0.0520**	0.0240
	(0.0247)	(0.0274)	(0.0234)	(0.0250)
$5K < Family income < $7.5K	-0.130	-0.0518	-0.178**	-0.0672
	(0.0946)	(0.102)	(0.0861)	(0.0918)
$7.5K < Family income < $10K	-0.137	0.00741	-0.0962	0.00962
	(0.0871)	(0.0972)	(0.0638)	(0.0679)
$10K < Family income < $12.5K	-0.0292	0.0293	-0.0742	0.00474
	(0.0757)	(0.0883)	(0.0596)	(0.0637)
$12.5K < Family income < $15K	-0.192**	-0.0383	-0.146**	-0.0703
	(0.0851)	(0.0949)	(0.0621)	(0.0662)
$15K < Family income < $20K	0.00178	0.157**	-0.150**	-0.00987
	(0.0663)	(0.0738)	(0.0596)	(0.0635)
$20K < Family income < $25K	-0.0331	-0.0277	-0.124**	-0.0395
	(0.0611)	(0.0687)	(0.0577)	(0.0614)
$25K < Family income < $30K	-0.0512	0.0771	-0.100*	0.00785
	(0.0633)	(0.0713)	(0.0585)	(0.0624)
$30K < Family income < $35K	-0.0677	0.0783	-0.174***	-0.0505
	(0.0600)	(0.0675)	(0.0569)	(0.0605)
$35K < Family income < $40K	-0.0452	0.0498	-0.0917	-0.00828
	(0.0605)	(0.0679)	(0.0583)	(0.0622)
$40K < Family income < $50K	-0.0722	0.0627	-0.0847	-0.0505
	(0.0577)	(0.0650)	(0.0549)	(0.0585)
$50K < Family income < $60K	-0.0427	0.0310	-0.0751	-0.0312
	(0.0578)	(0.0651)	(0.0544)	(0.0579)
$60K < Family income < $75K	-0.0804	0.0452	-0.126**	-0.0770
	(0.0577)	(0.0651)	(0.0545)	(0.0580)
Family income > $75K	-0.0904	0.00167	-0.109**	-0.0601

	(0.0571)	(0.0643)	(0.0539)	(0.0573)
$1K < Fin wealth < $10K	-0.0163	0.0291	-0.0220	-0.00784
	(0.0245)	(0.0273)	(0.0287)	(0.0305)
$10K < Fin wealth < $50K	0.00735	0.0197	-0.0236	0.00199
	(0.0241)	(0.0267)	(0.0288)	(0.0307)
$50K < Fin wealth < $100K	0.0260	0.0492	-0.00687	-0.00234
	(0.0272)	(0.0302)	(0.0310)	(0.0330)
$100K < Fin wealth < $250K	-0.00633	0.000879	-0.0531*	0.00334
	(0.0291)	(0.0322)	(0.0305)	(0.0325)
Fin wealth > $250K	0.0270	0.0227	-0.0372	0.00916
	(0.0308)	(0.0343)	(0.0303)	(0.0323)
African American	0.00883	0.0106	0.0486*	0.106***
	(0.0241)	(0.0266)	(0.0258)	(0.0277)
Other Race	0.00298	-0.01000	0.0108	0.0303
	(0.0231)	(0.0256)	(0.0314)	(0.0338)
Hispanic	0.00643	0.0270	0.0330	0.0515**
	(0.0203)	(0.0224)	(0.0243)	(0.0260)
Fair/Poor Health Status	0.0150	-0.0183	0.0141	-0.0132
	(0.0240)	(0.0270)	(0.0183)	(0.0195)
Risk Averse	0.00479	-0.00160	-0.00610	-0.00917
	(0.0172)	(0.0190)	(0.0158)	(0.0169)
Physical Disability First - DI	0.0287**	0.0204		
	(0.0138)	(0.0153)		
Physical Disability First - LTC			0.00107	-0.0615***
			(0.0133)	(0.0142)
Constant	0.472***	0.243*	0.281	0.301
	(0.115)	(0.128)	(0.456)	(0.485)
Observations	1,305	1,304	1,497	1,491
R-squared	0.027	0.033	0.031	0.040

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Dependent variable is percent of balls in disabled state for physical and mental disabilities that prevent work and physical and mental disabilities needing long-term care.

Table 4: Relationship between Supplemental Disability Insurance Coverage and State-Dependence Proxies

VARIABLES	(1)	(2)	(3)	(4)
Percent of Balls in Physically Disabled Bin	0.0391			
	(0.0459)			
5 - 45% Balls in Physically Disabled Bin		0.0194		
		(0.0470)		
50% Balls in Physically Disabled Bin		0.0554		
		(0.0443)		
55 - 95% Balls in Physically Disabled Bin		0.0575		
		(0.0452)		
100% Balls in Physically Disabled Bin		0.0248		
		(0.0595)		
Percent of Balls in Mentally Disabled Bin			0.0838**	
			(0.0412)	
5 - 45% Balls in Mentally Disabled Bin				0.0257
				(0.0385)
50% Balls in Mentally Disabled Bin				0.0613
				(0.0389)
55 - 95% Balls in Mentally Disabled Bin				0.0725*
				(0.0390)
100% Balls in Mentally Disabled Bin				0.0572
				(0.0549)
Physical Disability First - DI	-0.00618	-0.00729	-0.00417	-0.00300
	(0.0226)	(0.0226)	(0.0225)	(0.0226)
Constant	0.196***	0.175***	0.176***	0.168***
	(0.0278)	(0.0412)	(0.0247)	(0.0343)
Observations	1,324	1,324	1,323	1,323
R-squared	0.001	0.002	0.003	0.004

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Notes: Dependent variable is binary variable indicating coverage by supplemental disability insurance, excluding those covered by required employer-sponsored disability insurance programs. Omitted category in Columns (2) and (4) is 0% Balls in Disabled Bin. State-dependence proxies obtained from survey regarding disabilities that prevent work.

Table 5: Relationship between Long-Term Care Insurance Coverage and State-Dependence Proxies

VARIABLES	(1)	(2)	(3)	(4)
Percent of Balls in Physically Disabled Bin	0.0801**			
	(0.0363)			
5 - 45% Balls in Physically Disabled Bin		0.0680**		
		(0.0270)		
50% Balls in Physically Disabled Bin		0.0424		
		(0.0290)		
55 - 95% Balls in Physically Disabled Bin		0.0832**		
		(0.0337)		
100% Balls in Physically Disabled Bin		0.104**		
		(0.0520)		
Percent of Balls in Mentally Disabled Bin			0.00233	
			(0.0343)	
5 - 45% Balls in Mentally Disabled Bin				0.0153
				(0.0246)
50% Balls in Mentally Disabled Bin				-0.0218
				(0.0284)
55 - 95% Balls in Mentally Disabled Bin				0.0338
				(0.0331)
100% Balls in Mentally Disabled Bin				0.0494
				(0.0482)
Physical Disability First - LTC	0.00521	0.00316	0.00591	0.00518
	(0.0185)	(0.0186)	(0.0187)	(0.0187)
Constant	0.120***	0.0976***	0.149***	0.142***
	(0.0189)	(0.0246)	(0.0183)	(0.0227)
Observations	1,513	1,513	1,506	1,506
R-squared	0.003	0.006	0.000	0.003

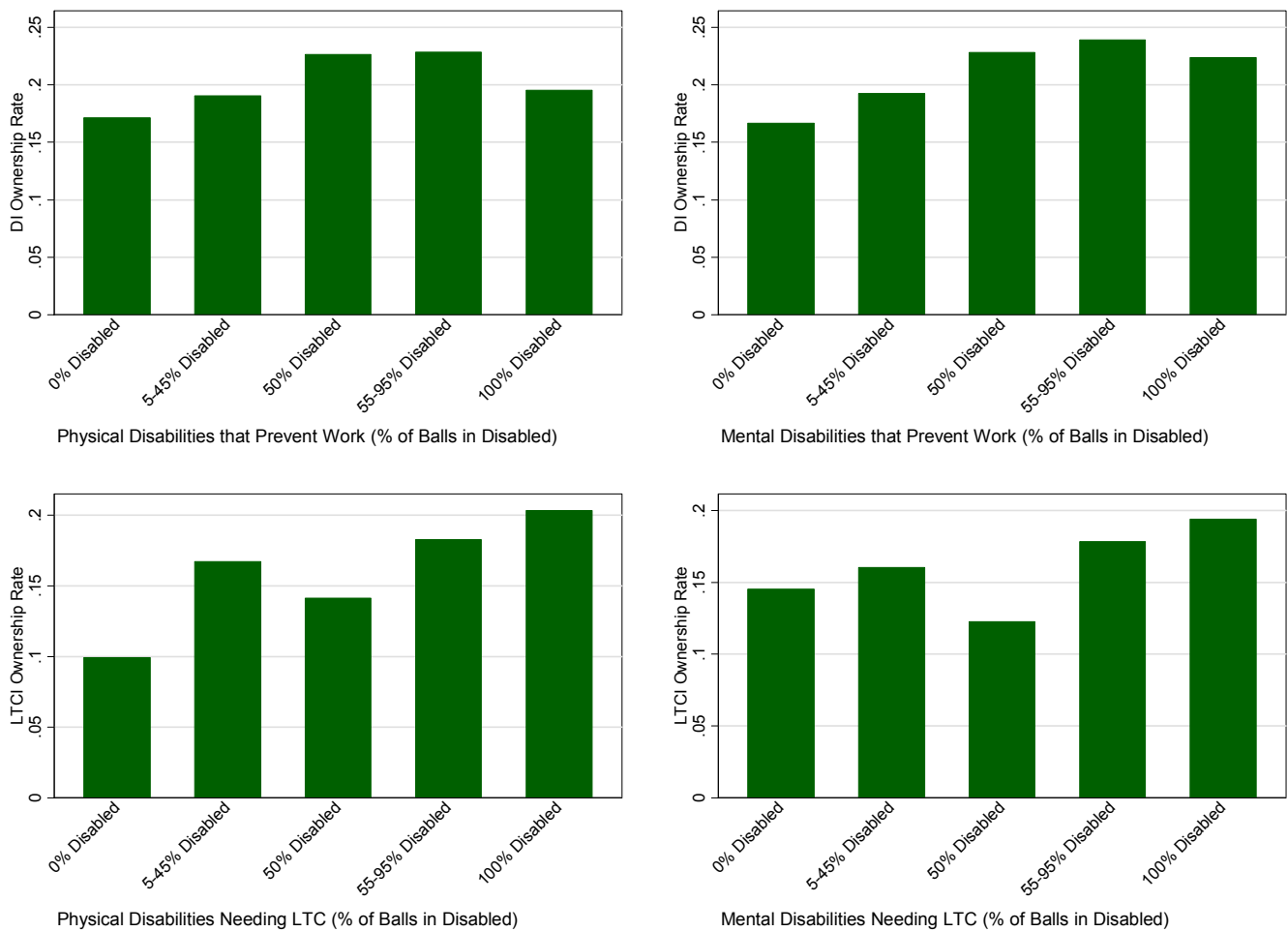Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Dependent variable is binary variable indicating coverage by private long-term care insurance. Omitted category in Columns (2) and (4) is 0% Balls in Disabled Bin. State-dependence proxies obtained from survey regarding disabilities needing long-term care.

Figure 1: Distribution of Balls Allocated to Disabled State by Type of Disability
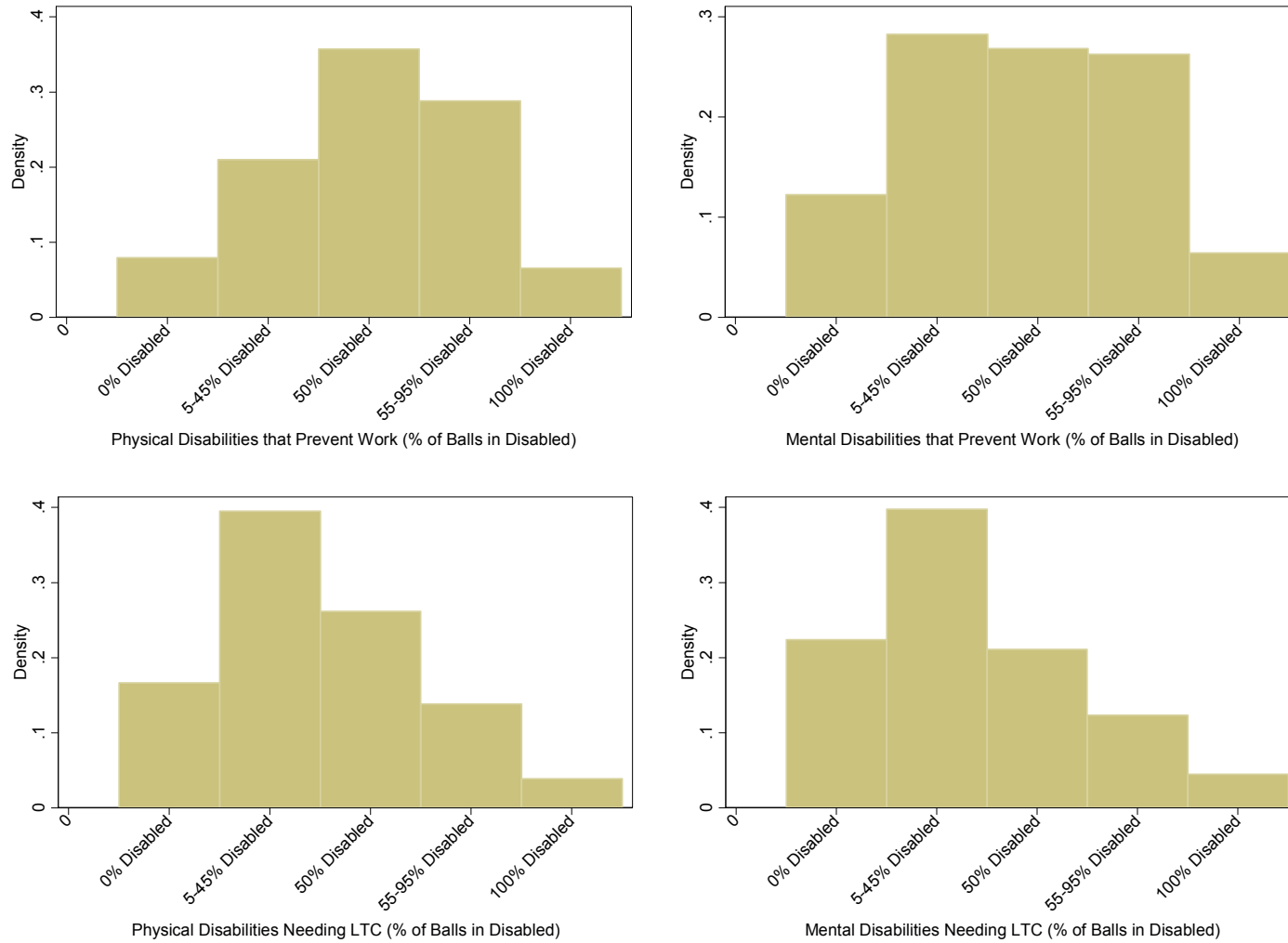
Notes: Sample for disabilities that prevent work are under age 60 and working (N=1,301). Sample for disabilities needing long-term care are ages 50-80 (N=1,486).

Figure 2: Insurance Ownership by State Dependence Proxy and Type of Disability

Notes: Sample for disabilities that prevent work are under age 60 and working (N=1,301). Sample for disabilities needing long-term care are ages 50-80 (N=1,486).