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journal homepage: [www.elsevier.com/locate/jmoneco](http://www.elsevier.com/locate/jmoneco)Occupational hazards and social disability insurance<sup>☆</sup>Amanda Michaud<sup>a,\*</sup>, David Wiczer<sup>b</sup><sup>a</sup> Department of Economics, Indiana University, 100 S. Woodlawn Ave, Bloomington, IN 47405-7104, United States<sup>b</sup> Stony Brook University, United States

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## ABSTRACT

Using retrospective data, we introduce evidence that occupational exposure significantly affects disability risk. Incorporating this into a general equilibrium model, social disability insurance (SDI) affects welfare through (i) the classic, risk-sharing channel and (ii) a new channel of occupational reallocation. Both channels can increase welfare, but at the optimal SDI they are at odds. Welfare gains from additional risk-sharing are reduced by overly incentivizing workers to choose risky occupations. In a calibration, optimal SDI increases welfare by 6.3% relative to actuarially fair insurance, mostly due to risk sharing.

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## 1. Introduction

How do workers' occupational choices affect the optimality of social—or public—disability insurance (SDI)? The two are related because, in choosing their occupation, workers are choosing their physical health risk and, hence, their likelihood to need disability insurance. Disability insurance then alters the composition of occupations by incentivizing workers to choose occupations with higher risk. This reallocation towards risky occupations can, however, be desirable when occupations are imperfect substitutes in production and insurance markets are incomplete.

Our central results are based on a theoretical model of occupation choice, occupation-specific disability risk, and incomplete markets for private insurance. We show that fewer workers choose occupations with high disability risk than would achieve productive efficiency. This occurs because workers in high-risk jobs demand a compensating differential, a wage sufficient to self-insure against disability. But with a downward sloping demand for additional workers in each occupation, these high wages obtain only if there are inefficiently few workers in high-risk occupations. In other words, self-insurance is too expensive and so equilibrium prices correspond to an inefficient distribution of workers.

The introduction of SDI improves welfare through two channels. The first is through risk sharing: social insurance improves welfare by helping workers in risky occupations to smooth consumption. The second, novel channel is occupational reallocation: SDI encourages more workers to choose risky occupations. On the margin, the allocation of workers across occupations becomes more efficient and output increases. The gains are larger than the cost to fund the scheme because social

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insurance is more efficient than self-insurance. With self-insurance, some workers who accumulate savings never become disabled. The increase in output provides welfare gains even for workers with zero disability risk and many whose disability risk never realizes.

The two channels, risk-sharing and the reallocation, both work to increase welfare upon introduction of social insurance, but at the welfare-maximizing level they are at odds. Although reallocation towards risky occupations initially improves productive efficiency, additional insurance can increase the risky occupational allocation beyond the output maximizing level. At the point at which an SDI expansion reduces output, welfare gains from risk-sharing remain. This result is general and not a quantitative statement; welfare is maximized by an SDI program that induces workers to choose risky occupations beyond the output maximizing level.

Our results are qualitatively robust to ex ante heterogeneity in preferences that induce sorting and to private information over disability status. Further, private information over disability status is a reason for why private insurance cannot achieve the same welfare gains as social insurance. If neither public nor private contracts can condition on workers' risk-level, i.e. contracts are not occupation-specific, high-risk workers over-subscribe to private insurance contracts. This adverse selection leads to a market failure typical of insurance contracts with private information.<sup>1</sup> Social insurance can dictate equal insurance coverage so it is not subject to adverse selection and always generates welfare gains.

To motivate our theoretical work, we show heterogeneity in disability incidence across occupations. Using data from the University of Michigan's Health and Retirement Survey [Health and Retirement Study HRS](#), we find a natural grouping between low- and high-risk occupations, the latter have about twice the disability rate as the low-risk group. While this is suggestive, occupational choice is endogenous and potentially influenced by unobservable factors. To begin addressing this, we propose an instrument scheme using O\*NET measures of physical and non-physical occupational requirements. Physical requirements have health repercussions, but their estimated effect may be influenced by sorting along these physical requirements. Therefore, we instrument physical requirements by the non-physical requirements in the O\*NET. The intent is to use how occupations bundle requirements: While workers' unobserved physical traits may guide sorting along the physical requirements, they hopefully do not guide sorting on non-physical requirements, but, these requirements can predict the physical requirements. This instrumenting scheme is not a definitive solution, but it does uncover significant bias in the estimate assuming exogeneity.

We use these facts, along with the U.S. SSDI system, to calibrate our model of occupation risk. We find the optimal SDI program costs 4.9% of GDP and provides welfare gains equivalent to a 6.3% increase in consumption in a world with actuarially fair insurance alone. Relative to this optimal program, the current U.S. system captures 84% of the potential gains. We conclude from these findings that there is a quantitatively important role for SDI beyond the insurance that is provided by private markets.

The economic mechanism of this paper is most related to that of [Acemoglu and Shimer \(1999\)](#). They show unemployment insurance can raise output by inducing workers to search for higher productivity jobs which are rarer, and therefore, more risky to pursue. In this paper, SDI also increases output by inducing workers to take on more risk in their job search; specifically choosing occupations with greater disability risk. In both, social insurance is not simply a transfer to those experiencing bad luck. Instead, improvements in productive efficiency increase the welfare of all individuals, even those who face little or no risk.

[Schulhofer-Wohl \(2011\)](#) also considers workers who choose jobs with different levels of risk and focuses on underlying heterogeneity in preferences. He shows that this generalization can reduce the welfare costs associated with incomplete insurance. In an extension, we incorporate preference heterogeneity and show our SDI scheme still generates Pareto-improving welfare gains, although those gains may now be unequal. Quite consistent with the results of [Schulhofer-Wohl \(2011\)](#), workers in the most risky occupations may gain the least from insurance because the most impatient agents select into those occupations.

Several papers discuss disability's interaction with other economic factors. Notably, [Golosov and Tsyvinski \(2006\)](#) also consider optimal DI, but from a mechanism design approach to prevent misreporting. Private information is a potentially important consideration, and so we show that workers reveal their status in our baseline SDI scheme because our policy tool is less generous than would tempt misreporting.

We motivate our normative work by estimating the heterogeneity in disability risk across occupations. A few papers present similar empirical results (e.g. [Fletcher et al., 2011](#); [Morefield et al., 2012](#)). These papers both connect physically demanding occupations to health problems later in life. [Ravesteijn et al. \(2013\)](#) use German data and, again, link occupational physical demands to health deteriorations. They use a dynamic fixed effects model to control the individual effects affecting both occupational choice and health outcomes. We introduce a set of instrumental variable techniques to specifically address this problem of endogeneity between occupational choice and potential heterogeneity in risk sensitivity.

## 2. Data on occupations and disability

In this section, we present data regarding the connection between an individual's occupation and disability risk. First, we construct a measure of lifetime exposure to an occupation using the University of Michigan's Health and Retirement Study

<sup>1</sup> Market failure here is Rothschild Stiglitz-like, in that if an insurance contract were offered, it would attract high-risk workers and earn a negative profit. Increasing the price only makes adverse selection worse.

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