ANNUAL REVIEWS

Annual Review of Economics

Choice in Insurance Markets: A Pigouvian Approach to Social Insurance Design

Nathaniel Hendren,[1,2] Camille Landais,[3,4] and Johannes Spinnewijn[3,4]

[1]Department of Economics, Harvard University, Cambridge, Massachusetts 02138, USA; email: nhendren@fas.harvard.edu

[2]National Bureau of Economic Research, Cambridge, Massachusetts 02138, USA

[3]London School of Economics, London WC2A 2AE, United Kingdom; email: c.landais@lse.ac.uk, j.spinnewijn@lse.ac.uk

[4]Centre for Economic Policy Research, London EC1V 0DX, United Kingdom

Annu. Rev. Econ. 2021. 13:457–86

First published as a Review in Advance on May 24, 2021

The *Annual Review of Economics* is online at economics.annualreviews.org

https://doi.org/10.1146/annurev-economics-090820-111716

Copyright © 2021 by Annual Reviews. All rights reserved

JEL codes: D82, G22, J65

ANNUAL REVIEWS CONNECT

www.annualreviews.org

- Download figures
- Navigate cited references
- Keyword search
- Explore related articles
- Share via email or social media

Keywords

adverse selection, moral hazard, optimal mandate, Pigouvian subsidy

Abstract

Should choice be offered in social insurance programs? This review presents a conceptual framework that identifies the key forces determining the social value of offering choice. We show that the value of offering choice is higher the larger the variation in individual valuations for extra insurance is, but it gets reduced by both selection on risk and selection on moral hazard. Besides adverse selection, the implementation of choice-based policies is further challenged by the presence of choice frictions or the obligation to offer basic uncompensated care. All these inefficiencies can be seen as externalities that do not rationalize the absence of providing choice per se but point to the need for regulatory policies and suggest the potential value of corrective pricing à la Pigou. Applying this framework to the existing evidence on these forces in the context of unemployment insurance, we find that offering insurance choice can be valuable even in the presence of significant adverse selection. We conclude by showing how this framework can constitute a fruitful guide for further empirical research in different insurance domains.

1. INTRODUCTION

A key distinguishing feature between social insurance programs across risk domains and countries is the extent to which they allow for choice. Most programs mandate a single benefit, without offering any choice. But sometimes choice is given, and individuals are offered a menu of contracts that differ in terms of coverage and price. When choice is allowed, its provision is sometimes decentralized to the market, whereas in other cases coverage and prices remain centrally determined or strongly regulated.

To illustrate this large variation in the extent of choice, **Table 1** compares the design of social insurance systems across risk domains for two countries, the United States and Sweden. Both countries are the focus of recent empirical work reviewed in this article. First, the table demonstrates the important differences in social insurance design across risks. In the United States, unemployment insurance (UI) and workers' compensation are examples of social insurance systems in which no choice is provided over the level of coverage. In contrast, choice of coverage has become central in the design of the US health insurance (HI) system. This trend is most evident in the Affordable Care Act of 2010, which set up subsidized exchanges for private insurers to offer a range of regulated plans (e.g., gold, silver, and bronze) in combination with the (now repealed) mandate to take up coverage. Over the past 30 years, various options for supplemental HI coverage have also been added for the elderly within and around the publicly provided Medicare program. Second, **Table 1** shows that there is significant variation across these two countries within each risk domain. UI is a case in point. Sweden is one of the very few countries, along with Denmark,

Table 1 Summary structure of social insurance systems by risk in the United States and Sweden

	Unemployment insurance		Disability insurance		Workers' compensation		Long-term care insurance		Health insurance	
	US	Sweden	US	Sweden	US	Sweden	US	Sweden	US	Sweden
Public mandate	Yes[a]	Yes[b]	Yes	Yes	Yes[g]	Yes	No[i]	Yes	No[k]	Yes
Provision of choice										
Supplemental public coverage	No	Yes[c]	No	No	No	No	No	No	No	No
Supplemental private coverage	No[d]	No[e]	Yes[f]	No	No	No[h]	Yes[j]	No	Yes[l]	No[m]

[a]All US states publicly mandate unemployment insurance (UI). Coverage varies across states, replacing roughly half of earnings on average.
[b]The public UI mandate in Sweden is a flat benefit that replaces only about 22% of the average salary as of 2019 (Stat. Swed. 2020 and own calculations).
[c]Sweden, Denmark, Finland, and Iceland are the only countries to provide public supplemental UI. The supplemental coverage replaces 80% of earnings up to a cap. The premium is heavily subsidized.
[d]In the United States, some private supplemental UI is provided by unions and employers, especially in the manufacturing sector (see Oswald 1986). In 1997, however, only 2% of the US workforce was covered by private supplemental UI (Parsons 2002).
[e]As of 2017, roughly half the active labor force was estimated to be covered by a union membership–based, private complementary income insurance (Inkomstförsäkring) scheme, providing compensation above the benefit ceiling for the supplemental public coverage (Lindellee 2018). A few smaller private insurance companies such as Accept, Jobbgarant, and Solid also offer such plans to those without labor union membership. Few data exist on the number of individuals purchasing these non-union-based plans, but it is unlikely to be substantial (Rasmussen 2014, Lindellee 2018).
[f]As of 2019, 33% of US workers had a private long-term disability insurance plan (US Bur. Labor Stat. 2019).
[g]Note that Texas is the only US state that does not mandate workers' compensation (Cabral et al. 2019).
[h]A large part of the Swedish labor force has collectively organized supplemental workers' compensation. Employees are, however, not able to individually opt in or out of such agreements.
[i]Although the United States does not mandate long-term care insurance, long-term care is provided on a means-tested basis (through Medicaid).
[j]As of 2014, only 11% of the US population aged 65 and older and not living in nursing homes was covered by long-term care insurance (Johnson 2016).
[k]In 2018, 8.5% of the US population had no health insurance, despite the presence of a penalty for those without health insurance (with exemptions) (Berchick et al. 2019). The penalty was removed in 2019, and currently there is no public mandate to purchase health insurance.
[l]Medicare recipients can choose to purchase supplemental coverage (Medigap) and prescription drug coverage (Medicare Part D). Both are heavily regulated and provided by private companies (Keane & Stavrunova 2016, Polyakova 2016).
[m]Private supplemental health insurance exists but accounts for less than 1% of Swedish health care expenditures (Glenngård 2017).

Finland, and Iceland, where choice is available in the UI system. Workers can purchase a generous public supplemental UI coverage on top of the UI mandate at subsidized prices. To the contrary, in the United States, as in all other developed countries, workers are mandated into a single contract, and no supplemental coverage is available, neither in the public system nor in the private market. Whereas the United States offers little choice compared to Sweden in UI, the opposite holds when it comes to HI. In Sweden, the public HI system functions as a universal mandate, providing a unique level of coverage; besides, the private market for supplemental HI is very small. In the United States, to the contrary, there is a lot of choice in the HI public system, and there exists a large private market complementing the public system.

Why and when should we allow for choice in these social insurance contexts? And if choice is valuable, how should we design the contract space, i.e., the prices and coverage levels of insurance contracts? The responses to these questions have, until recently, been quite elusive. In social insurance contexts where no choice is available, it is by construction hard to identify the value and costs associated with providing insurance choice. This perhaps explains why the literature did not pay much attention to questioning whether restricting choice was indeed optimal in these contexts. In insurance settings where choice is available, the literature has studied extensively, although often in isolation, the various inefficiencies created by the presence of choice, like the possibility of adverse selection or the existence of choice frictions. But although the presence of these inefficiencies does not exclude the potential value of offering choice, the literature has mostly treated their existence as a rationale for limiting choice (e.g., by imposing mandates) without trying to characterize when maintaining some degree of choice is actually valuable.

This review summarizes recent work that aims to overcome these challenges. Building on this new body of research, we present a general framework as well as an empirical road map to evaluate the provision of choice in insurance markets.

We thus begin by laying out a theoretical framework that incorporates both moral hazard and adverse selection. These two forces have been mostly treated separately in the social insurance literature. This divide is apparent in a handbook chapter on social insurance by Chetty & Finkelstein (2013), which shows that moral hazard has been the main focus of the literature on UI or disability insurance (DI), contexts in which most countries have single mandates. In contrast, adverse selection is mostly a topic of interest in the literature on HI, a context in which coverage choice is much more widespread, especially in the United States. A few recent exceptions treat the two forces jointly; our framework builds on work by Landais et al. (2021), who characterize the welfare impact of changing coverage and prices for a menu of insurance plans, and it is closely related to work by Marone & Sabety (2021) and Barnichon & Zylberberg (2021), who characterize the situation in which offering a menu of insurance plans is desirable.

The framework allows for a simple characterization of the welfare effects of offering choice compared to a single mandated policy. This characterization closely relates to the characterization of the optimal level of uniform coverage, also known as the Baily–Chetty formula, which states that the value of extra coverage should be equal to its cost. The value of extra coverage depends on the premium individuals are willing to pay for it relative to their risk—i.e., their risk premium. The cost of extra coverage depends on the increase in risk due to the extra coverage—i.e., the moral hazard (MH) response. Now, the value of offering the choice to purchase supplemental coverage simply depends on the values and costs of those opting for the supplemental coverage relative to those of people who do not. Heterogeneity in the valuations of insurance is, evidently, the main reason that allowing for choice is potentially valuable; but this is counteracted by the fact that, in insurance contexts, there is a potential dependence between the take-up of coverage and risk. This can be driven by adverse selection, whereby riskier individuals take up more insurance, but also by moral hazard, in which take-up of insurance increases risk.

We show that the value of choice can be expressed as a function of two key forces: selection on risk premium and selection on moral hazard. The value is larger the more individuals who take up extra coverage are willing to pay relative to their risk, that is, when selection on risk premium is strong. But the value of choice is reduced when the extra coverage induces a strong MH response for those selecting it and thus increases the net cost to the government. Despite the large body of empirical work studying adverse selection, our framework shows that adverse selection by itself is not sufficient to rationalize the optimality of the absence of choice: Adverse selection could be counterbalanced by substantial heterogeneity in preferences for insurance conditional on risk.

After having characterized the potential value of offering choice, we turn to potential inefficiencies when implementing choice-based policies or decentralizing choice to private markets. These inefficiencies have been well documented in the literature but are largely studied in isolation. Most prominent is the evidence for adverse selection and its potential effect on equilibrium prices, for example, in health-related insurance contexts (e.g., Cutler & Reber 1998, Hendren 2013, Cabral 2016). Important inefficiencies also arise when willingness to pay (WTP) is depressed due to the presence of uncompensated care (e.g., Garthwaite et al. 2018) or distorted due to behavioral biases that prevent individuals from making utility-maximizing choices. The resulting choice frictions are documented in a large and growing literature, also with a focus on HI choices (e.g., Chandra et al. 2019).

In the context of our framework, it is useful to separate the inefficiencies that may arise when offering choice from the microfoundations that determine the potential value of choice. Indeed, these inefficiencies can be thought of as imposing a standard externality in the sense intended by Pigou, which calls for regulatory interventions. A single mandate is an extreme version of quantity regulation, but when there is value to offering choice, corrective pricing à la Pigou can be a preferable alternative to unlock some of the value from offering choice. In case of adverse selection, a Pigouvian subsidy that allows individuals on the margin of purchasing additional insurance to pay their own costs—as opposed to a price reflecting average costs—improves welfare over a single mandate. In the presence of uncompensated care, subsidies for additional coverage can overcome the low WTP displayed by those with uncompensated options for insurance. Subsidies could also improve efficiency when individuals undervalue insurance due to behavioral frictions. However, allowing for choice may not unlock the choice's potential value when individuals have inherent difficulties to make choices that maximize their true underlying (idiosyncratic) valuations of insurance.

Our framework characterizes the value of choice and optimal price subsidies as a function of moments that can be identified empirically. We illustrate this capability by applying our framework to the context of UI. This is a setting in which almost all countries have single UI mandates without choice. Whether this is desirable had, until recently, never been tested. We review an emerging stream of research that offers estimates of the moments necessary to assess the value of choice in UI. In particular, we distinguish between research that focuses on the few countries where some UI choice is available and papers that have developed clever techniques to identify risk-based selection and WTP in the absence of choice data. The main takeaway from this body of research is that UI is characterized by severe adverse selection. In spite of this, however, evidence from Scandinavian countries suggests that providing choice in UI can still be valuable. However, unlocking the value of choice requires large subsidies for more generous UI that may overcome adverse selection. It also requires a simple choice environment to limit the scope for choice frictions.

Our framework allows one to evaluate the provision of choice in other social insurance settings, too. Unfortunately, we lack evidence on several key sources of heterogeneity—in risk, moral hazard, preferences, and/or choice frictions—that potentially drive insurance choices in

these different domains. We provide a schematic review of the empirical literature, highlighting some existing gaps for evaluating choice-based policies, and we hope this will serve as a guide for future empirical work that addresses the value of choice in these other domains. A final gap we try to highlight throughout this review is the importance of equity concerns when evaluating the optimal choice structure of social insurance systems. When redistribution toward high-risk individuals is valuable, for instance, larger subsidies for supplemental coverage, or even mandates of generous coverage, may become desirable. Similarly, the social value of providing choice may strongly decrease when choice frictions strongly correlate with dimensions, such as income, along which society may want to redistribute.

The remainder of the review is organized as follows. Section 2 presents the framework and characterizes the value of offering choice. Section 3 presents three sets of inefficiencies that can arise when allowing for choice and characterizes, in the context of our unifying framework, the optimal Pigouvian subsidies necessary to correct them. Section 4 implements empirically our approach in the context of UI, reviewing the recent literature estimating the different moments necessary to assess the value of choice. The final section provides some general takeaways for other social insurance domains and concludes.

2. VALUE OF CHOICE

This section presents a stylized framework and characterizes the value of choice and the optimal setting of prices and coverages as a function of empirically estimable moments. The analysis builds on work by Landais et al. (2021), to which we refer the interested reader for more detail and further results.[1] The model features both moral hazard à la Chetty (2006) and adverse selection à la Einav et al. (2010), as combined by Einav et al. (2013).

2.1. Setup

We consider a population of individuals indexed by their type θ who face a binary risk that occurs with probability π. We often refer to unemployment risk specifically, but this risk could also reflect a disability, health, or another type of shock. Throughout, we allow the likelihood of this risk to differ across types and also to respond to incentives such as insurance.

We consider an insurance contract that provides an amount b in the event of unemployment, and we let P denote the price of this contract. We let $v_\theta(b)$ denote a type θ's WTP for insurance. For expositional simplicity, we assume quasi-linear utility, so that $v_\theta(b) - P$ denotes the net utility to a type θ who is able to obtain coverage b at price P.

We denote the cost that a type θ imposes on the insurer by $c_\theta(b) = \pi_\theta(b)b$. The cost is the product of the likelihood of the risky event, $\pi_\theta(b)$, multiplied by the insurance payout, b. If the insurance is sold at price P, the net cost to the insurer is $c_\theta(b) - P$.

To measure welfare, we limit our analysis to traditional social surplus. This means that the social value of insuring a type θ is given by

$$W_\theta(b) = v_\theta(b) - \pi_\theta(b)\, b, \qquad 1.$$

[1]Most closely related to our framework is recent work by Marone & Sabety (2021), who derive the value of choice in a regulated HI setting and apply it to the study of the optimal vertical choice of insurance coverage.

and all individuals' utilities are weighted equally. One can accommodate more general environments by defining $W_\theta = \lambda_\theta v_\theta(b) - \pi_\theta(b)b$, where λ_θ is a generalized social welfare weight for type θ, and conducting the analogous derivations below.[2]

2.2. No Choice: Universal Coverage

The first question we aim to answer in this environment is: What is the optimal level of universal coverage, denoted by b? This establishes a benchmark to study the value of offering choice between different coverage levels. The optimal level of universal coverage maximizes social welfare in the population; that is, we have

$$b^* = \text{argmax}_b \, E\left[W_\theta(b)\right]. \tag{2.}$$

We define two key microfoundations of the marginal value of coverage. First, let $\eta_\theta(b)$ denote the premium a type θ is willing to pay for extra coverage relative to their risk; we obtain

$$\eta_\theta(b) = \frac{v'_\theta(b) - \pi_\theta(b)}{\pi_\theta(b)}. \tag{3.}$$

This risk premium $\eta_\theta(b)$ captures how much a worker is willing to pay for a marginal dollar of coverage relative to the probability they will get it. For example, with expected utility $\pi_\theta u_\theta(c_u) + (1-\pi_\theta)u_\theta(c_e)$ in the context of unemployment risk, where u_θ is the von Neumann–Morgenstern (vNM) utility function and c_e (c_u) is the consumption level when employed (unemployed), this premium relates directly to the ratio of marginal utilities between unemployment and employment $\frac{u'_\theta(c_u)}{u'_\theta(c_e)}$.[3] Second, let $\varepsilon_\theta(b)$ denote the percentage increase in the likelihood of the event occurring in response to a percentage increase in benefits b. We obtain

$$\varepsilon_\theta(b) = \frac{\pi'_\theta(b)}{\pi_\theta(b)}b. \tag{4.}$$

The MH response $\varepsilon_\theta(b)$ captures the ratio of behavioral to mechanical effects on the insurer's costs when providing extra coverage. This is also known as fiscal externality in the public finance literature, as it reflects the externality that the individual imposes on the costs of the insurer (or the government) by changing the likelihood of the event in response to more generous coverage.

An increase in coverage for a given individual generates extra surplus as long as the premium the individual is willing to pay exceeds the fiscal externality to the insurer. At the population level,

---

[2] Alternatively, one can construct the marginal value of public funds (MVPF) of spending on a specific insurance program (Hendren & Sprung-Keyser 2020), which is given by the ratio of WTP of the beneficiaries to the net government cost of the spending,

$$\text{MVPF} = \frac{E\left[v_\theta(b)\right]}{\pi_\theta(b)\,b}.$$

Because the conclusions are highly related to those generated by the concepts of policies that maximize net surplus in Equation 1, we focus on that measure of well-being; but we note that the results readily extend to measuring the MVPF instead.

[3] To be precise, with vNM utility we obtain $\frac{v'_\theta}{\pi_\theta}\frac{1-\pi_\theta}{1-v'_\theta} = \frac{u'_\theta(c_u)}{u'_\theta(c_e)}$. To see this, note that we can define $\Delta v'_\theta$ in the vNM framework as the WTP to get Δ units of extra coverage:

$$\pi_\theta u(c_u) + (1-\pi_\theta)u_\theta(c_e) = \pi_\theta u_\theta\left(c_u + \Delta - \Delta v'_\theta\right) + (1-\pi_\theta)u_\theta\left(c_e - \Delta v'_\theta\right).$$

Taking the derivative with respect to Δ and evaluating at $\Delta = 0$ yields

$$\pi_\theta u'_\theta(c_u)\left[1 - v'_\theta\right] = (1-\pi_\theta)u'_\theta(c_e)v'_\theta \Rightarrow \frac{u'_\theta(c_u)}{u'_\theta(c_e)} = \frac{v'_\theta}{\pi_\theta}\frac{1-\pi_\theta}{1-v'_\theta}.$$

the welfare impact of an increase in coverage equals

$$\frac{d}{db}E\left[W_\theta\left(b\right)\right]=E\left[W'_\theta\left(b\right)\right] \tag{5.}$$

$$=E\left[v'_\theta\left(b\right)-\pi_\theta\left(b\right)-\pi'_\theta\left(b\right)b\right] \tag{6.}$$

$$=E\left[\pi_\theta\left(b\right)\eta_\theta\left(b\right)\right]-E\left[\pi_\theta\left(b\right)\varepsilon_\theta\left(b\right)\right]. \tag{7.}$$

We can rescale the welfare impact of the extra coverage using the average likelihood of the event,

$$\frac{d}{db}E\left[W_\theta\left(b\right)\right]/E\left[\pi_\theta\left(b\right)\right]=\underbrace{E\left[\frac{\pi_\theta\left(b\right)}{E\left[\pi_\theta\left(b\right)\right]}\eta_\theta\left(b\right)\right]}_{\text{Risk premium}}-\underbrace{E\left[\frac{\pi_\theta\left(b\right)}{E\left[\pi_\theta\left(b\right)\right]}\varepsilon_\theta\left(b\right)\right]}_{\text{MH response}}.$$

Here, the first term is simply the average premium individuals are willing to pay for insurance, weighted by their likelihood of experiencing the event, and the second term is the MH response (or fiscal externality), again weighted by the same likelihoods.

At the optimum, we have a standard Baily–Chetty formula (Baily 1978, Chetty 2006), as defined in the following proposition.

Proposition 1. Assuming social welfare $E[W_\theta(b)]$ is concave in b, the optimal universal coverage level b^* is given by

$$E\left[\frac{\pi_\theta\left(b^*\right)}{E\left[\pi_\theta\left(b^*\right)\right]}\eta_\theta\left(b^*\right)\right]=E\left[\frac{\pi_\theta\left(b^*\right)}{E\left[\pi_\theta\left(b^*\right)\right]}\varepsilon_\theta\left(b^*\right)\right].$$

The optimal universal coverage level equates the average premium that individuals are willing to pay for insurance to the average percentage increase in cost arising from the behavioral response to the insurance provision. At the optimal level, additional coverage may well generate positive insurance value to individuals, but the optimal coverage needs to account for the externality of more generous insurance on the cost of providing it.

2.3. Value of Offering Choice

Can welfare be improved by offering different values of b instead of a single mandated level of benefits? In particular, we imagine offering a choice between b_0 and $b_0+\Delta$ at prices P_0 and P_Δ. This means that the price per unit of additional coverage is $p=\frac{P_\Delta-P_0}{\Delta}$. For small Δ and in the absence of choice frictions, we expect individuals to buy extra coverage Δ if their marginal WTP for additional coverage exceeds its price, $v'_\theta\left(b_0\right)\geq p$.

To assess the welfare impact of choice, let $W_\theta(b_0,\Delta,p)$ denote the welfare of type θ when given the option to purchase policy b_0 or to obtain $b_0+\Delta$ at unit price p. Starting from the situation in which there is no effective choice ($\Delta=0$) and providing an infinitesimal amount of choice has an impact on welfare of

$$\frac{d}{d\Delta}W_\theta\left(b_0,\Delta,p\right)|_{\Delta=0}=1\left\{v'_\theta\left(b_0\right)\geq p\right\}\pi_\theta\left(b_0\right)\left[\eta_\theta\left(b_0\right)-\varepsilon_\theta\left(b_0\right)\right], \tag{8.}$$

which is equal to the event of purchasing the top-up insurance, $1\left\{v'_\theta\left(b_0\right)\geq p\right\}$, multiplied by the difference between the WTP and the cost of those who purchase. This latter component can be written as $\pi_\theta(b_0)[\eta_\theta(b_0)-\varepsilon_\theta(b_0)]$. To simplify notation, let $E_\Delta\left[\circ\right]=E\left[\circ|v'_\theta\left(b_0\right)\geq p\right]$ denote the conditional expectation over the set of people taking up top-up insurance when prices are p; let $E_0\left[\circ\right]=E\left[\circ|v'_\theta\left(b_0\right)<p\right]$ denote the set of people sticking to baseline coverage; and let

$E_p[\circ] = E\left[\circ | v'_\theta(b_0) = p\right]$ denote the set of people who are at the margin.[4] Finally, let $F_\Delta(b_0, p) = \Pr\left\{v'_\theta(b_0) \geq p\right\}$ denote the fraction of the population purchasing additional coverage at price p when b_0 is the baseline level of coverage. Pooling across all types θ, the impact on social welfare of offering choice at price p is given by

$$\frac{d}{d\Delta} E\left[W_\theta(b_0, \Delta, p)\right]|_{\Delta=0} = F_\Delta(b_0, p)\, E_\Delta\left[\pi_\theta(b_0)\left[\eta_\theta(b_0) - \varepsilon_\theta(b_0)\right]\right]. \tag{9.}$$

Does providing choice increase welfare? To assess this, we start from the optimal universal coverage point $b_0 = b^*$, characterized in Proposition 1. This means that we have $\frac{d}{db} E\left[W_\theta(b^*)\right] = 0$ when averaging over the entire population, but it does not tell us whether $\frac{d}{db} E_\Delta\left[W_\theta(b^*)\right]$ is positive or negative when restricting to the set of people who purchase the additional Δ units of insurance. When $b_0 = b^*$, we can rewrite Equation 9 as

$$\begin{aligned}\frac{\frac{d}{d\Delta} E\left[W_\theta(b^*, \Delta, p)\right]|_{\Delta=0}}{F_\Delta(b^*, p)} &= \underbrace{E_\Delta\left[\pi_\theta(b^*)\,\eta_\theta(b^*)\right] - E\left[\pi_\theta(b^*)\,\eta_\theta(b^*)\right]}_{\text{Selection on risk premium}} \\ &\quad - \underbrace{\left(E_\Delta\left[\pi_\theta(b^*)\,\varepsilon_\theta(b^*)\right] - E\left[\pi_\theta(b^*)\,\varepsilon_\theta(b^*)\right]\right)}_{\text{Selection on moral hazard}},\end{aligned} \tag{10.}$$

which is the difference between two selection effects governed by the difference in marginal versus average types (reflected in the different expectation operator, E_Δ versus E). The first term (selection on risk premium) is the extent to which those who choose more insurance are willing to pay a higher risk premium relative to the average population. The second term (selection on moral hazard) is the differential fiscal externality they impose on the insurer. If social welfare $E[W_\theta(b_0, \Delta, p)]$ is strictly concave in (b_0, Δ), then one can assess whether additional choice increases welfare by setting b^* to satisfy the Baily–Chetty formula in Proposition 1.

Proposition 2. Suppose social welfare $E[W_\theta(b_0, \Delta, p)]$ is strictly concave in b_0 and Δ. Then, offering choice increases welfare if and only if there exists a price p such that

$$E_\Delta\left[\pi_\theta(b^*)\,\eta_\theta(b^*)\right] \geq E_\Delta\left[\pi_\theta(b^*)\,\varepsilon_\theta(b^*)\right], \tag{11.}$$

evaluated at the optimal universal coverage level b^*.

Social welfare is then increased through choice if and only if there exists a price for which those induced to purchase insurance are willing to pay a premium that covers their marginal cost to the insurer.

2.3.1. Intuition. The value of choice is higher when there is more heterogeneity in the risk premia and these are positively correlated with the WTP, so that those selecting the supplemental coverage Δ are willing to pay a higher premium than the average population (i.e., $E_\Delta[\pi_\theta(b^*)\eta_\theta(b^*)] - E[\pi_\theta(b^*)\eta_\theta(b^*)]$ is larger). However, this needs to be compared to the heterogeneity in MH costs and how it relates to the WTP. If those selecting the supplemental coverage Δ also impose disproportionately large MH costs on the insurer, this will lower the value of choice. However, if there is little variation in moral hazard, the selection on moral hazard will be small.

[4] We use the notations $E_\Delta[\circ]$, $E_0[\circ]$, and $E_p[\circ]$ for simplicity to refer to the expected outcomes of the three groups of individuals who respectively buy the extra coverage, stick to b_0, and are marginal between the two coverages at price p. It is therefore important to note that these constructs all explicitly depend on p.

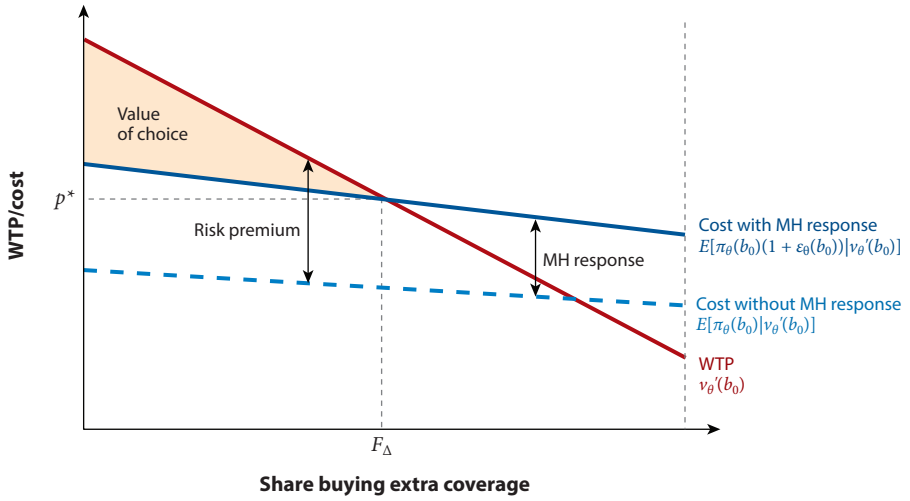


Figure 1

Schematic representation of demand and cost curves for extra coverage in the presence of moral hazard (MH) and risk-based selection. The figure offers a graphical representation of Proposition 2. The value of offering choice is captured by the area between the demand and cost curves for those with willingness to pay (WTP) higher than the price.

We can further decompose selection on risk premium into selection on WTP and selection on cost:

$$\underbrace{E_\Delta\left[\pi_\theta\left(b_0\right)\eta_\theta\left(b_0\right)\right]-E\left[\pi_\theta\left(b_0\right)\eta_\theta\left(b_0\right)\right]}_{\text{Selection on risk premium}}=\underbrace{E_\Delta\left[v_\theta'\left(b_0\right)\right]-E\left[v_\theta'\left(b_0\right)\right]}_{\text{Selection on WTP}}-\underbrace{E_\Delta\left[\pi_\theta\left(b_0\right)\right]-E\left[\pi_\theta\left(b_0\right)\right]}_{\text{Selection on risk}}.$$

Combined with Equation 10, this formula clearly illustrates that while heterogeneity in WTP increases the value of offering choice, this effect is mitigated when either selection on risk or selection on moral hazard is strong.[5]

2.3.2. Graphical representation. **Figure 1** provides a graphical representation of the drivers of the value of choice. This corresponds to the well-known representation comparing demand to cost curves proposed by Einav et al. (2010), but now referring to the supplemental coverage that is offered and explicitly accounting for selection on moral hazard, as done by Einav et al. (2013). For any price p, the red curve shows the share of individuals with higher marginal WTP $v_\theta'\left(b_0\right)$, who thus will buy the supplemental coverage. This can be interpreted as a demand curve that ranks individuals from high to low WTP on the horizontal axis. The graph then also plots the cost of providing the extra coverage for individuals ranked by their WTP, $E\left[\pi_\theta\left(b_0\right)\left(1+\varepsilon_\theta\left(b_0\right)\right)|v_\theta'\left(b_0\right)\right]$. This cost equals the mechanical cost of providing the supplemental coverage plus the behavioral cost due to the MH response. The total area under both curves would be the same when evaluated at the optimal level of universal coverage b^*, following Proposition 1. The difference between the demand and cost curves determines the surplus of getting the extra coverage. The value of offering choice is captured by the area between the demand and cost curves for those with WTP higher than the price, following Proposition 2. For comparison, we also plot the mechanical cost

[5] Marone & Sabety (2021) provide an alternative characterization for choice to be welfare increasing, which is that WTP and the efficient level of coverage are positively correlated.

of providing coverage, $E\left[\pi_\theta\left(b_0\right)|v'_\theta\left(b_0\right)\right]$. The difference relative to the demand curve equals the risk premium term, $E\left[\pi_\theta\left(b_0\right)\eta_\theta\left(b_0\right)|v'_\theta\left(b_0\right)\right]$. The difference relative to the cost curve indicates the MH response term, $E\left[\pi_\theta\left(b_0\right)\varepsilon_\theta\left(b_0\right)|v'_\theta\left(b_0\right)\right]$. The value of choice is higher for steeper demand curves and lower for steeper cost curves, with the former often being a result of the latter. Allowing choice therefore brings greater value if those with higher WTP for supplemental coverage do not have significantly higher costs.

2.4. Efficient Choice: Setting Prices and Coverages

So far we have asked whether and when offering choice can increase welfare; but in practice, policy makers can also regulate the coverage levels and corresponding prices. We briefly discuss the key trade-offs but refer readers to Landais et al. (2021) for a comprehensive characterization of the efficient coverage levels and prices.

We first consider the determination of the price for given coverage levels. To be efficient, the price should be equal to the cost of providing the additional coverage to the marginal buyers (as one might expect). By definition, the marginal types θ choosing to purchase at price p will be indifferent to that purchase, so that we have $v'_\theta\left(b_0\right) = p$. In the absence of choice frictions, the envelope theorem implies that individuals do not value the cost resulting from the increase in π_θ. This means that the optimal price must internalize this externality, so that the price equals the cost of providing additional coverage to the marginally indifferent types,

$$p^* = E\left[\pi_\theta\left(b_0\right)\left[1+\varepsilon_\theta\left(b_0\right)\right]|v'_\theta\left(b_0\right) = p^*\right]. \tag{12}$$

Graphically, this corresponds to the intersection of the WTP and cost curves in **Figure 1**.[6] Alternatively, we can state the efficiency condition as

$$E\left[\pi_\theta\left(b_0\right)\left[\eta_\theta\left(b_0\right)-\varepsilon_\theta\left(b_0\right)\right]|v'_\theta\left(b_0\right) = p^*\right] = 0, \tag{13}$$

setting the average net surplus from additional coverage for the marginal buyer as equal to zero, which clearly illustrates the link with the characterization of the optimal uniform benefit level in Proposition 1.

We now turn to the determination of coverage levels for given prices. When offering choice is desirable, the policy maker needs to decide how much to differentiate the coverage levels. The same key forces at play when evaluating choice at the margin are at work here. Consider an increase in the comprehensive coverage level $b_0 + \Delta$. The risk premium that individuals selecting it are willing to pay, $E_\Delta[\pi_\theta(b_0+\Delta)\eta_\theta(b_0+\Delta)]$, needs to be traded off against the MH cost for them, $E_\Delta[\pi_\theta(b_0+\Delta)\varepsilon_\theta(b_0+\Delta)]$. Similarly, when considering increasing the basic coverage level b_0, the premium $E_0[\pi_\theta(b_0)\eta_\theta(b_0)]$ and the moral hazard $E_0[\pi_\theta(b_0)\varepsilon_\theta(b_0)]$ for individuals selecting basic coverage become relevant. Strong selection on risk premium makes differentiation more desirable. Strong selection on moral hazard does the opposite. A natural limit on the value of differentiating coverage levels comes from risk aversion, which causes the risk premium for extra coverage to be decreasing in the coverage level itself.

In addition to evaluating the value and cost of providing extra coverage for individuals already on a given plan, any changes in coverage can cause further resorting of individuals. When plans are no longer marginally different, resorting imposes an additional cost externality on the insurer, determined by the difference in prices paid and insurance costs for the respective coverages. Hence, whether or not this externality is large will crucially depend on how prices are set. The interaction

[6] For nonmarginal additional levels of coverage, this becomes $p^* = E_p[\pi_\theta(b_0+\Delta)(b_0+\Delta) - \pi_\theta(b_0)b_0]$.

between price and coverage is thus key. This has been noted before in the literature (see Azevedo & Gottlieb 2017, Weyl & Veiga 2017, Geruso et al. 2019, Landais et al. 2021), in particular in relation to the use of minimum mandates. A minimum mandate can provide valuable coverage for low-risk individuals who are otherwise priced out of the market for comprehensive coverage. However, a more generous mandate will make the market for comprehensive coverage more adversely selected. This effect can be mitigated by reducing the price for comprehensive coverage. In what follows, we study insurance choices and the equilibrium determination of prices, taking coverage levels as given.

2.5. Ex-Ante Versus Observed Measures of Willingness to Pay

The previous sections characterize the optimal amount of insurance using individuals' hypothetical WTP for insurance. This has the advantage of writing the optimality formulas using estimable parameters. An important caveat, however, is that measures of WTP for insurance can be complicated by the fact that individuals may learn over time about their risk. This tends to lower the average WTP for insurance in the population (Hirshleifer 1971). Individuals who may have ex-ante value for insurance may no longer be willing to pay for insurance over their costs after they learn such costs. More broadly, WTP is generally not stable over time.

The question of when to measure WTP corresponds to imposing a classification for what insurance is versus redistribution. In general, the observed choices one might use to measure WTP occur after some information has been revealed—in this sense, measured WTP will incorporate an insurance value only against the risk that remains at the time of observing choices. In contrast, measuring WTP from behind the veil of ignorance incorporates the additional WTP that individuals might derive from the redistributive value of insurance. The framework can be easily extended to accommodate this option value and also allow for redistributive effects more generally (see Hendren 2021, Landais et al. 2021). In general, ex-ante perspectives tend to deliver higher values of insurance because they incorporate an option value that individuals get from being able to purchase insurance at lower prices.

While the framework can be extended to incorporate an ex-ante notion of WTP, an important direction for future work is to explore when individuals should be allowed to purchase insurance (e.g., Ghili et al. 2020). For example, should the open enrollment period for insurance covering risk in the year 2022 be in September 2021? Or September 2020? Or earlier? Allowing for choice at a point that is closer to the moment individuals use the insurance increases the scope for adverse selection[7] but can also allow for the realization of preference heterogeneity and help increase the value of choice. Exploring this trade-off is an interesting and policy-relevant direction for future work.

3. LIMITS TO CHOICE

Whereas Section 2 showed when offering choice can increase welfare, this section asks whether markets can provide these choice opportunities and/or individuals can leverage them. An often-cited advantage of markets is the variety producers can offer to consumers with heterogeneous tastes (Dixit & Stiglitz 1977). This section, however, outlines sources of externalities documented in existing work that prevent private markets from reaching efficient outcomes. In particular, we characterize the inefficiencies that arise from adverse selection, uncompensated care, and

[7] Cabral (2016) provides evidence of this in the dental insurance context.

behavioral frictions. By presenting them as externalities, we point to Pigouvian pricing as a key policy to complement the offering of choice through markets.

3.1. Adverse Selection

We begin with the classic case of adverse selection. The simplest case to consider in our framework is one without baseline insurance ($b_0 = 0$) and with private firms attempting to sell a small amount of insurance, Δ, at some price p. For any price, all those with $v'_\theta(0) \geq p$ will choose to purchase the insurance, and they will impose an expected cost of $\Delta E\left[\pi_\theta(0) \,|\, v'_\theta(0) \geq p\right]$. A competitive insurance market for a given policy Δ would expect to generate zero profits, $p\Delta = \Delta E\left[\pi_\theta(0) \,|\, v'_\theta(0) \geq p\right]$, or satisfy the fixed point

$$p = E\left[\pi_\theta(0) \,|\, v'_\theta(0) \geq p\right].$$

However, Akerlof (1970) shows that it is possible that no such fixed point exists. As prices rise, the set of people purchasing insurance [those with $v'_\theta(0) \geq p$] may have higher risk [i.e., higher values of $\pi_\theta(0)$]. In the extreme case, it could be that

$$p < E\left[\pi_\theta(0) \,|\, v'_\theta(0) \geq p\right] \quad \forall\, p, \tag{14.}$$

so that the market unravels and no private market can profitably provide insurance. Any time insurance companies try to set prices at p, the costs they have to pay ($E\left[\pi_\theta(0) \,|\, v'_\theta(0) \geq p\right]$) exceed p.

To assess the magnitude of this type of selection in the context of unemployment, Hendren (2017) makes the simplifying assumption that there is no preference heterogeneity conditional on the likelihood of employment. In this case, the average probability of those who purchase when prices are p is simply the average probability of those who are at least as likely to experience unemployment as the marginal purchaser. Equation 14 can then be written as

$$v'_{\tilde{\theta}}(0) > E\left[\pi_\theta(0) \,|\, \pi_\theta(0) \geq \pi_{\tilde{\theta}}(0)\right] \quad \forall\, \tilde{\theta},$$

where the expectation $E\left[\pi_\theta(0) \,|\, \pi_\theta(0) \geq \pi_{\tilde{\theta}}(0)\right]$ is the average probability (across values of θ) for which the probability exceeds the probability of the marginal type, $\pi_{\tilde{\theta}}(0)$. Subtracting $\pi_\theta(0)$ and dividing by $\pi_{\tilde{\theta}}(0)$ on both sides yields the expression

$$\eta_{\tilde{\theta}}(0) > \frac{E\left[\pi_\theta(0) - \pi_{\tilde{\theta}}(0) \,|\, \pi_\theta(0) \geq \pi_{\tilde{\theta}}(0)\right]}{\pi_{\tilde{\theta}}(0)} \quad \forall\, \tilde{\theta}. \tag{15.}$$

The left-hand side is the risk that individuals are willing to pay for insurance. The right-hand side is the risk that individuals have to pay in order to cover the pooled cost of worse risks. Unless some type in the economy is willing to pay the cost imposed by individuals with higher risks who purchase insurance, the market will completely unravel.[8] For risks that have probabilities closer to 0 than 1 (like the onset of unemployment), this ratio (plus 1) is analogous to the pooled price ratio discussed by Hendren (2017). This ratio can be measured if one observes the distribution of

[8] Hendren (2017) makes the additional assumption that individuals have a common vNM utility function, so that the ratio of marginal utilities between insured and uninsured states of the world is common across individuals: $\frac{v'_\theta}{\pi_\theta}\frac{1-\pi_\theta}{1-v'_\theta} = \frac{u'(c_u)}{u'(c_e)}$. With this additional assumption, Hendren (2017) shows that one can then write the no-trade condition in Equation 15 as

$$\frac{u'(c_u)}{u'(c_e)} = \frac{v'_\theta}{\pi_\theta(0)}\frac{1-\pi_\theta(0)}{1-v'_\theta} < \min_{\tilde{\theta}} \frac{1-\pi_{\tilde{\theta}}(0)}{\pi_{\tilde{\theta}}(0)} \frac{E\left[\pi_\theta(0) \,|\, \pi_\theta(0) \geq \pi_{\tilde{\theta}}(0)\right]}{1 - E\left[\pi_\theta(0) \,|\, \pi_\theta(0) \geq \pi_{\tilde{\theta}}(0)\right]}. \tag{16.}$$

π_θ across the population. It can be inferred from revealed preference choices, or, as we detail in Section 4.2, it can potentially be inferred from data on subjective probability elicitations.

The analysis above assumes $b_0 = 0$ and considers a market for a single insurance contract. One can also consider the impact of adverse selection in settings where we have both $b_0 > 0$ and $\Delta > 0$. In this case, one might want to have prices equal the average cost of those who enroll in the contract (e.g., as in Azevedo & Gottlieb 2017). This would mean they satisfy the equations

$$P_0 = b_0 E_0 [\pi_\theta (b_0)],$$
$$P_\Delta = (b_0 + \Delta) E_\Delta [\pi_\theta (b_0 + \Delta)],$$

where $E_0[\circ] = E[\circ \mid v'(b_0) < p]$ is the conditional expectation with respect to the set of types θ who purchase b_0 coverage. Hence, the marginal equilibrium price p satisfies the fixed point,[9] and we obtain

$$\begin{aligned} p\Delta &= P_\Delta - P_0 && 17. \\ &= (b_0 + \Delta) E_\Delta [\pi_\theta (b_0 + \Delta)] - b_0 E_0 [\pi_\theta (b_0)] && 18. \\ &= b_0 \times [E_\Delta [\pi_\theta (b_0)] - E_0 [\pi_\theta (b_0)]] + \Delta \times E_\Delta [\pi_\theta (b_0 + \Delta)] \\ &\quad + b_0 \times [E_\Delta [\pi_\theta (b_0 + \Delta)] - E_\Delta [\pi_\theta (b_0)]] && 19. \\ &\cong \underbrace{b_0 \times [E_\Delta [\pi_\theta (b_0)] - E_0 [\pi_\theta (b_0)]]}_{\text{Adverse selection in baseline coverage}} + \underbrace{\Delta \times E_\Delta [\pi_\theta (b_0) \times [1 + \varepsilon_\theta (b_0)]]}_{\text{Cost of extra coverage for } F_\Delta}. && 20. \end{aligned}$$

Hence, the equilibrium price reflects the difference in costs of providing the baseline coverage plus the marginal cost of providing the additional Δ coverage for all who buy the extra coverage (accounting for both mechanical and behavioral costs). In contrast, the efficient price reflects only the cost of providing the additional Δ coverage for those at the margin of buying the extra coverage; that is, $p^* = E_{p^*} [\pi_\theta (b_0) \times [1 + \varepsilon_\theta (b_0)]]$.

In our framework with two coverages, the pricing inefficiency will cause too few people to get the more generous coverage. Even worse, the adverse selection can lead to no differentiated coverage being provided, even when offering choice is valuable. To see why this is the case, it is perhaps most useful to consider the empirical example provided by Cutler & Reber (1998). They study the impact of Harvard University's moving to an HI pricing regime that requires their more and less generous HI policies to break even. This quickly led to an unraveling of the market for the more generous insurance, because those with higher expected costs chose the more generous plan, corresponding to the first term in Equation 20.

The right-hand side of this equation is the minimum pooled price ratio discussed by Hendren (2013, 2017). It differs from the right-hand side of Equation 15 by 1 plus a multiplicative factor $\frac{1-\pi_{\tilde{\theta}}(0)}{1-E[\pi_\theta(0)|\pi_\theta(0)\geq\pi_{\tilde{\theta}}(0)]}$. Note that when the distribution of π is concentrated near 0 (as it is in the unemployment context, where average yearly probabilities of entry into unemployment are around 5%), we have $\frac{1-\pi_{\tilde{\theta}}(0)}{1-E[\pi_\theta(0)|\pi_\theta(0)\geq\pi_{\tilde{\theta}}(0)]} \approx 1$, so that the right-hand side is approximately equal to $\frac{E[\pi_\theta(0)|\pi_\theta(0)\geq\pi_{\tilde{\theta}}(0)]}{\pi_{\tilde{\theta}}(0)}$, which is equivalent to 1 plus the right-hand side of Equation 15.

[9]Note that the approximation relies on $\Delta \times \{E_\Delta[\pi_\theta(b_0 + \Delta)] - E_\Delta[\pi_\theta(b_0)]\} \cong 0$.

In some settings, prices are not required to break even.[10] In particular, when the providers of supplemental coverage are different from the providers of basic coverage, the price setting for the supplemental coverage will not reflect the cost of providing the baseline coverage to its buyers (see Weyl & Veiga 2017), corresponding to the first term of Equation 20; nor will the providers of supplemental coverage account for the effect of moral hazard on the cost of providing baseline coverage, corresponding to the MH response in the second term of Equation 20. One example of this is the market for Medigap, which provides top-up insurance beyond Medicare's basic coverage of 80% of costs for individuals over age 65. Cabral & Mahoney (2019) show that the provision of Medigap coverage—which insures the remaining 20% of risk—leads individuals to use additional health care. This in turn increases the cost to Medicare of insuring the base 80% of costs. While the private Medigap insurers must cover their costs in order to make a profit, they do not need to compensate Medicare for this externality. In this sense, Medicare implicitly subsidizes Medigap coverage. An interesting direction for future work is to study whether this implicit subsidy is too large or too small relative to the optimal subsidy.

3.2. Uncompensated Coverage

Individuals can often rely on some basic level of implicit insurance coverage. The most natural example comes from uncompensated care, like emergency care, in the context of HI (e.g., Finkelstein et al. 2018, 2019; Garthwaite et al. 2018). But this issue generalizes to social insurance programs whereby individuals who did not contribute (or are not eligible) for standard social insurance can fall back on some social assistance or basic protection from the government, friends, hospitals, or other private charitable organizations. The issue of noncontributory coverage has also been particularly relevant during the COVID-19 crisis, as many governments have scaled up existing programs or offered ad hoc support against the unforeseen health and employment risks.

In our framework, the noncontributory protection can be interpreted as some baseline coverage b_0 that is always available for free ($P_0 = 0$). This naturally gives rise to pricing inefficiencies. Consider again the case in which competition requires each (standard) plan to break even; then we have

$$\begin{aligned}\Delta p &= P_\Delta - P \\ &= (b_0 + \Delta) E_\Delta [\pi_\theta (b_0 + \Delta)] \\ &\cong b_0 E_\Delta [\pi_\theta (b_0)] + \Delta E_\Delta [\pi_\theta (b_0) \times [1 + \varepsilon_\theta (b_0)]].\end{aligned}$$

As the offered insurance crowds out previously uncompensated care, $b_0 E_\Delta[\pi_\theta(b_0)]$, the insurer will want to cover this cost. Also, those purchasing insurance do not internalize the cost reduction, $b_0 E_\Delta[\pi_\theta(b_0)]$, on those who otherwise would have provided some degree of informal insurance. This again drives the market price p up relative to its efficient level, which would again be $p^* = E_{p^*} [\pi_\theta (b_0) \times [1 + \varepsilon_\theta (b_0)]]$. A Pigouvian subsidy could induce more individuals to buy the supplemental coverage and reduce the wedge between WTP and the marginal cost from providing the supplemental coverage.

[10]Market power is of course another important source of pricing inefficiencies (see, for example, Mahoney & Weyl 2017, Cabral et al. 2019).

3.3. Behavioral Frictions

The previous two sources of inefficiencies were coming from the supply side, which prevented the efficient pricing of plans. The inefficiencies, however, can come from the demand side as well. A growing empirical literature documents the presence of behavioral frictions distorting individuals' insurance choices (see Ericson & Sydnor 2017, Chandra et al. 2019). This can include inertia, optimistic beliefs, information frictions, limited attention, cognitive ability, etc. We can introduce choice frictions, $f_\theta(b)$, in our framework as driving a wedge between the true value $v'_\theta(b)$ and the WTP $\hat{v}'_\theta(b)$, following Spinnewijn (2017). The latter is the value individuals reveal through their choices. That is, an individual buys the extra coverage if $v'_\theta(b) + f_\theta(b) \geq p$, while their consumer welfare continues to be maximized by buying the extra coverage if $v'_\theta(b) \geq p$. For example, the presence of biased beliefs—whereby the perceived risk $\hat{\pi}_\theta(b)$ differs from the true risk $\pi_\theta(b)$—would induce a wedge between the WTP and the expected value from insurance (see, e.g., Stephens 2004 and Spinnewijn 2015 in the context of unemployment).

As choice frictions distort the selection into plans, they will crucially affect the value of providing choice. The condition for choice to be welfare improving remains that the selection on (true) risk should be stronger than the selection on moral hazard. In the presence of choice frictions, the selection on risk can be decomposed as

$$\underbrace{E_\Delta\left[\pi_\theta(b_0)\,\eta_\theta(b_0)\right] - E\left[\pi_\theta(b_0)\,\eta_\theta(b_0)\right]}_{\text{Selection on risk premium}} = \underbrace{E_\Delta\left[\hat{v}'_\theta(b_0)\right] - E\left[\hat{v}'_\theta(b_0)\right]}_{\text{Selection on WTP}}$$
$$- \underbrace{E_\Delta\left[\pi_\theta(b_0)\right] - E\left[\pi_\theta(b_0)\right]}_{\text{Selection on risk}} - \underbrace{E_\Delta\left[f_\theta(b_0)\right] - E\left[f_\theta(b_0)\right]}_{\text{Selection on frictions}}. \quad 21.$$

The presence of choice frictions prevents individuals with high valuation $v'_\theta(b)$ from buying supplemental coverage, and vice versa. As shown by Spinnewijn (2017), the demand curve is likely to overstate the value the supplemental coverage generates for those selecting it—for example, when individuals' risk perceptions are noisy measures of their true underlying risks. However, when considering whether to introduce corrective pricing à la Pigou, it is the average friction among the marginal buyers that is relevant. Indeed, the efficient price now equals

$$p^* = E_{p^*}\left[\pi_\theta(b_0)\left[1 + \varepsilon_\theta(b_0)\right] + f_\theta(b_0)\right]. \quad 22.$$

The role of choice frictions goes beyond this, as selection based on frictions tends to reduce selection on risk $\pi_\theta(b)$. In particular, when individuals underreact to their differences in risk, the choice of supplemental coverage is clearly less adversely selected. This then also affects the equilibrium price (e.g., Handel 2013, Polyakova 2016, Handel et al. 2019). Hence, inefficiencies from the demand and supply sides interact, affecting the efficient and equilibrium price, respectively, and they can aggravate or mitigate each other in welfare terms.[11]

Finally, the incidence of choice frictions is likely to be unequally distributed. Exploiting HI choices in the Netherlands, Handel et al. (2020) show how individuals with higher socioeconomic status and income are more likely to realize the value of the offered choice. Equity considerations are always important when considering to offer choice, but especially so when choice frictions are at play.

[11]Note that the presence of frictions can also affect the MH response (e.g., Baicker et al. 2015, Spinnewijn 2015). This can affect the magnitude of selection on moral hazard, which in turn determines the value of choice, but it also introduces extra corrective externalities when individuals change behavior in response to coverage changes.

3.4. A Pigouvian Perspective

Whereas Section 2 showed the potential value of choice, this section outlines three reasons for which enabling choice may lead to inefficiencies. Broadly, these inefficiencies arise from externalities: Individuals do not face the right prices. Adverse selection occurs when individuals internalize neither the cost they impose on the provider of the plan they buy, nor the costs they reduce for the provider of coverage they no longer get. Externalities also arise from the existence of uncompensated care that can depress WTP. More problematic, individuals may impose externalities on themselves (better referred to as internalities) in the presence of choice frictions. Importantly, these externalities may be orthogonal to the potential of offering choice. A single mandate can be too blunt as a policy response. Instead, one can try to overcome these externalities through appropriate Pigouvian taxes/subsidies so that prices reflect the optimal incentives outlined in Section 2. As with any effort of policy to correct externalities, implementation may be complicated in practice. Nonetheless, the conceptual tools for combating these inefficiencies are rooted in Pigou's idea of internalizing the externality.[12]

4. EMPIRICAL APPLICATION: EVALUATING CHOICE IN UI

We illustrate the implementation of our framework using two empirical pathways. First, in Section 4.1 we leverage the unique Scandinavian context, where the UI system allows for choice. We show there how we can identify all the relevant moments necessary to determine the value of giving choice. We also discuss how different policy parameters (prices and coverage levels) should be set in order to regulate UI choices optimally. Second, in Section 4.2 we focus on contexts where no choice is actually observed. We present the innovative approaches that have been recently developed in these settings to identify the sources of heterogeneity that are relevant to determine the costs and benefits of offering insurance choice.

4.1. Using Choice Data: Evidence from Scandinavia

The ideal context to identify all the moments to evaluate the value of choice (see Equation 10) is of course one in which it is possible to observe insurance choices. Whereas UI in almost all countries is organized along a single mandate, four countries—Iceland, Denmark, Finland, and Sweden—do offer choice. These UI systems have recently been studied in a series of papers (e.g., Parsons et al. 2015, Khomenko 2018, Landais & Spinnewijn 2020, Landais et al. 2021) and constitute a fruitful setting to evaluate the value of providing choice in UI.

The Scandinavian UI systems share a similar, two-tier feature. The first part of the UI system is mandated and provides basic coverage funded by a payroll tax. The benefit level that the unemployed receive with this basic coverage is noncontributory (i.e., it does not depend on the unemployed's earnings prior to displacement) and is generally low (e.g., with a median replacement rate of about 20% in Sweden). The second part of the UI system is voluntary. By paying an insurance to UI funds (on top of the payroll tax), workers can opt for more comprehensive coverage. Upon displacement, workers who have been paying premia for the

[12] Externalities are often individual specific and lead not only to over- or underinsurance, but also to inefficient sorting across plans. Rather than by using a uniform subsidy or taxes, the highest welfare potential may be realized by price or quantity corrections that are individual specific. This may call for individual risk rating rather than community rating in the context of adverse selection and for choice aids (e.g., smart defaults) in the context of choice frictions (see, for example, Handel et al. 2015, 2020).

supplemental coverage get, in lieu of the basic coverage, more generous benefits, replacing their pre-unemployment earnings proportionally up to a cap (e.g., with a replacement rate of 80% in Sweden).

Historically, this two-tier organization can be traced back to the so-called Ghent system, in which labor and trade unions played an important role in providing UI.[13] Today, the comprehensive UI coverage is often administered by UI funds that originated from funds set up by unions. However, the central governments took over the responsibility of supervising the entire UI system long ago, and the links between UI funds and unions have progressively loosened (see Carroll 2005). This, in practice, means that there is no competition between UI funds: The coverage, premia, and eligibility conditions for supplemental UI are all set by the central government, without variation across funds.[14]

4.1.1. Separating adverse selection and moral hazard. The presence of choice data allows one to test whether workers who choose more generous UI coverage are also more likely to be unemployed. This follows the traditional positive correlation test (PCT) approach that has been widely applied in the empirical insurance literature since the seminal work of Chiappori & Salanié (2000) (see reviews in Cohen & Siegelman 2010 and Chiappori & Salanié 2013). In practice, there is evidence of a strong positive correlation in the Scandinavian UI systems. Landais et al. (2021) find, for instance, that workers buying the supplemental UI coverage in Sweden over the period 2002–2006 have an unemployment risk that is at least twice the risk of workers who are on basic coverage. Parsons et al. (2015) obtain similar results in the Danish context.

However, it is well known that the PCT cannot separate moral hazard and adverse selection, let alone identify selection on moral hazard. So, in itself, a PCT is not sufficient to evaluate the optimality of the UI choice structure. Following our earlier notation, the PCT statistic can be decomposed between the MH effect of providing more generous coverage to individuals selecting supplemental UI and the differential risk of those selecting the supplemental UI evaluated under basic coverage. We can write this as

$$\underbrace{E_{\Delta}\left[\pi_{\theta}\left(b_0+\Delta\right)\right]-E_0\left[\pi_{\theta}\left(b_0\right)\right]}_{\text{PCT statistic}} \cong \frac{\Delta}{b_0}\underbrace{E_{\Delta}\left[\pi_{\theta}\left(b_0\right)\varepsilon_{\theta}\left(b_0\right)\right]}_{\text{Moral hazard for comprehensive buyers}}+\underbrace{E_{\Delta}\left[\pi_{\theta}\left(b_0\right)\right]-E_0\left[\pi_{\theta}\left(b_0\right)\right]}_{\text{Selection on risk in basic coverage}}.$$

These effects correspond to the terms in Proposition 2 needed to evaluate the value of offering choice at the margin (starting from the optimal uniform benefit level). An alternative way of decomposing the PCT statistic is between the MH effect for individuals sticking to basic coverage and their differential risk when on comprehensive coverage, that is,

$$\underbrace{E_{\Delta}\left[\pi_{\theta}\left(b_0+\Delta\right)\right]-E_0\left[\pi_{\theta}\left(b_0\right)\right]}_{\text{PCT statistic}} \cong \frac{\Delta}{b_0}\underbrace{E_0\left[\pi_{\theta}\left(b_0\right)\varepsilon_{\theta}\left(b_0\right)\right]}_{\text{Moral hazard for basic buyers}}+\underbrace{E_{\Delta}\left[\pi_{\theta}\left(b_0+\Delta\right)\right]-E_0\left[\pi_{\theta}\left(b_0+\Delta\right)\right]}_{\text{Selection on risk in comprehensive coverage}}.$$

Interestingly, the two decompositions combined correspond to the terms needed to evaluate the value of more differentiation in offered choice, and in particular the difference in moral hazard

[13] Union administration offered a variety of advantages. Unions could require that union members join UI funds, limiting adverse selection. Today, requiring union members to buy supplemental UI is generally no longer possible, but union members can often benefit from an extra rebate on the comprehensive UI coverage. Moreover the union had obvious advantages monitoring its own members, e.g., for slackness in job seeking, thus also limiting moral hazard.

[14] In 2008, Sweden implemented an extra risk adjustment fee, differentiated across UI funds, thus introducing average cost pricing within funds. However, as membership in riskier funds started to unravel, the government reverted to equal premia across funds in January 2014.

between workers who select the supplemental coverage and those who do not, as briefly discussed in Section 2.3 and fully developed by Landais et al. (2021).

Now, to separate the respective MH and selection effects, it is possible to rely on exogenous price variation, which allows one to identify individuals with different WTP and to study their unemployment risk under the same coverage. Alternatively, one can rely on exogenous benefit variation and study how the unemployment risk changes for a given group of workers. In practice, this variation can be combined with some structural assumptions on how demand and risk depend on coverage, prices, and observables. Landais et al. (2021) exploit a sharp and unexpected increase in the premia charged for the supplemental coverage in Sweden in 2007. The surge in premia, which more than quadrupled, generated a significant (although somewhat modest) demand response, with around 10% of Swedish workers switching out of the comprehensive plan as a result. This allows the authors to rank workers in three groups based on their WTP. They combine this price variation with a model predicting individuals' unemployment risk based on a rich set of observables under the comprehensive and basic coverage, respectively.[15]

Figure 2 reports Landais et al.'s (2021) estimated demand curve using the 2007 variation, but expressed as the WTP per SEK of supplemental coverage for each day spent unemployed in the next year. In the absence of any demand frictions, this scaled WTP for the supplemental coverage can be seen as an approximation of the marginal value of coverage $v'_\theta(b_0)$. **Figure 2** then compares the WTP to the marginal cost of providing the extra SEK of coverage, showing both its cost in the absence of any MH response, $E\left[\pi_\theta(b_0)\,|v'_\theta(b_0)\right]$, and its cost accounting for the MH response, $E\left[\pi_\theta(b_0)(1+\varepsilon_\theta(b_0))\,|v'_\theta(b_0)\right]$. The risk term $\pi_\theta(b_0)$ corresponds to the expected days spent unemployed under basic coverage in the next year. The MH elasticity $\varepsilon_\theta(b_0)$ is approximated using the increase in expected days spent unemployed under comprehensive coverage relative to basic coverage. All estimates are shown for three groups: those who continue to buy the supplemental coverage after the price increase, those who stop buying it after the price increase, and those who did not buy it even before the price increase. Several insights emerge from the figure.

First, as evidenced by the somewhat modest demand response, the WTP curve for supplemental UI is quite vertical; that is, demand is quite rigid. In other words, individuals opting for basic coverage are characterised by a very low WTP for the supplemental coverage, whereas individuals under comprehensive coverage are willing to pay a very high price for the supplemental coverage. Significant heterogeneity in valuation is a priori a strong argument in favor of offering coverage choice. However, this also assumes the absence of choice frictions, while the modest demand response could be driven by inertia.

As shown in Equation 10, the demand curve (and its steepness) must be evaluated against two forces: the importance of risk-based selection and the magnitude of selection on moral hazard. Intuitively, strong adverse selection counters the presence of strong heterogeneity in WTP. If people with large WTP also have high risk $\pi_\theta(b_0)$, this will make the cost curve—not accounting for moral hazard—very steep, thus significantly reducing the selection on the risk. Graphically, the

[15] In theory, one could just identify the average cost curve under the basic (resp. comprehensive) plan, by regressing average risk in the basic (resp. comprehensive) plan on the fraction of workers buying comprehensive coverage, using the price variation as instrument. A problem in practice comes from the fact that most price variation in Scandinavian UI systems is time-series variation. There is almost no variation across similar individuals over time that would allow for a difference-in-differences type of identification. Time-series estimation runs the risk of being confounded by aggregate unemployment risk, i.e., business-cycle variation in labor market conditions. To alleviate this issue, Landais et al. (2021) combine price variation to identify WTP with a model of predicted risk under both coverages: The correlation between WTP and predicted risk under basic and comprehensive coverage is thus immune to the presence of aggregate risk.

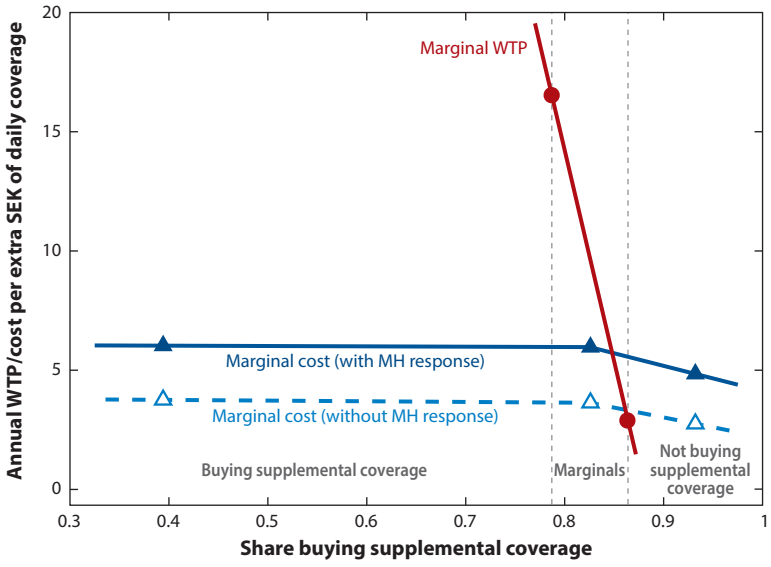


Figure 2

Estimated demand and cost curves for supplemental coverage in Sweden's two-tier unemployment insurance (UI) policy. The figure corresponds to the empirical implementation of **Figure 1** in the context of the Swedish UI system, using estimates from Landais et al. (2021). The red line plots the willingness to pay (WTP) per additional SEK of UI, identified using a large variation in the charges for supplemental UI in 2007. The blue curves correspond to the marginal cost per SEK of additional coverage without moral hazard (MH) responses (*dashed curve*) and with MH responses (*solid curve*). The steepness of the WTP curve is evidence of significant heterogeneity in the value of additional UI. The decreasing marginal cost curves indicate the presence of significant adverse selection, but this adverse selection is small relative to moral hazard. Furthermore, there is a slight advantageous selection on moral hazard. These estimates imply that there is value to providing choice in UI in the Swedish context.

risk is represented by the distance between the WTP and the cost under basic coverage. Similarly, strong selection on moral hazard will also reduce the value of choice: If individuals who value UI more are also much more responsive in their risk to an increase in UI coverage, this will increase the cost of providing additional coverage to individuals with high WTP. Schematically, this will make the cost curve even steeper once we account for moral hazard, potentially resulting in a cost curve that exceeds WTP for individuals with high WTP.

Interestingly, **Figure 2** shows that the choices into supplemental coverage are indeed adversely selected, but the magnitude of adverse selection is relatively modest in the Swedish context. This, in turn, implies that the WTP markup is significantly larger for individuals who buy the comprehensive coverage compared to individuals who do not.

Finally, there is also substantial moral hazard shifting up the cost of providing coverage uniformly. In fact, expressed as elasticities, there is some advantageous selection on moral hazard. That is, the relative cost increase of providing extra coverage is larger among individuals with low WTP than among workers with high WTP for more UI. This advantageous selection on moral hazard is therefore also a force pushing for coverage differentiation.

4.1.2. Evaluating choice in the Scandinavian context. What can we conclude from these estimates regarding the value of offering choice and the optimal structure of the Scandinavian two-tier UI system?

The first immediate implication is that mandating all workers to buy the generous comprehensive coverage would not be optimal: A significant fraction of workers (about 15%) have a WTP for supplemental coverage that is below the cost of providing this extra coverage to them. As shown in **Figure 2**, this discrepancy is partly driven by the large MH cost of providing extra coverage to these workers. At the same time, the largest share of workers (about 85%) seem to value the supplemental coverage above the cost of providing the extra coverage. Hence, offering the option to buy comprehensive coverage seems to generate substantial value for them.

Of course, we are evaluating an option between coverage levels that are significantly different. Proposition 2 makes clear, though, that to identify the value of giving choice, we should consider a marginal option evaluated at the optimal uniform benefit level b^*. In other words, even if a mandate of the comprehensive coverage would not be optimal, can we rule out that some single mandate, with coverage level between the basic and the comprehensive plan, would do better than a design with choice?

To shed light on this, one should evaluate the desirability of further coverage differentiation at the current levels of the basic coverage, b_0, and of supplemental coverage, $b_0 + \Delta$. If further differentiation is desirable, then, under standard concavity assumptions, a universal mandate at some intermediate level between b_0 and $b_0 + \Delta$ cannot do better than giving choice. As discussed in Section 2.4, the cost of further differentiation depends on the relative fiscal externalities created when decreasing b_0 and when increasing Δ. These fiscal externalities are direct functions of the relative MH effects for workers with high versus low WTP, but also of the selection responses the changes in coverage would entail. On the other hand, the welfare gain is captured by the relative value of marginal coverage for individuals under basic versus comprehensive coverage. Importantly, this relative value of marginal coverage depends on the amount of heterogeneity in WTP, but now it must also account for diminishing marginal utility, as this value is evaluated at b_0 for individuals under basic coverage and at $b_0 + \Delta$ for individuals under supplemental coverage. The empirical implementation of the formula by Landais et al. (2021) suggests that the level of coverage differentiation is probably close to optimal at current prices. This result is driven by the significant heterogeneity in WTP for insurance and the presence of some advantageous selection on moral hazard in the Swedish context. An important implication is that the presence of significant adverse selection is not enough to justify mandating UI in the Scandinavian context: Giving the option between strongly differentiated coverages seems to be optimal.

Of course, it is important to remember that these welfare statements on coverage differentiation are conditional on price levels. In Scandinavia, it turns out that the price of the supplemental coverage tends to be heavily subsidized, so that the premia that workers have to pay represent a relatively small fraction of the average cost of the comprehensive coverage. Is this subsidy too large? As shown in Equation 13, the efficient price can easily be determined as the intersection between the risk and the fiscal externality curves. In **Figure 2**, the efficient price would therefore be somewhere in between the pre- and post-2007 prices. This suggests that, in order to mitigate the adverse selection externality created by significant coverage differentiation, it is necessary to subsidize the premia quite heavily.

The Scandinavian experience therefore suggests that offering choice in UI can dominate a universal mandate. It is important to emphasize again that this conclusion ignores equity considerations and relies on the absence of important choice frictions. It is also important to highlight some specificities of the Scandinavian labor markets when thinking about the policy implications for other countries. First, a rich set of institutions regulate layoffs, and the search effort of unemployed workers is closely monitored by public employment services, arguably reducing the scope for risk-based selection in the Swedish context. Second, the choice environment is tightly controlled by the central government: Its simple structure may limit the scope for choice frictions but

cannot rule them out. Landais & Spinnewijn (2020), for example, find that workers' UI choices are correlated with scores on IQ tests. They also find that UI choices are more responsive to risk variation when such risk variation is more salient.

4.2. Evaluating Choice Without Choice Data

Looking only at contexts where choice data are available bears the risk of running into a lamppost problem. It is precisely in situations in which UI is mandated and no choice is available that policy makers would benefit from assessing the welfare consequences of providing choice. So how can we still assess the value of providing choice in situations where markets do not exist and revealed preference cannot shed light on WTP? A recent literature has been trying to push the frontier, and it offers important insights on the potential selection on the relevant dimensions in contexts with a single UI mandate.

4.2.1. Identifying selection on risk. There is significant and well-documented heterogeneity in unemployment risk by income, education level, and occupation, across space and time, etc. To what extent would this heterogeneity in risk translate into adverse selection if one were to offer individuals choice over their amount of UI? This depends on whether this information is private information to workers and on whether they would be able to act on this knowledge.

Following Stephens (2004) and Manski (2004), a recent literature illustrates how subjective probability elicitations from surveys can be used to answer these questions. Most related to this context, Hendren (2017) shows that elicited beliefs are strongly predictive of future unemployment status, even after controlling for a rich set of observable characteristics that could be priced by insurers in the market. **Figure 3*a*** displays the correlation between subjective probability elicitations in the Health and Retirement Study (HRS) in the United States and realized unemployment, controlling for job industry, job occupation, log wage, log wage squared, job tenure, and job tenure squared, along with a set of demographic characteristics: census division dummies, gender dummies, age, age squared, and year dummies. The graph suggests that the predictive content of private beliefs, conditional on public information, is very strong. Most strikingly, Hendren (2017) shows that individuals do actually act on the basis of such private information and self-insure against their perceived risk of job loss: Spousal labor supply and consumption dynamics both significantly correlate with elicited unemployment risk.

These results provide solid evidence indicating the potential for significant adverse selection in UI. So would a market be able to exist in the United States? To explore this, Hendren (2017) uses subjective probability elicitations to estimate the markup individuals would have to be willing to pay for a market to exist, as shown in Equation 15. The estimate suggests that individuals would have to be willing to pay at least a 300% risk premium (i.e., a 4:1 ratio of marginal utilities between unemployed and employed) in order for a private market to be able to provide additional UI beyond what the government currently provides (plotted with confidence intervals on the right side of **Figure 3*b***). In contrast, estimates of individuals' WTP for UI suggest individuals are willing to pay a risk premium of at most 60%. This means that left to the invisible hand, private markets would not provide individuals with the ability to choose their desired levels of UI: Decentralized private markets for supplemental UI coverage would unravel. However, this does not imply that a market would not exist if it were subsidized, as in the Scandinavian example above. Nor does it rule out that there could be value to providing choice. The core empirical result, however, is that these markets will unravel unless the choices are subsidized.

Hendren's (2017) implementation assumes that individuals have rational beliefs about their likelihood of unemployment. This contrasts with a growing literature suggesting that individuals

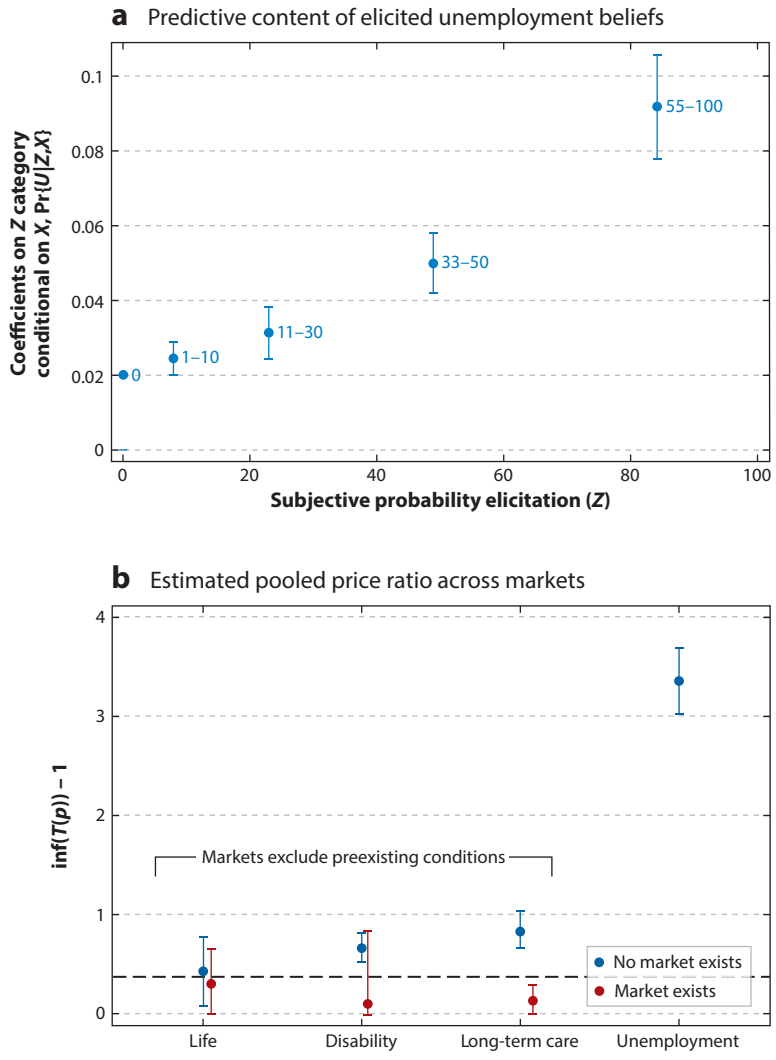


Figure 3

Private information and estimated pooled price ratios. This figure illustrates the methodology of Hendren (2013, 2017) to identify adverse selection in the absence of choice data using elicited risk beliefs. Panel *a* shows the predictive content of unemployment risk elicitation. The graph reports the mean rate of job loss in each elicitation category controlling for demographics, job characteristics, and year controls. It shows a strong positive correlation between beliefs and actual job loss conditional on these controls. Panel *b* shows the inferred minimum pooled price ratio $T(p)$ minus 1 constructed from these estimates. This corresponds to the minimum risk that an individual would have to be willing to pay for a market to exist. The graph compares the estimates of $\inf(T(p)) - 1$ in the unemployment context to the estimates provided by Hendren (2013) for three other insurance markets: life insurance, disability insurance, and long-term care insurance. For these markets, the graph separately reports estimates for the sample of individuals who are unable to purchase insurance due to a preexisting condition (*blue dots*) and for the sample of individuals whose observables would allow them to purchase insurance in each market (*red dots*). In the latter, one cannot reject the null hypothesis of no private information. Figure adapted with permission from Hendren (2017).

exhibit biased beliefs about their unemployment and job prospects (e.g., Stephens 2004, Spinnewijn 2015), which may be important to factor in. Mueller et al. (2021) recently proposed an extension of Hendren's (2013, 2017) method to account for biases in beliefs, but studying heterogeneity in the reemployment prospects of unemployed workers rather than in the unemployment risk of employed workers.

Ultimately, the main challenge in the absence of choice data remains that one needs to make assumptions about how the heterogeneity in risks translates into insurance choices. Although higher risk increases the demand for insurance, and the risk heterogeneity estimated in Hendren (2017) is very substantial, this mapping depends on the heterogeneity in other drivers of insurance choice and on how they are correlated with the risk heterogeneity. In particular, the empirical calculation of the pooled price ratio by Hendren (2017) requires an absence of preference heterogeneity conditional on risk: It assumes that if an individual with a likelihood π of experiencing unemployment purchases insurance, then all types $\pi_\theta > \pi$ purchase insurance. Future work could expand the derivation of the no-trade condition in the presence of other sources of demand heterogeneity.

4.2.2. Identifying selection on moral hazard. Estimating the MH response to UI coverage has been the subject of a long and still developing literature (see Krueger & Meyer 2002, Schmieder & von Wachter 2016). Although individuals are not making choices, one can use policy changes to the mandated coverage to identify the impact of UI expansions on the cost of providing such insurance. From the perspective of our framework, two key insights emerge from this vast literature. First, the average behavioral responses are generally very large in all UI settings. Schmieder & von Wachter (2016) summarize estimates from 18 studies from 5 different countries, and they find a median estimate for the elasticity of unemployment duration with respect to mandated benefit coverage of 0.53. Second, there is some significant heterogeneity in estimates across contexts and individuals. For instance, the responses vary significantly across unemployed workers depending on whether they are expecting recall from their previous employer (Katz & Meyer 1990), on the time they have spent unemployed (Kolsrud et al. 2018), and on their access to liquidity (Chetty 2008).

But from the perspective of evaluating choice, there is unfortunately little work relating this heterogeneity in moral hazard to WTP for insurance in the UI context, which would help assess the extent of selection on moral hazard. The empirical challenge is the same as the one encountered when gauging the importance of risk-based selection, and it is especially difficult to estimate in the absence of choice data. Nonetheless, it is a key parameter for understanding the value of choice. If individuals who attach little value to UI also impose large MH externalities, then mandating them into generous coverage runs the risk of driving costs above WTP. In such a context, offering choice could increase welfare.

4.2.3. Quantifying selection on the risk premium. Large variation in WTP conditional on individual risk increases the value of allowing for choice. In the presence of adverse selection on risk and moral hazard, heterogeneity in the risk premia that workers are willing to pay for insurance becomes a crucial ingredient for offering choice. But risk premia, let alone the variation therein, are notoriously complicated to estimate in contexts where no choice is observed.

As noted before, the risk premium relates directly to the ratio of marginal utilities when unemployed to marginal utilities when employed, $\frac{u'_\theta(c_u)}{u'_\theta(c_e)}$. To measure this marginal rate of substitution between consumption when unemployed and when employed, the literature has mostly focused on the so-called consumption-based approach, pioneered by Gruber (1997). This approach relies on translating the drop in consumption at unemployment into a welfare value of insurance

using an assumption on risk preferences. Whereas the original literature, constrained by statistical power, was focused on measuring the average drop in consumption, recent studies, helped by the availability of more granular consumption data, have been able to document the presence of significant heterogeneity in consumption drops at unemployment (e.g., Ganong & Noel 2019, Landais & Spinnewijn 2020, Gerard & Naritomi 2021). Translating this heterogeneity in consumption patterns into heterogeneity in WTP for insurance is potentially problematic, however, as consumption is endogenous to risk preferences: Individuals who value insurance more may find ways to insure themselves against the risk of job loss, thus experiencing a smaller drop in consumption at unemployment (Chetty & Looney 2006, Andrews & Miller 2013).

To circumvent the issues faced by the consumption-based approach, a number of optimization-based approaches have been developed, relying on the logic of revealed preferences arguments. These approaches have inferred the value of insurance from responses in various observable behaviors, from search effort (e.g., Chetty 2008, Landais 2015) to labor supply (Hendren 2017), UI take-up (e.g., Fontaine & Kettemann 2019, Landais & Spinnewijn 2020), and marginal propensities to consume (Landais & Spinnewijn 2020). Although most of these studies also focus on identifying the average value of insurance, these methods could be fruitfully employed to document heterogeneity in valuation. One should note, however, that these approaches maintain an assumption of individual optimization, which may fail in the presence of frictions. In other words, as in standard revealed preference methods, it is difficult to disentangle heterogeneity in WTP from heterogeneneity in choice frictions.

In general, the strands of research described above exemplify that, even without choice data, it remains possible to identify the relevant dimensions of heterogeneity. However, to evaluate selection into insurance, one needs to deal with a fundamental difficulty, which is to figure out how these dimensions of heterogeneity correlate with the WTP itself. Future work could try to use elicitations to measure the extent of selection on different dimensions, building on the methodologies used to capture risk-based selection.

5. TAKEAWAYS FOR OTHER INSURANCE CONTEXTS

The governments provide a large set of social insurance programs beyond UI. What can we say about the value of offering choice in DI, workers' compensation, HI, or long-term care insurance (LTCI)? Should countries allow for choice in these social insurance contexts? Our framework identifies the key microfoundations that are required to evaluate choice, which include heterogeneity in preferences, selection on risk and moral hazard, and choice frictions. Our framework can thus be used to provide a road map for the empirical work that needs to be done to fill the gaps in all these contexts.

Table 2 aims to identify some gaps in the empirical literature. While this is not an attempt at providing a comprehensive review of the rich body of literature evaluating social insurance programs, we believe that some general lessons can be drawn.

A first lesson is that, despite the rich body of literature evaluating important features of each of the social insurance programs, we know relatively little about the key ingredients to evaluating choice. Indeed, for all insurance programs, there is abundant work measuring the incentive effects (see reviews in Krueger & Meyer 2002, Schmieder & von Wachter 2016 for UI; Low & Pistaferri 2020 for DI; and Einav & Finkelstein 2018 for HI), but in general we know much less about how much individuals value social insurance, let alone what dimensions of heterogeneity would drive selection.

A second, related lesson is that we know more about these key ingredients in insurance contexts that embed choice. This explains the large literature on the different dimensions of selection in HI

Table 2 Summary of existing applied work

	Unemployment insurance	Disability insurance	Workers' compensation	Long-term care insurance	Health insurance
Preference heterogeneity	✔[a]	–[b]	–	✔[c]	✔[d]
Risk-based selection	✔[e]	✔[f]	✔[g]	✔✔[h]	✔✔[i]
Selection on moral hazard	✔[j]	–	–	–	✔✔[k]
Choice frictions	✔[l]	–	–	✔[m]	✔✔[n]

–indicates the absence of empirical evidence; ✔ indicates the presence of some limited evidence; ✔✔ indicates the availability of significant empirical work.

[a]Although a large literature analyses the average value of unemployment insurance, evidence on preference heterogeneity in unemployment insurance is scarce. A notable exception is provided by Landais & Spinnewijn (2020), who find substantial heterogeneity.

[b]Note that Einav et al. (2012) and Coppola (2014) relate risk preferences to disability insurance choices.

[c]Using proxies of risk preferences, Finkelstein & McGarry (2006) find substantial heterogeneity, potentially explaining the observed advantageous selection; however, this ignores the role of insurers' rejection practices (Hendren 2013).

[d]For example, Barsky et al. (1997), Einav et al. (2013), Hackmann et al. (2015), Handel & Kolstad (2015), Ottaviani & Vandone (2015), and Marone & Sabety (2021) find mixed results. Cutler et al. (2008), Fang et al. (2008), and Keane & Stavrunova (2016) study risk preferences related to Medigap coverage.

[e]Using elicitations, Hendren (2017) finds private unemployment insurance to be too adversely selected to be profitable, at any price. Landais et al. (2021) find evidence of significant risk-based selection in the public provision of supplemental unemployment insurance in Sweden.

[f]Using elicitations, Hendren (2013) finds substantive private information among applicants with preexisting conditions (see also Soika 2018, Cabral & Cullen 2019).

[g]One notable exception is provided by Cabral et al. (2019), who find no evidence of adverse selection in the Texan workers' compensation market.

[h]Most research points toward the presence of risk-based selection (Sloan & Norton 1997, Finkelstein et al. 2005, Finkelstein & McGarry 2006, Hendren 2013, Browne & Zhou-Richter 2014, Boyer et al. 2017). Zick et al. (2005) and Oster et al. (2010) link it to genetic testing.

[i]Risk-based selection in health insurance continues to be the focus of much research. For a selection that is by no means exhaustive, readers are referred to Cutler & Reber (1998), Cardon & Hendel (2001), Einav et al. (2010, 2013), Handel (2013), Hackmann et al. (2015), Polyakova (2016), Finkelstein et al. (2019), Ghili et al. (2020), and Powell & Goldman (2021).

[j]One notable exception is provided by Landais et al. (2021).

[k]A small but growing literature looks at selection on moral hazard in the market for health insurance (Einav et al. 2013, Shepard 2016, Péron & Dormont 2018, Alessie et al. 2020, Marone & Sabety 2021).

[l]Landais & Spinnewijn (2020) provide some evidence on choice frictions; Spinnewijn (2015) and Mueller et al. (2021) offer some evidence on biased beliefs.

[m]Some evidence exists that limited awareness and risk misperceptions are responsible for reduced demand for long-term care insurance (Cramer & Jensen 2006, Zhou-Richter et al. 2010, Boyer et al. 2017).

[n]There exists substantial evidence of choice frictions in the context of health care insurance (see Abaluck & Gruber 2011, Handel 2013, Heiss et al. 2013, Loewenstein et al. 2013, Marzilli Ericson 2014, Handel & Kolstad 2015, Polyakova 2016, Bhargava et al. 2017, Ho et al. 2017, Wright et al. 2017, Handel et al. 2020).

and LTCI choices, especially in the United States. Our knowledge of other insurance contexts is limited to a few exceptions leveraging offered choice in a particular setting. We discussed at length the UI choice offered in Sweden and studied by Landais & Spinnewijn (2020) and Landais et al. (2021). Other notable exceptions are represented by Cabral & Cullen (2019), who study private long-term DI supplementing public DI in the United States, and Cabral et al. (2019), who study voluntary workers' compensation in Texas. Much more work is needed to improve our understanding of selection and the importance of preferences in frictions in all these domains. As discussed,

survey elicitations can be a crucial instrument in the absence of private markets or choice data. In particular, Hendren (2013) uses subjective probability elicitations to find that private information can prevent markets from selling any insurance at all to some populations, notably those with preexisting conditions. **Figure 3*b*** shows the risk premium individuals would have to be willing to pay for a market to exist, broken out separately for the sample of people who have preexisting conditions and those who do not (and can therefore purchase insurance in private markets). The pattern shows that the risk premium individuals would need to pay to overcome adverse selection is significantly higher for those with preexisting conditions; unsubsidized private markets seem to operate only when individuals do not have significant amounts of private information.

Finally, even when choice data are available, the traditional focus of the literature has been on adverse selection, in both HI and LTCI. In the context of HI, a rapidly growing literature documents the importance of choice frictions in distorting plan choices (see Chandra et al. 2019) and the way these frictions interact with adverse selection (e.g., Handel 2013, Polyakova 2016, Handel et al. 2019). A recent literature has also started analyzing the role of selection on moral hazard (e.g., Einav et al. 2013, Shepard 2016, Marone & Sabety 2021). Relatively little is known about the importance of heterogeneity in the preferences underlying choices, even though offering choice only has value when there is significant heterogeneity in valuations that is uncorrelated with people's risk and choice frictions (e.g., Handel & Kolstad 2015, Ericson & Sydnor 2017, Handel et al. 2019).

Our framework, combined with existing empirical estimates in the context of UI, suggests that expanding choice must be done carefully and with appropriate subsidies. Although appropriately subsidized choices can help increase welfare, it is important to also note that it is not always the case that choice increases welfare, as outlined in Section 2.3. Choice increases welfare only if the value of supplemental coverage to those selecting it exceeds the costs, but it brings the possibility of inefficient allocations due to behavioral biases and choice frictions. An ongoing challenge is to separate preference heterogeneity from choice frictions when using revealed preference methods (e.g., Handel & Kolstad 2015). A final issue we know too little about in basically all insurance contexts is how the dimensions of choice relate to income, which is crucial to evaluate the equity implications of embedding choice in social insurance design (e.g., Handel et al. 2020).

DISCLOSURE STATEMENT

The authors are not aware of any affiliations, memberships, funding, or financial holdings that might be perceived as affecting the objectivity of this review.

ACKNOWLEDGMENTS

The authors thank Sebastian Ernst for excellent research assistance and Amy Finkelstein for her valuable comments and suggestions. The authors also gratefully acknowledge support from the European Research Council (grants 679704 and 716485). N.H. received funding from the Gates Foundation, the National Science Foundation, and the Chan-Zuckerberg Initiative.

LITERATURE CITED

Abaluck J, Gruber J. 2011. Choice inconsistencies among the elderly: evidence from plan choice in the Medicare Part D program. *Am. Econ. Rev.* 101(4):1180–210

Akerlof GA. 1970. The market for "lemons": quality uncertainty and the market mechanism. *Q. J. Econ.* 84(3):488–500

Alessie RJM, Angelini V, Mierau JO, Viluma L. 2020. Moral hazard and selection for voluntary deductibles. *Health Econ.* 29(10):1251–69
Andrews I, Miller C. 2013. *Optimal social insurance with heterogeneity*. Work. Pap., Mass. Inst. Technol., Cambridge
Azevedo EM, Gottlieb D. 2017. Perfect competition in markets with adverse selection. *Econometrica* 85(1):67–105
Baicker K, Mullainathan S, Schwartzstein J. 2015. Behavioral hazard in health insurance. *Q. J. Econ.* 130(4):1623–67
Baily MN. 1978. Some aspects of optimal unemployment insurance. *J. Public Econ.* 10(3):379–402
Barnichon R, Zylberberg Y. 2021. A menu of insurance contracts for the unemployed. *Rev. Econ. Stud.* **https://doi.org/10.1093/restud/rdab026**
Barsky RB, Juster FT, Kimball MS, Shapiro MD. 1997. Preference parameters and behavioral heterogeneity: an experimental approach in the Health and Retirement study. *Q. J. Econ.* 112(2):537–79
Berchick ER, Barnett JC, Upton RD. 2019. *Health insurance coverage in the United States: 2018*. Curr. Popul. Rep. P60-267(RV), US Gov. Print. Off., Washington, DC
Bhargava S, Loewenstein G, Sydnor J. 2017. Choose to lose: health plan choices from a menu with dominated option. *Q. J. Econ.* 132(3):1319–72
Boyer M, De Donder P, Fluet C, Leroux ML, Michaud PC. 2017. *Long-term care insurance: knowledge barriers, risk perception and adverse selection*. NBER Work. Pap. 23918
Browne MJ, Zhou-Richter T. 2014. Lemons or cherries? Asymmetric information in the German private long-term care insurance market. *Geneva Pap. Risk Insur. Issues Pract.* 39(4):603–24
Cabral M. 2016. Claim timing and ex post adverse selection. *Rev. Econ. Stud.* 84(1):1–44
Cabral M, Cui C, Dworsky M. 2019. *What is the rationale for an insurance coverage mandate? Evidence from workers' compensation insurance*. NBER Work. Pap. 26103
Cabral M, Cullen MR. 2019. Estimating the value of public insurance using complementary private insurance. *Am. Econ. J. Econ. Policy* 11(3):88–129
Cabral M, Mahoney N. 2019. Externalities and taxation of supplemental insurance: a study of Medicare and Medigap. *Am. Econ. J. Appl. Econ.* 11(2):37–73
Cardon JH, Hendel I. 2001. Asymmetric information in health insurance: evidence from the National Medical Expenditure Survey. *RAND J. Econ.* 32(3):408–27
Carroll E. 2005. Voluntary state-subsidized social insurance in the advanced industrialized world since the 1890s: the Nordic experience in comparative perspective. In *Social Policy and Economic Development in the Nordic Countries: Social Policy in a Development Context*, ed. O Kangas, J Palme, pp. 60–87. London: Palgrave Macmillan
Chandra A, Handel B, Schwartzstein J. 2019. Behavioral economics and health-care markets. In *Handbook of Behavioral Economics*, Vol. 2: *Foundations and Applications*, ed. BD Bernheim, S DellaVigna, D Laibson, pp. 459–502. Amsterdam: North-Holland
Chetty R. 2006. A general formula for the optimal level of social insurance. *J. Public Econ.* 90(10):1879–901
Chetty R. 2008. Moral hazard versus liquidity and optimal unemployment insurance. *J. Political Econ.* 116(2):173–234
Chetty R, Finkelstein A. 2013. Social insurance: connecting theory to data. In *Handbook of Public Economics*, Vol. 5, ed. AJ Auerbach, R Chetty, M Feldstein, E Saez, pp. 111–93. Amsterdam: Elsevier
Chetty R, Looney A. 2006. Consumption smoothing and the welfare consequences of social insurance in developing economies. *J. Public Econ.* 90(12):2351–56
Chiappori PA, Salanié B. 2000. Testing for asymmetric information in insurance markets. *J. Political Econ.* 108(1):56–78
Chiappori PA, Salanié B. 2013. Asymmetric information in insurance markets: predictions and tests. In *Handbook of Insurance*, ed. G Dionne, pp. 397–422. New York: Springer. 2nd ed.
Cohen A, Siegelman P. 2010. Testing for adverse selection in insurance markets. *J. Risk Insur.* 77(1):39–84
Coppola M. 2014. Eliciting risk-preferences in socio-economic surveys: How do different measures perform? *J. Socio-Econ.* 48:1–10
Cramer AT, Jensen GA. 2006. Why don't people buy long-term-care insurance? *J. Gerontol. Ser. B* 61(4):S185–93

Cutler DM, Finkelstein A, McGarry K. 2008. Preference heterogeneity and insurance markets: explaining a puzzle of insurance. *Am. Econ. Rev.* 98(2):157–62

Cutler DM, Reber SJ. 1998. Paying for health insurance: the trade-off between competition and adverse selection. *Q. J. Econ.* 113(2):433–66

Dixit AK, Stiglitz JE. 1977. Monopolistic competition and optimum product diversity. *Am. Econ. Rev.* 67(3):297–308

Einav L, Finkelstein A. 2018. Moral hazard in health insurance: what we know and how we know it. *J. Eur. Econ. Assoc.* 16(4):957–82

Einav L, Finkelstein A, Cullen MR. 2010. Estimating welfare in insurance markets using variation in prices. *Q. J. Econ.* 125(3):877–921

Einav L, Finkelstein A, Pascu I, Cullen MR. 2012. How general are risk preferences? Choices under uncertainty in different domains. *Am. Econ. Rev.* 102(6):2606–38

Einav L, Finkelstein A, Ryan SP, Schrimpf P, Cullen MR. 2013. Selection on moral hazard in health insurance. *Am. Econ. Rev.* 103(1):178–219

Ericson KM, Sydnor J. 2017. The questionable value of having a choice of levels of health insurance coverage. *J. Econ. Perspect.* 31(4):51–72

Fang H, Keane MP, Silverman D. 2008. Sources of advantageous selection: evidence from the Medigap insurance market. *J. Political Econ.* 116(2):303–350

Finkelstein A, Hendren N, Shepard M. 2019. Subsidizing health insurance for low-income adults: evidence from Massachusetts. *Am. Econ. Rev.* 109(4):1530–67

Finkelstein A, Mahoney N, Notowidigdo MJ. 2018. What does (formal) health insurance do, and for whom? *Annu. Rev. Econ.* 10:261–86

Finkelstein A, McGarry K. 2006. Multiple dimensions of private information: evidence from the long-term care insurance market. *Am. Econ. Rev.* 96(4):938–58

Finkelstein A, McGarry K, Sufi A. 2005. Dynamic inefficiencies in insurance markets: evidence from long-term care insurance. *Am. Econ. Rev.* 95(2):224–28

Fontaine F, Kettemann A. 2019. *Quasi-experimental evidence on take-up and the value of unemployment insurance*. Work. Pap., Paris Sch. Econ., Paris

Ganong P, Noel P. 2019. Consumer spending during unemployment: positive and normative implications. *Am. Econ. Rev.* 109(7):2383–424

Garthwaite C, Gross T, Notowidigdo MJ. 2018. Hospitals as insurers of last resort. *Am. Econ. J. Appl. Econ.* 10(1):1–39

Gerard F, Naritomi J. 2021. Job displacement insurance and (the lack of) consumption-smoothing. *Am. Econ. Rev.* 111(3):899–942

Geruso M, Layton TJ, McCormack G, Shepard M. 2019. *The two margin problem in insurance markets*. NBER Work. Pap. 26288

Ghili S, Handel B, Hendel I, Whinston MD. 2020. *Optimal long-term health insurance contracts: characterization, computation, and welfare effects*. Discuss. Pap. 2218R, Cowles Found., Yale Univ., New Haven, CT

Glenngård A. 2017. The Swedish health care system. In *International Profiles of Health Care Systems*, ed. E Mossialos, A Djordjevic, R Osborn, D Sarnak, pp. 146–54. New York: Commonw. Fund

Gruber J. 1997. The consumption smoothing benefits of unemployment insurance. *Am. Econ. Rev.* 87(1):192–205

Hackmann MB, Kolstad JT, Kowalski AE. 2015. Adverse selection and an individual mandate: when theory meets practice. *Am. Econ. Rev.* 105(3):1030–66

Handel BR. 2013. Adverse selection and inertia in health insurance markets: when nudging hurts. *Am. Econ. Rev.* 103(7):2643–82

Handel BR, Hendel I, Whinston MD. 2015. Equilibria in health exchanges: adverse selection versus reclassification risk. *Econometrica* 83(4):1261–313

Handel BR, Kolstad JT. 2015. Health insurance for "humans": information frictions, plan choice, and consumer welfare. *Am. Econ. Rev.* 105(8):2449–500

Handel BR, Kolstad JT, Minten T, Spinnewijn J. 2020. *The social determinants of choice quality: evidence from health insurance in the Netherlands*. NBER Work. Pap. 27785

Handel BR, Kolstad JT, Spinnewijn J. 2019. Information frictions and adverse selection: policy interventions in health insurance markets. *Rev. Econ. Stat.* 101(2):326–40
Heiss F, Leive A, McFadden D, Winter J. 2013. Plan selection in Medicare Part D: evidence from administrative data. *J. Health Econ.* 32(6):1325–44
Hendren N. 2013. Private information and insurance rejections. *Econometrica* 81(5):1713–62
Hendren N. 2017. Knowledge of future job loss and implications for unemployment insurance. *Am. Econ. Rev.* 107(7):1778–823
Hendren N. 2021. Measuring ex ante welfare in insurance markets. *Rev. Econ. Stud.* 88(3):1193–223
Hendren N, Sprung-Keyser B. 2020. A unified welfare analysis of government policies. *Q. J. Econ.* 135(3):1209–318
Hirshleifer J. 1971. The private and social value of information and the reward to inventive activity. *Am. Econ. Rev.* 61(4):561–74
Ho K, Hogan J, Scott Morton F. 2017. The impact of consumer inattention on insurer pricing in the Medicare Part D program. *RAND J. Econ.* 48(4):877–905
Johnson RW. 2016. *Who is covered by private long-term care insurance?* Tech. Rep., Urban Inst., Washington, DC
Katz LF, Meyer BD. 1990. Unemployment insurance, recall expectations, and unemployment outcomes. *Q. J. Econ.* 105(4):973–1002
Keane M, Stavrunova O. 2016. Adverse selection, moral hazard and the demand for Medigap insurance. *J. Econom.* 190(1):62–78
Khomenko M. 2018. *Private information and design of unemployment insurance*. PhD Thesis, Univ. Gothenburg, Gothenburg, Swed.
Kolsrud J, Landais C, Nilsson P, Spinnewijn J. 2018. The optimal timing of unemployment benefits: theory and evidence from Sweden. *Am. Econ. Rev.* 108(4–5):985–1033
Krueger AB, Meyer BD. 2002. Labor supply effects of social insurance. In *Handbook of Public Economics*, Vol. 4, ed. AJ Auerbach, M Feldstein, pp. 2327–92. Amsterdam: North-Holland
Landais C. 2015. Assessing the welfare effects of unemployment benefits using the regression kink design. *Am. Econ. J. Econ. Policy* 7(4):243–78
Landais C, Nekoei A, Nilsson P, Seim D, Spinnewijn J. 2021. Risk-based selection in unemployment insurance: evidence and implications. *Am. Econ. Rev.* 111(4):1315–55
Landais C, Spinnewijn J. 2020. The value of unemployment insurance. *Rev. Econ. Stud.* In press
Lindellee J. 2018. *Beyond retrenchment: multi-pillarization of unemployment benefit provision in Sweden*. PhD Thesis, Lund Univ., Lund, Swed.
Loewenstein G, Friedman JY, McGill B, Ahmad S, Linck S, et al. 2013. Consumers' misunderstanding of health insurance. *J. Health Econ.* 32(5):850–62
Low H, Pistaferri L. 2020. Disability insurance: theoretical trade-offs and empirical evidence. *Fiscal Stud.* 41(1):129–64
Mahoney N, Weyl EG. 2017. Imperfect competition in selection markets. *Rev. Econ. Stat.* 99(4):637–51
Manski CF. 2004. Measuring expectations. *Econometrica* 72(5):1329–76
Marone V, Sabety A. 2021. *When should there be vertical choice in health insurance markets?* Work. Pap., Univ. Tex., Austin
Marzilli Ericson KM. 2014. Consumer inertia and firm pricing in the Medicare Part D prescription drug insurance exchange. *Am. Econ. J. Econ. Policy* 6(1):38–64
Mueller AI, Spinnewijn J, Topa G. 2021. Job seekers' perceptions and employment prospects: heterogeneity, duration dependence, and bias. *Am. Econ. Rev.* 111(1):324–63
Oster E, Shoulson I, Quaid K, Dorsey ER. 2010. Genetic adverse selection: evidence from long-term care insurance and Huntington disease. *J. Public Econ.* 94(11):1041–50
Oswald AJ. 1986. Unemployment insurance and labor contracts under asymmetric information: theory and facts. *Am. Econ. Rev.* 76(3):365–77
Ottaviani C, Vandone D. 2015. Decision-making under uncertainty and demand for health insurance: a multidisciplinary study. *J. Psychophysiol.* 29(2):80–85
Parsons DO. 2002. *Private "unemployment" insurance: asymmetric information and severance pay design*. Unpublished manuscript, George Washington Univ., Washington, DC

Parsons DO, Tranaes T, Lilleør HB. 2015. *Voluntary public unemployment insurance*. IZA Discuss. Pap. 8783, Inst. Labor Econ., Bonn, Ger.

Péron M, Dormont B. 2018. *Heterogeneous moral hazard in supplementary health insurance.* Work. Pap. 18/27, Health Econom. Data Group (HEDG), Univ. York, York, UK

Polyakova M. 2016. Regulation of insurance with adverse selection and switching costs: evidence from Medicare Part D. *Am. Econ. J. Appl. Econ.* 8(3):165–95

Powell D, Goldman D. 2021. Disentangling moral hazard and adverse selection in private health insurance. *J. Econom.* 222(1A):141–60

Rasmussen P. 2014. *Privatizing unemployment protection: the rise of private unemployment insurance in Denmark and Sweden*. Work. Pap. 2014-83, Cent. Comp. Welfare Stud. (CCWS), Aalborg Univ., Aalborg, Den.

Schmieder JF, von Wachter T. 2016. The effects of unemployment insurance benefits: new evidence and interpretation. *Annu. Rev. Econ.* 8:547–81

Shepard M. 2016. *Hospital network competition and adverse selection: evidence from the Massachusetts health insurance exchange*. NBER Work. Pap. 22600

Sloan FA, Norton EC. 1997. Adverse selection, bequests, crowding out, and private demand for insurance: evidence from the long-term care insurance market. *J. Risk Uncertain.* 15(3):201–19

Soika S. 2018. Moral hazard and advantageous selection in private disability insurance. *Geneva Pap. Risk Insur. Issues Pract.* 43(1):97–125

Spinnewijn J. 2015. Unemployed but optimistic: optimal insurance design with biased beliefs. *J. Eur. Econ. Assoc.* 13(1):130–67

Spinnewijn J. 2017. Heterogeneity, demand for insurance, and adverse selection. *Am. Econ. J. Econ. Policy* 9(1):308–43

Stat. Swed. 2020. *Average monthly salary by sector 1992–2019.* Table, Stat. Swed., Solna, Swed., updated June 16. **https://www.scb.se/en/finding-statistics/statistics-by-subject-area/labour-market/wages-salaries-and-labour-costs/salary-structures-whole-economy/pong/tables-and-graphs/average-monthly-salary-by-sector/**

Stephens M. 2004. Job loss expectations, realizations, and household consumption behavior. *Rev. Econ. Stat.* 86(1):253–69

US Bur. Labor Stat. 2019. *National compensation survey: employee benefits in the United States, March 2019.* Bull. 2791, US Dep. Labor, Washington, DC. **https://www.bls.gov/ncs/ebs/benefits/2019/employee-benefits-in-the-united-states-march-2019.pdf**

Weyl EG, Veiga A. 2017. Pricing institutions and the welfare cost of adverse selection. *Am. Econ. J. Microecon.* 9(2):139–48

Wright BJ, Garcia-Alexander G, Weller MA, Baicker K. 2017. Low-cost behavioral nudges increase Medicaid take-up among eligible residents of Oregon. *Health Aff.* 36(5):838–45

Zhou-Richter T, Browne MJ, Gründl H. 2010. Don't they care? Or, are they just unaware? Risk perception and the demand for long-term care insurance. *J. Risk Insur.* 77(4):715–47

Zick CD, Mathews CJ, Roberts JS, Cook-Deegan R, Pokorski RJ, Green RC. 2005. Genetic testing for Alzheimer's disease and its impact on insurance purchasing behavior. *Health Aff.* 24(2):483–90