

Targeting with In-kind Transfers: Evidence from Medicaid Home Care

Ethan M.J. Lieber and Lee M. Lockwood*

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Abstract

Many of the most important government programs make transfers in kind as opposed to in cash. Making transfers in kind has the obvious cost that recipients would often prefer cost-equivalent cash transfers. But making transfers in kind can have benefits as well, including better targeting transfers to desired recipients or states of the world. In this paper, we provide a unified framework for evaluating this tradeoff and apply it to the context of Medicaid home care. Exploiting large-scale randomized experiments run by three state Medicaid programs, we find that in-kind provision of formal home care significantly reduces the value of benefits to recipients while targeting benefits to a small fraction of the eligible population that has greater demand for formal home care, is sicker, and has worse informal care options than the average eligible. Under a wide range of assumptions within a standard model, the targeting benefit of in-kind provision exceeds the distortion cost. This highlights an important cost of recent reforms that move toward more flexible, cash-like benefits.

*Lieber: Notre Dame, Ethan.Lieber.2@nd.edu; Lockwood: University of Virginia and NBER, leelockwood@virginia.edu. We are grateful to our department colleagues, Norma Coe, Gopi Shah Goda, Tami Gurley-Calvez, Seema Jayachandran, Brian Melzer, Matt Notowidigdo, Iuliana Pascu, Mike Powell, Emmanuel Saez, Diane Schanzenbach, Jesse Shapiro, Courtney Van Houtven, and many seminar participants for helpful comments. We thank Jose Carreno, Vishal Kamat, and Zeyu Wang for excellent research assistance. The research reported herein was performed pursuant to a grant from the U.S. Social Security Administration (SSA) through the Michigan Retirement Research Center (Grant #5 RRC08098401-05), funded as part of the Retirement Research Consortium. The opinions and conclusions expressed are solely those of the authors and do not represent the opinions or policy of the Social Security Administration, any agency of the Federal Government, or the Michigan Retirement Research Center.

1 Introduction

In-kind transfers are a ubiquitous feature of government programs, private contracts, and charitable giving. In the U.S., government spending on in-kind health and education programs alone totals more than 12 percent of GDP (Currie and Gahvari, 2008). The vast majority of government spending on means-tested welfare programs is on in-kind health benefits, and the recent Affordable Care Act increased such benefits substantially through expanded Medicaid eligibility and subsidies for health insurance.¹ In-kind transfers are also at the heart of a wide-ranging debate about the relative desirability of benefit programs that are more universal and flexible versus more targeted and restrictive.²

Central to this debate is a tradeoff inherent to in-kind transfers. In-kind provision has a fundamental cost: Recipients would prefer cost-equivalent cash transfers. But this cost is linked to an important potential benefit: When information or other constraints preclude direct targeting, in-kind provision can better target desired recipients by leading certain people to take up more benefits than others (Nichols and Zeckhauser, 1982; Blackorby and Donaldson, 1988). In the context of insurance, for example, if someone’s valuation of a particular in-kind benefit is higher in states of the world in which marginal utility is higher, in-kind provision can help concentrate benefits in those states and thereby better insure the risk. In such cases, there is a tradeoff between providing benefits that are more valuable to recipients (for which less restrictive cash-like benefits are best) and providing benefits that better target transfers to higher-marginal utility states (for which more restrictive in-kind benefits might be best). Although these costs and benefits are crucial determinants of optimal policy, little is known about their relative magnitudes across a wide range of important contexts.

In this paper, we develop a general framework for analyzing this key tradeoff of in-kind provision, and we apply it to the context of home care. Home care helps people with chronic health problems live at home instead of in nursing homes. It includes assistance with eating, dressing, and bathing, and it is provided by both professional caregivers (“formal care”) and family and friends (“informal care”). Home care is an especially important and fruitful context in which to analyze the consequences of in-kind provision for three main reasons. First, it is one of the largest and fastest-growing components of what is likely

¹In 2014, government spending on means-tested in-kind health benefits through Medicaid was \$497 billion, about seven times larger than government spending on any other welfare program, including the Earned Income Tax Credit (\$68 billion), the Supplemental Nutrition Assistance Program (formerly called “food stamps”) (\$76 billion), and Temporary Assistance for Needy Families (\$32 billion).

²In domestic policy, foreign aid, and private charitable giving, for example, there are active debates about the desirability of more flexible benefits (e.g., direct cash transfers and universal basic income programs) versus more restrictive in-kind transfers of food, housing (Collinson et al., 2015), medical care (Doty et al., 2010), and other goods.

the largest and fastest-growing type of in-kind transfer: in-kind health care. In the U.S. in 2013, government spending on Medicaid home care was \$57 billion, and government spending on in-kind health-benefit programs as a whole was \$1.1 trillion, more than six percent of GDP (Kaiser Commission on Medicaid and the Uninsured, 2016; Centers for Medicare and Medicaid Services, 2017). Second, many states in the U.S. and countries in Europe have reformed their home care programs to make benefits more flexible and cash-like (National Conference of State Legislatures, 2007; Da Roit and Le Bihan, 2010). Fifteen state Medicaid programs allow recipients to use benefits to pay informal caregivers or buy equipment for their homes (Doty et al., 2010), and early versions of the bill that became the Affordable Care Act included a long-term care insurance program that would have paid cash benefits. Third, the Cash and Counseling experiments—large-scale experiments in which participants were randomized to either Medicaid’s traditional in-kind home care benefit or a near-cash benefit—enable us to credibly identify the main inputs of our framework.

The theory, which is based on the observation that an in-kind transfer has the same effect on a recipient’s budget set as a (potentially non-linear) price subsidy, highlights three key determinants of the welfare consequences of in-kind provision.³ One determinant of the welfare consequences of in-kind provision is heterogeneity in demand for the good within benefit-eligible states of the world. The greater is this heterogeneity, the greater the targeting effects of in-kind provision. Using nationally representative data, we find that the demand for formal care is highly heterogeneous within benefit-eligible states (having two or more activities of daily living limitations). While 62 percent of people in benefit-eligible states do not consume any formal care, among those who do there is a long right tail. The 95th percentile is 168 hours per week (around-the-clock care), which at the average hourly price of \$15 per hour (Genworth Financial, 2005) amounts to about \$131,000 per year. Moreover, we find that the demand for formal care is highly heterogeneous even conditional on an extensive set of personal, household, and family characteristics, including the results of a detailed medical exam. This suggests that even extensively-“tagged” cash benefits (Akerlof, 1978) would leave significant risk uninsured.

A second key determinant of the welfare consequences of in-kind provision is its moral hazard effect, the extent to which it increases consumption of the good. The greater this increase, the lower the value to recipients of the in-kind benefit relative to its cost. Using the exogenous variation in home care benefits from the Cash and Counseling experiments, we find

³The fundamental feature of in-kind transfers that we focus on—that they reduce the recipient’s cost of consuming the good over some range of quantities—is shared by a wide range of other policies, including vouchers, conditional cash transfers, benefit programs with ordeals (the benefit effectively subsidizes consumption of the ordeal), insurance policies with non-unitary “coinsurance rates,” and commodity taxes and subsidies. The key tradeoff we analyze is likely central to the welfare consequences of these other types of policies as well.

that in-kind provision increases formal care consumption substantially. Our estimates imply that among people consuming any formal care, in-kind provision increases formal care consumption by 25 hours per week, over twice average consumption among the benefit-eligible population. This implies that many recipients value their in-kind benefit far below its cost. A recipient of the average in-kind transfer in the Cash and Counseling experiments, for example, would value it at just 28 percent of its cost.

A third key determinant of the welfare consequences of in-kind provision is the covariance between benefits and the marginal utility of income. If in-kind provision differentially reduces benefit take-up in relatively low-marginal utility states of the world, it can help insure the risk. On the extensive margin program take-up decision, we estimate that only 4 to 16 percent of those eligible for Medicaid home care take up benefits. Compared to the average eligible individual, those who take up have much greater demand for formal care, are sicker, and have fewer potential informal caregivers. Using the Cash and Counseling experiments, we find that in-kind provision concentrates benefits substantially on the intensive margin as well. The variance in benefits is seven times greater for those randomized to the in-kind benefit, and among the top five percent of formal care users in each of the randomized groups the average benefit is four times greater in the in-kind group. Together these results indicate that in-kind provision sharply concentrates benefits on a small fraction of the eligible population that has a greater demand for formal home care, is sicker, and has worse informal care options than the average eligible. To the extent that such states of the world tend to have relatively high marginal utility, in-kind provision could significantly improve insurance.

These results suggest that designers of home care benefits face a stark tradeoff: Restrictive in-kind benefits are much less valuable to recipients, but flexible cash-like benefits leave most of the risk uninsured. This raises the question: Does the targeting benefit of in-kind provision exceed the moral hazard cost? We combine our reduced-form estimates with a structural model to quantify these costs and benefits in a stylized expected utility framework. We find that under a wide range of assumptions the optimal contract involves a large in-kind component and delivers substantial welfare gains over cash-benefit contracts, despite the large moral hazard cost.

A large literature analyzes several known barriers to private, voluntary long-term care insurance, with two of the most important being adverse selection (Finkelstein and McGarry, 2006; Hendren, 2013) and the implicit taxation of private insurance by Medicaid (Pauly, 1990; Brown and Finkelstein, 2008) (see Brown and Finkelstein, 2011, for a review). We complement and extend this literature by estimating the importance of two barriers to any long-term care insurance, whether private or government, voluntary or mandatory: hard-to-verify heterogeneity and moral hazard. Our findings reveal a fundamental dilemma for

benefit design. The large moral hazard cost of in-kind provision means that many recipients would be significantly better off *ex post* with a cost-equivalent cash transfer.⁴ But that even richly-tagged cash benefits leave most of the risk uninsured means that providing home care in kind, although costly, might be the best way to insure the risk from chronic health problems. Especially when combined with the other potential advantages of providing home care in kind, our findings raise concerns about the many recent reforms that make long-term care benefits more flexible and cash-like.⁵

Our approach links the theoretical and empirical literatures on in-kind transfers, which have been largely disconnected so far (see Currie and Gahvari, 2008, for a review). The theoretical branch has investigated a variety of potential advantages of in-kind transfers, including improving targeting efficiency (Nichols and Zeckhauser, 1982; Blackorby and Donaldson, 1988), increasing the efficiency of the tax system (Munro, 1992), and reducing moral hazard in the context of the Samaritan’s Dilemma (Bruce and Waldman, 1991). The empirical branch has mostly focused on estimating in-kind provision’s effects on consumption.⁶ Noting the equivalence of an in-kind transfer and a subsidy allows us to utilize the well-developed theoretical and quantitative approaches for analyzing subsidies from the vast literature on optimal taxation. Our analysis of home care sheds new light on the costs and benefits of in-kind provision in an important instance of the largest class of in-kind benefits, in-kind health care benefits.

Our work also contributes to the literature that studies the targeting of benefit programs with incomplete take up, including disability insurance (Low and Pistaferri, 2015; Deshpande and Li, 2017), Medicaid (Cutler and Gruber, 1996), housing assistance (Reeder, 1985), and Supplemental Security Income (Benitez-Silva et al., 2004) (see Currie, 2006, for a review). A related literature investigates the targeting effects of fees (Greaney et al., 2016), ordeals (Atalas et al., 2016), subsidized prices (Cohen and Dupas, 2010), and delegating authority over the distribution of benefits to local leaders (Atalas et al., 2012; Basurto et al., 2017). A key finding in these literatures is that in many benefit programs, only a small fraction of the eligible population takes up benefits. While low take-up can be undesirable in some contexts,

⁴It also means that a large “moral hazard tax” plagues most long-term care insurance contracts and raises the effective loads to consumers above existing estimates (e.g., Brown and Finkelstein, 2007; Friedberg et al., 2014).

⁵To the extent that providing home care in kind reduces informal care, it likely improves tax system efficiency (since informal care provision appears to reduce labor supply and wages, e.g., Ettner, 1995; McGarry, 2006; Van Houtven et al., 2013) and may alleviate the Samaritan’s Dilemma (since informal care provision, by reducing labor supply and worsening health (Do et al., 2015), may increase reliance on means-tested transfers in the future). In addition to these other potential benefits of in-kind provision, a full welfare analysis must account for any differences in administrative and other costs of different benefit types as well.

⁶Moffitt (1989), Whitmore (2002), Hoynes and Whitmore Schanzenbach (2009), and Hastings and Shapiro (2017), for example, analyze the effects of in-kind food transfers on consumption. A rare exception is Cunha et al. (2011) who find that in-kind provision of food transfers reduced food prices in Mexican villages.

our analysis suggests that low take-up of home care benefits improves risk sharing. Our work complements and extends these literatures by providing a simple framework for analyzing a key tradeoff of program features that lead to incomplete take up: they may improve targeting at the expense of reducing the value of benefits. Our framework is well-suited to analyzing programs with not only binary extensive margin take-up decisions but continuous intensive margin take-up decisions as well. Intensive margin take-up decisions are a key determinant of the welfare consequences of alternative benefit designs in contexts in which demand for the benefit is highly heterogeneous, such as in-kind health care benefits.

2 Theory

This section develops a theoretical framework for analyzing a central tradeoff for in-kind provision: In-kind provision can improve targeting at the expense of distorting consumption and being less valuable to recipients than a cost-equivalent cash transfer. The key feature of in-kind provision on which we focus—and which is shared by many other policies, including vouchers, conditional cash transfers, benefit programs with ordeals, and commodity taxes and subsidies—is that the size of the transfer an individual receives depends on his or her consumption of the good in question.

One can view an in-kind benefit program as providing a cash benefit while at the same time imposing a restriction on recipients that they must consume at least a certain amount of the good in question. As Nichols and Zeckhauser (1982) emphasize, imposing restrictions on recipients can improve the targeting of benefits to desired recipients who cannot otherwise be distinguished from would-be “mimics,” if meeting the restriction is more costly for mimics than for desired recipients. Imposing such a restriction relaxes the incentive compatibility constraints on mimics’ participation and thereby allows the program to make greater transfers to desired recipients. In order to guide our analysis of home care insurance, we focus on the problem of insuring a risk, where the goal is to target high-marginal utility states of the world. But with small adjustments, the framework can be applied to questions of redistribution across different types of people as well.⁷

An in-kind benefit has the same effect on a recipient’s budget set as a (potentially non-linear)

⁷To focus on the problem of insuring a risk, we ignore any second-best considerations that might arise from the interaction between the program and other distortions in the economy. The problem can therefore be viewed as that of a private insurer, which would not account for such effects, or of a government that can condition the insurance benefit on ability type. In the case of a government that cannot condition on ability, the optimal in-kind benefit in a government program would depend on the joint distribution of ability and demand for the good and on any effect of in-kind provision on tax system efficiency (see Atkinson and Stiglitz, 1976; Saez, 2002; Kaplow et al., 2008). We discuss how such considerations might affect optimal government home care benefits in Section 6.5.

price subsidy. Many in-kind benefit programs, such as food stamps, offer individuals up to a fixed quantity of the good at no charge. When resale is not possible, this has the same effect on a recipient’s budget set as a non-linear price subsidy of 100 percent on units up to the benefit limit and 0 percent on units above the limit.⁸ We focus on the case of a subsidy program with no quantity limit. We do this both for simplicity of exposition and because many Medicaid home care programs, including those in the Cash and Counseling experiments, do not appear to have binding benefit limits in practice. The analysis is easily extended to cases with finite benefit limits.

The key considerations for in-kind provision can be seen in Figure 1. Figure 1 shows the values (in terms of equivalent variations) and efficiency costs of a price subsidy on a particular good in each of two states of the world with different levels of demand for the good. The subsidy has a moral hazard cost: It is worth less in each state than it costs the government or insurance company to provide due to the induced change in consumption, which is increasing in the compensated own-price elasticity of demand. The subsidy also has a targeting effect: It is worth more in states of the world in which demand for the good is greater. Relative to a cost-equivalent cash benefit, the subsidy redistributes toward states in which demand for the good is greater from states in which demand is smaller.

2.1 The benefit program and its budget constraint

An individual faces a risk that potentially affects prices, income, and preferences. The state of the world, θ , is drawn from the distribution, $G(\theta)$, with density $g(\theta)$. The planner knows $G(\theta)$ and how θ affects prices, income, and preferences but cannot verify which state has occurred ex-post.

Consider an idealized in-kind benefit program that potentially combines two elements: a cash benefit, b , and a linear subsidy, σ , on good K , x_K . The cash benefit and subsidy rate are common across all states of the world and are automatic in the sense that there are no take-up decisions; the individual receives the cash benefit and the subsidy on purchases of good K in all states. Expected program spending, B , is comprised of the cash benefit and

⁸The nature of resale opportunities, if any, is an important determinant of the effects of in-kind benefit programs. The better are resale opportunities, the more cash-like is an in-kind benefit. In the case of home care benefits, resale is impossible. In the case of food stamps, by contrast, resale does occur, albeit at a discount from face value (Whitmore, 2002). Another important consideration is whether recipients can “top up” their consumption of the good beyond the in-kind benefit by spending their own resources. Schooling vouchers, for example, can generally be topped up, whereas public schooling cannot.

spending on the subsidy on good K :

$$b + \sigma p_K^0 \int_{\Theta} x_K(\sigma, B; \theta) g(\theta) d\theta = B,$$

where p_K^0 is the (constant) before-subsidy (sellers') price of good K and $x_K(\sigma, B; \theta)$ is consumption of K in state θ as a function of the policy. For simplicity, we assume that the supply of every good is perfectly elastic. In this case, an increase in the subsidy reduces the individual's after-subsidy price of good K one-for-one (no incidence on supply), $p_K(\sigma) = (1 - \sigma)p_K^0$, and has no effect on the prices of any other goods, $p_i(\sigma) = p_i^0$ for $i \neq X$, where p_i^0 is the price of good i without any benefit program.

Two special cases of this combined cash-plus-subsidy program are a pure cash-benefit program ($b = B, \sigma = 0$) and a pure subsidy program with no cash benefit ($b = 0, \sigma > 0$). A pure in-kind benefit program has a zero cash component and a full subsidy, ($b = 0, \sigma = 1$).

2.2 Analysis of a budget-neutral shift toward in-kind benefits

A budget-neutral shift toward in-kind benefits involves increasing the subsidy rate, σ , and at the same time decreasing the cash benefit in order to maintain the same program budget. The change in the cash benefit that maintains the same program budget in response to a marginal increase in the subsidy rate is

$$\begin{aligned} \frac{\partial b(\sigma, B)}{\partial \sigma} &= - \int_{\Theta} \left[p_K^0 x_K(\sigma, B; \theta) + \sigma p_K^0 \frac{\partial x_K(\sigma, B; \theta)}{\partial \sigma} \right] g(\theta) d\theta \\ &= - \left[p_K^0 E_{\Theta} (x_K(\sigma, B; \theta)) + \sigma p_K^0 E_{\Theta} \left(\frac{\partial x_K(\sigma, B; \theta)}{\partial \sigma} \right) \right]. \end{aligned}$$

The cash benefit falls by the increase in expected spending on the in-kind benefit (subsidy). Expected spending on the subsidy is the sum of two terms: (i) the mechanical increase in spending on the subsidy due to the increase in the subsidy rate, holding fixed consumption of good K in each state, $p_K^0 E_{\Theta} (x_K(\sigma, B; \theta))$ (“mechanical effect”); and (ii) the increase in spending on the subsidy due to the induced change in consumption of good K in response to the shift in program benefits, $\sigma p_K^0 E_{\Theta} \left(\frac{\partial x_K(\sigma, B; \theta)}{\partial \sigma} \right)$ (“behavioral effect”).⁹

⁹The “behavioral effect” can be positive or negative, though in most cases it will be positive. It includes the income effects from the reduction in cash benefits, which tend to reduce the consumption of K (provided K is normal), as well as the income and substitution effects from the reduction in the after-subsidy price of K , which tend to increase consumption of K . A shift toward in-kind provision increases average consumption of K as long as the income effects of demand for K are not so much larger in states that lose from the shift than in states that gain as to overcome the substitution effects of the reduction in the price of K .

2.2.1 The net ex-post value in each state of a shift toward in-kind provision

In each state, the net ex-post value of the shift toward in-kind provision is the benefit of the increase in the subsidy on good K (i.e., the benefit from the reduction in the after-subsidy price of K) less the cost of the reduction in the cash benefit. A marginal increase in the subsidy rate on K reduces its after-subsidy price by p_K^0 , $\frac{dp_K(\sigma)}{d\sigma} = -p_K^0$. The value (in units of income) of this reduction in the price of K to an individual of type θ is, by the envelope theorem (Roy's identity), proportional to consumption of K ,

$$\frac{\frac{\partial v(p(\sigma;\theta), m(\sigma, B; \theta); \theta)}{\partial p_K(\sigma)} \frac{dp_K(\sigma)}{d\sigma}}{\frac{\partial v(p(\sigma;\theta), m(\sigma, B; \theta); \theta)}{\partial m}} = p_K^0 x_K(\sigma, B; \theta),$$

where $v(p, m; \theta)$ is the indirect utility function of an individual in state θ and $m(\sigma, B; \theta) = m_0(\theta) + b(\sigma, B)$ is benefit-inclusive income in state θ . This benefit from a lower after-subsidy price of K must be weighed against the reduction in the cash benefit required to hold fixed total spending on the program. Combining these two elements gives the net value (in units of income) of a budget-neutral marginal shift toward in-kind benefits of

$$\begin{aligned} \frac{\partial V(\sigma, B; \theta)}{\partial \sigma} &\equiv \frac{\frac{dv(p(\sigma;\theta), m(\sigma, B; \theta); \theta)}{d\sigma}}{\frac{\partial v(p(\sigma;\theta), m(\sigma, B; \theta); \theta)}{\partial m}} = \frac{\frac{\partial v(p(\sigma;\theta), m(\sigma, B; \theta); \theta)}{\partial p_K} \frac{dp_K(\sigma)}{d\sigma} + \frac{\partial v(p(\sigma;\theta), m(\sigma, B; \theta); \theta)}{\partial m} \frac{\partial b(\sigma, B)}{\partial \sigma}}{\frac{\partial v(p(\sigma;\theta), m(\sigma, B; \theta); \theta)}{\partial m}} \\ &= p_K^0 x_K(\sigma, B; \theta) - \int_{\Theta} \left(p_K^0 x_K(\sigma, B; \theta) + \sigma p_K^0 \frac{\partial x_K(\sigma, B; \theta)}{\partial \sigma} \right) g(\theta) d\theta \\ &= p_K^0 [x_K(\sigma, B; \theta) - E_{\Theta}(x_K(\sigma, B; \theta))] - \sigma p_K^0 E_{\Theta} \left(\frac{\partial x_K(\sigma, B; \theta)}{\partial \sigma} \right). \quad (1) \end{aligned}$$

The marginal net value for an individual in state θ of a budget-neutral marginal shift in benefits toward in-kind benefits is the net benefit of the resulting redistribution to that state (redistribution benefit), $p_K^0 [x_K(\sigma, B; \theta) - E_{\Theta}(x_K(\sigma, B; \theta))]$, which is greater for states with greater levels of demand for K , less the average marginal distortion cost from the induced change in consumption of K (moral hazard cost), $\sigma p_K^0 E_{\Theta} \left(\frac{\partial x_K(\sigma, B; \theta)}{\partial \sigma} \right)$.

Equation 1 shows that the shift toward in-kind provision has two key effects. It redistributes toward states with above-average demand for the good, and it distorts consumption of the good. The extent to which the individual gains ex post from a marginal shift toward greater in-kind provision is increasing in her level of demand for the good in that state and is decreasing in the average sensitivity of the demand for the good across all states.

2.2.2 The net ex-ante value of a shift toward in-kind provision

Ex-ante expected utility is

$$EU(\sigma, B) = \int_{\Theta} v(p(\sigma; \theta), m(\sigma, B; \theta); \theta) g(\theta) d\theta.$$

The partial derivative of expected utility with respect to the in-kind component σ (adjusting the cash component b to hold fixed total program spending B) is

$$\begin{aligned} \frac{\partial EU(\sigma, B)}{\partial \sigma} &= \int_{\Theta} \frac{dv(p(\sigma; \theta), m(\sigma, B; \theta); \theta)}{d\sigma} g(\theta) d\theta = \int_{\Theta} \lambda(\sigma, B; \theta) \frac{\partial V(\sigma, B; \theta)}{\partial \sigma} g(\theta) d\theta \\ &= p_K^0 Cov_{\Theta} [\lambda(\sigma, B; \theta), x_K(\sigma, B; \theta)] - \sigma p_K^0 E_{\Theta} [\lambda(\sigma, B; \theta)] E_{\Theta} \left(\frac{\partial x_K(\sigma, B; \theta)}{\partial \sigma} \right), \end{aligned}$$

where $\lambda(\sigma, B; \theta)$ is the marginal utility of income.¹⁰

This analysis reveals three key determinants of the welfare effects of in-kind provision. The first is heterogeneity within benefit-eligible states in the demand for K . This determines the extent to which in-kind provision concentrates benefits in certain eligible states and not others. The second is the sensitivity of the demand for K to the composition of benefits. This determines the moral hazard cost of in-kind provision and the value to recipients of the in-kind benefit. The third is the covariance across states in the demand for K and marginal utility. This covariance—which is increasing in the variance in the demand for K , the variance in marginal utility, and the correlation between demand for K and marginal utility—determines the targeting benefit of in-kind provision. In the following sections, we investigate these key determinants of the welfare effects of in-kind provision in the context of home care insurance.

3 Home Care Risk and Insurance

Chronic health problems are the source of one of the most important risks people face over the life cycle. Roughly 15 percent of Americans over age 50 have at least one person helping them

¹⁰Appendix A.1 analyzes the optimal mix of in-kind and cash benefits. Absent heterogeneity in the demand for K , the optimal policy is a pure cash benefit with no subsidy on K , ($b = B, \sigma = 0$). Absent moral hazard, the optimal policy eliminates the covariance between marginal utility and the demand for K , since the in-kind benefit redistributes across states with different levels of demand for K at no efficiency cost. If the demand for K is heterogeneous across states and at least somewhat elastic, the optimal policy trades off the insurance benefit of increasing in-kind provision against the moral hazard cost. In most cases it will stop short of eliminating the covariance between marginal utility and the demand for K , since at the margin there would be only a moral hazard cost and no targeting benefit.

perform activities of daily living (ADL) such as bathing, eating, and dressing (Barczyk and Kredler, 2016). The vast majority of those receiving help (87 percent) live in the community (the rest live in care-giving facilities, mainly nursing homes), and 74 percent of all care hours occur in private homes (Barczyk and Kredler, 2016). Spending on formal home care was \$88 billion in 2015 (Reaves and Musumeci, 2015; Centers for Medicare and Medicaid Services, 2017), and the total cost of home-based care, including (hard-to-measure) informal care from family and friends, is thought to exceed the total cost of formal long-term care services (Arno et al., 1999). Despite the magnitude of this risk, just 10 percent of people 65 and older own private long-term care insurance, and as a result a large share of the costs of long-term care in general and home care in particular are paid by the means-tested Medicaid program.

Medicaid home care programs are an important source of care for many people. In 2013, Medicaid spent \$57 billion on the home-based care of more than 3 million recipients (about \$17,000 per beneficiary). This is about half of Medicaid’s total spending on long-term care (Kaiser Commission on Medicaid and the Uninsured, 2016) and about two-thirds of all spending on formal home care. Eligibility for Medicaid home care benefits is determined by financial- and health-related criteria. An individual must have sufficiently low income and assets and must have at least two ADL limitations that are expected to persist at least 90 days. The traditional Medicaid home care benefit is an in-kind benefit of formal home care from a Medicaid-approved agency. The amount of care an individual can receive free of charge is determined by a medical examination, though in the specific cases we analyze there does not appear to be a binding upper limit (see Appendix A.4). But in recognition of the importance of informal care and other ways of dealing with chronic health problems, many state Medicaid programs have implemented reforms toward more flexible, cash-like benefits (Doty et al., 2010). These programs tend to allow recipients to spend their benefits on a wide range of personal care goods and services, including assistive devices, home modifications, and, most important, informal care from family or friends. More flexible, cash-like benefits are increasingly common in other countries as well. Germany, France, Italy, Austria, Sweden, and the Netherlands, for example, all have long-term care programs that either pay benefits in cash or allow recipients to choose between cash and in-kind benefits (Da Roit and Le Bihan, 2010).

An important milestone in the debate about more- vs. less- flexible benefits, and an important source of evidence in our paper, is the Cash and Counseling demonstrations. These were large-scale experiments run by Medicaid programs in Arkansas, Florida, and New Jersey that began in 1998. Participants were randomly assigned to either the traditional in-kind home care benefit or a near-cash benefit.¹¹ The main goal of the experiments was to test

¹¹Appendix A.2 contains more information about Medicaid home care and the Cash and Counseling experiments, including summary statistics of Cash and Counseling participants and balance tests which

whether recipients could effectively manage their cash benefits and receive “enough” care. The results were almost uniformly positive. Members of the cash-benefit treatment group reported greater satisfaction with their care (Foster et al., 2003) and with their lives as a whole (Brown et al., 2007) and had similar, if not better, health outcomes (Lepidus Carlson et al., 2007). In the official final report on the experiments, Brown et al. (2007) conclude that the near-cash transfer had overwhelmingly positive effects on recipients.

That recipients prefer more flexible transfers is an important cost of providing home care in kind. This cost must be weighed against any benefits. But despite the rich evidence from the Cash and Counseling experiments, little is known about the potential benefits of in-kind provision, whether for Medicaid home care or for other programs more generally (Currie and Gahvari, 2008). A potential benefit likely to be important in many contexts, including home care, is better targeting.

The targeting effects of in-kind provision, as discussed in Section 2, are increasing in the heterogeneity in demand for the good within the eligible population. Data from the National Long Term Care Survey (NLTC), a nationally representative survey of Americans 65 and older, indicate that the demand for formal home care is highly heterogeneous within the eligible population (see Table 4 for summary statistics). Figure 2 shows the distribution of formal care consumption in the population eligible for home care benefits, people with two or more ADL limitations living in the community. Even within this group of people with severe chronic health problems, there is significant heterogeneity in demand for formal care. 62 percent do not consume any formal care, and among those who do there is a long right tail. Conditional on consuming any care, median consumption is 14 hours per week (\$11,000 per year at the average market price) and the 95th percentile is 168 hours per week (\$131,000 per year). Such heterogeneity within the benefit-eligible population means that in-kind provision likely has important targeting effects, concentrating benefits on those with the greatest demand for formal care. The heterogeneity also suggests that a cash benefit would leave significant risk uninsured, since heterogeneity in spending on formal care translates into heterogeneity in the resources available for non-care consumption.¹²

Whether the targeting effects of in-kind provision can be achieved more directly by “tagging” cash transfers (Akerlof, 1978) depends on how well the heterogeneity in the demand

provide evidence of a valid randomization. The near-cash benefit was a cash budget that had to be spent on personal care services. This requirement seems unlikely to have been binding in practice since the vast majority of participants had been receiving enough informal care at baseline to more than exhaust their benefit. Participants randomized to the near-cash benefit could revert to the standard in-kind benefit at any time; those randomized to the in-kind benefit could not receive the near-cash benefit.

¹²This heterogeneity in the cross section likely overstates the risk facing any individual, since it partly reflects permanent or predictable heterogeneity across different types of people in addition to heterogeneity in realizations of a common risk faced by ex-ante identical individuals.

for formal care can be predicted by verifiable, and ideally immutable, characteristics. Appendix A.3 shows that the vast majority of the variation in formal care consumption cannot be explained by even an extensive set of individual and household characteristics, including Medicaid care plans based on individual medical exams. The share of the variance that even non-parametric, machine-learning models can predict out of sample never exceeds about 20 percent. A key consequence of this unexplained variation is that even extensively-tagged cash transfers would leave much of the heterogeneity in formal care and non-care consumption uninsured. The scope for tagging appears limited in this context, even ignoring any verification and moral hazard costs that would be involved.

A likely cause of the unexplained variation in the demand for formal care is hard-to-verify heterogeneity in both health problems and the costs of coping with a given set of health problems. Among people with the same severe chronic health problems, for example, the cost of coping with those problems is likely to be much greater for those who do not have good informal care options. But it may be difficult for insurers, whether private insurers or government programs, to condition benefits on such differences. To the extent that the cost of coping with bad health varies widely within states of the world that insurers cannot easily distinguish from one another—as suggested by the likely difficulties of verifying differences in health and coping costs and by the substantial residual variation in formal care consumption conditional on even large sets of characteristics—high-cost states cannot be targeted directly. Hard-to-verify heterogeneity in the costs of bad health introduces a potential targeting rationale for in-kind provision.

4 Moral Hazard Effects of In-Kind Provision and the Value of In-Kind Benefits

As shown in Section 2, the welfare effects of in-kind provision depend on the sensitivity of demand to the composition of benefits, which determines the moral hazard cost of in-kind provision and how much recipients value the in-kind benefit. We use the Cash and Counseling experiments to estimate the slope of this demand curve.¹³ The Cash and Counseling experiments have two major advantages. First, the randomization solves an especially difficult simultaneity problem: Many factors that shift the supply of formal care are also likely

¹³Previous research on the Cash and Counseling demonstrations has focused on *paid* and *unpaid* home care, whether provided by professionals or family and friends, rather than on formal care (provided by professionals). For example, Carlson et al. (2007) and Brown et al. (2007) compare hours of paid care, unpaid care, and total hours of care across the in-kind and near-cash groups. To our knowledge, we are the first to use the Cash and Counseling experiments to estimate the slope of demand for formal care.

to shift the demand for formal care by changing the opportunity cost of informal care.¹⁴ Second, the variation in the price of formal care spans the full range most relevant for policy, from zero to the market price.

The experimental results provide strong evidence that in-kind provision of home care has a large moral hazard cost. Table 1 shows that being randomized to in-kind benefits doubles average consumption of formal care from 7.1 to 14.8 hours per week. Figure 3 shows that in-kind provision increases formal care consumption throughout the distribution, more than doubling the fraction of people who consume formal care (from 21 to 55 percent) and increasing 95th-percentile consumption by 15 hours per week.

We estimate the sensitivity of the demand for formal care to the composition of benefits taking into account censoring at zero and imperfect compliance. We account for censoring by treating an individual’s observed hours of care, q_i , as the outcome of a censored, latent demand for care, $q_i = \max\{0, q_i^*\}$. We account for imperfect compliance—some people assigned to the near-cash benefit reverted to the traditional in-kind benefit and some people left Medicaid home care altogether—by using the randomized assignment as an instrument for the price each participant faced.¹⁵ We estimate the system

$$\begin{aligned} q_i^* &= \alpha + \beta p_i + X_i \gamma + \varepsilon_i \\ q_i &= \max\{0, q_i^*\} \\ p_i &= \mu_0 + \mu_1 \text{Cash}_i + X_i \mu_2 + \nu_i, \end{aligned}$$

where p_i is the price of formal care, Cash_i is an indicator of whether the participant was randomized to the near-cash treatment, and X_i includes indicators for gender, education level, race, self-rated health, five-year age bins, and state. The key parameter of interest is β , the effect on formal care consumption of an increase in its net-of-subsidy price. Absent income effects of demand for formal care, β is sufficient for analyzing counterfactual policies

¹⁴For example, consider using minimum wage laws (or their changes over time) as instruments for the price of formal care. Many formal home care workers earn roughly the minimum wage, so changes in the minimum wage are likely to shift the supply of formal care. But at the same time, changes in the minimum wage are also likely to change the opportunity cost of informal care-giving by changing the wage or employment prospects of some potential informal care-givers. This in turn likely shifts the demand for formal care since formal and informal care are closely-related goods.

¹⁵Participants who receive the near-cash benefit or who leave Medicaid home care face the market price in their state. Participants who receive the in-kind benefit face a price of zero. In principle, care plans or maximum benefit rules could limit the amount of formal care that those receiving the in-kind benefit could consume free of charge and thereby raise the shadow price of formal care above zero. In practice, recipients of the traditional in-kind benefit (but not the near-cash benefit) had opportunities to increase their benefit amount, and a variety of evidence suggests that they were able to consume as much care as they wished free of charge. Appendix A.4 has additional details and evidence. It also tests the robustness of the results to a variety of different assumptions.

that affect the relative price of formal care, regardless of any effects they might have on income.¹⁶ As a baseline, we assume that (ε_i, ν_i) are jointly normal and estimate this system using an instrumental variables Tobit specification.

The first-stage results are presented in Table 2, and the instrumental variables estimate of β is presented in Table 3. As one would expect given the nature of the experiment, the first stage relationship is economically and statistically large (being assigned to the in-kind benefit decreases the average price of formal care by \$8.84, and the F-statistic exceeds 1,000), and adding control variables has little effect the estimates. The instrumental variables estimate implies that a one-dollar increase in the hourly price of formal care reduces consumption by 1.8 hours per week. Evaluated at the sample means, this implies an elasticity of -1.2 . The conclusion that the demand for formal care is highly sensitive to its price holds in each of the three states and is robust to a wide range of alternative assumptions about the distribution of the error terms and benefit limits (see Appendix A.4).¹⁷

The estimates imply that in-kind provision has a large moral hazard cost. Someone consuming the average amount of formal care among participants randomized to in-kind benefits (14 hours per week), for example, would not consume any formal care without the subsidy and values the care she does receive at only 28 percent of its cost. The implication that many recipients value the in-kind benefit much less than its cost is qualitatively consistent with earlier research documenting negative effects of being assigned to the in-kind benefit on satisfaction with one’s care and life as a whole (Foster et al., 2003; Brown et al., 2007).

5 Targeting Effects of In-Kind Provision

We investigate the targeting effects of in-kind provision of home care using both nationally representative data from the NLTCs and the experimental variation in the Cash and Coun-

¹⁶With non-zero income effects of demand for formal care, this parameter is appropriate for analyzing the Cash and Counseling experiments but not policies with different cash benefits. The Cash and Counseling experiments roughly held fixed Medicaid spending on each participant of the experiments—a group whose average cost is much greater than that of the population of eligibles as a whole. Cash and Counseling’s near-cash benefits were therefore on average greater than those under the main policy counterfactual we have in mind, which, as discussed in Section 2, holds fixed total spending on the program. With positive income effects of demand for formal care, our estimates will tend to understate the true moral hazard costs of these other policies of interest.

¹⁷Appendix A.4 also discusses the generalizability of the results to other populations and policies of interest. There are two key issues that tend to offset each other. First, people whose demand was more sensitive to price had a greater incentive to participate in the experiment. Second, the nature of the experiment—especially its unexpected occurrence and uncertain duration—likely reduced the size of the responses relative to those that would be expected under an anticipated, permanent change in policies. In light of the possible issues with generalizability, in our welfare analysis (Section 6), we test the robustness of our results to a wide range of values of the slope of demand.

selling demonstrations. As discussed in Section 2, better targeting means a higher covariance between benefits and marginal utility. Since marginal utility is not observable, we summarize the relationship between benefits received and various observable characteristics likely to be associated with marginal utility. We focus on three sets of characteristics that both empirical evidence and theoretical reasoning suggest are closely linked to marginal utility in our context: formal care consumption, proxies for informal care costs, and health. The greater is someone’s formal care consumption and the worse are someone’s informal care options and health, the greater are the costs of coping with bad health. Greater costs of coping with bad health leave fewer resources for non-care consumption. In many models, this means higher marginal utility.¹⁸

In-kind transfers can have targeting effects on both the extensive and intensive margins. On the extensive margin, if taking up benefits is costly, people with relatively low demand might not join the program. This concentrates benefits on those who do join. We investigate take-up of Medicaid home care benefits among the eligible population using nationally representative data from the NLTCs. Take up of Medicaid home care reflects the combined effects of not only in-kind provision but also other features of Medicaid home care, including awareness of the program, hassle costs of taking up benefits, and stigma of participating. The first three rows of Table 4 show estimates of the fraction of people eligible for Medicaid home care who take up benefits (see Appendix A.2 for details). We estimate that only 4–16 percent of those eligible take up benefits. The low take-up rate implies a significant concentration of benefits within the eligible population: Benefits per recipient are between 6 and 24 times greater than they would be under a hypothetical program with the same budget and 100 percent take up.

Whether the targeting induced by extensive-margin take-up decisions improves insurance depends on whether take-up is greater in higher-marginal utility states. The next several rows of Table 4 compare the characteristics of those who do versus do not take up benefits. People who take up have a much greater demand for price-adjusted formal care, are sicker, and appear to have worse informal care options.¹⁹ Even conditional on the personal and

¹⁸Although spending on formal care is far from the only cost of bad health, high formal care consumption seems likely to be the best indicator of high marginal utility in this context. That many private long-term care insurance contracts subsidize the consumption of formal care is suggestive revealed-preference evidence that formal care consumption is positively related to marginal utility. Moreover, many models of formal care consumption, including the standard model of health risks in which health spending is equivalent to a wealth shock, predict a (usually strong) positive link between formal care consumption and marginal utility. Formal care consumption likely reflects the combined influence of health, informal care options, and other determinants of coping costs. Differences in formal care consumption are not offset by differences in informal care. In the Cash and Counseling experiments, the correlation between formal and informal care hours is roughly zero.

¹⁹For this table, we have adjusted each individual’s formal care consumption for differences in prices in order to isolate differences in the level of demand. We use our estimated price sensitivity of demand to simulate each individual’s consumption if she were to face a price of \$18.50 per hour, the highest price in

family characteristics in Table 4, including measures of health and proxies for informal care costs, those who take up Medicaid home care have much greater demand for formal care, both on average and throughout the right tail of the distribution (see Appendix Table A.1). This suggests that the (self-)targeting from Medicaid take-up decisions might be hard to replicate even with tagged cash transfers that conditioned on health and informal care-related characteristics. These results are consistent with in-kind provision and other aspects of Medicaid home care affecting take-up decisions in a way that targets relatively high-marginal utility states. Although in principle awareness, stigma, or other factors could have led to “perverse targeting” in which those most desperate for help were least likely to receive it, in practice take-up is strongly increasing in the demand for formal care.

Unlike cash benefits, in-kind benefits can have important targeting effects on the intensive margin among those who take up benefits as well. We investigate the targeting effects of in-kind provision on the intensive margin using the Cash and Counseling experiments. Whereas decisions to take up Medicaid home care could reflect a variety of factors, the experimental design isolates the effect of in-kind provision. One comparison of interest is between the distribution of benefits among those randomized to the in-kind benefit and the counterfactual distribution of benefits that would have arisen under a hypothetical uniform cash benefit. Another is between the distribution of benefits among those randomized to the in-kind benefit and the distribution of benefits among those randomized to the experimental near-cash benefit. Because the experimental near-cash benefits were based on individual medical exams, in principle they could be much more targeted than a hypothetical uniform cash benefit would be.

Figure 4a shows kernel density plots of benefits for members of the in-kind and near-cash groups.²⁰ In-kind provision concentrates benefits substantially. The variance in benefits received is 7 times greater in the in-kind group, with much larger fractions of very low and very high benefits. The fraction of people who received no benefit is over three times larger in the in-kind group (31 percent vs. 10 percent), and 17 percent of the in-kind group received benefits whose cost is at least as great as the 99th percentile benefit of the near-cash group. Figure 4b plots differences in benefits between the in-kind group and either the near-cash group or a hypothetical pure-cash benefit group (each of whom receives an identical cash

the data.

²⁰The figure is based on data from Arkansas because it is the only state with information on care plan hours, which is necessary to estimate the size of the near-cash benefits. The near-cash benefit is the product of care plan hours and the hourly price of care. The in-kind benefit amount is the product of hours of care received and the hourly price of care. Because our interest is in the concentration of benefits, we scale up the near-cash group’s benefit to have the same mean as the in-kind group (the near-cash group’s average benefit was slightly smaller than that for the in-kind group). In practice, this leads our reported measures of differences in concentration to be smaller than those calculated with the near-cash group’s unscaled cost data.

transfer equal to the per-participant average benefit in the in-kind group). Even compared to Cash and Counseling’s tagged near-cash transfer, in-kind provision significantly concentrates benefits on the intensive margin. The relative lack of targeting by the tagged near-cash benefit reinforces the evidence discussed in Section 3 that the vast majority of the variation in the demand for formal care cannot be predicted by even extensive sets of individual and household characteristics.

Figure 5 shows average benefits among those randomized to the in-kind and near-cash groups by percentile of the distribution of formal care consumption. Because formal care consumption is highly concentrated even among participants of the Cash and Counseling experiment, in-kind benefits are highly concentrated as well. Whereas the average in-kind benefit is \$133 per week, those between the 91st and 95th percentiles of the formal care distribution receive an average of \$350 per week and those above the 95th percentile receive an average of \$843 per week—almost 7 times the average benefit. The tagged near-cash benefits, by contrast, are roughly constant throughout the formal care distribution, leaving those who consume more formal care fewer resources for non-care consumption. Appendix A.5 provides suggestive evidence that in-kind provision concentrates benefits on recipients who are sicker and have worse informal care options than the average recipient.

Taken as a whole, these results show that in-kind provision sharply concentrates benefits on a small fraction of benefit-eligible states in which people are sicker, have worse informal care options, and have a greater demand for formal care. These results are consistent with in-kind provision having a large insurance benefit. When combined with the evidence that the potential for targeting these states directly using tagged cash benefits is quite limited, the targeting effects of in-kind provision appear unlikely to be achievable with alternative, less costly means of targeting. This raises the question of whether the targeting benefit of in-kind provision outweighs the moral hazard cost, the question to which we now turn.

6 Welfare Effects of In-Kind Provision: Targeting Benefit Versus Moral Hazard Cost

This section uses a stylized expected utility model to investigate the net welfare effects of the targeting benefit and moral hazard cost of the in-kind provision of home care benefits. The general approach is similar to those of the literatures on health spending risk and on optimal taxation, with small adjustments to match the home care setting.

6.1 Model

An individual faces uncertainty about her health and costs of coping with bad health. Together, these determine the level of her demand for formal care. The amount of formal care at which she reaches satiation (i.e., how much she would consume if facing a price of zero) is $\theta \in \mathbb{R}$. θ is drawn from the known distribution, $G(\theta)$ with density $g(\theta)$, but is not verifiable. Once θ is realized, the individual chooses formal care consumption, F , and non-care consumption, A (i.e., “all other goods,” the numeraire), to maximize utility subject to a budget constraint that depends on the policy in operation. Indirect utility is

$$v(p, m; \theta) = \max_{A \geq 0, F \geq 0} u \left(A - \frac{(\max\{\theta, 0\} - F)^2}{2\beta} \right) \text{ subject to } A + pF = m,$$

where p is the after-subsidy price of formal care and m is total after-transfer income, including any cash benefit from the home care program and any transfer from separate means-tested programs that provide a consumption or utility floor. The corresponding Marshallian demand for formal care is

$$F(p, m; \theta) = \max\{0, \min\{m/p, \theta - \beta p\}\}.$$

$\beta \geq 0$ determines the utility cost of consuming levels of care other than the satiation level θ and thereby determines the sensitivity of the demand for formal care to the composition of benefits.

This utility function is motivated by key evidence from our setting. It produces a simple function for the demand for formal care that is consistent with the sensitivity of formal care consumption to its price and that people become satiated at finite levels of formal care consumption.²¹ This utility function also has several appealing features. It nests as a special case the widely-used model in which health spending is equivalent to a wealth shock.²² It

²¹The most direct evidence of satiation is that among Cash and Counseling participants with information on their care plan hours, 43 percent consumed less care than they were entitled to based on their care plan. Intuitively, satiation might arise from a demand for privacy or space, since home care involves close contact with caregivers in one’s home. This utility function is also consistent with the fact that most people who need assistance do not consume any formal care. This implies that there is no Inada condition on formal care consumption and that formal care is not too complementary with other goods that people consume.

²²As β approaches 0, formal care consumption approaches θ ($F(p, m; \theta) \rightarrow \theta$, ignoring corner solutions), and the indirect utility function approaches $v(p, m; \theta) = u(m - p\theta)$. For $\beta > 0$, the demand for formal care is sensitive to its price and the indirect utility function is

$$v(p, m; \theta) = \begin{cases} u \left(m - \frac{\max\{\theta, 0\}^2}{2\beta} \right), & \text{if } \theta < \beta p; \\ u \left(m - p(\theta - \beta p) - \frac{\beta p^2}{2} \right), & \text{if } \theta \geq \beta p. \end{cases}$$

This differs from the benchmark case in which health spending is a wealth shock by just a slight adjustment, which is necessary to accommodate a non-zero price sensitivity of demand for formal care. Appendix A.6.1

has an intuitive interpretation: Utility is decreasing in any unmet, residual health needs, $(\theta - F)$, the size of which is decreasing in formal care consumption, F , and increasing in the level of demand for formal care, θ . This captures the idea that certain health problems are costly for people to cope with on their own. Marginal utility of income depends on the demand for formal care mainly through the budget constraint: Greater spending on formal care means lower non-care consumption.

We analyze idealized mixed in-kind/cash-benefit policies with a linear subsidy rate σ and a cash benefit b . Take up is automatic and there are no participation costs. Following standard practice for Medicaid home care and private long-term care insurance, we focus on programs that limit eligibility to people with two or more activities of daily living limitations. For each candidate subsidy rate $\hat{\sigma}$, we find the cash benefit $b(\hat{\sigma}, B_{IK})$ that holds fixed expected program spending (on both the cash benefit and subsidy) at the expected spending on a pure in-kind benefit program (a 100 percent subsidy with no cash benefit), B_{IK} . Policies with smaller subsidy rates have larger cash benefits.²³ We measure the welfare effect of a policy $\hat{\sigma}$ as its ex ante equivalent variation, $EV(\hat{\sigma})$, the extra income the individual would have to receive to make her as well off (in expected utility, $EU(\sigma, B)$) under a budget-equivalent pure-cash policy as she is under the policy in question:

$$EU(\sigma = 0, b = B_{IK} + EV(\hat{\sigma})) = EU(\sigma = \hat{\sigma}, b = b(\hat{\sigma}, B_{IK})).^{24}$$

6.2 Baseline parameter values

The key parameters of the model are the sensitivity of formal care demand to its price, β , and the distribution of the level of demand for formal care in the states of the world in which the individual is eligible for home care benefits, $G(\theta)$. For β , we use our main estimate from the Cash and Counseling experiment. For $G(\theta)$, we use our estimate of β to convert the observed joint distribution of formal care consumption and formal care prices in the NLTCs into a distribution of the level of demand for formal care, $G(\theta)$.²⁵ For the main analysis, which

develops further intuition about this utility function by characterizing the first-best policy.

²³We do not include spending by the means-tested consumption floor program in the budget of the home care benefit program. This tends to reduce the value of insurance and targeting benefit of in-kind provision since part of what insurance does is displace spending by the means-tested program. In the context of long-term care, this implicit taxation of private insurance by government means-tested programs is quite large (Brown and Finkelstein, 2008).

²⁴Expected utility is $EU(\sigma, B) = \int_{\Theta} \max\{\bar{u}, v(p(\sigma), m + b(\sigma, B); \theta)\} f(\theta) d\theta$, where \bar{u} is the utility floor guaranteed by separate means-tested programs, whether government programs or private charity.

²⁵This follows the common practices of using the observed cross-sectional distribution to proxy for the (unobservable) counterfactual distribution facing any one individual (e.g., Finkelstein et al., 2015) and of treating all ex-post heterogeneity as the outcome of an exogenous process (e.g., the vast majority of the large literature on optimal taxation; see Keane, 2011, for a review).

takes as given standard eligibility criteria for home care benefits, our sample is everyone aged 65 and older with at least two activities of daily living limitations. For the tags analysis, we estimate separate $G(\theta)$ distributions for each sub-group of this population as defined by their tagged characteristics (e.g., for people with different numbers of activities of daily living limitations). Estimating $G(\theta)$ would be entirely straightforward were it not for people who consume no care when facing a positive price. For the 62 percent of the population of interest who consume no formal care, however, revealed-preference analysis only bounds the level of their demand: their marginal value at zero hours of care is no greater than the price. But because we will be analyzing policies that reduce the prices people face, it is important to know at which price each individual would begin purchasing care. As a baseline, we handle this fundamental unobservability issue by extrapolating the observed distribution among people who consume a strictly positive amount of care backward to “fill in” the unobservable θ values of people who consume no formal care when facing a positive price (see Appendix A.6.2 for details).

Figure 6 presents our main estimate of the density of the level of demand for formal care, $g(\theta)$. The key features of this distribution, inherited from the observed distribution of formal care consumption, are that it exhibits a long right tail (the median is 7.8 hours per week, the mean is 20.6, and the 90th percentile is 47.9) and that most of the mass is at low values (about 60 percent of states have $\theta \leq 10$).

The remaining parameters take standard values. We follow most of the literature on health spending risks and use a constant relative risk aversion utility function, $u(c) = \frac{c^{1-\gamma}}{1-\gamma}$ (e.g., Brown and Finkelstein, 2008; Ameriks et al., 2011). In our model, the argument c is “net consumption,” non-care consumption net of any residual coping costs, $c = A - \frac{(\theta-F)^2}{2\beta}$. We follow Brown and Finkelstein (2008) and many others in taking as a baseline value a coefficient of relative risk aversion, γ , of three. Income before transfers is \$15,000 per year. The distribution of before-subsidy prices of formal care is the empirical distribution observed in the NLTCs. If the individual cannot achieve net consumption of at least $\bar{c} = \$5,000$ per year, she receives transfers that enable her to enjoy net consumption of \$5,000 per year (a consumption floor). This is meant to approximate the combined effects of means-tested government programs like Medicaid and Supplemental Security Income as well as any non-government charity care.

With these parameters, the risk within the set of states of the world traditionally eligible for home care benefits (with two or more ADL limitations) is substantial. In order to make the individual as well off as she is with the first-best policy under an alternative pure-cash benefit program, the cash benefit would have to be about \$9,377 (137 percent) greater than the expected cost of the first-best program.

6.3 Welfare effects of in-kind provision

Figure 7 shows the equivalent variation of the mixed in-kind and cash benefit policy as a function of the in-kind component, the subsidy rate σ . The optimal subsidy rate is 88 percent, close to a pure in-kind program. The optimal subsidy increases welfare substantially relative to a pure-cash benefit program. In order to make the individual as well off as she is with the optimal policy under an alternative pure-cash benefit program, the cash benefit would have to be about \$5,528 (80 percent) greater than the expected cost of the in-kind program.

The first column of Table 5 shows clearly the key tradeoff of in-kind provision. The optimal subsidy reduces expected non-care consumption due both to moral hazard and, to a lesser extent, to crowding out transfers from the consumption floor. The moral hazard cost is large: Formal care consumption is 2.4 times greater than it is in the absence of the program, and the expected ex-post equivalent variation of the optimal benefit is only 48 percent of its cost. Despite this, it is optimal to subsidize formal care at a high rate because doing so provides valuable insurance. The standard deviation of annual non-care consumption is 4.5 times greater under the pure-cash program than under the optimal program, \$5,610 vs. \$1,237. The optimal program is quite effective in targeting states of the world with greater marginal utility. The correlation between an individual's marginal utility in the absence of any program and his ex-post equivalent variation of benefits under the optimal program is 0.84. The net benefit from in-kind provision comes from the large transfers it makes to the rarely-occurring states with the greatest demand for care (and lowest non-care consumption). Ex post the individual values the optimal benefit at least as much as the cash benefit of the cost-equivalent pure-cash program only 16 percent of the time. This might help explain why many countries and U.S. states have made home care benefits more cash-like. Making benefits more cash-like helps most recipients ex post, often significantly. A key finding of this paper, however, is that the greater ex-post value of more cash-like benefits comes at the expense of much smaller benefits in states of the world with high demand for formal care, which likely worsens insurance.

The other columns of the table show how different assumptions about the key ingredients of the model affect the results. The conclusions are highly robust to changes in the price sensitivity of demand, β , the distribution of the level of demand, $G(\theta)$, and state-dependence in the utility function.²⁶ The only plausible specification in which the optimal subsidy is not

²⁶Moreover, the likely importance of state-dependent utility in our context is mitigated somewhat by the fact that our comparisons are within bad-health states (two or more ADL limitations). That private long-term care insurance contracts typically subsidize formal care suggests that any state dependence in utility does not overcome the force operating through the budget constraint pushing toward marginal utility being greater in higher-demand states. See Appendix A.6.3 for more detail about the analysis of state-dependent utility.

large is one that combines relatively low risk aversion together with a relatively generous consumption floor. But this reflects the fundamental undesirability of *any* insurance—including a first-best contract—in situations with sufficiently attractive means-tested programs rather than any undesirability of in-kind provision per se (see Brown and Finkelstein, 2008, for a related result). A government program that internalized spending by the providers of the consumption floor would wish to subsidize formal care even in this case. These columns also shed light on the key factors driving the results. As expected, the net benefit of subsidizing formal care is decreasing in the price sensitivity of demand for formal care and in the generosity of alternative insurance arrangements, such as any consumption floor or means-tested programs. It is increasing in risk aversion and in the extent to which any state-dependence in utility increases marginal utility in states with greater demand for formal care. Appendix A.6.4 discusses these results in more detail.

Although the optimal policy significantly improves upon a pure-cash policy, it achieves only 59 percent of the incremental value over a pure-cash benefit that the hypothetical first-best policy does. This shortfall is a measure of the potential gain from using a richer set of policies. A natural enrichment is to condition benefits on verifiable characteristics—i.e., to use tags—a possibility to which we now turn.

6.4 Welfare effects of more extensive tagging

This section extends the analysis to the case in which people in different states of the world, defined by their verifiable characteristics, can be offered different benefits. We estimate the gains from catering benefits to different groups of states of the world defined by whether the individual lives alone or by the number of activities of daily living limitations the individual has (2–4, 5, and 6), the two strongest predictors of formal care consumption uncovered in Section 5.²⁷ The procedure is the same as that in the last section, except that we estimate different θ distributions for each verifiably distinguishable group of states and allow the program to offer a different benefit to each group. Figures of the θ distributions of each group are reported in Appendix A.6.2.

Table 6 shows that the ex-ante welfare gain from using tags to target high-marginal utility states is quite small. The incremental welfare gain from optimally tagging a pure-cash benefit based on whether someone lives alone is \$227, just 4 percent of the gain from an optimal un-tagged mixed benefit. The incremental welfare gain from optimally tagging benefits based on the number of activities of daily living limitations someone has is even smaller.

²⁷We are limited in the number of partitions into which we can divide the state space by the size of the NLTCs sample. We chose the partitions to maximize the across-partition heterogeneity in the demand for formal care.

The fundamental reason for tags’ ineffectiveness in insuring this risk is that much of the heterogeneity in demand for formal care occurs within rather than across states that can be distinguished on the basis of their verifiable characteristics; the correlation between marginal utility in the absence of any program and the optimal tagged cash benefit is just 0.20 with the “lives alone” tag and 0.05 with the “number of activities of daily living limitations” tag. These results are similar to those of Mankiw and Weinzierl (2010), who use height as a tag for income taxation.²⁸ Better data might enable an insurer to improve on these results. But both the small gains from tagging with two of the strongest predictors of formal care consumption and the limited ability of even extensive sets of observable characteristics to predict formal care consumption (as discussed in Section 3) suggest that the scope for tagging home care benefits is quite limited. In-kind benefits appear to have an important role to play in targeting benefits to high-marginal utility states of the world.

6.5 Discussion of results

This analysis is highly stylized and leaves out a variety of potentially important factors. It does not include any potential benefits of in-kind provision other than targeting, whereas in-kind provision likely improves tax system efficiency, alleviates the Samaritan’s dilemma, and has paternalistic benefits in this context.²⁹ Nor do we consider any differences in the costs of administering or taking up different types of benefits. In the particular case of the Cash and Counseling near-cash benefit, any such differences in costs seem likely to be second order, so it seems likely that the net effect of the costs and benefits outside our analysis would be to increase the relative attractiveness of in-kind provision.³⁰ The analysis abstracts from take-up decisions and costs. Patterns of take-up decisions among those eligible for Medicaid

²⁸In both cases, the optimal tagged transfers are large; the optimal “lives-alone subsidy” is \$4,790 and the optimal “height tax” on someone earning \$50,000 is \$4,500. But the welfare gains from tagging are a small fraction of aggregate income—about 1.5 percent for a “lives-alone subsidy” and about 0.2 percent for a “height tax.”

²⁹In-kind provision of home care seems likely to improve tax system efficiency and alleviate the Samaritan’s dilemma by reducing informal care and increasing the labor supply of potential informal caregivers (Ettner, 1995; McGarry, 2006; Van Houtven et al., 2013). In-kind provision of home care may have significant paternalistic benefits given the severe cognitive health problems from which some recipients suffer. This was one of the main concerns with more flexible benefits that the Cash and Counseling experiments aimed to evaluate.

³⁰The Cash and Counseling near-cash benefit seems about as likely to involve larger as smaller costs than the traditional in-kind benefit. It requires the same medical exam to create a care plan (which, given the evidence that care plans are not binding for the traditional in-kind benefit, is higher-stakes for the near-cash benefit). It requires counseling that participants might value less than cost (otherwise the requirement would not be necessary). And it requires that recipients track and document their spending and that Medicaid monitor this spending. These aspects of the Cash and Counseling near-cash benefit may make it an exception to the general rule that more flexible, cash-like benefits tend to be less costly to administer and take up than in-kind benefits. Of course, any such cost differences are central to the welfare effects of different types of benefits.

home care appear to be consistent with “good targeting” (see Section 5), but such an analysis is obviously not definitive. The analysis focuses on home care and does not explicitly model substitution across other types of care. This was done both for simplicity and because there appears to be little substitution across different types of long-term care (Grabowski and Gruber, 2007; Kemper, 1988). Finally, it ignores any effects on the welfare of potential care-givers. Whether the actual and potential suppliers of informal care would prefer that home care benefits be provided in kind or in cash depends on the fundamental determinants of informal care (e.g., the relative importance of feelings of altruism and guilt). This is an interesting topic for future research.

Acknowledging these caveats, the results are suggestive that in-kind provision of home care increases welfare despite the large moral hazard costs. Although targeting with in-kind transfers is costly, the main alternative means of targeting—using (more extensively-)tagged cash benefits—appears to be much less effective in this context. These conclusions are fundamentally driven by the combination of significant hard-to-verify heterogeneity in the demand for formal care and the rapid rate at which marginal utility diminishes in consumption under standard utility functions (Kaplow, 2011).

7 Conclusion

We develop a general approach for analyzing a central tradeoff inherent to in-kind provision—in-kind provision can improve the targeting of benefits at the cost of being less valuable to recipients—and apply it to home care. Despite the ubiquity of in-kind transfers and the centrality of this tradeoff for their welfare effects, little is known about the magnitude of these key costs and benefits. We find that the targeting benefit of in-kind provision of home care appears to exceed its large moral hazard cost. The main factor driving this result is the significant, hard-to-verify heterogeneity in the demand for formal care—whether from hard-to-verify differences in underlying health or in the costs of coping with a given set of health problems—which implies significant heterogeneity in non-care consumption and so, in many models, in marginal utility.

Our results have important policy implications. Several recent policy reforms and proposals make restrictive in-kind benefits more flexible and cash-like.³¹ A major impetus for these proposals is the view that recipients would much prefer cost-equivalent cash transfers, a

³¹The European Commission, for example, recently urged policymakers to “always ask the question, ‘Why not cash?’ ” U.N. Secretary-General Ban Ki-moon has argued that “cash-based programming should be the preferred and default method of support.” The desirability of a universal basic income is the subject of an active debate in many countries, and the relative desirability of in-kind vs. cash benefits is the subject of an active debate in development aid and charitable giving.

view that is consistent with our analysis of the particular case of Medicaid home care. But another consequence of such reform proposals that tends to receive less attention is that they tend to systematically change the distribution of benefits received by different groups of people. To the extent that achieving a good targeting of benefits in any particular context is difficult without in-kind provision, as our analysis suggests is the case in home care, any gain from increasing the value of the benefit to recipients must be weighed against any resulting reduction in targeting efficiency.

The issue of optimal benefit design in government programs is a central one, as many of the most important government programs involve in-kind benefits, including public schooling, food vouchers, public housing, and health care. Although home care shares much in common with other important contexts, especially other types of health care, the desirability of in-kind provision is necessarily context-specific. It is therefore important to evaluate the costs and benefits of alternative benefit designs on a case-by-case basis, and our hope is that the approach we have developed in this paper will prove fruitful in the analysis of other policies as well.

References

- Akerlof, G. A. (1978). The economics of “tagging” as applied to the optimal income tax, welfare programs, and manpower planning. *American Economic Review* 68(1), 8–19.
- Ameriks, J., A. Caplin, S. Laufer, and S. V. Nieuwerburgh (2011, 04). The joy of giving or assisted living? Using strategic surveys to separate public care aversion from bequest motives. *Journal of Finance* 66(2), 519–561.
- Arno, P. S., C. Levine, and M. M. Memmott (1999). The economic value of informal caregiving. *Health Affairs* 18(2), 182–188.
- Atalas, V., A. Banerjee, R. Hanna, B. A. Olken, R. Purnamasari, and M. Wai-Poi (2016). Self-targeting: Evidence from a field experiment in indonesia. *Journal of Political Economic* 124(2), 371–427.
- Atalas, V., A. Banerjee, R. Hanna, B. A. Olken, and J. Tobias (2012). Targeting the poor: Evidence from a field experiment in indonesia. *American Economic Review* 102(4), 1206–1240.
- Atkinson, A. B. and J. E. Stiglitz (1976). The design of tax structure: direct versus indirect taxation. *Journal of Public Economics* 6(1–2), 55–75.
- Barczyk, D. and M. Kredler (2016). Evaluating long-term care policy options, taking the family seriously. *Review of Economic Studies*, forthcoming.
- Basurto, P. M., P. Dupas, and J. Robinson (2017). Decentralization and efficiency of subsidy targeting: Evidence from chiefs in rural malawi. *NBER Working Paper No. 23383*.
- Benitez-Silva, H., M. Buchinsky, and J. Rust (2004). How large are the classification errors in the social security disability award process? *NBER Working Paper No. 10219*.
- Blackorby, C. and D. Donaldson (1988). Cash versus kind, self-selection, and efficient transfers. *American Economic Review* 78(4), 691–700.
- Brown, J. R. and A. Finkelstein (2007, November). Why is the market for long-term care insurance so small? *Journal of Public Economics* 91(10), 1967–1991.
- Brown, J. R. and A. Finkelstein (2008). The interaction of public and private insurance: Medicaid and the long-term care insurance market. *American Economic Review* 98(3), 1083–1102.
- Brown, J. R. and A. Finkelstein (2011). Insuring long-term care in the United States. *Journal of Economic Perspectives* 25(4), 119–42.
- Brown, R. S., B. L. Carlson, S. Dale, L. Foster, B. Phillips, and J. Schore (2007). *Cash and Counseling: Improving the Lives of Medicaid Beneficiaries who Need Personal Care Or Home-and Community-based Services: Final Report*. Mathematica Policy Research.
- Bruce, N. and M. Waldman (1991). Transfers in kind: Why they can be efficient and nonpaternalistic. *American Economic Review* 81(5), 1345–1351.

- Carlson, B. L., L. Foster, S. B. Dale, and R. Brown (2007). Effects of cash and counseling on personal care and well-being. *Health Services Research* 42(1), 467–487.
- Centers for Medicare and Medicaid Services (2017, June). National health expenditure accounts.
- Cohen, J. and P. Dupas (2010). Free distribution or cost-sharing? evidence from a randomized malaria prevention experiment. *Quarterly Journal of Economics* CXXV(1), 1–45.
- Collinson, R. A., I. Gould Ellen, and J. Ludwig (2015). Low-income housing policy. *Kreisman Working Paper Series in Housing Law and Policy*.
- Cunha, J. M., G. De Giorgi, and S. Jayachandran (2011). The price effects of cash versus in-kind transfers. Technical report, National Bureau of Economic Research.
- Currie, J. (2006). *Public Policy and the Income Distribution*, Chapter The Take-Up of Social Benefits, pp. 80–148. Russell Sage Foundation.
- Currie, J. and F. Gahvari (2008, June). Transfers in cash and in-kind: Theory meets the data. *Journal of Economic Literature* 46(2), 333–383.
- Cutler, D. and J. Gruber (1996). Does public insurance crowd out private insurance? *Quarterly Journal of Economics* 111(2), 391–430.
- Da Roit, B. and B. Le Bihan (2010). Similar and yet so different: Cash-for-care in six european countries’ long-term care policies. *Milbank Quarterly* 88(3), 286–309.
- Dale, S., R. Brown, and B. Phillips (2004, June). Does arkansas’ cash and counseling affect service use and public costs? Technical report, Mathematica Policy Research.
- Deshpande, M. and Y. Li (2017). Who is screened out? application costs and the targeting of disability programs. *NBER Working Paper No. 23472*.
- Do, Y. K., E. C. Norton, S. C. Stearns, and C. H. Van Houtven (2015). Informal care and caregiver’s health. *Health Economics* 24, 224–237.
- Doty, P., K. J. Mahoney, and M. Sciegaj (2010). New state strategies to meet long-term care needs. *Health Affairs* 29(1), 49–56.
- Ettner, S. (1995, February). The impact of “parent care” on female labor supply decisions. *Demography* 32(1), 63–80.
- Finkelstein, A., N. Hendren, and E. F. Luttmer (2015). The value of Medicaid: Interpreting results from the Oregon health insurance experiment. Technical report, National Bureau of Economic Research, Inc.
- Finkelstein, A. and K. McGarry (2006, September). Multiple dimensions of private information: Evidence from the long-term care insurance market. *American Economic Review* 96(4), 938–958.
- Foster, L., R. Brown, B. Phillips, J. Schore, and B. Lepidus Carlson (2003, March). Improving the quality of medicaid personal assistance through consumer direction. *Health Affairs Web Exclusive*.

- Friedberg, L., W. Hao, W. Sun, A. Webb, and Z. Li (2014, October). New evidence on the risk of requiring long-term care. Working Papers, Center for Retirement Research at Boston College wp2014-12, Center for Retirement Research.
- Genworth Financial (2005). Costs of care survey. Technical report.
- Grabowski, D. C. and J. Gruber (2007). Moral hazard in nursing home use. *Journal of Health Economics* 26(3), 560–577.
- Greaney, B. P., J. P. Kaboski, and E. Van Leemput (2016). Can self-help groups really be “self-help”? *Review of Economic Studies* 83(4), 1614–1644.
- Hastings, J. S. and J. M. Shapiro (2017, January). How are SNAP benefits spent? Evidence from a retail panel. NBER Working Papers 23112, National Bureau of Economic Research, Inc.
- Hendren, N. (2013, 09). Private information and insurance rejections. *Econometrica* 81(5), 1713–1762.
- Hoynes, H. W. and D. Whitmore Schanzenbach (2009). Consumption responses to in-kind transfers: Evidence from the introduction of the food stamp program. *American Economic Journal: Applied Economics* 1(4), 109–139.
- James, G., D. Witten, T. Hastie, and R. Tibshirani (2013). *An Introduction to Statistical Learning*. Springer.
- Kaiser Commission on Medicaid and the Uninsured (2011). Medicaid home and community-based service programs: Data update. Technical report, Henry J. Kaiser Family Foundation.
- Kaiser Commission on Medicaid and the Uninsured (2016). Medicaid home and community-based services programs: 2013 data update. Technical report, Henry J. Kaiser Family Foundation.
- Kaplow, L. (2011). *The theory of taxation and public economics*. Princeton University Press.
- Kaplow, L. et al. (2008). Optimal policy with heterogeneous preferences. *The BE Journal of Economic Analysis & Policy* 8(1), 1–30.
- Keane, M. P. (2011). Labor supply and taxes: A survey. *Journal of Economic Literature* 49(4), 961–1075.
- Kemper, P. (1988). The evaluation of the national long term care demonstration: Overview of the findings. *Health Services Research* 23(1), 161.
- LeBlanc, A. J., C. Tonner, and C. Harrington (2001). State Medicaid programs offering personal care services. *Health Care Financing Review* 22(4), 155–174.
- Lepidus Carlson, B., L. Foster, S. B. Dale, and R. Brown (2007). Effects of cash and counseling on personal care and well-being. *Health Services Research* 42(1), 467–487.
- Low, H. and L. Pistaferri (2015, October). Disability insurance and the dynamics of the incentive insurance trade-off. *American Economic Review* 105(10), 2986–3029.

- Mankiw, N. G. and M. Weinzierl (2010, February). The optimal taxation of height: A case study of utilitarian income redistribution. *American Economic Journal: Economic Policy* 2(1), 155–76.
- McGarry, K. M. (2006). Does caregiving affect work? In D. A. Wise and N. Yashiro (Eds.), *Health Care Issues in the United States and Japan*, pp. 87–106. University of Chicago Press.
- Moffitt, R. (1989). Estimating the value of an in-kind transfer: The case of food stamps. *Econometrica* 57(2), 385–409.
- Mullainathan, S. and J. Spiess (2017). Machine learning: An applied econometric approach. *Journal of Economic Perspectives* 31(2), 87–106.
- Munro, A. (1992). Self-selection and optimal in-kind transfers. *The Economic Journal* 102(414), 1184–1196.
- National Conference of State Legislatures (2007). The state of long-term care. Technical report.
- Nichols, A. L. and R. J. Zeckhauser (1982). Targeting transfers through restrictions on recipients. *American Economic Review* 72(2), 372–377.
- Pauly, M. V. (1990, February). The rational nonpurchase of long-term-care insurance. *Journal of Political Economy* 98(1), 153–168.
- Reaves, E. L. and M. Musumeci (2015, December). Medicaid and long-term services and supports: A primer. Technical report, Kaiser Family Foundation.
- Reeder, W. J. (1985). The benefits and costs of the section 8 existing housing program. *Journal of Public Economics* 26(3), 349–377.
- Saez, E. (2002). The desirability of commodity taxation under non-linear income taxation and heterogeneous tastes. *Journal of Public Economics* 83(2), 217–230.
- Schneider, A., K. Fennel, and P. Keenan (1999, May). Medicaid eligibility for the elderly.
- Simpson, E. H. (1951). The interpretation of interaction in contingency tables. *Journal of the Royal Statistical Society. Series B (Methodological)*, 238–241.
- U.S. Department of Health and Human Services (1992, April). Estimating eligibility for publicly-financed home care: Not a simple task ...
- Van Houtven, C. H., N. B. Coe, and M. M. Skira (2013). The effect of informal care on work and wages. *Journal of health economics* 32, 240–252.
- Whitmore, D. (2002). What are food stamps worth? *Princeton University Working Paper #468*.

Tables and Figures

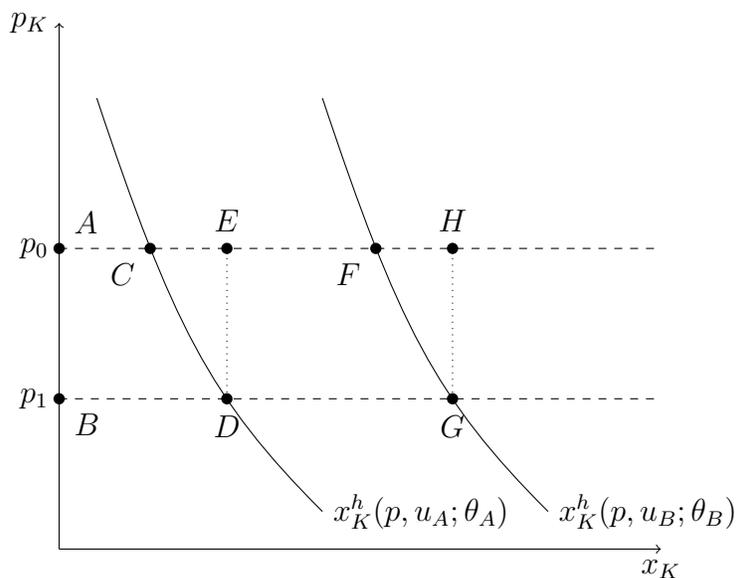
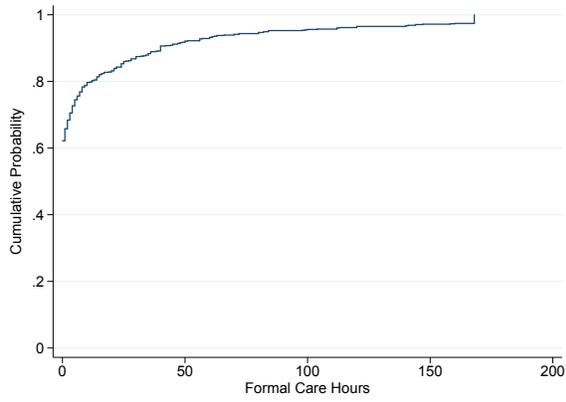
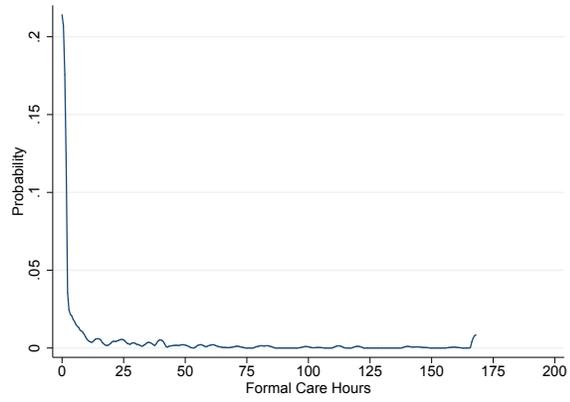


Figure 1: Equivalent variations and excess burdens of a subsidy

[Equivalent variations and excess burdens of a price subsidy that reduces the after-subsidy price from p_0 to p_1 for individuals with different levels of demand for the subsidized good. The equivalent variation of the subsidy is increasing in the level of demand for the good (individual B 's equivalent variation, the area bounded by the vertices $ABGF$, exceeds individual A 's equivalent variation, the area bounded by the vertices $ABDC$). The excess burdens of the subsidy are independent of the level of demand; they instead depend only on the slope. The excess burden of subsidizing individual A 's purchases of the good is the area bounded by the vertices CDE , and the excess burden of subsidizing individual B 's purchases of the good is the area bounded by the vertices FGH .]



(a) CDF



(b) PDF (excluding zeros)

Figure 2: Distribution of Formal Care Consumption Among Benefit-Eligible Population, NLTCS

[Consumption of formal home care, in hours per week, among the home care benefit-eligible population (65 and older with two or more ADL limitations). Data from the 1999 National Long-Term Care Survey. 62 percent do not consume any formal care. Conditional on consuming formal care, median consumption is 14 hours per week, the 75th percentile is 40 hours per week, the 90th percentile is 120 hours per week, and the 95th and 99th percentiles are 168 hours per week (around-the-clock care). One individual reported consuming more than 168 hours of care per week and has been omitted from the figures.]

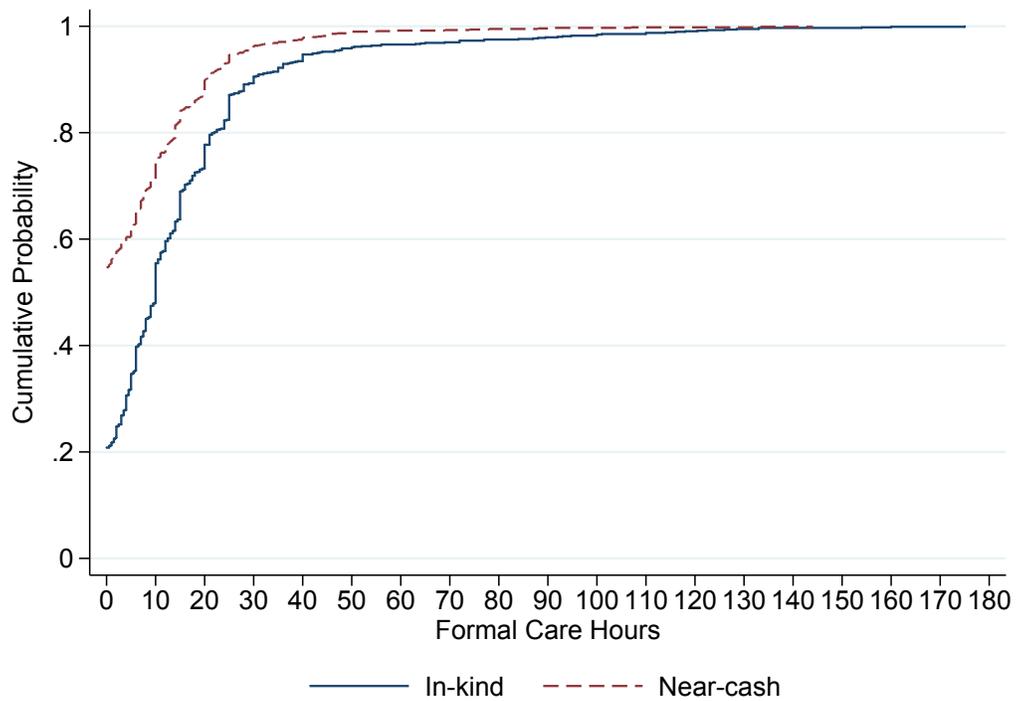
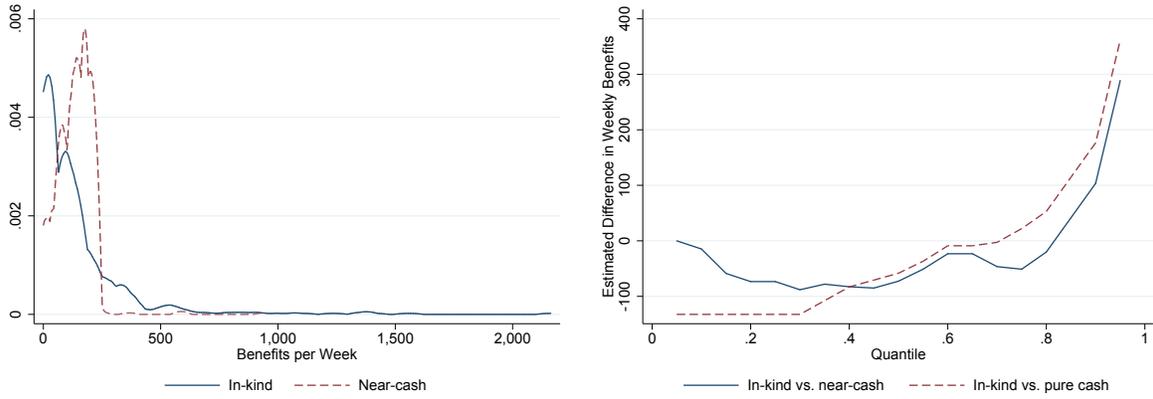


Figure 3: CDFs of Formal Care Consumption by Randomized Benefit Assignment
 [Formal home care consumption in hours per week among participants randomly assigned to in-kind vs. near-cash benefits. Data from Cash and Counseling follow-up survey.]



(a) PDFs of Benefits, Excluding Zeros

(b) Differences of Benefits

Figure 4: Targeting Effects of In-Kind Provision on the Intensive Margin

[Distributions and differences of benefits in the Arkansas Cash and Counseling experiment. Benefits are measured in cost per week at market prices. Groups are based on each individual's randomized assignment. Panel (a) plots kernel density estimates. Panel (b) shows the excess of the in-kind benefit over either the near-cash benefit or hypothetical uniform pure cash benefit equal to the average cost of the in-kind group of \$133 per week.]

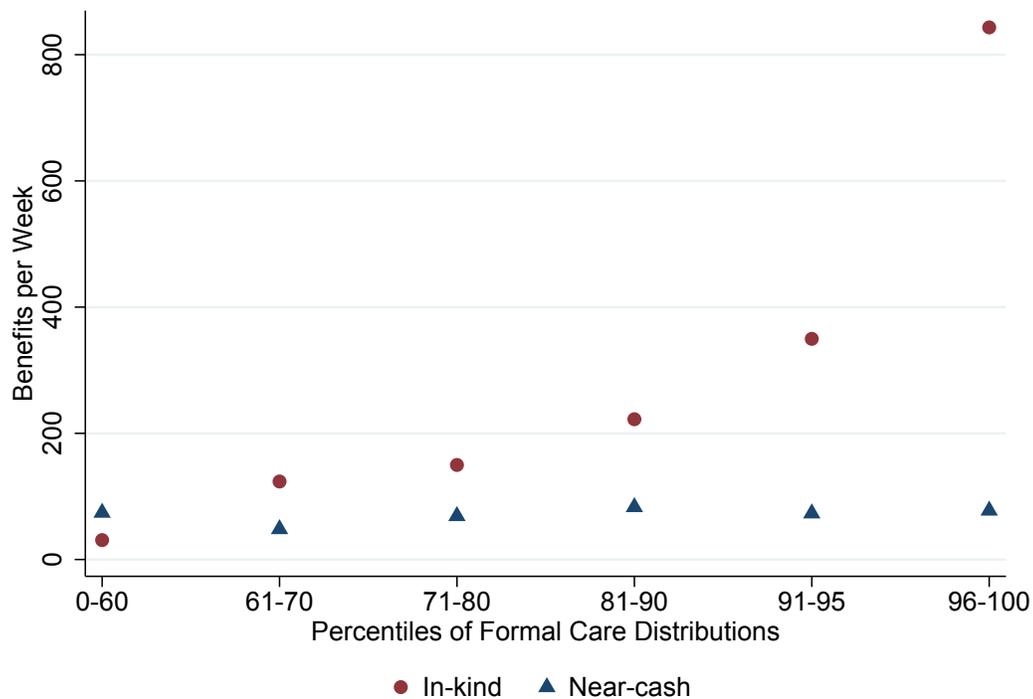


Figure 5: Targeting Effects of In-Kind Provision on the Intensive Margin: Formal Care Demand

[Average benefit costs per week in the Arkansas Cash and Counseling experiment, separately for those randomized to the in-kind and near-cash benefit. Within groups, individuals are ranked by their use of formal care at follow-up to determine their percentiles. 57 percent of those randomized to near-cash do not consume any formal care.]

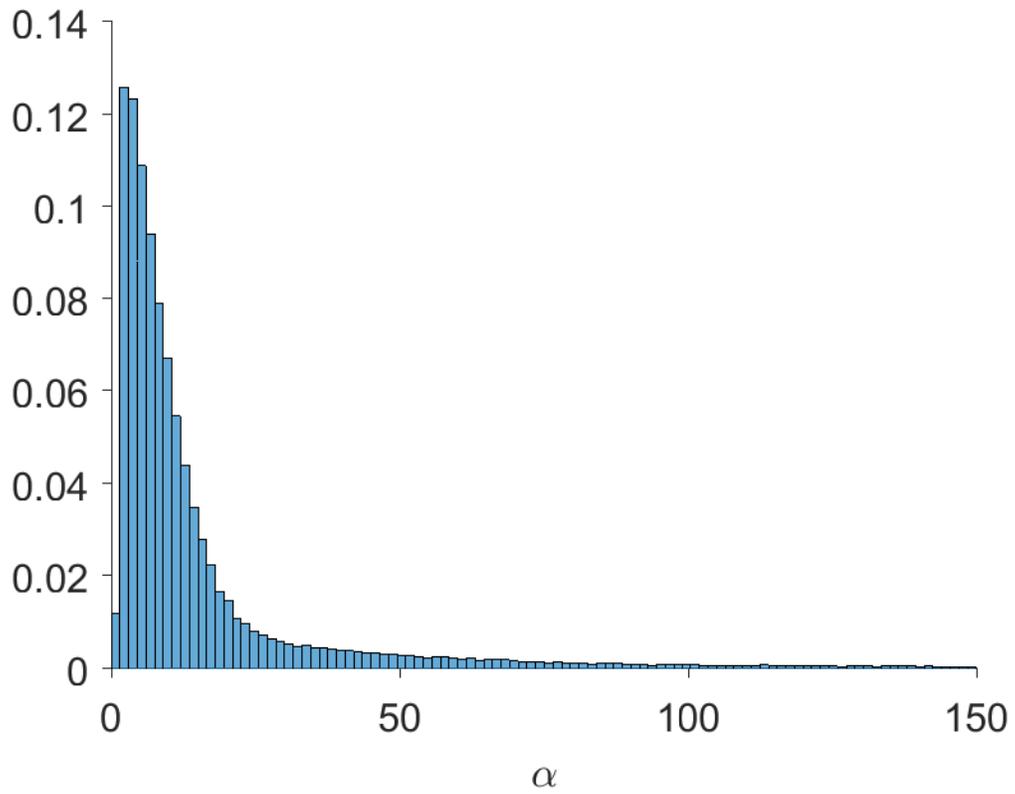


Figure 6: Distribution of the demand for formal care

[Simulated distribution of formal care satiation point, θ , in hours per week. The population is people age 65 and older with at least two activities of daily living limitations. The mean is 21 hours per week.]

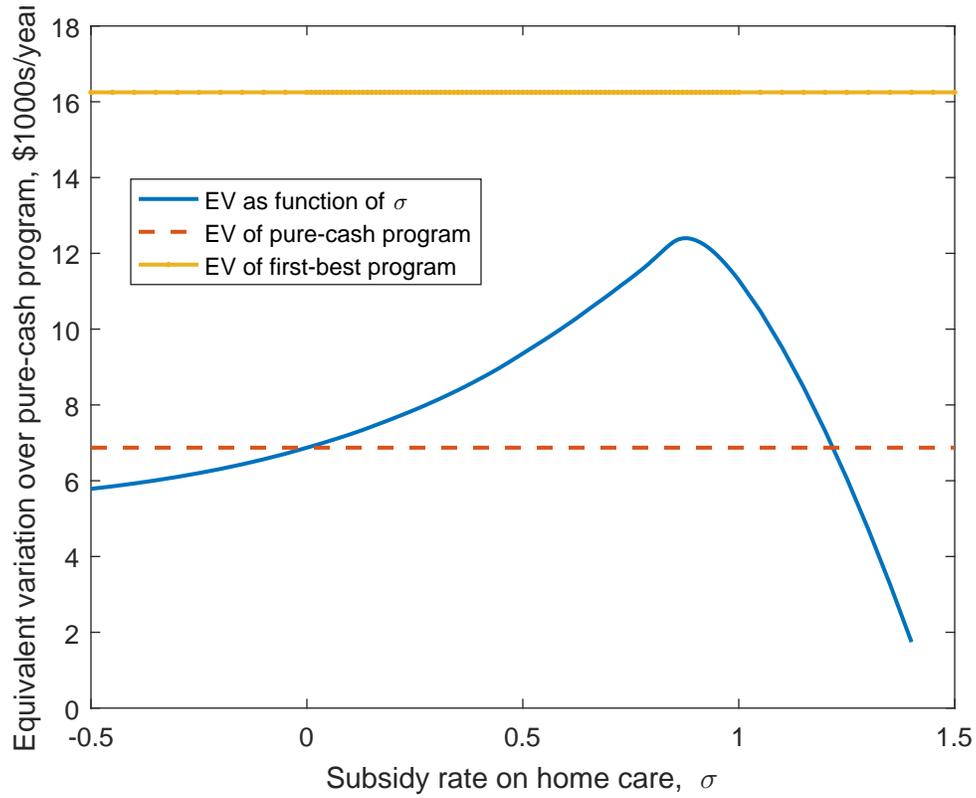


Figure 7: Equivalent variation of mixed cash/in-kind program as function of subsidy rate, σ [Equivalent variation of mixed cash/in-kind program as function of the subsidy rate, σ . Programs with larger subsidy rates have smaller cash benefits in order to hold fixed total program spending. $\sigma = 1$ corresponds to a pure in-kind benefit program (a 100 percent subsidy on formal care with no cash benefit). $\sigma = 0$ corresponds to a pure cash benefit program (a 0 percent subsidy on formal care).]

Table 1: Average Formal Care Consumption by Treatment Group

	Near-cash	In-kind	Difference p-value
Overall	7.11	14.76	0.00
Arkansas	6.94	11.00	0.00
Florida	7.79	19.35	0.00
New Jersey	6.81	16.60	0.00

Mean formal care consumption in hours per week. “Near-cash” and “In-kind” groups are defined by randomized treatment assignment. P-values test equality of means. Rows denote different samples.

Table 2: Price Sensitivity of Demand for Formal Care, First Stage Estimates

	(1)	(2)
Assigned to near-cash	8.14***	8.07***
	(0.25)	(0.25)
Controls	No	Yes
F-Statistic	1,066	1,046
Mean market price	13.73	13.73
Adjusted R-squared	0.35	0.37
Observations	1,946	1,946

Dependent variable is the marginal price of formal care. Data are from the Cash and Counseling experiments. Controls included in column (2) are indicators for gender, education level, race, self-rated health, five-year age bins, and state. Robust standard errors reported. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: The Price Sensitivity of Demand for Formal Care

	(1)	(2)
Price	-1.85***	-1.82***
	(0.17)	(0.17)
Controls	No	Yes
Mean hours, in-kind	14.76	14.76
Observations	1,946	1,946

Dependent variable is formal care consumption in hours per week. Specifications are instrumental variables Tobits where formal care hours are censored at zero. Controls included in column (2) are indicators for gender, education level, race, self-rated health, five-year age bins, and state. Data are from the Cash and Counseling experiments. Robust standard errors reported. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Targeting of Medicaid Home Care

	(1)	(2)	(3)	(4)
	Overall	Take-up = 0	Take-up = 1	Difference p-value
<i>Fraction of eligibles who do vs. do not take up, under different definitions of eligibility</i>				
Income eligible, < 2 cars		0.96	0.04	
Income eligible, no cars		0.90	0.10	
Restrictive income, no cars		0.84	0.16	
<i>Summary Statistics</i>				
Level of formal care demand	9.78	8.16	17.73	0.02
Age	82.14	82.06	82.76	0.53
Four or more ADLs	0.49	0.47	0.62	0.02
Health fair or poor	0.66	0.63	0.78	0.01
Female	0.72	0.71	0.76	0.43
Unmarried	0.61	0.58	0.73	0.02
Has children	0.74	0.76	0.75	0.84
Income	675.83	700.27	572.33	0.02

Overall means and means for people who did (column (3)) vs. did not (column (2)) take up Medicaid home care. “Difference p-value” tests the equality of means across groups. Income eligible is based on the income thresholds each state uses to determine eligibility. Restrictive income applies the lowest income limit to all states to try to estimate an upper bound on take-up. Number of cars is an important determinant of eligibility for Medicaid home care. Summary statistics by take-up decision are for those who meet the “Income eligible, <2 cars” criteria. This sample has 481 individuals. The level of formal care demand, in hours per week, uses our estimate of price sensitivity to simulate each individual’s consumption if she faced a price of \$18.50 per hour, the maximum in the data. The alternative to health fair or poor is health good or excellent. Data from the 1999 NLTCS.

	(1)	(2)	(4)	(5)	(6)	(7)	(8)	(9)–(11)				(12)	(13)	(14)	(15)
	Baseline	0	25	50	0	Max	1	2	3	4	$\gamma = 1$	$\bar{c} = \$2.5k$	Drop $\theta > 50$	θ distribution	$\theta/2$
Optimal policy															
Subsidy rate, σ^*	0.88	1.00	0.77	-0.50	0.94	0.86	1.30	-0.50	0.69	1.10	-0.50	0.89	0.59	0.75	
Equivalent variation over pure-cash policy, \$1,000s															
Optimal subsidy policy	5.53	7.60	0.71	0.00	6.09	4.28	>38.13	0.67	1.86	35.74	0.23	21.07	1.74	2.31	
First-best policy	9.38	7.60	1.96	0.22	8.35	9.52	-	-	-	-	-0.08	25.39	2.63	3.34	
Non-care consumption, \$1,000s															
Mean, optimal subsidy	15.83	15.00	20.75	21.87	15.14	15.98	12.89	20.38	16.97	14.30	20.38	15.77	17.30	16.34	
Mean, pure-cash policy	19.56	16.16	21.87	21.87	17.99	21.14	19.56	19.56	19.56	19.56	19.56	19.56	18.61	17.56	
Std. dev., optimal subsidy	1.24	0.00	1.17	0.00	0.65	1.34	3.20	6.03	3.00	1.05	6.03	1.13	1.56	1.22	
Std. dev., pure-cash policy	5.61	5.98	0.13	0.00	5.34	5.84	5.61	5.61	5.61	5.61	5.61	5.61	2.56	3.09	
Consumption distortion															
Total CV over total cost	0.48	0.65	0.88	-	0.44	0.51	0.02	-	0.63	0.26	-	0.52	0.85	0.73	
$E(q_{FC} optimal\ subsidy)$	14.01	15.80	2.84	0.00	11.67	17.73	20.31	3.78	11.55	17.30	3.78	14.15	5.37	4.97	
$E(q_{FC} pure-cash\ policy)$	5.72	13.38	0.02	0.00	5.51	6.26	5.72	5.72	5.72	5.72	5.72	5.72	2.33	2.18	
Targeting benefit															
Corr(marg. utility, CV)	0.84	0.90	0.24	-0.68	0.90	0.81	0.11	0.19	0.64	0.85	-0.94	0.81	0.74	0.81	
$E(1(subsidy > cash\ pol.))$	0.16	0.24	0.04	0.00	0.18	0.14	0.14	0.83	0.15	0.15	0.83	0.16	0.18	0.13	

Table 5: Policy analysis and robustness. Column 1 presents results based on the baseline assumptions. Columns 2–5 vary the value of β away from the baseline value of 1.8. Columns 6 and 7 vary the values of the θ 's corresponding to people who consume no formal care when facing a positive price (which are only partially-identified). Column 8 sets these θ 's to zero. Column 9 sets these θ 's to the maximum value consistent with these individuals' choices to consume no formal care when facing a positive price. Columns 10–11 use different models of state-dependent utility in which $\mu(\theta)$ is linear in θ and in which the multiplier factors $\mu(\theta)$ vary by a factor of 100, $\max_{\theta}\{\mu(\theta)\}/\min_{\theta}\{\mu(\theta)\} = 100$. In columns 12 and 13, the utility function is “inner state-dependent.” In columns 14 and 15, the utility function is “outer state-dependent.” In columns 8 and 9, $\mu(\theta)$ is decreasing, and in columns 10 and 11, $\mu(\theta)$ is increasing. See Appendix A.6 for more details about state-dependent utility. Column 12 sets the coefficient of relative risk aversion to one (log utility), whereas the baseline coefficient of relative risk aversion is three. Column 13 sets the consumption floor to \$2,500, whereas the baseline value is \$5,000. Column 14 drops values of θ (formal care satiation levels) that exceed 50 hours per week. Column 15 cuts every θ value in half. Subsidy rates are constrained to be no smaller than -0.5 (a 50 percent tax) and no greater than 1.5 (a 150 percent subsidy, under which individuals are paid 50 percent of the market price to consume units of formal care). “Total CV over cost” is the total ex-post compensating variation of benefits under the optimal program as a fraction of the total cost of these benefits. Mean values of formal care consumption, $E(q_{FC})$, are in hours per week. “Corr(marg. utility, CV)” is the correlation between marginal utility in the absence of any policy and the ex-post compensating variation of benefits under the optimal subsidy. “ $E(1(subsidy > cash\ pol.))$ ” is the fraction of people who prefer the optimal subsidy to the pure-cash policy benefit ex post.

	Tag: Lives alone		Tag: Number of ADL limitations			
	No	Yes	2-4	5	6	
Average formal care consumption, h/w	9.3	25.1	8.8	19.3	27.3	
Optimal policy, \$s in \$1,000s						
Tagged pure-cash benefits, ($B = b$)	5.67	10.46	6.08	6.4	7.92	
Tagged mixed benefits, (B, σ, b)	(5.67, 0.87, 1.4)	(10.46, 0.9, 1.77)	(6.02, 0.87, 1.52)	(8.53, 0.9, 1.11)	(7.92, 0.92, 0.68)	
Equivalent variation over untagged policy, \$1s						
Tagged pure-cash benefits, ($B = b$)	227		4			
Tagged mixed benefits, (B, σ, b)	44		8			
Targeting benefit						
Corr(marg. utility, tagged pure-cash benefit)	0.20		0.05			

Table 6: Tags analysis. Average formal care consumption, in hours per week, is estimated in the NLTCs. The sample consists of people age 65 and older with at least two activities of daily living limitations. Subsidy rates are constrained to be no smaller than -0.5 (a 50 percent tax) and no greater than 1.5 (a 150 percent subsidy, under which individuals are paid 50 percent of the market price to consume units of formal care). “Corr(marg. utility, tagged pure-cash benefit)” is the correlation between marginal utility in the absence of any policy and the optimal tagged pure-cash benefits.

Appendices

A.1 Theory Appendix

A.1.1 The optimal mix of in-kind and cash benefits

Consider a planner choosing how to allocate a given budget, B , between cash and in-kind benefits. The planner's goal is to choose the benefits package that maximizes expected utility:

$$\max_{\sigma} EU(\sigma, B) = \int_{\Theta} v(p(\sigma; \theta), m(\sigma, B; \theta); \theta) g(\theta) d\theta.$$

The first-order condition, which holds with equality at an interior optimum, σ^* ,³² is

$$\begin{aligned} \frac{\partial EU(\sigma^*, B)}{\partial \sigma} &= \int_{\Theta} \frac{dv(p(\sigma^*; \theta), m(\sigma^*, B; \theta); \theta)}{d\sigma} g(\theta) d\theta = E_{\Theta} \left(\lambda(\sigma^*, B; \theta) \frac{\partial V(\sigma^*, B; \theta)}{\partial \sigma} \right) = 0 \\ \iff Cov_{\Theta} [\lambda(\sigma^*, B; \theta), x_K(\sigma^*, B; \theta)] &= \sigma^* E_{\Theta} [\lambda(\sigma^*, B; \theta)] E_{\Theta} \left(\frac{\partial x_K(\sigma^*, B; \theta)}{\partial \sigma} \right). \quad (2) \end{aligned}$$

The second version of Equation 2 shows that, at the margin at an optimum, the covariance between marginal utility and the level of demand for K must be the same sign as the mean marginal change in K due to the shift in benefit composition, i.e.,

$$\text{sign} (Cov_{\Theta} [\lambda(\sigma^*, B; \theta), x_K(\sigma^*, B; \theta)]) = \text{sign} \left(E_{\Theta} \left(\frac{\partial x_K(\sigma^*, B; \theta)}{\partial \sigma} \right) \right).$$

This is the classic insurance–moral hazard tradeoff. Absent moral hazard, i.e., if $E_{\Theta} \left(\frac{\partial x_K(\sigma^*, B; \theta)}{\partial \sigma} \right) = 0$, the optimal benefit fully eliminates the covariance between marginal utility and the demand for K , $Cov_{\Theta} [\lambda(\sigma^*, B; \theta), x_K(\sigma^*, B; \theta)] = 0$. More generally, the greater is the marginal moral hazard cost of shifting toward in-kind provision, the greater must be the marginal targeting benefit.

The first version of Equation 2 implies that, at the margin at an interior optimum, the benefit in some states of the world from shifting toward greater in-kind provision must be exactly offset by the cost in other states. Suppose there are two states, L and H . Then at an interior optimum, at the margin the planner optimally imposes

$$\frac{\left| \frac{\partial V(\sigma^*, B; \theta_L)}{\partial \sigma} \right|}{\frac{\partial V(\sigma^*, B; \theta_H)}{\partial \sigma}} = \frac{p_H \lambda_H}{(1 - p_H) \lambda_L}$$

dollars' worth of costs on the L state in exchange for \$1 worth of benefits in the H state.

³²In certain contexts, including possibly home care, it might be feasible to subsidize formal care at more than a 100 percent rate, so that consumers face a negative net-of-subsidy price of formal care. In this case, the subsidy rate σ can take any real value and the first-order condition holds with equality. Necessary conditions for a greater-than-100-percent subsidy to be feasible are that recipients are not able to freely dispose of the good and that they eventually become satiated with the good.

The marginal willingness to pay in terms of costs imposed on the L state in order to benefit the H state by \$1 is increasing in the ratio of expected marginal utility in the H state to expected marginal utility in the L state.

A.1.2 First best

In the first-best case in which the state of the world is verifiable, the planner can choose different (b, σ) benefit bundles for each state. The total derivative of indirect utility in state θ with respect to the in-kind component of its benefit, σ , is

$$\begin{aligned} \frac{dv(p(\sigma; \theta), m(\sigma, B; \theta); \theta)}{d\sigma} &= \lambda(\sigma, B; \theta) \left[p_K^0 x_K(\sigma, B; \theta) - p_K^0 x_K(\sigma, B; \theta) - \sigma p_K^0 \frac{\partial x_K(\sigma, B; \theta)}{\partial \sigma} \right] \\ &= -\lambda(\sigma, B; \theta) \sigma p_K^0 \frac{\partial x_K(\sigma, B; \theta)}{\partial \sigma}, \end{aligned}$$

which is negative for all positive subsidy rates. When the state is verifiable, a pure cash contract is optimal, and the cash benefits in each state are chosen to equalize each state's marginal utility. With verifiable states, the planner can provide full insurance without distorting behavior, so there is no reason to introduce any distortions.

A.2 Medicaid Home Care and the Cash and Counseling Demonstrations: Additional Background

A.2.1 Medicaid Home Care

Medicaid plays a major role in financing home care. Medicaid home care programs have grown rapidly in recent years, from 1.9 million recipients in 1999 to nearly 3 million recipients in 2013, and from 18 percent of Medicaid's long-term care spending in 1995 to 51 percent in 2014 (Kaiser Commission on Medicaid and the Uninsured, 2016). Summaries of Medicaid-provided home care services are available in LeBlanc et al. (2001) and Kaiser Commission on Medicaid and the Uninsured (2011).

Eligibility for Medicaid home care is based upon a financial means tests and an assessment of one's "need" for home care based on one's health. Medicaid is financed jointly by the federal and state governments, and Medicaid policies vary somewhat across states. In most states, Medicaid provides home care primarily through two programs: the Medicaid Title XIX PCS optional State plan and the Medicaid 1915(c) HCBS waiver program. For the elderly, the means tests for Medicaid home care are often less restrictive than those for general Medicaid coverage. The majority of states provide coverage for individuals with incomes up to 300 percent of the monthly Supplemental Security Income (SSI) amount (LeBlanc et al., 2001). Those with more restrictive income limits use 100 percent of the SSI amount. The amount of Medicaid home care for which an individual qualifies is determined by a medical exam. The applicant's health care provider must submit a care plan that details the services deemed appropriate based on the applicant's health status.

Estimating take-up rates for means-tested programs in general, and for Medicaid home care in particular, is notoriously difficult (Currie, 2006; U.S. Department of Health and Human Services, 1992). Eligibility rules are complex, vary from state-to-state, and often depend on household characteristics that are unobservable to the researcher. We estimate take-up rates by combining data from the NLTCs with information on the size of the 65-and-older population and administrative estimates of the number of Medicaid home care users from LeBlanc et al. (2001). We use the NLTCs to estimate the fraction of the elderly who are eligible for benefits, based on the eligibility criteria from Schneider et al. (1999). To be eligible, someone must have at least two activities of daily living limitations and meet income and asset requirements. The main source of uncertainty in our estimated take-up rate is the incompleteness of the information on household assets in the NLTCs. Given this data limitation, we aim to bound the true eligibility rate. Our less restrictive eligibility threshold uses the income limits from Schneider et al. (1999) and limits eligibility to households with fewer than two cars. Our more restrictive eligibility threshold uses (much) more restrictive income and asset requirements than the actual limits in the vast majority of states: Household income must be no more than 100 percent of the SSI benefit and the household must have no cars (car value is one of the primary inputs to the asset tests). The more restrictive the eligibility definition, the greater the implied take up rate among eligibles. Given that our more restrictive eligibility estimate likely understates eligibility substantially, the implied take-up rate of 16 percent likely exceeds the true take-up rate.

A.2.2 Cash and Counseling Demonstrations

The Cash and Counseling experiments were large-scale experiments conducted by the Medicaid programs of Arkansas, Florida, and New Jersey in the late 1990s and early 2000s (Brown et al., 2007, for more details see). Participants were enrolled beginning in 1998 in Arkansas, 1999 in New Jersey, and 2000 in Florida. In New Jersey and Florida, only individuals who were currently receiving Medicaid home care were eligible to participate in the demonstrations. Arkansas allowed a limited number of individuals who qualified for but were not receiving Medicaid home care to participate.³³ Both non-elderly and elderly individuals were enrolled and there was no screening on whether the individual had or would be able to find sources of care. Participants were given a baseline survey and then randomized to the traditional in-kind benefit or an experimental near-cash benefit, each with a 50 percent probability. Participants were surveyed 4-6 months after enrollment and again 9 months after enrollment. We use data from the baseline and 9-month follow-up surveys.

The near-cash benefit was slightly less than the cashed-out cost of the individual's care plan. This stemmed from a requirement that the experimental cash treatment be budget-neutral, which meant that the costs of paying the counselors who helped treatment group members manage their care came out of the cash allowances. For example, in New Jersey, 10 percent of the value of the care plan was set aside to cover program costs. Counselors were available to participants to help them develop plans for spending the money, issue checks (to caregivers or other service providers), handle paperwork associated with being an employer (e.g. payroll taxes), and maintain account records related to the demonstrations. Recipients

³³These individuals had to verbally commit to seeking the in-kind benefit if they were not randomized to the near-cash benefit.

had to submit receipts documenting that they spent their benefits on personal care services, though they were allowed to spend up to 10 percent of their allowance on services that could not be readily invoiced, e.g., payments to a neighbor for mowing the lawn.

Appendix Table A.2 provides summary statistics on the Cash and Counseling participants. We restrict the sample to those who are at least 65 years of age with nonmissing data on age, gender, race, education, and self-rated health. Our final sample includes 1,946 individuals. At baseline, average formal care consumption ranges from 8 (Arkansas) to 16 (New Jersey) hours per week, and the average number of informal caregivers is two. The average age is in the upper 70s, the majority of participants are female, and education levels are low. Although non-negligible fractions of the treatment and control groups attrited from the experiment before the nine-month follow-up survey (20 and 35 percent, respectively), of the 30 balance tests, none of the differences between treatment and control groups are statistically significant at the 5 percent level and only one is significant at the 10 percent level—fewer than would be expected to arise by chance without any differential attrition.

Not surprisingly, participants in the experiments are somewhat different from the broader population of Medicaid home care users in the US. Comparing Appendix Table A.2 to Table 4, participants in the experiments used less formal care and were somewhat younger and less likely to be married than Medicaid home care users in the US. These differences could arise from selection into the experiment or from differences in the composition of Medicaid home care users across states. Unfortunately, the NLTCs has too few Medicaid home care recipients in Arkansas, Florida, and New Jersey to address this directly. We discuss issues related to the internal and external validity of our analysis in more detail in Section A.4.

A.3 Predicting Formal Care Consumption

This appendix investigates the extent to which observable characteristics can predict formal care consumption. The goal is to gauge the extent to which the risk from chronic health problems could potentially be insured by directly-targeted benefits (i.e., conditioning benefits on “tags”). We separately predict formal care consumption among the home care benefit-eligible population and among Cash and Counseling participants.

We follow the standard approach from the predictive modeling literature: randomly split the sample into two subsamples, train the model on one subsample (the training sample), use the trained model to make predictions for the other subsample (the test sample), and assess predictive power in the test sample. We repeat this process 1,000 times and report the mean and standard deviation of the results. We implement two separate modeling approaches: OLS and machine learning. OLS is familiar and transparent and produces intuitive output. Machine learning methods are the state-of-the-art. We implement random forest models and use five-fold cross-validation. Dimensions that are optimized include the number of trees, tree depth, minimum leaf size, and number of variables to (randomly) sample at each split.³⁴

Appendix Table A.3 reports the results. The top panel shows the analysis of the benefit-

³⁴We have also experimented with two different aggregation methods, bagging and boosting. These have little effect on the results. See James et al. (2013) for background on machine learning techniques and Mullainathan and Spiess (2017) for a discussion on the uses of machine learning in economics.

eligible population, using the NLTCs. The NLTCs includes 887 individuals eligible for home care benefits (with two or more ADL limitations) and features an extensive set of individual- and household-level variables.³⁵ It has especially rich measures of health, including self-rated health and many detailed objective measures. Yet despite this richness, across the two techniques and the many specifications, observable characteristics never explain more than about 12 percent of the variation in formal care consumption among the benefit-eligible population out of sample, leaving the vast majority of the variation unexplained.³⁶ Although predictive power would presumably be at least somewhat greater in a larger dataset with an even richer set of variables, these results suggest that even extensively-tagged cash benefits would leave much of the variation in formal care consumption among the benefit-eligible population uninsured.³⁷

The bottom panel of Appendix Table A.3 reports the results of a similar analysis of participants of the Cash and Counseling experiments. This analysis differs from the previous one in two main ways. First, Cash and Counseling participants are a selected subset of the benefit-eligible population that is likely much more homogeneous, especially in demand for formal care, than the benefit-eligible population as a whole. Second, the variables in the Cash and Counseling data are much less extensive than those in the NLTCs but include a potentially important observable that the NLTCs lacks: Medicaid care plan hours.³⁸ Medicaid home care programs require participants to have a medical exam with a physician or nurse, who creates a care plan meant to reflect recipients “need” for care. “Need” is supposed to reflect not just health problems but the availability of paid and unpaid caregivers as well (Dale et al., 2004). In principle, care plan hours should be as close to a summary measure of demand on which an insurer could potentially condition benefits as is feasible. Such case-by-case examinations by experts, which are commonly used by disability insurance programs, are an alternative, costly way to condition benefits on individual circumstances beyond using readily-observable characteristics.

The results show that the vast majority of the variation in formal care consumption among Cash and Counseling participants remains unexplained by care plan or any other variable in the data: The out-of-sample R^2 never exceeds about 0.21. Care plan hours account for less

³⁵See table notes for a listing of the specific variables used.

³⁶Of course, including enough variables in the model can produce an in-sample fit that is arbitrarily high. The in-sample R^2 gets as high as 0.56 in one specification. But in-sample R^2 is a biased measure of predictive ability due to overfitting. Such overfitting is apparent in the out-of-sample fit of the richest models, which perform worse than a simple regression with a constant alone ($R^2 < 0$). Because the machine learning algorithms are non-parametric, the interaction variables added in rows 4-7 do not effectively alter the set of “predictors” available to the algorithm.

³⁷This analysis ignores the moral hazard and verification costs that would be involved in using many of these variables as tags. In practice these factors would limit the net value of using tagged cash benefits still further. In this sense the analysis represents an upper bound on the likely value of using tagged cash benefits.

³⁸This analysis focuses on Cash and Counseling participants in Arkansas (the only state for which we have information on care plans) who were randomized to the in-kind benefit (the main group for whom care plan hours should be predictive of formal care consumption). We use two measures of care plan hours in the analysis: care plan hours at baseline and care plan hours twelve months after baseline. Care plans are updated every six months in Arkansas. Because formal care consumption is measured nine months after baseline, we do not know which of the two care plans is in operation at that time. But the lack of variation in care plans over the twelve month period—the correlation between an individuals care plan at baseline and follow up is 0.86—mitigates this concern.

than 2 percent of the total variation and even less of the residual variation once the other variables are included. This suggests that even costly means of assessing an individual’s “needs” would leave much of the risk uninsured.

A.4 Moral Hazard Effects of In-Kind Provision: Robustness and Generalizability

As we discuss in Section 6, the key conclusion about the desirability of subsidizing formal care is robust to a wide range of values of the price sensitivity of demand for formal care. But the magnitudes of the optimal subsidy and the welfare gains from in-kind provision depend on the particular value of the price sensitivity of demand. The price sensitivity of demand for care is important for other questions as well, including the extent to which insurance contracts that subsidize formal care suffer from a “moral hazard tax.” In this section, we address issues related to both the internal and external validity of our estimate of the price sensitivity of demand for formal care.

A.4.1 Internal validity

There are two main threats to the internal validity of our estimate of the price sensitivity of demand for formal care. The first is quantity constraints that might limit consumption of traditional Medicaid home care. If quantity constraints bind, the first stage of our IV overstates the change in prices (marginal values) associated with being randomized to the cash group and thereby leads us to underestimate the price sensitivity of demand. Quantity constraints may have taken two main forms in this context: supply constraints and statutory or de facto limits on Medicaid home care benefits.

Supply constraints are thought to have faced Medicaid home care recipients in Arkansas during the period of the Cash and Counseling experiment (Brown et al., 2007). These constraints apparently arose from some combination of Medicaid paying below-market prices and the local home care market being in disequilibrium around the time of the experiment. To the extent that such issues were important, ignoring them would tend to lead us to underestimate the true price sensitivity of demand. The simplest way to avoid this issue is to drop Arkansas from the analysis and instead focus on Florida and New Jersey.

Quantity constraints may also have arisen from statutory or de facto limits on how much Medicaid home care people can use. Both Arkansas and New Jersey had statutory limits on Medicaid home care—16 hours per week in Arkansas and 25 hours per week in New Jersey. (Florida had no statutory limit.) Moreover, as discussed in the text, the amount of Medicaid home care that someone can consume is determined by a care plan written by the individual’s physician. If physicians, whether in an effort to be “good agents” of Medicaid or for other reasons, prescribe care plans whose hours fall short of their patient’s satiation point, then Medicaid home care recipients may not be able to reach their satiation points.

Although in principle maximum benefit limits and care plans could limit the quantity of Medicaid home care available to recipients, in practice it does not appear that they con-

strained consumption in our context. Many recipients consume strictly less than their care plan hours, and it is not clear what incentive physicians might have to restrict hours. If anything, physicians' professional norms and ethos might lead them to act as an agent of the patient rather than Medicaid. Maximum benefit limits also appear to be less binding than might have been expected. LeBlanc et al. (2001) survey Medicaid home care programs and discuss several explicit mechanisms for granting exceptions to the limits. For example, in New Jersey, where the statutory limit was 25 hours per week, with prior authorization a recipient could receive up to 40 hours of care per week and with central office approval a recipient could receive as much care as "needed." Consistent with these or other mechanisms relaxing quantity limits, the distributions of formal care consumption among Cash and Counseling participants receiving traditional Medicaid home care do not exhibit much bunching around these limits. If the limits were binding, one would expect significant bunching because a binding limit creates a large convex kink in the budget constraint between formal care and all other goods. Appendix Figures A.1–A.3 present the CDFs of formal care hours for people randomized to the in-kind group in each of the three Cash and Counseling states. In Arkansas (Appendix Figure A.1), there is no apparent bunching that would suggest that consumption was constrained by the state's limit. In addition to there not being a large mass point at 16 hours, nearly one-fifth of the sample consumed more care than the state's limit. In New Jersey (Appendix Figure A.3), there is bunching at certain points in the CDF of care hours, but this appears to be more of a function of rounding than any limits being imposed. The mass points at 15 and 20 hours (8 and 9 percent of the distribution, respectively) are similarly sized to the mass point at the statutory limit of 25 hours (11 percent). Of course, any test of bunching faces the limitation that measurement error lessens observed bunching. A useful feature of our context in this regard is that the tested-for kink in the budget constraint is quite sharp, from zero up to the market price. To the extent that care limits were truly binding, one might expect the limits to be highly salient to recipients and as a result perhaps less attenuation from reporting error.

In Appendix Table A.4, we present estimates of the price sensitivity of formal care separately for each state. The first row shows that the IV Tobit estimates range from -0.96 (Arkansas) to -2.79 (Florida). In the second row, we impose the upper bounds on care hours implied by the Arkansas and New Jersey limits. We censor observations above those cutoffs and use the IV Tobit to re-estimate the price sensitivity. The additional censoring reduces our estimated price sensitivity in Arkansas but increases it in New Jersey. (We exclude Florida since care hours are not limited there.) The differences across states are similar to those found with the standard IV Tobit. Because average care consumption is so different across states, it is also useful to consider the percentage changes implied by the coefficients. A one-dollar increase in the price of formal care is estimated to increase formal care consumption by 9 percent in Arkansas, 10 percent in New Jersey, and 14 percent in Florida. The results also reveal important heterogeneity in price sensitivity across states above and beyond that which appears to be due to quantity constraints. We return to this issue in our discussion of external validity below.

Generally, the results are consistent with the concern that quantity constraints—whether from supply constraints in Arkansas or statutory limits in Arkansas and New Jersey—might be biasing our price sensitivity estimates towards zero. The state without limits (Florida) consistently displays greater price sensitivity than the other states. This suggests that our estimate will tend to understate the true price sensitivity.

The second main threat to the internal validity of our estimate of the price sensitivity of demand for formal care is the distributional assumptions we make in the estimation. The key assumption we make is that the unobservables are jointly normally distributed (particularly that ε_i , the residual in the latent demand function, is normal). This assumption is important because the majority of the cash group and a large minority of the in-kind group do not consume any formal care. People who do not consume any formal care are at a corner, so revealed preference analysis only bounds their level of demand. The Tobit normality assumption is one way among many to deal with this missing data problem.

We test the sensitivity of our results to several different assumptions about the distribution of the error term, ε_i . In each case, we continue to instrument for price as in the main analysis. The results, reported in Appendix Table A.5, show that the estimated price sensitivity changes somewhat from one specification to the next but not dramatically. The first four columns show results that vary the distribution of the error term while maintaining the assumption, as in the baseline specification, that observed consumption reflects a latent demand that is censored at zero to be non-negative. Because those in the cash group were more likely to consume zero hours of care than those in the in-kind group, this greater mass at the censoring point tends to imply that the (latent) mean of the care hours distribution for the cash group is lower than the mean for the in-kind group's distribution. An OLS model that ignores any censoring, however, does not have this feature and, as a result, tends to produce smaller mean differences between the cash and in-kind groups. In our setting, this translates into a smaller price sensitivity. The next three columns assume instead that everyone who is potentially at a corner solution at $q = 0$ has a marginal value of care of exactly p , the maximum consistent with their behavior. Under these distributional assumptions, we tend to find a price sensitivity around -1 .

As we show in Section 6, only values of the price sensitivity far greater than any we have been able to find can overturn the result that the optimal subsidy on formal care is significantly greater than zero.

A.4.2 External validity

The generalizability of the results from the Cash and Counseling experiments to other contexts depends on the similarity of the experiments' participants (in terms of their price sensitivity of demand for formal care) to various populations of interest and how well the experiments match various policies of interest.

Cash and Counseling participants are unlikely to be representative of Americans 65 and older in bad health. Most participants selected into Medicaid home care, and Medicaid home care recipients have a greater demand for formal care than the population as a whole. The participants are also unlikely to be representative of the population of Medicaid home care recipients. Participation in the Cash and Counseling demonstrations was voluntary, and the expected benefits from participating are increasing in the price sensitivity of demand for formal care.³⁹ It is natural to expect that participants in the experiments were more sensitive

³⁹Participants gain the possibility of receiving in cash roughly the cost to Medicaid of providing their formal care benefit. The extent to which an individual values the cash benefit more than the in-kind benefit is increasing in the sensitivity of the individual's demand for formal care to its price.

to the price of formal care than the broader population of Medicaid home care recipients in the Cash and Counseling states. This tends to increase our estimate of the price sensitivity of demand for formal care relative to what we would expect to find among the population of recipients of Medicaid home care.

Another reason the results of the Cash and Counseling experiments might not generalize well to other contexts is the nature of the experiment itself. Care-giving arrangements, for which people often make important investments such as moving or adjusting their labor supply, likely depend on both the past history of policies and expectations about future policies. People arrange their lives in order to make the best of the opportunities available to them, and their decisions about where to live and work and how much formal and informal home care to consume likely depend on which if any home care benefits they might be eligible for. The Cash and Counseling experiments likely came as a surprise to many participants, and it is unclear what participants might have expected about the persistence of this policy, e.g., would it continue indefinitely or would they soon be reverted back to traditional Medicaid home care? Both the surprise aspect and the uncertainty about how long cash benefits might last likely dampened responses relative to what they would have been under an anticipated, permanent policy.

These considerations suggest caution in applying the results of the Cash and Counseling experiments to other contexts. But the robustness of our main conclusions to even large changes in the price sensitivity of demand for formal care greatly limit this concern in our context. And the strengths of the Cash and Counseling experiments—the large, exogenous price variation—make it a valuable piece of evidence about the demand for formal care and the effects of alternative home care-related policies.

A.5 Targeting Effects of In-Kind Provision: Additional Evidence from the Cash and Counseling Experiments

Those who take up Medicaid home care benefits are a highly selected subset of the population eligible for benefits, in terms of both their observable and unobservable determinants of demand for formal care (see Tables 4 and A.1). Among those who take up Medicaid home care, on average, recipients whose observable characteristics would normally suggest a low demand for formal care are likely to have unobservable characteristics that are strongly associated with having high demand for formal care. If not, then the value of taking up Medicaid home care would have been low for this individual and she would likely not have joined the program.⁴⁰ Such selection complicates comparisons of benefits received by different groups of recipients based on their observable characteristics. For example, although in the population as a whole being married is associated with having below-average demand for formal care, among Medicaid home care recipients being married could be associated with having above-average demand for formal care. Similarly, although in the population as a whole in-kind provision will tend to target unmarried people relative to married people, among Medicaid home care recipients in-kind provision could target married people rela-

⁴⁰It is worth noting that heterogeneity in the costs of joining Medicaid home care are likely to play a role as well.

tive to unmarried people.⁴¹ Whether such “reversals” arise depends on features of the joint distribution of observable and unobservable characteristics and the nature of selection into Medicaid home care and the Cash and Counseling experiments. Because such levels comparisons are subject to selection bias, we pursue a differences-in-differences approach that likely mitigates, though does not eliminate, this issue. We also separately analyze the subset of participants of the Cash and Counseling experiments who had not been receiving Medicaid home care before the experiments, who are likely to be more representative of the eligible population as a whole. Even so, selection issues are a major caveat of the results that follow, which at best provide suggestive evidence of the effects of in-kind provision on targeting on the intensive margin.

Using data from the Arkansas Cash and Counseling experiment, we run regressions of the form

$$benefits_i = \beta_0 + \beta_1 inkind_i + \beta_2 X_i + \beta_3 (inkind_i * X_i) + \varepsilon_i \quad (3)$$

where $benefits_i$ is the dollar cost of benefits received by participant i , $inkind_i$ is an indicator for whether i was randomized to the in-kind group, and X_i is a particular demographic characteristic. The coefficient of interest, β_3 , tells us whether those with more of the characteristic X_i receive differentially greater transfers in the in-kind group (relative to the near-cash group) than do those with lower values of X_i . For example, if X_i indicates having more disabilities, $\beta_3 > 0$ would imply that those who are more disabled are targeted to a greater extent by the in-kind benefit (relative to the tagged near-cash benefit) than those who are less disabled. Note that the in-kind benefit is being compared to the Cash and Counseling tagged near-cash benefit. Because of the tagging (based on an individual medical exam), the near-cash benefit targets resources more than would a hypothetical pure (untagged) cash transfer. As a result, this analysis likely understates the degree to which in-kind provision targets particular demographic groups relative to a pure cash transfer.

Appendix Table A.6 reports the effects of in-kind provision on average benefits (estimated with OLS regressions) and on the right tail of the benefit distribution (estimated with quantile regressions). The right tail of the distribution is of particular importance because that is where there is the greatest scope for targeting to provide insurance value. If in-kind provision concentrates transfers, the OLS estimates will reflect an average of negative effects at the bottom of the benefits distribution with the positive effects at the top. The quantile regressions, by contrast, estimate the effects at the top of the benefits distribution, where targeting is likely to have the greatest impact on utility.

Column (1) shows that in-kind provision differentially targets people who are older and who have more ADL limitations. There are no significant differential targeting effects by self-rated health, sex, and marital status. In-kind provision differentially targets people who lived with others at baseline. This may be because living with others signals worse health, which may more than offset the likely effect of living with others on having better informal care options. This interpretation is consistent with the fact that those who lived with others had a greater average cost (\$129 per week for those who lived with others vs. \$107 per week for those who lived alone). Columns (2) through (4) show effects on the 90th, 95th, and 99th quantiles, respectively. In-kind provision differentially targets people with more ADL limitations, women, and the unmarried, all to a greater extent higher up in the benefits

⁴¹These are examples of Simpson’s paradox (Simpson, 1951).

distribution.

Columns (5) through (8) repeat the analysis for the subset of participants who had not been in the Medicaid home care program at baseline. This group is likely more representative of the roughly 90 percent of eligibles who do not take up Medicaid home care. The patterns are qualitatively similar, though with larger standard errors. In-kind provision appears to target recipients in worse health and with worse informal care options.

A.6 Welfare Analysis: Further Details and Robustness

A.6.1 Optimal first-best insurance

To better understand the nature of the risk the individual faces and the desired insurance transfers, consider the benchmark of a first-best insurance program. The first-best transfer schedule satisfies:

$$b(\theta; B) = \begin{cases} b(B) + \frac{\max\{\theta, 0\}^2}{2\beta}, & \text{if } \theta < \beta p; \\ b(B) + p(\theta - \beta p) + \frac{\beta p^2}{2}, & \text{if } \theta \geq \beta p, \end{cases}$$

where B is expected spending on someone eligible for home care benefits and $b(B)$ is the cash transfer that makes total program spending equal B . The first-best transfer is increasing in θ , first quadratically then linearly. With these transfers, indirect utility is

$$v_{FB}(p, m, B; \theta) = u(m + b(B)),$$

which is independent of θ . The first-best contract does not distort consumption, and it fully insures all risk. By making larger transfers in states of the world with greater demand for formal care, it fully compensates the individual for her expenditures on formal care and any residual utility costs she faces from coping with her health problems.

A.6.2 Estimating the distribution of demand for formal care

As discussed in the text, we use our estimate of the price sensitivity of demand for formal care, β , to convert the observed joint distribution of formal care consumption and formal care prices in the NLTCs into a distribution of the level of demand for formal care, $G(\theta)$. We express the level of demand for formal care in terms of satiation points, θ . The only tricky part of this calculation is that observed formal care consumption does not point-identify θ for people consuming zero formal care, it only bounds it: $\theta_i \leq \beta p_i$. We estimate the full θ distribution, including the θ 's of people who consume zero formal care, in three steps.

The first step involves using the observed distribution of formal care consumption, q , to infer the partially-unobserved distribution of latent demand, q^* , where $q_i = \max\{0, q_i^*\}$. In the baseline specification, we fill in the censored values of q_i^* corresponding to the $q_i = 0$ cases by linearly extrapolating the observed q density among people with small positive quantities. In particular, we calculate the number of people in each of two groups: those who consume

more than zero and less than five hours of care per week and those who consume more than five and less than ten hours of care per week. Based on the shares of people in each group, we estimate the implied (constant) slope of the probability density function over this range and its level at $q^* = 0$. We assume that this slope remains constant at lower values of q^* , which amounts to assuming that the left part of the underlying latent quantity distribution has a triangular distribution. For each censored q^* (corresponding to an individual who consumed no formal care), we draw the underlying latent q^* from the truncated triangle distribution based on the estimated slope. Appendix Figure A.4 shows the underlying distribution of formal care consumption on which this calculation is based.

Second, we convert each q^* to its corresponding θ using the estimated price sensitivity of demand for formal care, $\theta_i = q_i^*(p) + \beta p$. This adjusts (potentially latent) formal care consumption by our estimate of the impact of the price on consumption. Finally, we estimate the kernel density of the implied θ distribution. Figure 6 shows the resulting θ distribution. It is mostly just a rightward-shifted version of the observed distribution of formal care consumption, with adjustments for the censoring of people who consume no formal care.

For the tags analysis, we repeat the same procedure for estimating the θ distribution separately for different groups of people, as defined by their tagged characteristics. Appendix Figures A.5 and A.6 show the θ distributions of people who do vs. do not live alone and for people with different numbers of activities of daily living limitations. All of the distributions are similarly-shaped, and they exhibit the expected differences in levels. The demand for formal care is greater among people who live alone than among people who live with others, and it is greater among people with more activities of daily living limitations.

We test the robustness of our results to making different extreme assumptions about how to fill in the unidentified θ values. In one case, we set every unidentified θ value to zero, which is equivalent to assuming that anyone who consumed no care when facing market prices would also consume no care when facing a price of zero. In the other extreme, we set all of the partially-identified θ 's equal to their (point-identified) upper bound, $\theta_i = \hat{\beta} p_i$.

A.6.3 State-dependent utility

As discussed in the text, any state-dependence in utility that is correlated with formal care consumption is centrally important for the value of in-kind provision, since it affects the value of targeting states of the world with greater demand for formal care. State-dependence that increases the marginal utility in states with greater demand for formal care relative to states with lower demand for formal care increases the attractiveness of in-kind formal care transfers, whereas state-dependence that decreases the marginal utility in states with greater demand for formal care relative to states with lower demand for formal care decreases the attractiveness of in-kind formal care transfers. Given the possibility that states with different demands for formal care might have systematically different utility functions, it is therefore important to test the robustness of the results to different possibilities about state-dependent utility.⁴²

⁴²Although health-dependent utility is a natural concern, in the context of home care benefits its importance is somewhat diminished by the fact that most home care benefit programs limit eligibility to people with at least two activities of daily living limitations. This ensures that home care benefits are limited to

Two natural ways in which to model state-dependent utility are to introduce a scaling factor on the outside or inside of the utility function:

$$U(c; \theta) = \begin{cases} \mu(\theta)u(c), & \text{“outer state-dependence”;} \\ u(\mu(\theta)c), & \text{“inner state-dependence”}. \end{cases}$$

“Outer state-dependence” multiplies the standard, type-independent component of the utility function by a factor $\mu(\theta) \geq 0$, which is potentially correlated with demand for formal care. This type of state dependence has a straightforward effect on the value of redistribution across types. Types with greater scaling factors have greater marginal utility for any given level of net consumption. “Inner state-dependence” multiplies net consumption (non-care consumption net of any utility costs of residual health problems) inside the standard, type-independent utility function. Unlike “outer state-dependence,” “inner state-dependence” can have a subtle effect on the marginal utility of a given level of net consumption. On the one hand, types with greater scaling factors are more effective at converting income into net consumption (“effective consumption” is $\mu(\theta)c$, which is increasing in $\mu(\theta)$ for any c), which tends to increase the marginal utility of income. On the other hand, types with greater scaling factors have greater effective consumption for any given level of net consumption, which tends to reduce the marginal utility of income due to marginal utility diminishing in the level of effective net consumption. With log utility, these two effects exactly offset, and “inner state-dependence” has no effect on the marginal utility of income. With preferences in which marginal utility diminishes more rapidly in effective consumption than in the log case, such as constant relative risk aversion preferences with a coefficient of risk aversion greater than one, the latter effect dominates and types with greater scaling factors have lower marginal utility for any given level of net consumption.

A.6.4 Robustness and intuition

This section provides additional information about the robustness tests reported in Table 5 and discussed in the main text.

As Table 5 shows, the results are highly robust to plausible changes in the model. The price sensitivity of demand for formal care must be quite large—over 10 times larger than we estimate based on evidence from the Cash and Counseling experiment—in order to overturn the conclusion that the optimal subsidy is large. Even if the distribution of partially-identified θ values is in the “worst-case” configuration (i.e., each θ_i equal to the maximum value consistent with observed behavior), the optimal subsidy rate is still 86 percent. The utility function must exhibit strong state dependence of just the right kind—greatly decreasing the marginal utility in states with high demand for formal care in just the right way—in order to overcome the fact that, holding other resources constant, greater formal care consumption leads to lower non-care consumption. Although the right tail of the distribution of demand for formal care is an important determinant of the targeting benefit and so the optimal subsidy, the optimal subsidy remains large even when the right tail of the distribution is

states of the world with fairly severe chronic health problems. As a result, the type of state-dependence of utility that is relevant for the design of home care benefits (taking as given the eligibility criteria for home care benefits) is state-dependence within the set of (sick) states eligible for benefits, not between states with good vs. bad health.

chopped off or when all of the θ values are scaled down. If states in which a person consumes more than 50 hours per week of care are dropped, the optimal subsidy is 59 percent. If all of the θ values are cut in half, the optimal subsidy is 75 percent. Finally, a combination of relatively low risk aversion together with a relatively generous consumption floor can overturn the optimality of a large subsidy on formal care, although, as discussed in the main text, this reflects the undesirability of *any* insurance—including a first-best contract—in situations in which means-tested programs are sufficiently attractive rather than any undesirability of in-kind provision per se.

The reason that the results are robust to large changes in the distribution of demand for formal care among states of the world with low demand is that the key driver of the targeting benefit from in-kind provision is the shape of the other tail of the formal care distribution: states with high demand for care. The distribution of demand among states with a low demand for care matters mainly for determining the moral hazard cost of in-kind provision.

The robustness of the results to changes in the right tail of the distribution of demand for formal care partially addresses possible biases from modeling a dynamic situation in a static model. The static nature of the model means that formal care costs must be financed by reducing non-care consumption in that period; they cannot be smoothed over time by saving and borrowing. To the extent that shocks are not entirely persistent, this tends to lead us to overstate the welfare cost of uninsured risk and so the value of insurance against it. This issue is less relevant for Medicaid home care—with its strict asset tests—than for private long-term care insurance. It also addresses possible biases from ignoring other risk-sharing arrangements, e.g., informal family insurance.

That a combination of relatively low risk aversion together with a relatively generous consumption floor can overturn the optimality of a large subsidy on formal care reflects the undesirability of *any* insurance—including a first-best contract—in situations in which means-tested programs are sufficiently attractive. The final column of the table shows that if risk aversion is relatively low ($\gamma = 1$) and the consumption floor is relatively generous ($\bar{c} = \$5,000$), the first-best insurance policy that provides complete insurance without distorting consumption is dominated by an alternative uniform pure-cash benefit that provides no insurance at all. The reason that even a first-best, actuarially-fair insurance contract is dominated by the no-insurance alternative in this case is the high rates of implicit taxation from the consumption floor. Without insurance, the consumption floor pays for much of the care in states with the greatest demand for care. As a result, insurance reduces average consumption among the insured by reducing the transfers they receive from consumption-floor programs. This is similar to Brown and Finkelstein's (2008) findings about how Medicaid can crowd out purchases of even actuarially fair long-term care insurance by a large part of the wealth distribution. It should be noted that while the first-best contract is dominated by no insurance from the perspective of someone eligible (or potentially eligible) for home care, the first-best contract is better from the perspective of society as a whole. From the perspective of society as a whole, the home care benefit should internalize any effects alternative home care benefits might have on the rest of society, including government or private consumption-floor programs.

The alternative specifications also shed light on the key factors driving the results. As expected, the net benefit of subsidizing formal care is decreasing in the price sensitivity of

demand for formal care. When demand for formal care is completely inelastic ($\beta = 0$), a 100 percent subsidy achieves the first best.⁴³ The targeting benefit of in-kind provision is increasing in risk aversion and decreasing in the generosity of alternative insurance arrangements, such as any consumption floor or means-tested programs. The targeting benefit of subsidizing formal care is increasing in the extent to which there is state-dependent utility in which marginal utility is greater in states with greater demand for formal care (above and beyond the effects operating through the budget constraint or residual coping costs). If such state-dependence is strong enough, it is optimal to more than fully subsidize formal care (columns 8 and 11).

⁴³One caveat about this result is that it is based on a model in which formal care is borderline inferior (no income effects). This result need not hold in a more general model with income effects of demand for formal care. Note that the assumption that formal care is borderline inferior tends to work against the value of in-kind provision by increasing the consumption distortion. The greater are income effects of demand for formal care, the more that the (negative) income effects from subsidizing formal care (due to the consumption distortion) offset the inefficient over-consumption of formal care due to the substitution effect.

Appendix Figures and Tables

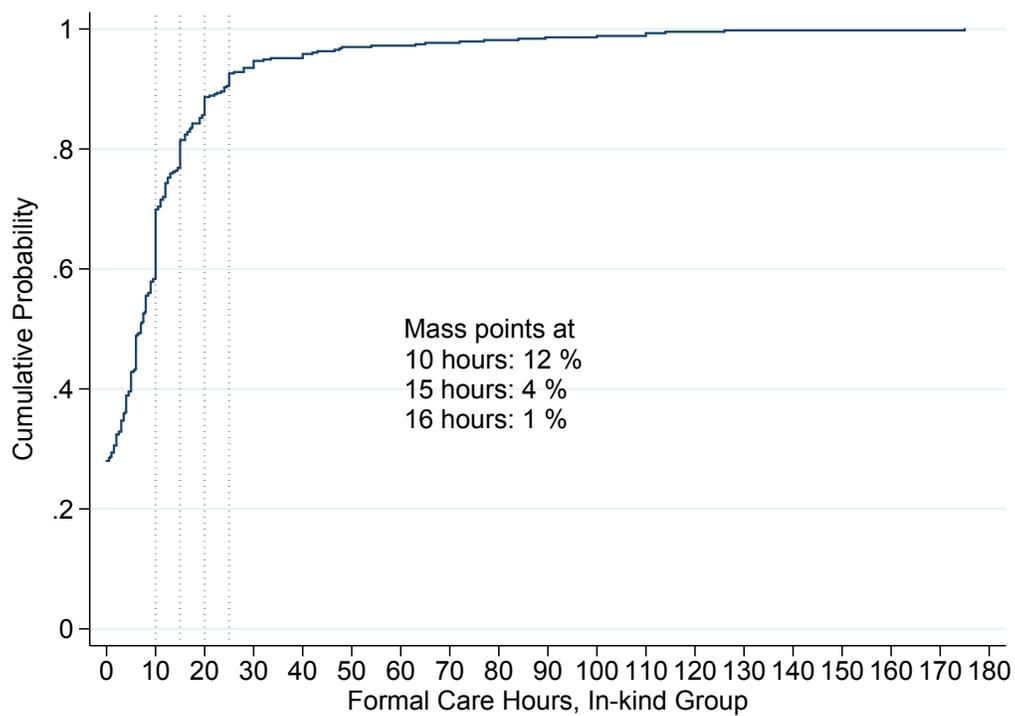


Figure A.1: CDF of Formal Care in Cash and Counseling, Arkansas

[Data from the Cash and Counseling follow-up survey of the in-kind group in Arkansas. Formal care is measured in hours per week. Arkansas had a regulation that in principle limited care to 16 hours per week (LeBlanc et al., 2001). The vertical dotted lines mark 10, 15, 20, and 25 hours per week for reference.]

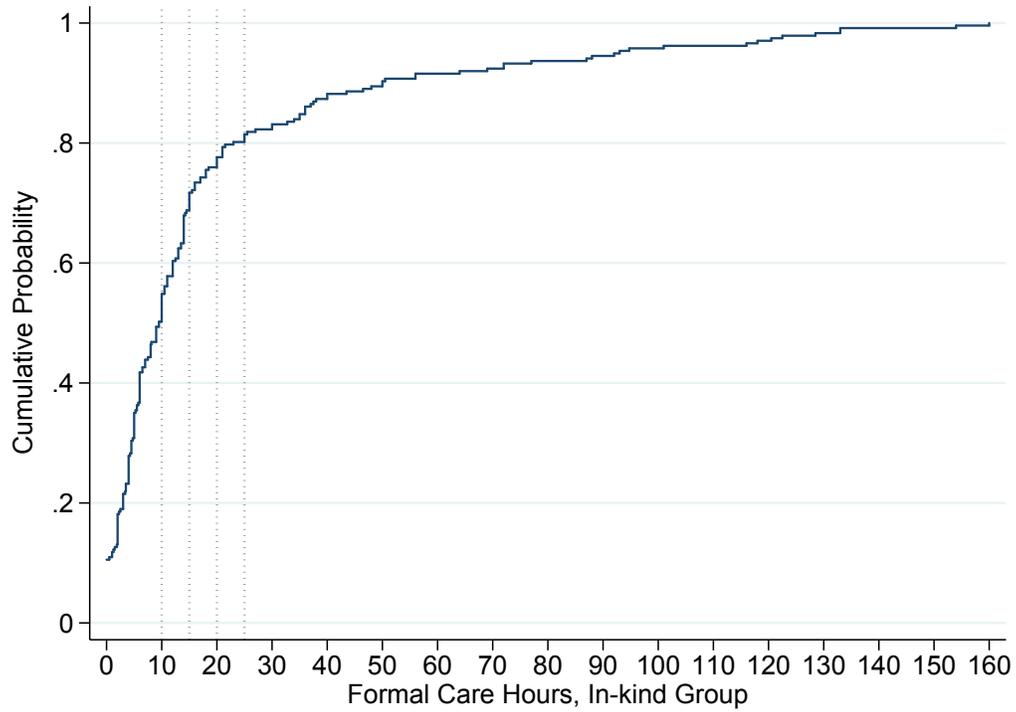


Figure A.2: CDF of Formal Care in Cash and Counseling, Florida

[Data from the Cash and Counseling follow-up survey of the in-kind group in Florida. Formal care is measured in hours per week. Florida had no regulation limiting care hours (LeBlanc et al., 2001). The vertical dotted lines mark 10, 15, 20, and 25 hours per week for reference.]

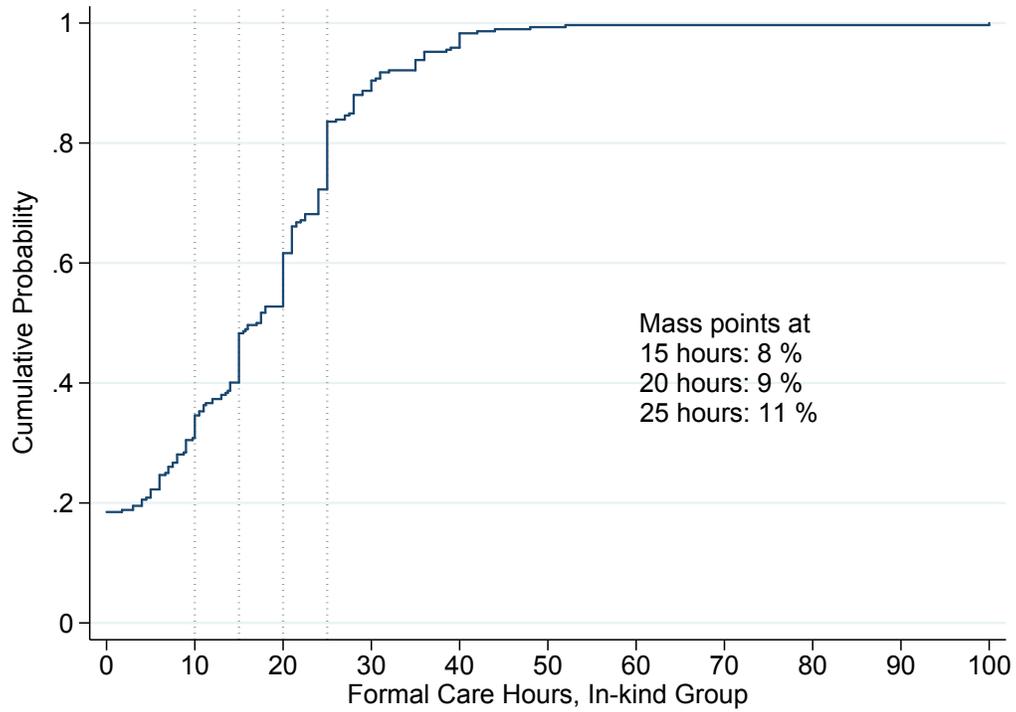


Figure A.3: CDF of Formal Care in Cash and Counseling, New Jersey

[Data from the Cash and Counseling follow-up survey of the in-kind group in New Jersey. Formal care is measured in hours per week. New Jersey had a regulation that in principle limited care to 25 hours per week (LeBlanc et al., 2001). The vertical dotted lines mark 10, 15, 20, and 25 hours per week for reference.]

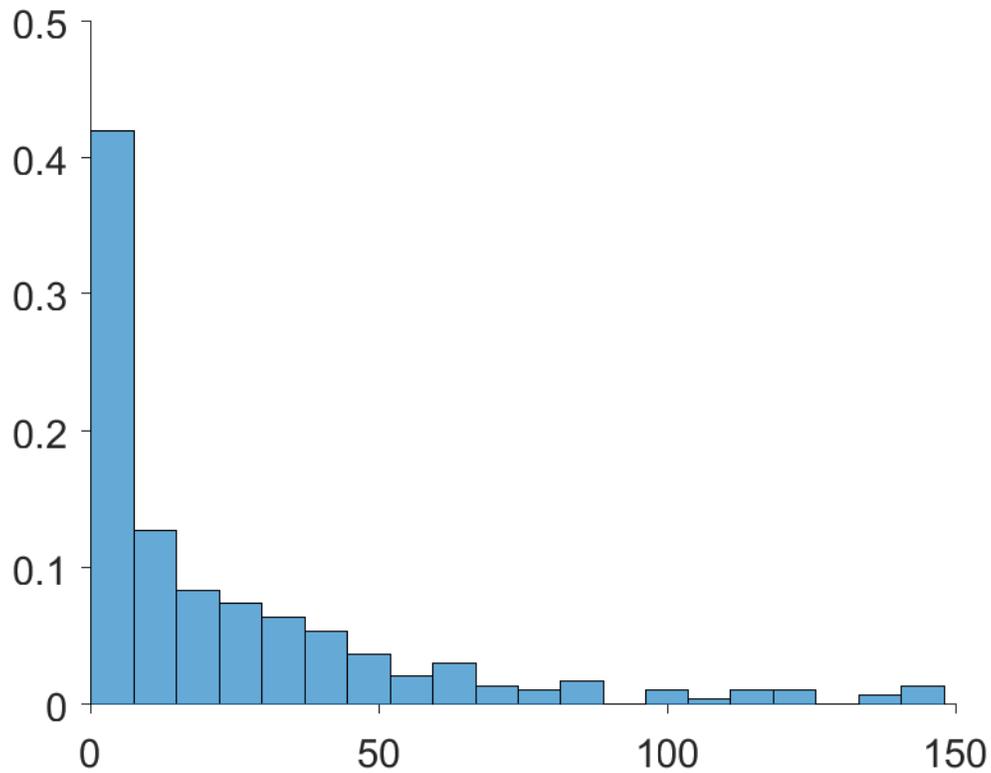


Figure A.4: Distribution of formal care consumption among people with two or more ADL limitations

[Empirical density of formal care consumption among people with two or more activity of daily living limitations in the NLTCs. For readability the figure omits the 65 percent of people who report consuming no formal care and the 3 percent of people who report consuming more than 150 hours per week of formal care. The mean of the full distribution is 12 hours per week.]

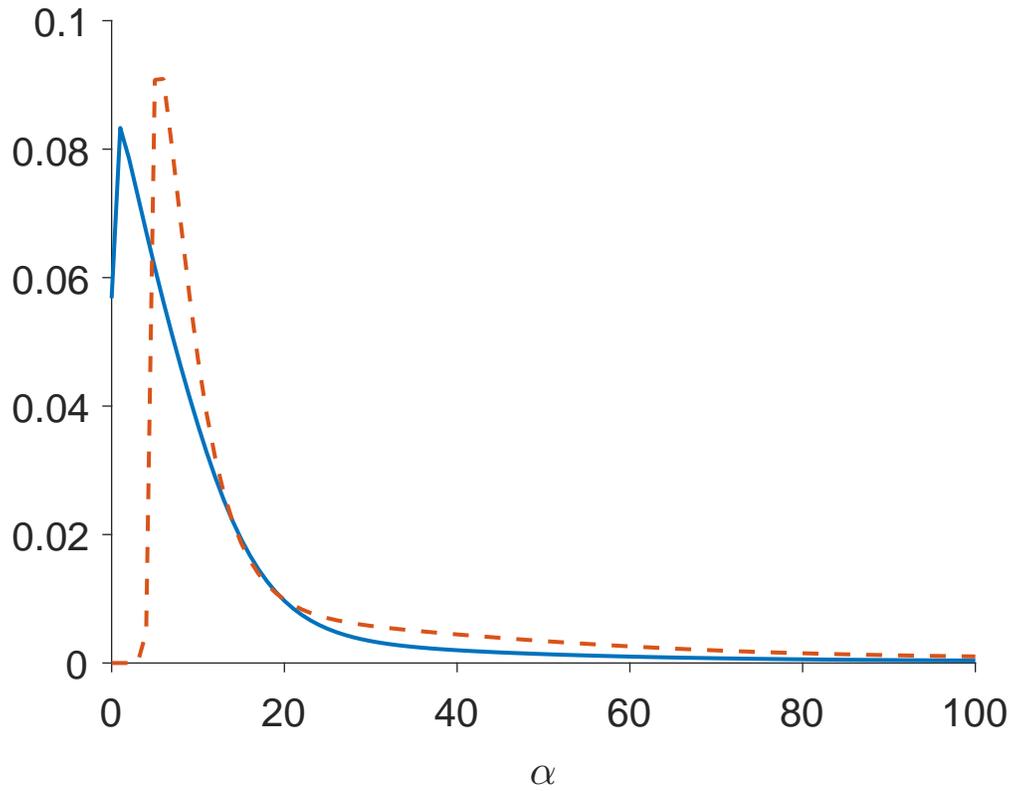


Figure A.5: Distribution of demand for formal care by whether someone lives alone

[Estimated probability density functions of formal care satiation points, θ , for each of two groups: people who do not live alone (left-most pdf) and people who do live alone (right-most pdf). The mean of the distribution is 16 hours per week among people who do not live alone and 37 hours per week among people who do live alone.]

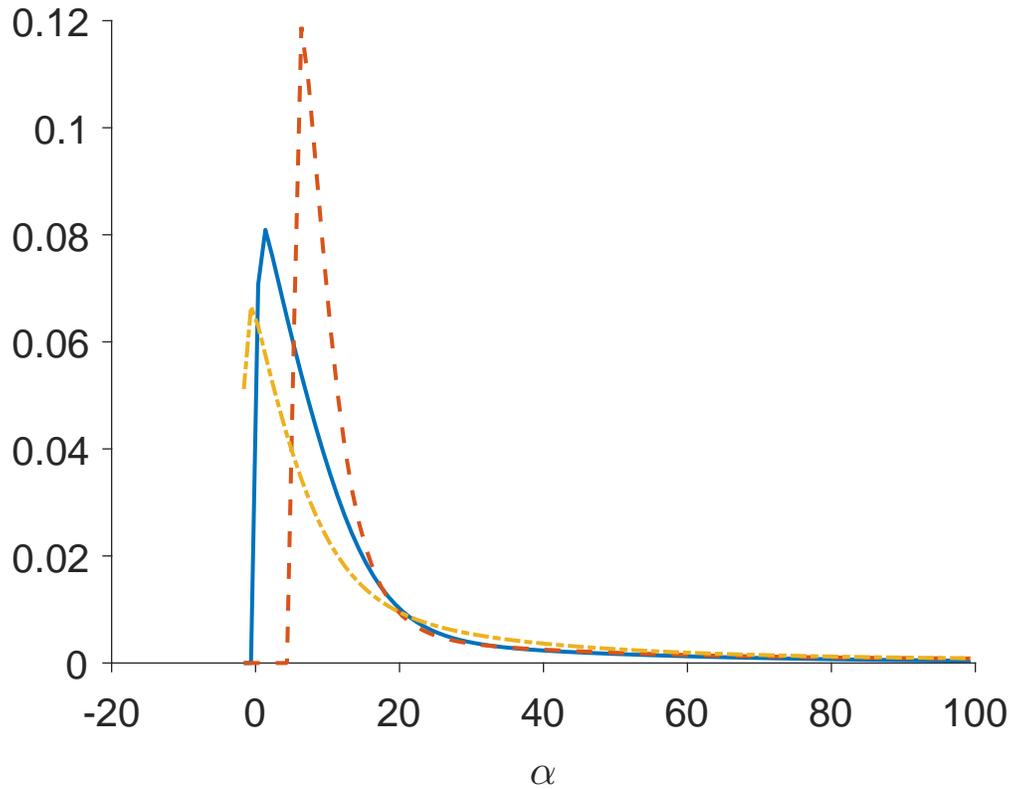


Figure A.6: Distribution of demand for formal care by number of ADL limitations

[Estimated probability density functions of formal care satiation points, θ , for each of three groups: people with 2–4 ADL limitations (left-most pdf), people with five ADL limitations (middle pdf), and people with six ADL limitations (right-most pdf). The mean of the distribution is 16 hours per week among people with 2–4 ADL limitations, 31 hours per week among people with 5 ADL limitations, and 34 hours per week among people with six ADL limitations.]

Table A.1: Predicting Formal Care Consumption Among the Benefit-Eligible Population

	(1)	(2)	(3)	(4)
	OLS	90th	95th	99th
Medicaid home care	9.59*	17.73	40.55	74.76*
	(5.44)	(26.49)	(30.23)	(41.65)
Age	0.40**	0.40	0.37	2.72*
	(0.17)	(0.62)	(0.96)	(1.43)
Four or more ADLs	10.73***	31.73	86.95***	16.75
	(3.25)	(19.49)	(26.58)	(30.43)
If health fair or poor	-1.85	-1.29	-2.20	33.25
	(3.56)	(12.58)	(16.99)	(21.15)
Female	1.26	-1.74	-2.68	-40.59
	(3.94)	(8.40)	(14.46)	(25.23)
Unmarried	13.58***	40.23***	60.88**	84.70***
	(3.45)	(12.06)	(26.20)	(30.44)
Has children	5.40	9.36	4.43	29.89
	(4.71)	(15.40)	(19.22)	(19.01)
Income	-0.00	-0.01	-0.00	-0.02
	(0.00)	(0.01)	(0.01)	(0.02)

Dependent variable is price-adjusted formal care consumption, in hours per week. The sample is those eligible for Medicaid home care (using “Income eligible, < 2 cars” measure). The sample has 481 observations. Column (1) reports results from an OLS regression with robust standard errors. Columns (2)-(4) present results from quantile regressions, with the quantile specified in the column heading, with bootstrapped standard errors. * p<0.10, ** p<0.05, *** p<0.01

Table A.2: Summary Statistics and Balance Tests for the Cash and Counseling Experiments

	Arkansas			Florida			New Jersey		
	Cash	In-kind	Difference p-value	Cash	In-kind	Difference p-value	Cash	In-kind	Difference p-value
Formal care hours, baseline	9.05	9.02	0.96	12.99	13.01	0.99	16.22	15.56	0.52
Number unpaid caregivers, baseline	2.20	2.11	0.30	1.95	2.04	0.45	2.04	2.11	0.59
Age	78.93	79.07	0.76	79.00	79.86	0.18	77.54	77.79	0.65
Male	0.17	0.17	0.92	0.18	0.21	0.45	0.18	0.22	0.15
White	0.62	0.64	0.37	0.67	0.71	0.28	0.50	0.56	0.12
Less than high school degree	0.67	0.66	0.93	0.35	0.38	0.48	0.66	0.65	0.79
High school degree	0.28	0.26	0.48	0.47	0.46	0.97	0.18	0.20	0.54
College degree or more	0.03	0.05	0.10	0.16	0.14	0.48	0.10	0.11	0.68
Health, baseline	3.19	3.22	0.51	3.14	3.06	0.26	3.19	3.16	0.65
Lives alone, baseline	0.32	0.31	0.67	0.25	0.31	0.14	0.33	0.38	0.20
Unmarried	0.85	0.85	0.95	0.77	0.81	0.20	0.79	0.76	0.25
Observations	567	569	.	303	291	.	368	355	.

Means presented by state and type of transfer. P-value is for test that means are the same across the cash and in-kind groups within the state. Formal care hours, Number unpaid caregivers, Health, and Lives alone are presented for the baseline survey at time of randomization. Remaining variables are measured at the nine-month followup.

Table A.3: Predicting Formal Care Consumption

	(1) OLS in-sample	(2) OLS out-of-sample	(3) Machine learning out-of-sample
<i>NLTCS:</i>			
Health controls	0.075 (0.016)	0.034 (0.033)	0.030 (0.025)
Add informal care	0.102 (0.017)	0.046 (0.034)	0.049 (0.031)
Add income	0.106 (0.018)	0.040 (0.036)	0.054 (0.035)
Make all categorical except income	0.200 (0.020)	-0.105 (0.073)	
Add interactions with # ADLs	0.123 (0.023)	0.010 (0.052)	
All categorical, interact with ADLs	0.562 (0.042)	-0.860 (0.381)	
All categorical, interact with unmarried	0.270 (0.029)	-0.224 (0.134)	
All related variables in dataset			0.115 (0.035)
<i>Cash and Counseling:</i>			
Care plan, demographics	0.136 (0.027)	-0.046 (0.082)	0.213 (0.157)

Each entry is the average R^2 from 1,000 sample splits. The standard deviation of the R^2 is presented in parentheses below the mean for each entry. Rows denote different sets of variables included in the analysis. (The machine learning algorithm is nonparametric, so rows 4–7 are equivalent to row 3.) Columns denote the model used (OLS or machine learning) and whether it is an in-sample or out-of-sample R^2 . A negative R^2 means that the sample average (i.e., a simple regression with only a constant) provides better predictions. “Health controls” include age, number of ADLs, self-rated health, and gender. “Add informal care” adds indicators for having children and being married (in addition to health controls). “Add income” adds a control for total income (in addition to health and informal care controls). The following rows use all health, informal care, and income controls. “Make all categorical except income” creates indicator variables for each value of each variable (except income) and includes those in the regression. “Add interactions with # ADLs” includes full set of variables as well as interactions of each variable with the number of ADLs. “All categorical, interact with ADLs” uses the categorical variables and creates interactions of each variable with the number of ADLs. “All categorical, interact with unmarried” is the same as the previous row but interactions are with variable indicating if person unmarried. “All related variables in dataset” includes additional variables related to health, informal care options, or income. This row cannot be estimated with OLS because there are more variables (895) than observations (887). Cash and Counseling results are based on participants in Arkansas (the only state with information on care plan hours) assigned to the traditional in-kind benefit (the main group for whom care plan hours should be predictive of formal care consumption). “Care plan, demographics” includes care plan hours at baseline and twelve months as well as controls for health, informal care, and demographics from the baseline.

Table A.4: Price Sensitivity of Demand for Formal Care and Statutory Limits

	(1)	(2)	(3)
	Arkansas	Florida	New Jersey
Price, IV Tobit	-0.96*** (0.25)	-2.79*** (0.46)	-1.71*** (0.15)
Price, IV Tobit Limits	-0.45*** (0.12)		-1.93*** (0.16)
Controls	Yes	Yes	Yes
Market price, formal care	12.36	15.09	14.59
Mean hours, in-kind group	11.00	19.35	16.60
Observations	860	482	604

Dependent variable is formal care consumption in hours per week. Data are from the Cash and Counseling experiments. Separate regressions run for each state. First row is IV Tobit (baseline specification). Second row is IV Tobit with statutory limit as upper bound. All regressions control for indicators for gender, education level, race, self-rated health, five-year age bins, and state. Robust standard errors reported. * p<0.10, ** p<0.05, *** p<0.01

Table A.5: Robustness to the Distribution of the Error Term, ε_i

	Censored errors				Uncensored errors		
	Normal (1)	Extreme Value (2)	Logistic (3)	T-location scale (4)	Normal (5)	Negative binomial (6)	Poisson (7)
Price	-1.85*** (0.14)	-2.47*** (0.24)	-1.40*** (0.10)	-1.21*** (0.08)	-0.94*** (0.09)	-0.72*** (0.11)	-1.07*** (0.21)
Mean hours	10.89	10.89	10.89	10.89	10.89	10.89	10.89
Observations	1,946	1,946	1,946	1,946	1,946	1,946	1,946

Dependent variable is formal care consumption in hours per week. Data are from the Cash and Counseling experiments. Each column presents the estimated sensitivity of demand under a different distributional assumption on the underlying error term. Column (1) is the baseline specification. Columns (1)-(4) assume, as in the baseline, that observed consumption is censored to be non-negative. Columns (5)-(7) assume that everyone with $q_i = 0$ has a marginal value of care of exactly p_i , the maximum consistent with their behavior (i.e., no censoring). All models instrument for price with the participant's randomized treatment status and are estimated via two-stage residual inclusion. Columns (6) and (7) report average marginal effects. All columns include indicators for gender, education level, race, self-rated health, five-year age bins, and state. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.6: Targeting on the Intensive Margin (Among Recipients)

	Entire Sample				Not Enrolled at Baseline			
	(1) OLS	(2) 90th Quantile	(3) 95th Quantile	(4) 99th Quantile	(5) OLS	(6) 90th Quantile	(7) 95th Quantile	(8) 99th Quantile
Age ≥ 80	36.0* (18.9)	30.9 (39.8)	111.2 (121.3)	584.0 (382.2)	56.6 (38.6)	241.0** (117.3)	305.9 (324.9)	1,579.0*** (485.9)
ADLs	20.8*** (8.0)	70.0*** (13.8)	105.1*** (31.1)	168.9 (152.4)	6.4 (13.2)	24.7 (51.3)	86.5 (104.5)	559.3** (277.3)
Health fair or poor	-6.6 (27.6)	-24.7 (66.5)	-123.6 (433.5)	435.7 (496.9)	-31.1 (44.6)	-98.9 (106.1)	-123.6 (419.3)	312.1 (789.4)
Female	12.9 (18.3)	37.1 (41.6)	185.4** (72.6)	543.8* (321.9)	36.5 (27.3)	105.1 (86.5)	281.2** (125.8)	1,053.7** (488.5)
Unmarried	-6.7 (18.7)	-0.0 (60.1)	123.6 (102.2)	716.9*** (203.8)	21.1 (27.9)	49.4 (76.3)	309.0** (129.4)	1,016.6* (522.4)
Lived alone at baseline	-37.6** (17.4)	-98.9* (57.4)	-185.4** (90.2)	-704.5* (382.1)	-46.5 (28.9)	37.1 (101.6)	-222.5 (207.9)	-855.9 (571.2)

Data from the Arkansas Cash and Counseling experiment. Dependent variable is weekly cost of benefits in dollars. Each entry corresponds to a different regression. Columns (1) through (4) include all participants in the Cash and Counseling experiments in Arkansas. Columns (5) through (8) only include the subset who had not been enrolled in Medicaid home care before the experiment. Columns (1) and (5) are OLS regressions with robust standard errors. Remaining columns are quantile regressions with bootstrapped standard errors. The omitted health category is health good or excellent. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$