Household Risks and the Demand for Housing Commitments

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First draft: July 6, 2004
This draft: November 28, 2004.

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[3]Please do not circulate or cite without permission. We thank Alex Janovsky, Andrew Au, and Daniel Simundza for outstanding research assistance. We received helpful comments from Tom Davidoff, Joe Gyourko, Brigitte Madrian, Albert Saiz, Nick Souleles, Joel Waldfogel, Matt White, Justin Wolfers, and participants in the Wharton Applied Economics workshop. Shore gratefully acknowledges financial support from the National Institutes of Health - National Institute on Aging, Grant number P30 AG12836, and the Boettner Center for Pensions and Retirement Security at the University of Pennsylvania as well as the Zell/Lurie Real Estate Center at The Wharton School. Sinai received support from the Research Scholars Program at the Zell/Lurie Real Estate Center.

[4]JEL Classification: R21 (Housing Demand), E21 (Consumption; Saving), D8 (Information and Uncertainty)

Abstract

A standard model of precautionary saving predicts that increasing risk leads to increased saving and decreased consumption. This paper will argue that the impact of risk can be complicated by the commitment feature of some forms of consumption, the fact that adjusting the quantity of consumption can be costly.

In particular, we present cleanly identified variation in a major risk – unemployment – for which commitment inverts the standard precautionary saving result. Couples who share an occupation face increased risk as their unemployment shocks are more highly correlated. These couples spend more on housing than other couples. We exploit variation in moving costs and unemployment insurance generousity to show that these results are consistent with a theory of consumption commitments and do not reflect unobservable differences between couples.

1 Introduction

The impact of risk on behavior is central to research on topics from unemployment insurance and entrepreneurship to progressive taxation and retirement saving. The core idea underlying this relationship is precautionary saving: an increase in risk leads to increased saving and decreased consumption (Kimball (1990), Carroll (1997), and many others). This paper will argue that the impact of risk can be complicated by the commitment feature of some forms of consumption, the fact that adjusting the quantity of consumption can be costly. In particular, we will present cleanly identified variation in a major risk–unemployment–for which the standard precautionary saving result is inverted; increasing risk leads to increased consumption of commitment goods, both in theory and in the data.

Many forms of consumption – most obviously housing – have a substantial commitment feature. To adjust housing consumption, a household must incur the large costs of selling a house, buying a new one, and moving. These costs are large even when the change in housing consumption is small, as it would be if a household moved to a similar house across the street. Other goods, such as automobiles, private schooling, and cellular telephone plans, also have this commitment feature, where there is a cost to adjusting consumption. Warren and Tyagi (2003) argue that a typical American family earmarks 75 percent of their income for these kinds of "fixed expenses", items like a mortgage, car payments, child care, and health insurance.

A standard model of precautionary saving implies that a household facing increased risk should save more and consume less. This need not be true in the presence of consumption commitments. The intuition for this argument can be explained by considering a dual-income household that devotes resources to housing consumption, which is costly to adjust, and food consumption, which is not. The household faces the risk that either the husband or wife, or both, could become unemployed.

If exactly one spouse becomes unemployed, the household must weigh the costs of moving against the benefits of choosing a level of housing consumption more appropriate to their new circumstances. The reduction in income may be small enough that they decide to keep housing consumption constant but, as a result, reduce food consumption substantially. The household therefore consumes more housing and less food than it would in the absence of moving costs; the marginal utility of food is greater than the marginal utility of housing. In this case, the household strongly wishes it had initially bought a smaller house for two reasons. First, *ceteris paribus*, decreasing initial housing consumption serves the usual function of increasing saving and therefore transferring wealth over time. Second, decreasing initial housing consumption reduces the level of current housing consumption. This effectively reallocates wealth from current housing consumption, which has a low marginal utility, to current food consumption, which has a high marginal utility. As a result, when exactly one spouse becomes unemployed, spending less on housing consumption initially would have increased lifetime utility substantially.

By contrast, if both spouses become unemployed, the household may find it optimal to move to a smaller house (i.e. adjust the consumption of the commitment good). In this case, the household is able to rebalance their consumption of food and housing, equating the marginal utility of each form of consumption. As in the case where exactly one spouse becomes unemployed, spending less on housing consumption initially transfers wealth over time. However, unlike that case, spending less on housing initially does not bring the household closer to equating marginal utilities of current housing and food consumption, as moving already serves this function. Since this second motivation for reducing initial housing consumption is absent when both spouses become unemployed, spending less on housing consumption initially may actually increase lifetime utility more when only one spouses become unemployed than when both become unemployed.

Increasing the correlation of the couple's unemployment events is a traditional mean-preserving increase in risk. It increases the probability that neither or both spouses will become unemployed, while reducing the probability that exactly one spouse will become unemployed. In the one-unemployed state, the household is stuck in a house which is too big and their lifetime utility would have been higher had they spent less on housing initially. Since increasing risk reduces the probability of this state, increasing risk increases the optimal consumption of initial housing.

Prior research in this area argues that consumption commitments impact people's attitude towards risk. Postlewaite et. al. (2004) argue that "consumption commitments can cause risk-neutral consumers to care about risk...."; Chetty and Szeidl (2004) show that "the presence of commitments magnifies the impact of shocks, effectively making the consumer more risk averse." Chetty (2004) finds that consumption commitments imply that people are more risk averse in the domain of small losses than in the domain of large ones. This paper argues that the converse is also true: the risks people face impact their willingness to undertake consumption commitments.[1] In particular, households may

[1] Other work has considered the possibility of endogenous consumption commitments, of course. Flavin (2001) endogenizes the size of the consumption commitment

have a higher marginal utility of initial housing consumption if they suffer small losses ex-post than if they suffer larger ones. This implies that introducing a mean-preserving spread to risk can actually increase consumption of commitment goods. This prediction is exactly the opposite of the one obtained by a classical precautionary saving model without consumption commitments. In that setting, the marginal utility of consumption is increasing in the size of the loss, so that increasing risk reduces consumption.

We test this hypothesis empirically by examining the housing consumption of households. While our hypothesis applies to many types of consumption, housing comprises a large fraction of household spending and requires a considerable commitment, and is therefore an obvious first place to look for evidence. In particular, we look at the relationship between the correlation of couples' unemployment shocks and their housing consumption. We compare the house values of dual-earning couples with the same occupation to those with different ones. Couples with both spouses in the same career have less diversified human capital and higher income correlations than do couples in different careers. Thus, having a same-career spouse can be thought of as adding a mean-preserving spread to income. While a traditional model of precautionary saving would predict that same-career couples would buy smaller houses than different-career couples, a simple model of consumption commitments predicts the opposite.

Using data from the Integrated Public Use Microdata Series (IPUMS) of the census, we find evidence that same-career couples spend 4.3 to 1.5 percent more on their houses, controlling for income, than different-career couples, consistent with a theory of consumption commitments. This result is robust to the introduction of controls for each spouse's occupation, as well as region, educational attainment, hours worked, and a variety of other demographic controls. A natural concern about this result is that it may reflect merely the preferences of the kind of people who marry same-career spouses and not the impact of consumption commitments. To address this concern, we exploit two forms of variation in the cost of moving to show that our results about same-career couples are confined to couples facing greater moving costs. Comparing homeowners (high moving costs) and renters (low moving costs), same-

(housing, in her case) in an adjustment cost model, and looks at the effect in a theoretical context on the intertemporal elasticity of substitution of nondurable goods and on asset prices. However, her focus is on asset price and house price risk. Postlewaite *et al* refers to the endogeneity of consumption commitments to income risk, but does not pursue the idea. Chetty and Szeidl (2004) implicitly acknowledge the endogeneity of the size of consumption commitments in their empirical work by instrumenting for the price of the house.

career couples who rent do not consume more housing than other renting couples, suggesting that our results cannot be explained by a preference for housing by same-career couples. Similarly, the difference in house values between same-career and different career couples is greater when couples face effectively higher moving costs because they are less likely to move for exogenous demographic reasons. Finally, we exploit variation in the replacement rate of unemployment insurance. Consistent with a theory of consumption commitments, we find that the difference in house values between same-career and different-career couples is greater when the replacement rate of unemployment insurance is lower.

The remainder of the paper is laid out as follows: Section 2 sets up a simple model of consumption commitments which predicts that mean-preserving spreads can increase a household's willingness to undertake consumption commitments; we test this model in Section 3 by using cross-sectional variation in human-capital diversification among households; Section 4 concludes.

2 Model of Consumption Commitments

In this section, we develop a simple model to illustrate the impact of household risk on consumption commitments. Unlike other models of consumption commitments which take commitments as exogenous and portfolio risk as endogenous, this model treats household labor income risk as exogenous and aims to determine the optimal level of consumption commitment. Following Chetty (2004), the model has two periods, $t = 1, 2$, and two goods, h (housing) and f (food). The units of h and f are normalized so that the price of each is 1. We assume that there is no goods price risk. For simplicity, we assume that household utility in a given period is the following separable function:

$$u(h_i, f_i) = g(h_i) + \mu g(f_i) \tag{1}$$

where μ is a parameter which indicates the relative importance of goods h and f to the household. g is a differentiable, concave function. In this section, we will consider $g(x) = \ln(x)$ and $g(x) = x - \frac{1}{2}\alpha x^2$ as two simple functional forms for g. For algebraic simplicity, we will set $\mu = 1$ for the rest of this section, so that the two goods are equally important to the household. Loosening this assumption does not impact the substance of any of the results we obtain. While separability is not critical to obtain our results, it is important that the marginal utility of food must increase relative to the marginal utility of food when food consumption falls. The family's lifetime expected utility is just a weighted average of the expected utility from the two periods:

$$U = u(h_1, f_1) + \beta E[u(h_2, f_2)] \tag{2}$$

For further algebraic simplicity, we set $\beta = 1$, though again this assumption has no impact on the substance of our results. In the first period, the household receives an income Y_1 and decides how much of each good, h_1 and f_1 to consume. Remaining wealth, $Y_1 - h_1 - f_1$, is saved. Because we are abstracting from the investment problems examined in other work on consumption commitments, we make the simplifying assumption that there are no risky assets and that the riskless interest rate is zero. In the second period, the household receives an income $\tilde{Y}_2$, which is not known at $t = 1$. At that time, the household must allocate its wealth, $Y_1 + \tilde{Y}_2 - h_1 - f_1$, between the two goods. However, the household must pay a transaction cost, $k(h_1)$, if it adjusts its consumption of good h.[2] It is this transaction cost which gives h its commitment feature. While the case of proportional transaction costs, $k = ch_1$, is probably the most empirically relevant, fixed transaction costs provide greater analytic tractability. Both types of transaction costs generate the results discussed. Therefore, the household's inter-temporal budget constraint can be written as:

$$\begin{aligned} Y_1 + \tilde{Y}_2 &= 2h_1 + f_1 + f_2 \text{ if } h_1 = h_2 \\ Y_1 + \tilde{Y}_2 &= h_1 + k(h_1) + h_2 + f_1 + f_2 \text{ if } h_1 \neq h_2. \end{aligned} \tag{3}$$

To determine the optimal consumption in the first period, we must first determine optimal consumption and indirect utility in the second period and then work backwards. In the second period, the household maximizes

$$u(h_2, f_2) = g(h_2) + g(f_2) \tag{4}$$

subject to constraint (3). Therefore, the optimal consumption is

$$\left\{ \begin{array}{l} h_2 = \frac{1}{2}\left(Y_1 + \tilde{Y}_2 - h_1 - f_1 - k(h_1)\right) \\ f_2 = \frac{1}{2}\left(Y_1 + \tilde{Y}_2 - h_1 - f_1 - k(h_1)\right) \end{array} \right\} \text{if } h_2 \neq h_1 \text{ and} \tag{5}$$
$$\left\{ \begin{array}{c} h_2 = h_1 \\ f_2 = Y_1 + \tilde{Y}_2 - 2h_1 - f_1 \end{array} \right\} \text{if } h_2 = h_1$$

[2] While it is difficult to ascertain the total utility cost of moving, the cost for owners is typically assumed to be large. In addition to a realtor's fee of 6 percent, a moving homeowner has to pay transfer taxes, financing costs for a new home, movers, and also incurs a whole host of nonpecuniary costs, such as search for a new home, the time cost of selling, and the psychic costs of uprooting. Renters face much lower moving costs, with smaller or no realtor's fee, taxes, or upfront financing costs, in addition to not having to sell the prior apartment and searching in a thick, more commoditized market for a new place.

and indirect utility is

$$v\left(Y_1+\tilde{Y}_2-h_1-f_1,h_1\right)=g\left(h_1\right)+g\left(Y_1+\tilde{Y}_2-2h_1-f_1\right)\text{ if }h_2=h_1$$
$$v\left(Y_1+\tilde{Y}_2-h_1-f_1,h_1\right)=2\bullet g\left(\frac{1}{2}\left(Y_1+\tilde{Y}_2-h_1-f_1-k\left(h_1\right)\right)\right)\text{ if }h_2\neq h_1 \quad (6)$$

where $h_2 = h_1$ if and only if

$$2\bullet g\left(\frac{1}{2}\left(Y_1+\tilde{Y}_2-h_1-f_1-k\left(h_1\right)\right)\right)\leq g\left(h_1\right)+g\left(Y_1+\tilde{Y}_2-2h_1-f_1\right).$$

The household will not change their level of housing consumption, h, unless the shock to wealth is large enough relative to the cost of adjusting consumption. In the presence of small shocks, when the desired level of housing consumption is not very different from the commitment level, the household will prefer to maintain the commitment level of housing consumption.[3] The benefits of being able to adjust housing consumption are swamped by the large costs of moving. In the presence of large shocks, the household is willing to pay a cost to adjust housing consumption to an optimal level.[4] As described by Chetty (2004), this leads to a non-convex indirect utility function, shown in Figure 2.1. Here, the marginal utility of wealth is much higher when the household is just rich enough so that they do not have to adjust housing consumption than when they are just poor enough that they have to.

[3] Another way households could respond is by reducing their maintenance expenditures on their houses. In effect, this reduces the periodic price of housing below 1, at least temporarily. At the time of sale, the greater depreciation will result in a lower residual value, so deferred maintenance can only change the timing of the cost of housing services, not the total amount. Since our income shock is intended to be permanent, deferring housing maintenance is not a valuable option for our households. If the household does not fully value the sale price of the house, perhaps because it is after death, then deferred maintenance can lower the cost of housing. In that case, it would make it more difficult for us to find an effect empirically since housing consumption would be adjustable within a small range. There is some support for these hypotheses in the literature. Gyourko and Tracy (2003) show that households defer maintenance to smooth consumption over transitory shocks to income. Davidoff (2004) presents evidence that older households spend less on housing maintenance and experience lower house price appreciation.

[4] This result contrasts with Browning and Crossley (2004) who show that households respond to small shocks by reducing expenditure on new durables such as pillows and socks but respond to larger shocks by reducing consumption of nondurables as well. The difference in these results stems largely from their focus on the impact of liquidity constraints and transitory or small shocks on consumption. In contrast, our results are intended to explore the impact of permanent or larger shocks on consumption.

Once we have solved for the optimal consumption rule for the second period, it is conceptually, though not algebraically, simple to solve for optimal consumption in the first period. The household's lifetime utility function (2) can be rewritten as:

$$U(h_1, f_1) = g(h_1) + g(f_1) + E\left[\max\left\{\begin{array}{c} g(h_1) + g\left(Y_1 + \tilde{Y}_2 - 2h_1 - f_1\right), \\ 2 \bullet g\left(\frac{1}{2}\left(Y_1 + \tilde{Y}_2 - h_1 - f_1 - k\right)\right) \end{array}\right\}\right]. \quad (7)$$

To better understand the optimal consumption rule in the first period, we must add structure by making assumptions about the distribution of $\tilde{Y}_2$. The impact of income risk on demand for commitment goods depends critically on the distribution of $\tilde{Y}_2$. In this paper, we explore an empirically relevant type of income risk: unemployment risk.[5] We assume that the household has two wage earners, a husband and wife, and that uncertainty comes from the possibility of unemployment in the second period. To reduce the number of states to consider in the second period, we make the simplifying assumption that income for either husband or wife is Y_2^E if employed and Y_2^U if unemployed. The probability of the husband's unemployment is p while the probability of the wife's unemployment is q. There is a correlation ρ between the employment status of the husband and of the wife. Therefore, the distribution of income in the second period, $\tilde{Y}_2$, can be written as:

$$\begin{aligned} \tilde{Y}_2 &= 2Y_2^E \text{ with probability } 1 - p - q + \phi \\ \tilde{Y}_2 &= Y_2^E + Y_2^U \text{ with probability } p + q - 2\phi \\ \tilde{Y}_2 &= 2Y_2^U \text{ with probability } \phi, \end{aligned} \quad (8)$$

where

$$\phi \equiv pq + \rho\sqrt{pq(1-p)(1-q)}.$$

The three states correspond to both spouses being employed, exactly one being unemployed, and both being unemployed. Note that increasing

[5] The negative skewness of unemployment risks will be important in generating our results, since our focus on negative shocks means that households that move will only move into smaller houses. While the framework developed below will be useful in understanding the impact of other risks on consumption commitments, model predictions will be quite different for other types of risks. For example, if households face lottery risk (the possibility of winning either a small or large amount of money), then increasing lottery risk (increasing the probability of winning a lottery large enough to induce moving while decreasing the probability of winning a lottery too small to induce a move) should lead to even further reductions in housing consumption than would be predicted by a model of precautionary saving.

ϕ while holding p and q fixed is equivalent to adding a mean-preserving spread to household labor income, increasing the probability of the best and worst outcomes while decreasing the probability of the medium outcome. In particular, increasing ρ, the correlation between the employment status of the husband and wife, adds a mean-preserving spread to income and therefore increases household risk. However, the expected household income,

$$E\left[\tilde{Y}_2\right] = 2Y_2^E - (p+q)\left(Y_2^E - Y_2^U\right),$$

is independent of ρ and depends on the rates of unemployment, p and q, only in an additive way.[6] Note that because this spread increases risk below the mean ($Y_2^E + Y_2^U < E\left[\tilde{Y}_2\right]$ for $p, q < \frac{1}{2}$) in this case, increasing risk also leads the distribution of income to become more negatively skewed.

2.1 Risk and Consumption With and Without Commitment

A classical model of precautionary saving is a special case of the model described above in which $k = 0$. If there are no costs to moving, then the household is always weakly better off by changing the level of housing consumption. In this case, their expected utility function is just

$$U(h_1, f_1) = g(h_1) + g(f_1) + E\left[2 \bullet g\left(\frac{1}{2}\left(Y_1 + \tilde{Y}_2 - h_1 - f_1\right)\right)\right]. \quad (9)$$

Taking first order conditions for h_1 and f_1 and equating them reveals that at an optimum, $h_1 = f_1$. Therefore, the utility function can be rewritten as:

$$U(h_1) = g(h_1) + E\left[g\left(\frac{1}{2}\left(Y_1 + \tilde{Y}_2 - 2h_1\right)\right)\right]. \quad (10)$$

Then, the first order condition can be rewritten as:

$$0 = \begin{bmatrix} g'(h_1) + (1 - p - q + \phi)\left[-g'\left(\frac{1}{2}\left(Y_1 + 2Y_2^E - 2h_1\right)\right)\right] \\ +(p + q - 2\phi)\left[-g'\left(\frac{1}{2}\left(Y_1 + Y_2^E + Y_2^U - 2h_1\right)\right)\right] \\ \phi\left[-g'\left(\frac{1}{2}\left(Y_1 + 2Y_2^U - 2h_1\right)\right)\right] \end{bmatrix}. \quad (11)$$

[6] Other parameters besides ρ could be modified to induce a mean-preserving increase in risk. For example, a mean-preserving spread could be created by decreasing Y_2^U while increasing Y_2^E. The impact of this mean-preserving increase in risk will be very different from an increase in ρ. We focus on variation in ρ both because of its novel implications and also because it can be identified relatively cleanly.

Lemma 1 *Let h_1^* be the solution to (11). If $g''' > 0$, then $\frac{dh_1^*}{d\phi} < 0$; if $g''' = 0$, then $\frac{dh_1^*}{d\phi} = 0$; if $g''' < 0$, then $\frac{dh_1^*}{d\phi} > 0$.*

Proof. *See Appendix A.1.* ■

The result is a simple illustration of precautionary saving and follows Kimball (1990). ϕ is a measure of household risk which is independent of expected household wealth. Increasing ϕ increases the likelihood that either both or neither spouse will be unemployed while reducing the probability that exactly one spouse will be unemployed. This is one example of a mean-preserving spread, though any mean-preserving spread will lead to changes in consumption that are directionally the same. For utility functions with positive third derivatives (such as power, log, and exponential), as the amount of household risk increases, optimal consumption, h_1 (which is also equal to f_1), falls and saving, $Y_1 - h_1 - f_1$, increases. Most economists take the $g''' > 0$ case to be the more realistic assumption about people's preferences, and therefore predict a negative relationship between risk and consumption. For utility functions with a zero third derivative (such as quadratic), increasing risk has no impact on consumption or saving.

This precautionary saving result can be reversed if there is a cost of adjusting housing consumption, so $k > 0$. Even when $g''' \geq 0$, increasing risk may actually increase consumption. This is difficult to show analytically for most utility functions and costs of adjustment. In this section, we prove this result for the simple case of quadratic utility and fixed adjustment costs. The subsequent sections will relax these assumptions and show that the same results can be obtained numerically under more realistic assumptions about utility and adjustment costs.

In the quadratic utility case with fixed adjustment costs, the household's objective function is:

$$\begin{aligned} U(h_1, f_1) = & \left(h_1 - \frac{1}{2}\alpha h_1^2\right) + \left(f_1 - \frac{1}{2}\alpha f_1^2\right) \\ & + E\left[\max\left\{ \begin{array}{c} \left[\begin{array}{c} h_1 - \frac{1}{2}\alpha h_1^2 \\ + \left(Y_1 + \tilde{Y}_2 - 2h_1 - f_1\right) - \frac{1}{2}\alpha\left(Y_1 + \tilde{Y}_2 - 2h_1 - f_1\right)^2 \end{array} \right], \\ \left[\left(Y_1 + \tilde{Y}_2 - h_1 - k - f_1\right) - \frac{\alpha}{4}\left(Y_1 + \tilde{Y}_2 - h_1 - k - f_1\right)^2\right] \end{array} \right\}\right]. \end{aligned} \tag{12}$$

When it is optimal to move only in the worst state of the world, the following first-order conditions determine optimal consumption:

$$0=\begin{bmatrix} (1-\alpha f_1) \\ +(1-p-q+\phi)\left\{\left(-1+\alpha\left(Y_1+2Y_2^E-2h_1-f_1\right)\right)\right\} \\ +(p+q-2\phi)\left[\left(-1+\alpha\left(Y_1+Y_2^E+Y_2^U-2h_1-f_1\right)\right)\right] \\ +\phi\left[-1+\frac{\alpha}{2}\left(Y_1+2Y_2^U-h_1-k-f_1\right)\right] \end{bmatrix};\quad (13)$$

$$0=\begin{bmatrix} (1-\alpha h_1)(2-\phi) \\ +(1-p-q+\phi)\left(-2+2\alpha\left(Y_1+2Y_2^E-2h_1-f_1\right)\right) \\ +(p+q-2\phi)\left(-2+2\alpha\left(Y_1+Y_2^E+Y_2^U-2h_1-f_1\right)\right) \\ +\phi\left[-1+\frac{\alpha}{2}\left(Y_1+2Y_2^U-h_1-k-f_1\right)\right] \end{bmatrix}.$$

Lemma 2 *Let h_1^* be the level of consumption that maximizes (12). Assume that model parameters make it strictly optimal to set $h_2^* \neq h_1^*$ if and only if $\tilde{Y}_2 = 2Y_2^U$, so that (13) are the relevant first order conditions. In this case, $\frac{dh_1^*}{d\phi} > 0$.*

Proof. *See Appendix A.2.* ■

Note that in the absence of moving costs, increasing risk had no impact on consumption for the case of quadratic utility. However, when moving costs are in a range where it is optimal to move only when both spouses become unemployed, this result is reversed. In this case, increasing risk leads to increased housing consumption.

In this setting, moving costs impact the relationship between risk and optimal consumption in two ways. First, if it is optimal to move only when both spouses become unemployed, increasing risk make moving more likely. Therefore, increasing risk increases the household's expected moving cost and makes them effectively poorer, thus reducing optimal consumption.

Second, increasing risk reduces the probability that exactly one-spouse will become unemployed. In the one-unemployed state, the household decides to maintain a level of housing consumption that is larger than it would choose in the absence of moving costs. This requires a substantial reduction in food consumption, causing the marginal utility of food consumption to exceed the marginal utility of housing consumption. In this state, the marginal utility of first-period housing is negative; the household's lifetime utility would have been higher had it spent less on housing in the first period. Reducing first-period housing consumption would have transferred wealth from the first period to the second period, when the marginal utility of consumption was higher. In addition, reducing first period housing consumption would have reduced second period housing consumption. This would have transferred consumption from second-period housing, which had a relatively low marginal utility, to second-period food, which had a relatively high marginal utility. Since increasing risk reduces the probability of a state where the marginal utility of first-period housing consumption is strongly negative, increasing risk increases the optimal level of first-period housing consumption. This finding is not limited to the special case of quadratic utility with fixed moving costs. The next section will use a numerical example with log utility and proportional moving costs to further develop the intuition for these results.

2.2 Graphical Illustration of Household Risk and Commitment

The last subsection provided a proof that increasing risk will lead to increased housing consumption when moving costs make it optimal to move only in the worst state of the world. However, this proof assumed that preferences were quadratic and adjustment costs were fixed. While these unrealistic assumptions are necessary to obtain an analytically tractable solution, they are not necessary to obtain the same qualitative results. To develop intuition behind these results and to show that they are not confined to a special case, we begin by showing the effect graphically. We use the two-period model described in Section 2 in which uncertainty comes from the possibility that one or both members of a couple could become unemployed.[7] Utility is assumed to of the log form, $g(\cdot) = \ln(\cdot)$, and we consider proportional moving costs, $k = ch_1$. We vary household risk by changing the correlation of spouses' unemployment events.

In a standard model without moving costs, $k = 0$, precautionary saving is obtained because the marginal utility of wealth goes up more than twice as much when both husband and wife are unemployed than when only one is unemployed. Therefore, a mean preserving spread (increasing the probability of neither or both spouses become unemployed while decreasing the probability that exactly one spouse will be unemployed) increases the expected marginal utility of wealth and decreases the expected marginal utility of first-period consumption. Therefore, increasing risk reduces the optimal level of consumption whenever the cost of adjusting consumption is small (e.g. the case of renting a home).

This is illustrated by Figure 2.2, which shows the marginal lifetime utility of first-period housing consumption, $dU(h_1, f_1^*(h_1))/dh_1$, for dif-

[7] We assume that $Y_2^U = 0.5 \cdot Y_2^E$, which corresponds to the 50 percent replacement rate common in many states' unemployment insurance systems. Furthermore, we assume $Y_1 = 2 \cdot Y_2^E$, so that household income stays constant if both partners remain unemployed. Without loss of generality, we normalize by setting $Y_2^E = 1$.

ferent levels of housing consumption in different states of the world. In other words, holding wealth fixed, how does a marginal increase in first-period housing consumption impact lifetime utility if both family members (or one or none) are employed in the second period? These lines represent the first-order condition for first-period housing if the second-period realization were known. The optimal level of housing if the second-period realization were known is simply the point where a given line crosses the y-axis.[8] If both husband and wife are unemployed, the "$\triangle$" plot, then the marginal utility of first-period housing consumption is strongly negative; the family could have done better if it had initially bought a smaller house. By contrast, if both spouses are employed, the "$\square$" plot, then the marginal utility of first-period housing is positive; the family could have increased utility had it bought a bigger house initially.

Plot "+" in this figure is merely an average of the a "$\triangle$", "o", and "$\square$" plots, weighted by the respective probabilities of these three outcomes. Since the first-order condition for h_1 is

$$E\left[dU\left(h_1, f_1^*\left(h_1\right)\right)/dh_1\right] = 0,$$

the optimal level of consumption is simply the point where the expected marginal utility plot, "+", crosses the y-axis. A mean preserving spread increases the weight on the neither employed and both employed states ("$\triangle$" and "$\square$" plots) by reducing the weight on the one employed state ("o" plot). Since the "$\triangle$" plot (neither employed) is substantially lower than the "o" plot (one employed) and the "$\square$" plot (both employed), a mean preserving spread will move the expected marginal utility (the "+" plot) to the left and therefore reduce the optimal level of initial housing consumption. This is a graphical representation of precautionary saving.

Figure 2.3 depicts the same problem as Figure 2.2; the parameter values are the same except that there is a 10 percent proportional cost of adjusting housing consumption. Throughout the range of interest, it is optimal to adjust housing consumption if both spouses become unemployed but not when neither or only one of them becomes unemployed. The noteworthy feature of this figure is the extremely low marginal utility of first-period housing consumption when exactly one spouse is unemployed. The marginal utility of first-period housing is highly negative for households with exactly one unemployed spouse because these households have to reduce food consumption dramatically

[8] However, these plots assume that the level of non-housing consumption in the first period is chosen optimally given first-period housing but given that the second period employment realization is not known in the first period. These plots assume the following parameters: $Y_1 = 2$, $Y_2^E = 1$, $Y_2^U = .5$, $p = q = .1$, $\rho = 0.2$.

in order to maintain their housing consumption.

Reducing first-period housing consumption by \$1 increases lifetime utility because it allows the household to increase second-period food consumption – which has a relatively high marginal utility – by \$2 (and decrease second-period housing consumption – which has a relatively low marginal utility – by \$1). In this context, inducing a mean preserving spread, namely moving probability mass from the state in which one spouse is employed to the states in which either both are employed or both are unemployed, has a very different effect than in the case without moving costs. An increase in risk reduces the probability of the state in which exactly one spouse is unemployed, when the marginal utility of first-period housing is highly negative. Since the "one employed" line is substantially below the midpoint of the "both employed" and "neither employed" lines, the mean preserving spread actually increases expected marginal utility at all levels of housing and therefore increases the optimal level of initial housing consumption.

These graphs represent the fundamental idea of the paper, that moving costs impact the relationship between risk and consumption. Unlike a traditional model of precautionary saving, increasing risk can actually increase the optimal level of consumption in a setting with consumption commitments. This result is generated because increasing risk reduces the probability of exactly one person becoming unemployed. Since this is the state in which the household is stuck with a house that is much too big and wish they had bought a smaller house initially, optimal housing consumption increases.

The next subsection quantifies the size of this effect. It solves this model numerically for a variety of parameter values to understand which parameter values generate these results.

2.3 Calibrating the Impact of Household Risk on Consumption Commitments

Section 2.2 developed the intuition that increasing risk may actually increase consumption. This section performs a calibration to examine the potential size of this effect. How big of an effect does the model predict? What parameter values make it optimal to move only in the dual-unemployment state and therefore generate these results?

If it is optimal to move only in the worst state of the world, we know that the optimal level of housing and food $\{h_1, f_1\}$ must satisfy the following criteria if $g(\cdot) = \ln(\cdot)$:

$$\ln h_1 + \ln\left(Y_1 + 2Y_2^E - 2h_1 - f_1\right) > 2\ln\left(Y_1 + 2Y_2^E - h_1(1+k) - f_1\right) - 2\ln 2; \quad (14)$$
$$\ln h_1 + \ln\left(Y_1 + Y_2^E + Y_2^U - 2h_1 - f_1\right) > 2\ln\left(Y_1 + Y_2^E + Y_2^U - h_1(1+k) - f_1\right) - 2\ln 2;$$
$$\ln h_1 + \ln\left(Y_1 + 2Y_2^U - 2h_1 - f_1\right) < 2\ln\left(Y_1 + 2Y_2^U - h_1(1+k) - f_1\right) - 2\ln 2.$$

These conditions merely state that the utility of not adjusting the level of housing consumption is greater than the utility of adjusting housing consumption when both spouses are employed or when exactly one is employed, but not when both are unemployed. If the optimal solution satisfies these criteria, then the first order conditions can be written as:

$$0 = \begin{bmatrix} \frac{1}{f_1} + (1-p-q+\phi)\left\{-\frac{1}{\left(Y_1+2Y_2^E-2h_1-f_1\right)}\right\} \\ +(p+q-2\phi)\left\{-\frac{1}{\left(Y_1+Y_2^E+Y_2^U-2h_1-f_1\right)}\right\} \\ +\phi\left\{-\frac{2}{Y_1+2Y_2^U-h_1(1+k)-f_1}\right\} \end{bmatrix}; \quad (15)$$

$$0 = \begin{bmatrix} \frac{1}{h_1} \\ +(1-p-q+\phi)\left\{\frac{1}{h_1} - \frac{2}{\left(Y_1+2Y_2^E-2h_1-f_1\right)}\right\} \\ +(p+q-2\phi)\left\{\frac{1}{h_1} - \frac{2}{\left(Y_1+Y_2^E+Y_2^U-2h_1-f_1\right)}\right\} \\ +\phi\left\{-\frac{2(1+k)}{Y_1+2Y_2^U-h_1(1+k)-f_1}\right\} \end{bmatrix}. \quad (16)$$

Similar first order conditions can be obtained when the parameters make it optimal to move in different states.[9]

Given sensible parameters, this setup generates a substantial impact of couples' income correlation on optimal housing consumption. For example, if the replacement rate for the unemployed is 50 percent, there is no earnings growth for the employed, the probability of becoming unemployed is 10 percent, and the cost of moving is 10 percent[10], it is optimal to adjust housing only if both spouses become unemployed. Figure 2.4 plots consumption for various levels of income correlation in this case. Increasing the correlation of unemployment from no correlation to perfect correlation increases optimal spending on housing by

[9] Since there are three states and the family can either move or not in each state of the world, there are $2^3 = 8$ possible pairs of first order conditions that could be satisfied given particular parameter choices. Of these, the case where you move if only one spouse becomes unemployed but not if both or neither do, can never be optimal. The other seven pairs of first order conditions will be relevant for some set of parameters.

[10] $Y_1 = 2, Y_2^E = 1, Y_2^U = 0.5, p = q = 0.1, k = 0.1$

2.9 percent (and decreases optimal non-housing consumption by 1.0 percent). The saving rate decreases from 3.8 percent to 2.9 percent when the correlation of income increases.

The results for housing consumption and saving are exactly the opposite of those predicted by the standard precautionary saving motive that exists in the absence of moving costs. With an otherwise identical setup without moving costs, the same increase in income correlation leads to a 1.2 percent reduction in both housing and non-housing consumption and in increase in the saving rate from 3.3 percent to 4.4 percent. Since this is a two-period model with stylized assumptions about time discounting, rates of return on saving, risk aversion, the relative importance of housing and food consumption, and the income shares of couples, these numbers should be taken with a grain of salt. Given different parameters or more realistic assumptions about risk aversion and time, the effect could vary. However, this calibration provides the intuition that in the presence of moving costs, increasing risk can lead to a substantial increase in housing consumption and a substantial reduction in saving. This effect is similar in size to – but of the opposite sign from – what would be predicted by a standard model of precautionary saving.

In a setting with moving costs, increasing risk impacts consumption through three distinct channels. First, a standard precautionary saving effect implies that increased risk should lead to reduced consumption when the third derivative of utility is positive. Second, if the household moves in some states of the world but not others, increasing risk impacts the likelihood that the household will adjust their level of housing consumption and therefore pay a moving cost. When moving is optimal only when both spouses become unemployed, increasing risk makes the household effectively poorer by increasing the likelihood of moving, thereby reducing optimal consumption. Finally, in the presence of moving costs, reducing housing consumption in the first period reduces second-period housing consumption and increases second-period food consumption. This rebalancing of consumption increases utility in the one-unemployed state when moving costs prevent the household from moving to a smaller house to increase food consumption. Therefore, an increase in risk that reduces the likelihood of this state increases optimal first-period housing consumption.

Table 2.1 presents a summary of the results for a variety of parameters. For the reasons discussed in Section 2.2, increasing the correlation of unemployment, ϕ, increases optimal housing consumption whenever it is optimal to move only when both spouses are unemployed. Unsurprisingly, there are many sets of parameter values for which it is not optimal to move only in this state. Reducing the cost of moving makes moving optimal in states where only one or even neither spouse is unemployed. Similarly, adjusting the income earned by the unemployed also impacts when it is optimal to move. When the income of the unemployed is low enough, it is optimal to move even when only one spouse is unemployed; when the income of the unemployed is high enough, it is not optimal to move even when both spouses are unemployed. For parameters that make it optimal to move when one and both spouses are unemployed, the impact of household risk on housing consumption varies but is weaker than when it is optimal to move only in the worst state.[11] These results lead to a prediction than can be tested in the data: the relationship between risk and housing consumption should be stronger (most positive) for households who choose to move only under extremely bad circumstances than for households who choose to move under less extreme circumstances.

2.4 Risk and the Willingness to Undertake Commitments

The previous subsections have shown that increasing risk, coupled with a substantial moving cost, can lead homeowners to spend more on housing. While households need to consume housing, they need not take on such large moving costs. While renting a home has a variety of disadvantages (e.g. moral hazard costs, rent is not tax-deductible), it has substantially lower adjustment costs. How does increasing risk impact a household's willingness to undertake a consumption commitment at all, to decide to buy rather than rent a home?

To answer this question, we make the stylized assumption that renting a home involves no moving costs, so that the household can always adjust housing consumption. By contrast, owning a home involves a substantial moving cost (in this case, 10 percent), so that given the parameter assumptions discussed above it will be optimal to move only in the state of the world, where both spouses are unemployed. In this setting, we compute the premium that a household must be offered to make it willing to accept higher moving costs. Neglecting the obvious benefits of homeownership, how much higher must salaries be to make a household willing to buy instead of rent? Figure 2.5 plots household utility with and without moving costs for various levels of spousal in-

[11] On one hand, a mean-preserving increase in risk leads to a precautionary saving motive to reduce overall consumption. On the other hand, this increase in risk reduces the probability of incurring moving costs since the both-employed state becomes more likely. Therefore, the effective price of housing falls, providing a pricing motive to increase housing consumption. Which of these effects dominates varies according to the parameters chosen.

come correlation, ρ, our measure of household risk. While consumption falls as risk increases when there are substantial moving costs, utility falls as risk increases for both levels of moving cost. However, utility falls faster when moving costs are higher.

This figure also plots the premium that households demand to make them willing to own their home. This premium is increasing in household risk, ρ. For example, when a couple's income risks are uncorrelated, the household must be offered 1.4 percent higher income to make it willing to buy a home instead of rent. However, when a couple's income risks are perfectly correlated, they must be offered 2.1 percent higher income to make them willing to buy a home.

Since the demanded home-owning premium increases with risk, households should be more likely to rent and less likely to buy as risk increases. The intuition for this is relatively straightforward when homeowners move only when both spouses are unemployed. Increasing risk increases the probability that both spouses will be unemployed, and therefore increases the probability of needing to move and pay a moving fee. As risk increases, households become more likely to rent as the effective cost of homeownership, including the expected cost of moving, goes up.

We have just developed a prediction for the impact of risk on housing consumption. In the empirically reasonable case when it is optimal to move only in the worst state of the world, increasing risk leads to increased housing consumption for homeowners; this prediction is exactly the opposite of the one generated by standard models of precautionary saving. Next, we perform an empirical test to see whether the standard precautionary saving story or our commitment story best fits the relationship between household risk and housing consumption.

3 Empirical Evidence

To test the hypothesis developed in Section 2 – do families engage in larger consumption commitments when they face small risks rather than large ones – we turn to households' demand for housing. This is an interesting and useful context in which to examine consumption commitments. Housing makes up a significant fraction of household consumption for most families. For owners, housing wealth comprises 27 percent of their total net worth on average (Poterba and Samwick (1997)), and the flow cost of that housing for homeowners averages about a third of annual income. Also, since changing the level of housing consumption is costly, home ownership is a real commitment. Estimates of the combined pecuniary and non-pecuniary costs of moving for owners are substantial. While looking for similar effects with mobile phone contracts or other commitment goods would be interesting, data on other goods is sparse.

Our primary test of consumption commitments will compare the housing consumption of families who vary in their risk profiles, using the structure in Section 2 as a guide.[12] As a proxy for variation in risk – in the theory, the correlation between the head and spouse's incomes – we use whether a couple shares the same occupation. A couple who work in the same occupation has a greater risk of simultaneous unemployment than a diversified pair. Table 3.1 uses data from the Survey of Income and Program Participation (SIPP) to document this fact. Same-career couples – defined as couples who share a 3-digit occupation code – do indeed face a higher rate of dual unemployment and a lower risk of single unemployment than couples with different careers. The rates of single- and dual-unemployment imply a correlation of unemployment events which is slightly less than zero (0% to -4%, depending upon the time horizon) for couples with different careers but of roughly 14% for couples who share a career. While Table 3.1 presents unconditional unemployment rates, this pattern of higher unemployment correlation for same-occupation spouses is also present after conditioning on other observables. By incorporating observable factors that affect the probability of unemployment for each spouse individually, we can control for other channels through which the risk of unemployment can affect housing demand, and our same-occupation proxy will then closely resemble the mean-preserving spread from Section 2.

Lemma 2 predicts a positive relationship between housing consumption and a couple's income correlation only for households who find it optimal to move when both become unemployed. For households who move under other circumstances, this effect is muted or absent. To understand how moving costs should impact the relationship between risk and consumption, it is important to document the moving rates for households in which no, one, or both spouses have become unemployed. Table 3.2 details these results using data from the SIPP. For homeowners, moving rates are low for households in which neither or one spouse has become unemployed in a given month (4% and 6% respectively, over the subsequent 12 months). However, moving rates are dramatically higher when both spouses become unemployed in a given month (16%

[12] Owner-occupied housing plays a dual role as both consumption and investment, potentially obscuring the meaning of a positive link between risk and housing consumption. However, the consensus of the literature (Henderson and Ioannides (1983), Geotzmann (1993), Brueckner (1997), and Flavin and Yamashita (2002)) is that people are forced to over-invest in housing to satisfy their consumption needs, hence the demand for housing for consumption is binding, while the desire for housing as investment is not. Consequently, the dual nature of housing does not preclude its use as an indicator of consumption. We return to this issue at the end of the paper.

over the subsequent 12 months). For home renters, the pattern is quite different. The rates of moving are much higher. Importantly, they are quite similar for households in which none, one, or both spouses have become unemployed (29%, 33%, and 39% respectively, over the subsequent 12 months). This suggests that while our theory would a positive relationship between risk and housing consumption for homeowners, no such relationship would be predicted for home renters.

The empirical section of this paper begins by examining the relationship between our proxy for risk – whether a couple share an occupation – and housing consumption. Naturally, one would be concerned that having the same occupation is simply a proxy for an unobserved taste for housing. Our initial identifying assumption is that the tendency to marry someone of the same occupation is uncorrelated with the preference for housing consumption, controlling for observables. Ideally, the marriage match is exogenous: that is, we hope our households married for love; it is okay if they married for money; and it's a potential problem if they married because they both love housing and they met because they both worked at Home Depot.

We use several different tests to address this concern about omitted variable bias. First, we use a variety of observable variables to control for potential channels through which whether spouses share an occupation might be correlated with their preference for housing. We control not only for individual-level observables like educational attainment and occupation-specific fixed-effects for both spouses, but also for household-level observables like location or whether spouses are similar along other dimensions besides occupation.

In addition, we exploit two forms of variation in the cost of moving. The theory we developed suggests that a positive relationship between risk and housing consumption should be present only when moving costs are high. This allows a more refined test of our hypothesis based on the identifying assumption that any difference in the preference for housing between couples that do and do not share a career is independent of moving costs. First, we look at renters, since renters have much lower transaction costs than owners. Under the consumption commitments hypothesis, families with lower transaction costs, like renters, should exhibit a weaker relationship between housing consumption and whether they have the same occupation. However, if sharing an occupation is merely a signal of an unobservable preference for housing, renters who share an occupation should rent more expensive homes than renters who do not.

Second, we exploit heterogeneity in moving costs based on the exogenous probability of moving. Households that are likely to move soon for exogenous demographic reasons have a lower effective cost of a forced move than households who never planned to move. For households who were likely to move, a bad income shock merely accelerates the timing of a move that was going to happen soon anyway. For households who were not planning to move, a move may incur a wholly unexpected set of costs. A model that incorporates consumption commitments would predict that the tendency of same-occupation couples to buy more expensive houses (relative to different-occupation couples) should be stronger when the exogenous probability of moving is lower.

In addition, we test a prediction of the model for the decision to rent versus own a home. A theory of consumption commitments would imply that increasing risk should make households more likely to rent, since increasing couples' unemployment correlation makes home-ownership effectively more costly by increasing the probability of moving.

Finally, we exploit variation across states in unemployment insurance. When unemployment insurance is more generous, households are less likely to move when both spouses become unemployed. As a result, the relationship between whether couples share an occupation and their housing consumption should be weaker for households who enjoy relatively more generous unemployment insurance.

To provide a preview of the results, all of these specifications are consistent with a theory of consumption commitments. Same-occupation couples spend more on owner-occupied housing than different-occupation couples, even after controlling for observables including occupation- and region-specific fixed-effects. However, this relationship does not hold for households that rent their homes. Same-occupation couples are more likely to rent their homes, after controlling for observables. The tendency of same-occupation couples to spend more on owner-occupied housing is stronger for households who were less likely to move for exogenous reasons. Finally, this tendency is stronger for couples who enjoy less generous unemployment insurance benefits.

3.1 Data and variable construction

To estimate these relationships empirically, we need a source of household-level data that contains information about housing consumption, incomes, and the occupations of both the householder and the spouse. For this we turn to the 1980, 1990, and 2000 Integrated Public Use Microdata Series (IPUMS) of the U.S. Census. The data are a one percent random sample of responses to the U.S. Decennial Census and contain self-reported house values, incomes, and occupations, as well as employment status, moving history, and a number of demographic variables and geographic identifiers. The data are cross-sectional, in that families may not be in the data repeatedly and we have no way of identifying them if they are.

The three waves of the IPUMS together contain 2,778,194 household-level observations.[13] We impose several restrictions on our sample, which substantially reduce the number of usable observations. These restrictions are detailed in Table 3.3. We limit our attention to families that live in Metropolitan Statistical Areas (MSAs), a geographical area defined by the Bureau of the Census, so we can control for local housing costs. While MSAs are typically centered around cities or clusters of cities, they are intended to correspond to labor market areas and have a minimum population cutoff, and thus are a broader definition than cities. Of our initial sample, more than one-third do not live in MSAs.

We keep only households containing a married couple where both spouses work full-time. For parsimony, we define the male spouse as the household head (hereafter: the couple will be referred to a husband and wife). We exclude unmarried households because there is no risk-sharing for a single homeowner. We also exclude households containing part-time or unemployed spouses. While these households may take advantage of potentially interesting sources of intra-household insurance, it is difficult to measure accurately their earnings capacity or occupation.[14] After excluding households where either spouse is under 25, or has a negative income, a missing occupation label, or a rare occupation (one with fewer than 200 occurrences in our sample), as well as farmers and households with more than eight people, we are left with 231,710 observations on home-owning households and 58,501 observations on households that rent their home.

The IPUMS reports one occupation variable that is consistently defined over all three waves, based on occupation categories from 1950. While some of the 227 occupation labels are archaic, they are generally appropriate. Table 3.4 lists the 20 occupations which have the highest incidence of husbands having the same occupation as their wives, as well as the number of times and the rate at which those occupations appear in

[13] We pool the three decades together for greater statistical power, especially when we include large numbers of dummy variables. We have tried the baseline regressions on a decade-by-decade basis. The results are qualitatively unchanged and still statistically significant. However, the impact of the same-occupation variable declines over time, consistent with a reduction in the importance of unemployment risk or the degree to which liquidity constraints bind.

[14] In particular, one spouse might keep their labor supply in reserve as a buffer against an unemployment spell for a the currently working spouse. (Cullen and Gruber (2000)) That behavior would be akin to consuming less housing relative to income. The distinction is that the relevant metric for the partially-employed couple is potential income. Since it is hard to measure potential earnings, we restrict our attention to those families working at their potential.

the data. As detailed in Table 3.5, the average rate of same-occupation couples across all occupations in the sample is 9.6 percent. However, Table 3.4 shows that the rate varies widely by occupation – it ranges from almost 45 percent for teachers to zero for many occupations not listed in the table. That variation does not appear to move in lockstep with the prevalence of the occupation. That is, one might have expected random matching to make same occupation couples more common in common occupations. While this might explain the high rate (17 percent) of same-occupation couples among managers, officials and proprietors (who make up 16.3 percent of the sample), it does not explain the high rate (22 percent) of same-occupation couples among physicians and surgeons (who make up just 0.7 percent of the sample). Nor does the frequency of same occupation appear to be income-related. While lawyers and judges have a high (12.5 percent) rate of same-occupation couples, cooks have a rate which is nearly as high (11.6 percent).

Section 3.2 will examine the relationship between this same-occupation variable and the household's house value, which is self-reported in the IPUMS.[15] Since the house value is recorded as a range, we assign the house value to be the midpoint of the range or 1.5 times the top code. In Table 3.5, the average owner-occupied house value in the sample is nearly $176,000. In comparison, family incomes average over $90,000 for home-owners.

Consistent with the framework developed in Section 2, our proxy for income risk will be unemployment; the risk of exactly one spouse becoming unemployed is considered a "small" risk and the risk of both spouses becoming unemployed is considered a "big" risk. We impute the probability of being unemployed for a husband (wife) as the average rate of unemployment by husbands (wives) in the same occupation and year, excluding the husband's (wife's) own observation.[16] We compute this measure separately for husbands and wives, imposing the same sample restrictions as in Table 3.3 (except for the full-time worker restriction), and use only those occupations where there are at least 200 observations over which to take the average. Table 3.5 shows that the unemployment rate for husbands (p) averages 6.7 percent and the unemployment rate for wives (q) averages 14.2 percent. The probability that just one spouses is unemployed ($p + q - pq$, assuming independence of spousal unemployment) averages 20.0 percent and the probability that both are unemployed (pq, assuming independence) averages 1.0 percent.

[15] While self-reported house value is a noisy measure of the true value, some evidence indicates that the error is random, except for a universal tendency towards overestimation. [Goodman and Ittner (1992)]

[16] We label people who report zero for their usual weekly hours as unemployed.

For some of our empirical work, we will need to consider an exogenous measure of the likelihood of moving. We impute this variable in a manner similar to our procedure for unemployment. The IPUMS reports when the family moved into their house. We construct the average rate of having moved within the last year by (age) • (education) • (presence of children) cells. We use 10-year age brackets, 17 education categories, and an indicator for if the family has any children to define the bins and take the average for all the other households in that bin. We use this estimate of the rate of recent past moving by similar families as an exogenous proxy for the probability of moving in the near future.

3.2 The relationship between income risk and house value

We begin by investigating whether our proxy for a mean-preserving increase in risk leads to more or less housing consumption. Following Section 2, one approach could be to regress house values on ϕ $\left(\phi = pq + \rho\sqrt{pq\left(1-p\right)\left(1-q\right)}\right)$. However, rather than take this structure literally, we will use it to inform the variables we include in our reduced-form estimation.[17] The reason for this is relatively straightforward: p and q contain information not just about risk, but also expected income. We use the same-occupation indicator variable, 1_{ρ}, as a measure of our parameter of interest, ρ. Since this variable proxies for a mean-preserving spread, a positive coefficient indicates that increasing risk increases consumption. The other components of ϕ – the probability of the husband and wife becoming unemployed (p and q, respectively) and the odds that both would be unemployed if the risks were independent (pq) – act as controls. We also include terms which take the square of the unemployment rates for a husband and wife in case the relationship between the risk of unemployment and housing demand is nonlinear in a way that is not reflected in the model.[18]

While the model in Section 2 assumed that husbands and wives earned the same amount, in practice one member of the household might have significantly greater income than the other. In that case, the possibility of unemployment for the low-income spouse poses a smaller risk to the household than would be implied by the unemployment rate. Similarly, the possibility of unemployment for the high-income spouse poses

[17] We have run the base case regressions restricting the specification to match the model exactly and have obtained similar results, both qualitatively and in terms of statistical significance.

[18] While the squared terms are statistically significant, excluding them does not substantially impact our estimate of the effect of the same-occupation indicator variable.

a larger risk than would be implied by unemployment rates. To correct this mismeasurement, we weight the variables by the husband's and wife's shares of family income. For example, suppose the husband was the primary earner and the wife earned a nominal amount, so effectively the husband accounted for the family's entire income. Then the risk to the household of the wife becoming unemployed is effectively zero, and we multiply the wife's unemployment rate by zero. The full impact of the husband's unemployment risk is important and we do not down weight it at all. Similarly, suppose the husband and wife earn equal amounts. Then we multiply each of the husband's and wife's unemployment risks by 0.5.[19]

To implement this weighting scheme, we construct the husband's share of family income as (husband's income) / (husband's + wife's income). In Table 3.3, on average the husband earns 62.4 percent of the family's income, when both spouses are working full-time. Calling the husband's share of income s and the wife's share $(1-s)$, the husband's unemployment risk controls become ps and p^2s^2; the wife's, $q(1-s)$ and $q^2\left(1-s\right)^2$; and, for both, $pqs(1-s)$. The same-occupation indicator variable, 1_ρ, also an interaction of both spouses, is multiplied by both income shares: $1_\rho s(1-s)$. We also control for the husband's income share alone.

We estimate the following regression on the sample of homeowners:

$$\ln\left(P^H\right)_{i,t} = \begin{bmatrix} \beta_1 1_\rho s\left(1-s\right)_{i.t} + \beta_2 ps_{i,t} + \beta_3\left(ps\right)^2_{i.t} + \beta_4 q\left(1-s\right)_{i,t} \\ +\beta_5\left(q\left(1-s\right)\right)^2_{i,t} + \beta_6 pqs\left(1-s\right)_{i,t} + \beta_7 s_{i,t} + \gamma\ln\left(Y\right)_{i,t} \\ +\varphi Z_{i,t} + \delta_t + \varepsilon_{i,t} \end{bmatrix} \tag{17}$$

for family i in year t. Family income is denoted by Y and year dummies by δ_i. Some regressions will include other covariates, Z, such as dummies for the number of people in the household, the number of children, the education of the husband and the wife, the age brackets for the husband and wife, the MSA of residence, and the husband's and wife's occupations.

Estimating equation 17, we find $\beta_1 > 0$, couples who share an occupation spend more on owner-occupied housing. The first column of Table 3.6 reports the results where the only covariates are the (unemployment) • (income share) variables and log of family income. The estimated coefficient of 0.182 (0.019 standard error) indicates that, at the average husband's income share, husbands and wives with the same occupation spend 4.3 percent more $(0.182 \bullet 0.624 \bullet (1-0.624))$ on housing than couples with different occupations.

This positive coefficient for the "same-occupation" variable shows

[19] The results are qualitatively unchanged if this adjustment is not used.

the impact of our proxy for a mean-preserving increase in risk, which increases the probability of "big" risks and decreases the probability of "small" risks. Non-mean preserving increases in risk, such as a higher risk of unemployment for either the husband or the wife, have the expected result of reducing the spending on housing. Income is a good predictor of housing consumption, with a estimated coefficient of 0.630 (0.003). The income share of the husband has a small negative effect on housing consumption, but that result is probably due to the variable picking up other omitted variables, an issue to which we now turn.

3.3 Does same-occupation reflect unobserved taste for housing?

The last subsection documented a correlation between the "same-occupation" variable and housing consumption. While this is consistent with a theory of consumption commitments, it might merely reflect other factors that are correlated both with marrying someone of the same occupation and housing consumption. For example, perhaps some cities are expensive and have few occupations. Couples in those cities would have to pay more for housing and also would be more likely to share an occupation. Alternatively, perhaps doctors prefer big houses and also tend to marry other doctors. In these examples, location and occupation are variables that must be controlled for to rule out these possibilities.

To address this problem, we begin by controlling for all of the covariates in Z except the occupations of the husband and wife. For example, by including MSA dummies, and thus comparing housing consumption for same-occupation and different-occupation couples within a metro area, we control for differences across locations in house prices or taste for housing. Many of these controls allow us to gain confidence at the expense of some of our identifying variation. For example, even if there is a causal impact of risk on housing consumption, households with increased risk might choose to consume more by locating in more expensive areas.

A regression with these controls are presented in the second column of Table 3.6, where the estimated coefficient on $1_{\rho} s\,(1-s)$ is now 0.096 (0.017). Even after controlling for MSA and a host of demographic characteristics, same-occupation couples buy houses that are on average more than 2 percent more expensive than other couples. The estimated coefficient on the husband's income share turns positive with the additional controls, indicating that more inequity in the couple's earnings – which increases the likelihood of income shocks being big – leads to higher housing consumption.[20] The other reported coefficients change in magnitude, but not in sign.

Next, we add two indicator variables for each occupation, one representing whether that occupation is held by the husband and the other representing whether it is held by the wife. These variables control for the possibility that same-occupation couples are clustered in occupations which have a preference for housing. That is, controlling for the occupations of each partner, if the pair happens to have the same occupation, do they purchase more housing? This regression implicitly assumes additivity, since it assumes that the taste for housing of a dual-doctor household can be proxied by the taste for housing of doctor-husbands and doctor-wives as estimated from doctors who are married to non-doctors.

The results from this regression are shown in the third column of Table 3.6. Here, the "same-occupation" variable remains significant and positive even after the introduction of occupation controls. The new coefficient of 0.064 (0.018) implies that same-occupation couples spend 1.5 percent more on their houses, all else equal. The unemployment rate and income controls decline in magnitude and significance, which is not surprising since much of the variation in unemployment rates is across occupation (with the remainder being within occupation over time), and income is correlated with occupation.

Another form of unobserved heterogeneity that could explain our results is similarity in general. Perhaps the kind of people who choose similar spouses have a preference for housing. In regressions that we do not report, we have controlled for other dimensions on which partners can be the same, namely age (in ranges) and education. While these variables occasionally have a statistically significant effect on housing demand, the sign of this impact is not uniform. Furthermore, including these variables has almost no effect on the estimated same-occupation coefficient. Therefore, similarity *per se* does not seem to account for our findings.

While the controls discussed so far rule out many explanations based on differences between same-occupation and different-occupation households, it is hard to dismiss all such possibilities. There are a host of

[20] This result is economically quite large: a one standard deviation increase in the head's income share (this standard deviation is 0.17) leads to a two percent more expensive house. However, this result says little about consumption commitments; people who like to spend money pair up with spouses who make a lot of money. Thus we think the income share variable alone is best considered a control for consumption-based matching stories and will keep our focus on the much better identified same-occupation variable, which is significantly positive regardless of whether or not it is multiplied by the income share variable.

unobservable variables that could be correlated with both housing preferences and the tendency to marry a spouse with the same occupation. For example, the amount of free time spent at home is one such unobservable variable. People who spend more time at home are likely to have a preference for housing. At the same time, they are more likely to meet their spouses in the office – since they have few other venues to meet people – and therefore marry people who share their occupation. The next section is intended to exploit variation in the cost of moving to rule out alternative explanations based on unobserved heterogeneity for which no direct evidence is available.

3.4 Using variation in transactions costs to test consumption commitments

In the model presented in Section 2, the impact of risk on the demand for consumption commitments is driven entirely by the cost of moving. Therefore, the effect of risk on consumption commitments should be greater when transaction costs are higher, when a higher fraction of households find it optimal to move only in the face of large shocks. Indeed, households with no transaction costs would be expected to exhibit precautionary saving behavior.

While we do not measure transaction costs directly, we exploit two types of variation in implicit transaction costs. The first is the difference in moving costs for renters and homeowners; the second is generated by variation in the probability of moving for exogenous demographic reasons. The empirical strategy looks *not* at the impact of "same-occupation" on housing consumption, but rather at the impact of the *interaction* of "same-occupation" and moving cost on housing consumption. Even if our proxy for risk (the "same-occupation" variable) is prone to omitted variable bias, this interaction may not be. The identifying assumption underlying this empirical strategy is that unobserved differences in the preference for housing between same-career and different-career couples should be independent of the moving costs they face. For example, even if same-occupation couples value housing consumption more than different-occupation couples, this difference must be the same for homeowners and renters.

First, we compare households who rent their homes to households who buy them. If same-career couples have an unobserved preference for housing, this should lead them to buy more expensive homes and to rent more expensive apartments; the relationship between the same-career variable and housing consumption should be positive for both renters and homeowners. However, if consumption commitments and not preferences explain increased housing consumption by same-career households, this effect would be limited to homeowners. Indeed, renters might have a precautionary saving motive and the relationship between the same-career variable and housing consumption could be negative.

Table 3.7 estimates equation 17, replacing log(house value) with log(rent), on a sample of renters. The same-occupation variable here is almost exactly zero, and is far from statistically significant. This result holds even with the addition of demographic controls, MSA fixed effects (the second column), and occupation dummies (the third column). Thus, a mean-preserving increase in risk has no effect on the demand for rental housing but a large effect on the demand for owned housing. This suggests that consumption commitments and not unobserved attributes explain the tendency of same-career households to spend more on housing.

Another source of variation in transaction costs comes from the rate of moving. Some households plan to move even in the absence of income shocks; others do not plan to move. For those considering a move anyway, being forced to move for financial reasons merely accelerates the timing of their moves. Regardless of whether this household moves sooner or later, it will have to pay moving costs. While there is some cost to changing the timing of a move, it is presumably much smaller than the transaction cost of the move itself. In the limit, a household that was about to move anyway does not face any additional transaction cost if forced to move as well. Conversely, the transaction cost is largest for a family that planned never to move; in that case, a forced move is a net new transaction cost. As a result, the effective transaction cost is declining in the likelihood of a move.[21] Households with higher moving costs are more likely to find it optimal to move only in the face of large shocks, and should therefore display stronger link between our proxy for risk and housing consumption.

This variation in transaction cost should lead the effect of the "same-occupation" variable to diminish as the probability of moving increases

[21] The reason for moving impacts whether effective moving costs are lower for households who are more likely to move. If moving is unpredictable (i.e., a job relocation to another city), then a family who has just been forced to move within their city will be forced to move again to another city for job reasons. The forced move is not a substitute for the relocation, and having a high probability of moving does not reduce the effective cost of being forced to move. By contrast, if a move is predictable (i.e. moving to a smaller house because your kids have moved out of the house), then a housedhold that is forced to move will not have to move again. The forced move is a good substitute for the planned move, and having a high probability of moving does reduce the effective cost of being forced to move. Since households who are forced to move and expect to change cities are unlikely to buy a house in the interim, the typical family with a high probability of moving probably faces a lower effective cost of moving.

and hence as the effective transaction cost declines. To test this hypothesis, use an exogenous measure of the likelihood of moving based on the average rate of moving among couples of similar age, education, and presence of children. The construction of this measure is detailed in Subsection 3.1. We re-estimate equation 17, adding the interaction of our imputed probability of moving (P(move)) and $1_\rho s(1-s)$, plus P(move) by itself, as a control. The identifying assumption underlying this regression is that any unobservable preference for housing by same-occupation couples is uncorrelated with the moving rate of similar households, after controlling additively for household attributes. In our consumption commitments framework, we would expect a positive coefficient on $1_\rho s\,(1-s)$ and a negative coefficient on $P(\text{move}) \bullet 1_\rho s\,(1-s)$.

That is exactly the pattern we observe in Table 3.8. The estimated coefficient on $1_\rho s\,(1-s)$ now corresponds to the case where the household expects never to move and thus faces the largest possible transaction costs. Consistent with our theory, the estimated coefficient is higher than in Table 3.6, and now ranges between 0.257 (0.035) and 0.142 (0.031), depending on the set of controls. The interaction between same-occupation and the probability of moving is negative and significant. Consistent with a model of consumption commitments, increasing risk does not increase housing consumption when the probability of moving is high (and therefore the effective transaction cost is low). The standard deviation across cells in the probability of moving is approximately 0.095, so the probability of moving has to be one to two standard deviations above the mean for the coefficient on the "same-occupation" variable to become negative.[22]

The probability of moving itself is positively correlated with the house value and the estimated coefficient increases between columns (1) and (2). Recall that the probability of moving is imputed based on (age) $\bullet$ (education) $\bullet$ (presence of children) cells. Columns (2) and (3) of Table 3.8 control for each of those variables separately while in column (1) there are no such controls. With the addition of these controls, the last two columns are identified by the interaction of age, education, and the presence of children. Reassuringly, the variables of interest seem to be more-or-less unaffected by the colinearity between those controls.

In addition to providing evidence in support of the consumption commitments behavior, Tables 3.7 and 3.8 provide evidence against the possibility that the same-occupation variable is simply a proxy for unobserved taste for housing. If unobserved tastes were driving the results,

[22] To get a sense of the scaling, at the mean, the household expects to move every 10 years (1.0/0.1). At a two standard deviation higher probability of moving, the expected length-of-stay is just over 3 years.

we should see couples with the same occupation both buy and rent more expensive homes than their peers. Finally, there is no taste-based reason for the relationship between same-occupation and house value to diminish with the likelihood of a move induced for demographic reasons, which is what we found in Table 3.8.

3.5 Consumption commitments and the rent/own decision

Knowing that they are more likely to be unemployed simultaneously, same-career couples may adapt by choosing consumption without a commitment feature. While all households must consume housing, they can reduce moving costs by renting instead of buying housing. Section 2.4 shows that renting becomes relatively more appealing as the correlation between spouses unemployment events increases. Increasing risk increases the probability of having both spouses unemployed and therefore of needing to move. Therefore, same-career couples should be more likely to rent, since they are more likely to need to move and therefore face effectively higher costs of home-ownership.

This prediction is borne out empirically in Table 3.9, which estimates a linear probability model of home-ownership. We again estimate the regression in equation 17, this time substituting a dummy variable that takes the value of one if the household owns their house as the left-hand-side variable. We find that households with less-diversified human capital ("same-occupation" couples) are less likely to own their houses. The estimated coefficients on $1_{\rho}s\,(1-s)$ range from -0.069 (0.011) to -0.077 (0.011), and are effectively unchanged by the addition of MSA dummies, demographic controls, or occupation dummy variables. A point estimate of -0.07 corresponds to a 1.6 percentage point lower probability of home-ownership for same-occupation couples.

This result also helps to discount one alternative interpretation of our results: that if the house is an investment vehicle, we are measuring a positive relationship between a mean-preserving increase in risk and saving rather than consumption. Under that interpretation, the evidence from Table 3.6 and 3.7 (though not 3.8) would reflect a precautionary saving motive rather than consumption commitments. However, households who rent do not invest in housing at all. To the degree that increasing risk leads households to save more by investing in housing, one obvious way to do this would be to buy instead of rent a home. Therefore, we should see increasing risk lead households to be more likely to buy and less likely to rent their homes. By contrast, a model of consumption commitments would imply that increasing risk would make households more likely to rent than own their homes. The results in this subsection thus provides strong evidence against the idea that increasing risk leads households to invest more in housing.

3.6 Consumption Commitments and Unemployment Insurance

The final empirical subsection exploits variation in the generousity of unemployment insurance. States differ in the structure of their unemployment insurance policies. Since most of these policies replace 50% of lost wages up to a cap, individuals vary in how much of their income would be replaced if they became unemployed. A theory of consumption commitments suggests that unemployment insurance generosity might interact with increases in risk. If unemployment insurance were generous enough, couples would not need to adjust housing consumption even when both spouses became unemployed. A theory of consumption commitments predicts a positive relationship between "same-occupation" and consumption when the household finds it optimal to move only when both spouses become unemployed. As a result, the relationship between "same-occupation" and consumption is less likely to hold when unemployment insurance is more generous.

To test this theory, we calculate unemployment insurance replacement rates for each spouse using the unemployment insurance calculator developed by Cullen and Gruber and extended by Chetty. We calculate the household's replacement rate as the average replacement rate for each spouse, weighted by their respective income shares. We include this measure of the household's replacement rate, both alone and interacted with the "same-occupation" variable in the regression estimating equation 17. Since we include MSA specific fixed-effects, we effectively control for state-specific variation in housing demand. This specification exploits variation in the nonlinearity of states' unemployment insurance policies. The difference in replacement rates for couples who make $90,000 and $100,000 varies across states. Assuming that this variation is uncorrelated with the state-specific demand for housing by same-occupation couples, then the model is identified. The coefficient on the "same-occupation" x replacement rate interaction should be negative.

Table 3.10 shows the results of the regression which includes unemployment insurance replacement rate variables. While same-occupation couples continue to spend more on housing, this result is weaker when unemployment insurance is more generous. This is consistent with they theory outlined above, that unemployment insurance may reduce the need of households to adjust housing consumption in the face of dual-unemployment and therefore blunts the relationship between risk and consumption.

4 Conclusion

This paper argued that the presence of moving costs complicate the relationship between risk and consumption. In particular, this paper shows that in the presence of moving costs, increasing risk can lead households to spend more on housing. This prediction is the opposite of a conventional precautionary saving model without moving costs in which a mean-preserving increase in risk leads to *reduced* consumption.

For dual-earning couples who face unemployment risk, high moving costs may make it optimal to move to a smaller house only when both spouses become unemployed. When only one spouse becomes unemployed, the couple may choose not to move and instead elects to reduce non-housing consumption substantially. In this case, the household's utility would have been higher if it had bought a smaller house initially. A mean-preserving increase in risk will decrease the probability of small shocks while increasing the probability of large shocks (and of no shock). Therefore, increasing risk reduces the likelihood of ending up in a state in which the household wishes it had spent less on housing initially, and therefore increases the optimal level of housing consumption.

To test this theory, we proxy for a mean-preserving increase in risk by whether a married couple shares the same occupation. If so, the household's human capital is less diversified against unemployment risk than if they had different occupations. Controlling for each spouse's characteristics, including their individual occupations and probabilities of unemployment, and a host of other characteristics, we find that same-occupation households spend relatively more on owner-occupied housing. To rule out the possibility that our results might merely reflect an unobserved taste for housing by same-career couples, we exploit variation in moving costs and the generosity of unemployment insurance benefits. Same-occupation households who rent their homes, and therefore face lower transaction costs, do not spend more on housing. Similarly, the tendency of same-occupation couples to buy larger houses is strongest for couples who are unlikely to move for demographic reasons and thus for whom the cost of moving is greatest. Finally, same-occupation households spend relatively more on housing consumption compared to different-career couples when their unemployment insurance is more generous. All of these patterns are consistent with households increasing housing consumption in the face of increased risk in the presence of moving costs.

A Appendix A: Proofs

A.1 Proof of Lemma 1

The first order condition can be written as:

$$0 = \begin{bmatrix} g'(h_1) + (1-p-q+\phi)\left[-g'\left(\frac{1}{2}\left(Y_1 + 2Y_2^E - 2h_1\right)\right)\right] \\ +(p+q-2\phi)\left[-g'\left(\frac{1}{2}\left(Y_1 + Y_2^E + Y_2^U - 2h_1\right)\right)\right] \\ +\phi\left[-g'\left(\frac{1}{2}\left(Y_1 + 2Y_2^U - 2h_1\right)\right)\right] \end{bmatrix}. \quad (18)$$

Implicit differentiation of (18) yields:

$$\frac{dh_1}{d\phi} = \frac{g'\left(\frac{1}{2}\left(Y_1 + 2Y_2^U - 2h_1\right)\right) - 2g'\left(\frac{1}{2}\left(Y_1 + Y_2^E + Y_2^U - 2h_1\right)\right) + g'\left(\frac{1}{2}\left(Y_1 + 2Y_2^E - 2h_1\right)\right)}{\begin{bmatrix} g''(h_1) + (1-p-q+\phi)\left[g''\left(\frac{1}{2}\left(Y_1 + 2Y_2^E - 2h_1\right)\right)\right] \\ +(p+q-2\phi)\left[g''\left(\frac{1}{2}\left(Y_1 + Y_2^E + Y_2^U - 2h_1\right)\right)\right] + \phi\left[g''\left(\frac{1}{2}\left(Y_1 + 2Y_2^U - 2h_1\right)\right)\right] \end{bmatrix}}$$

The denominator of this expression is negative singe $g'' < 0$. (g is assumed to be concave). The numerator will be positive if g' is concave, or equivalently if $g''' < 0$. Therefore, $\frac{dh_1}{d\phi} > 0$ if $g''' < 0$. Similarly, the numerator will be zero if g' is linear, or equivalently if $g''' = 0$. Therefore, $\frac{dh_1}{d\phi} = 0$ if $g''' = 0$. Finally, the numerator will be negative if g' is convex, or equivalently if $g''' > 0$. Therefore, $\frac{dh_1}{d\phi} < 0$ if $g''' > 0$.

A.2 Proof of Lemma 2

If it is optimal to move only in the worst state of the world, then the problem can be described with the following first order conditions:

$$0 = \begin{bmatrix} (1-\alpha f_1) \\ +(1-p-q+\phi)\left\{\left(-1 + \alpha\left(Y_1 + 2Y_2^E - 2h_1 - f_1\right)\right)\right\} \\ +(p+q-2\phi)\left[\left(-1 + \alpha\left(Y_1 + Y_2^E + Y_2^U - 2h_1 - f_1\right)\right)\right] \\ +\phi\left[-1 + \frac{\alpha}{2}\left(Y_1 + 2Y_2^U - h_1 - k - f_1\right)\right] \end{bmatrix};$$

$$0 = \begin{bmatrix} (1-\alpha h_1)(2-\phi) \\ +(1-p-q+\phi)\left(-2 + 2\alpha\left(Y_1 + 2Y_2^E - 2h_1 - f_1\right)\right) \\ +(p+q-2\phi)\left(-2 + 2\alpha\left(Y_1 + Y_2^E + Y_2^U - 2h_1 - f_1\right)\right) \\ +\phi\left[-1 + \frac{\alpha}{2}\left(Y_1 + 2Y_2^U - h_1 - k - f_1\right)\right] \end{bmatrix}.$$

These first order conditions can be simplified:

$$0 = Y_1\left(1 - \frac{1}{2}\phi\right) + Y_2^E\left[2-p-q\right] + Y_2^U\left[(p+q-\phi)\right] - \frac{1}{2}k\phi$$
$$+f_1\left[-2 + \frac{1}{2}\phi\right] + h_1\left[-2 + \frac{3}{2}\phi\right]$$

$$0 = Y_1\left[2 - \frac{3}{2}\phi\right] + Y_2^E\left[4-2p-2q\right] + Y_2^U\left[2p+2q-3\phi\right] - \frac{1}{2}\phi k$$
$$+f_1\left[-2 + \frac{3}{2}\phi\right] + h_1\left[-6 + \frac{9}{2}\phi\right].$$

The optimal levels of consumption can be found by solving this system of equations to yield:

$$f_1^* = \frac{1}{4}\left(Y_1 + 2Y_2^E + (p+q)\left(Y_2^U - Y_2^E\right) - k\phi\right)$$
$$h_1^* = \left[\begin{array}{c} \frac{1}{4}\left(Y_1 + Y_2^E\left(2-p-q\right) + Y_2^U\left(p+q\right) - k\phi\right) \\ +\phi\frac{[2-p-q]\left(Y_2^E - Y_2^U\right) + k(1-\phi)}{[4-3\phi]} \end{array}\right].$$

Note that there is, depending upon the definition, either precautionary saving or no precautionary saving in food consumption. Food consumption in the first period falls with ϕ, the measure of the mean-preserving increase in risk. In this sense, there is precautionary saving. However, food consumption is exactly equal to one quarter of expected net income, when expected moving costs are included in the measure of income.

Differentiating the expression for optimal consumption with respect to ϕ gives:

$$\frac{dh_1}{d\phi} = \frac{18\left(Y_2^E - Y_2^U\right)\left(1 - \frac{1}{2}p - \frac{1}{2}q\right) - \frac{9}{2}\phi k + \frac{27}{16}\phi^2 k}{\left[6 - \frac{9}{2}\phi\right]^2}.$$

Note that $\frac{dh_1^*}{d\phi} > 0$ if and only if

$$\frac{2\left[2-p-q\right]\left(Y_2^E - Y_2^U\right)}{\phi\left(1 - \frac{3}{8}\phi\right)} > k.$$

Since

$$[2-p-q] > \phi\left(1 - \frac{3}{8}\phi\right)$$

the condition will be satisfied whenever

$$2\left(Y_2^E - Y_2^U\right) > k.$$

This can be shown most simply by noting that the decision in the dual unemployment state to move necessarily means having a lower level of housing consumption relative to not moving. To be optimal, moving must allow for a higher level of food consumption than not moving:

$$\frac{1}{2}\left(Y_1 + 2Y_2^U - k - f_1 - h_1\right) > Y_1 + 2Y_2^U - f_1 - 2h_1$$
$$0 > \frac{1}{2}Y_1 + Y_2^U + \frac{1}{2}k - \frac{1}{2}f_1 - \frac{3}{2}h_1 \quad (19)$$

Note that initial food and housing consumption when it is optimal to move only in the worst state, $\{f_1^*, h_1^*\}$, will be greater than the level of initial housing or food consumption, $\underline{c}_1$, that would be chosen if the dual unemployment state obtained for sure and if the household were required to move in the dual unemployment state. Therefore,

$$f_1^*, h_1^* > \underline{c}_1 \equiv \frac{1}{4}\left(Y_1 + 2Y_2^U - k\right).$$

Note that the inequality (19) is satisfied with equality if $f_1^* = h_1^* = \underline{c}_1$ and is satisfied is satisfied strictly for all greater values. Therefore,

$$\frac{dh_1}{d\phi} > 0.$$

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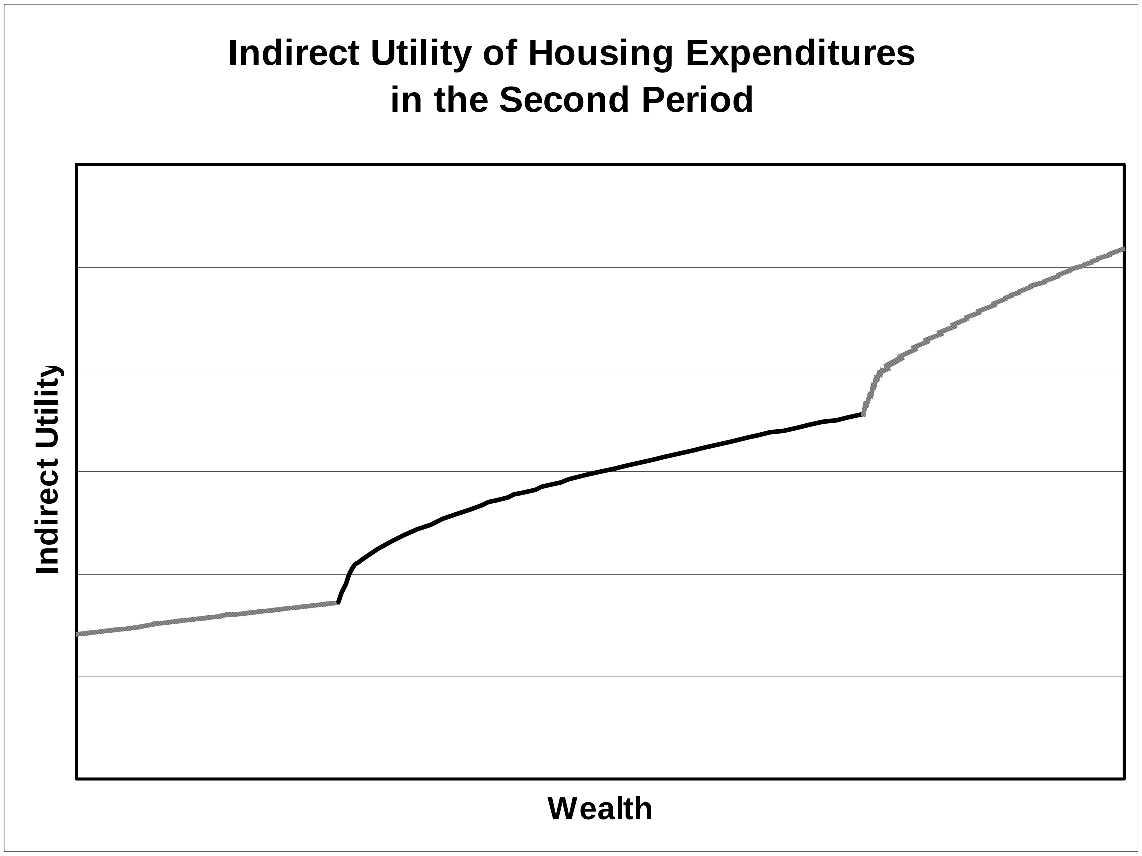
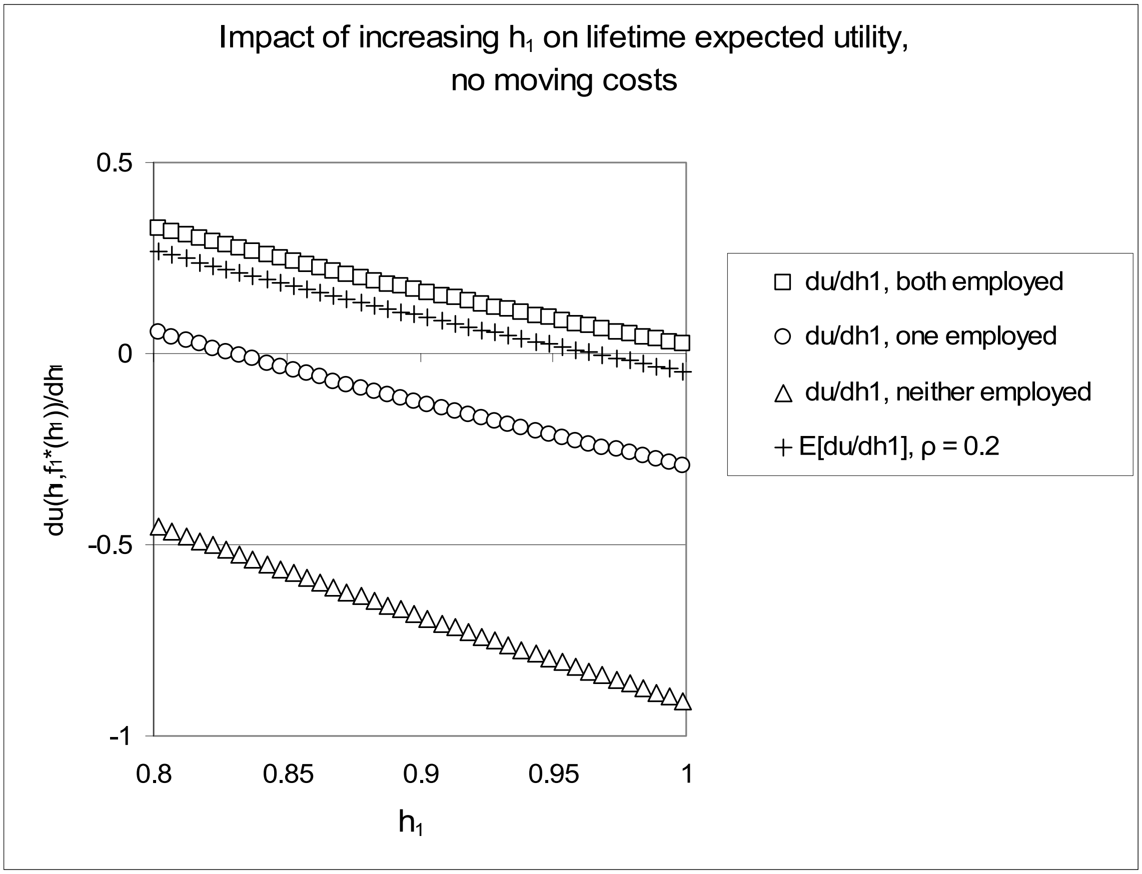
Figure 2.1: Indirect Utility with Commitment
Concavity is greater in the range of small changes in income,
when it is optimal not to move.



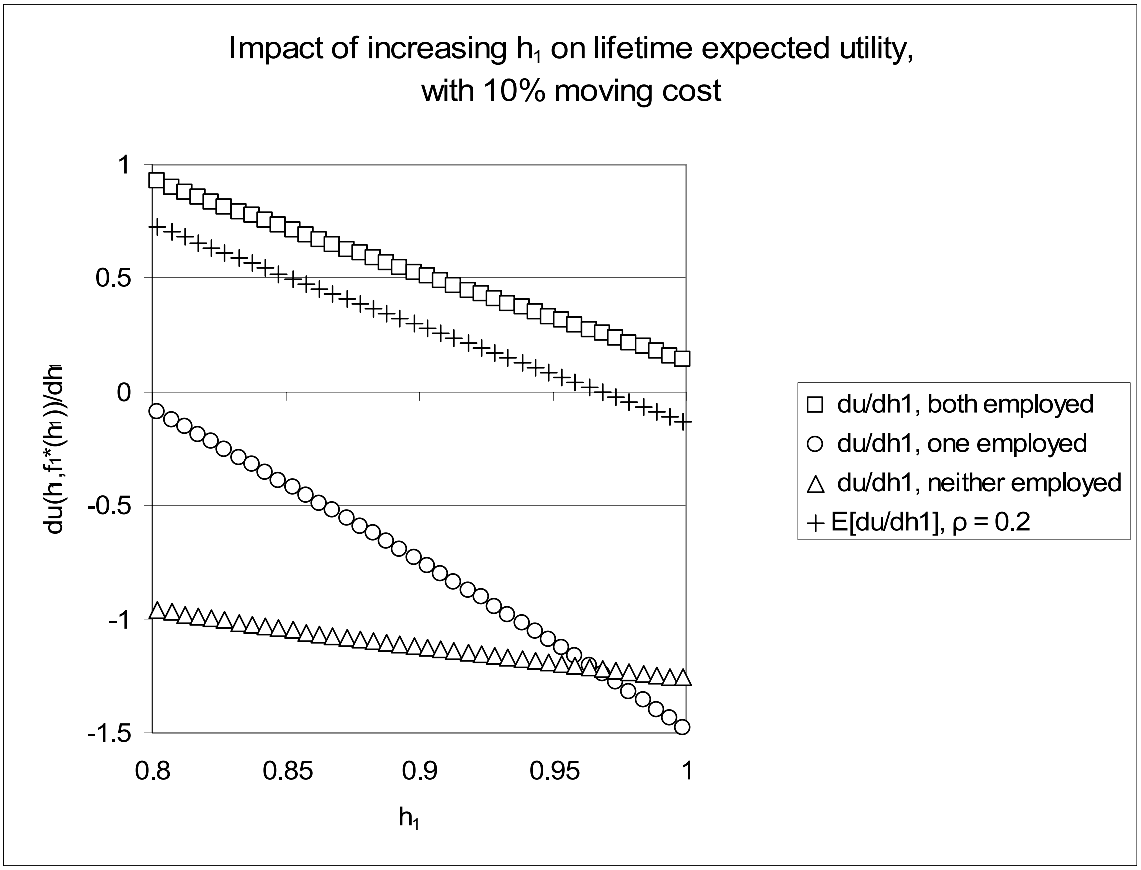
Note: This figure plots the indirect utility in the second period, assuming that wealth is optimally allocated between food and housing. Not to scale.

Figure 2.2:



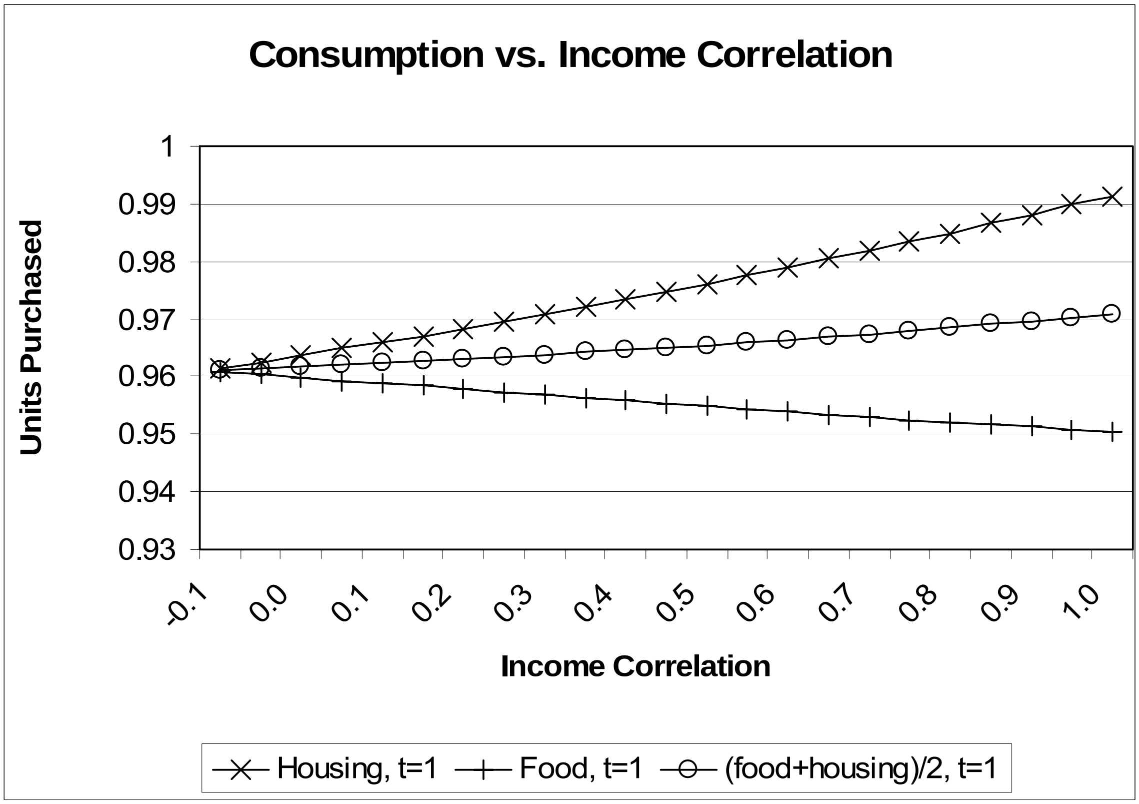
This figure plots the marginal lifetime utility of first-period housing consumption against first-period housing consumption. There are no moving costs, so k=0. First-period income, Y_1=2; second period income for a given spouse is either Y_2^E=1 with probability 1-p=1-q=0.9 or Y_2^U =0.5 with probability p=q=0.1. As a result, total household second-period income is 2, 1.5, or 1. The correlation of the household's unemployment shocks is ρ=0.2. Lifetime utility is given as the sum of log food and log housing consumption in periods 1 and 2.

Figure 2.3:



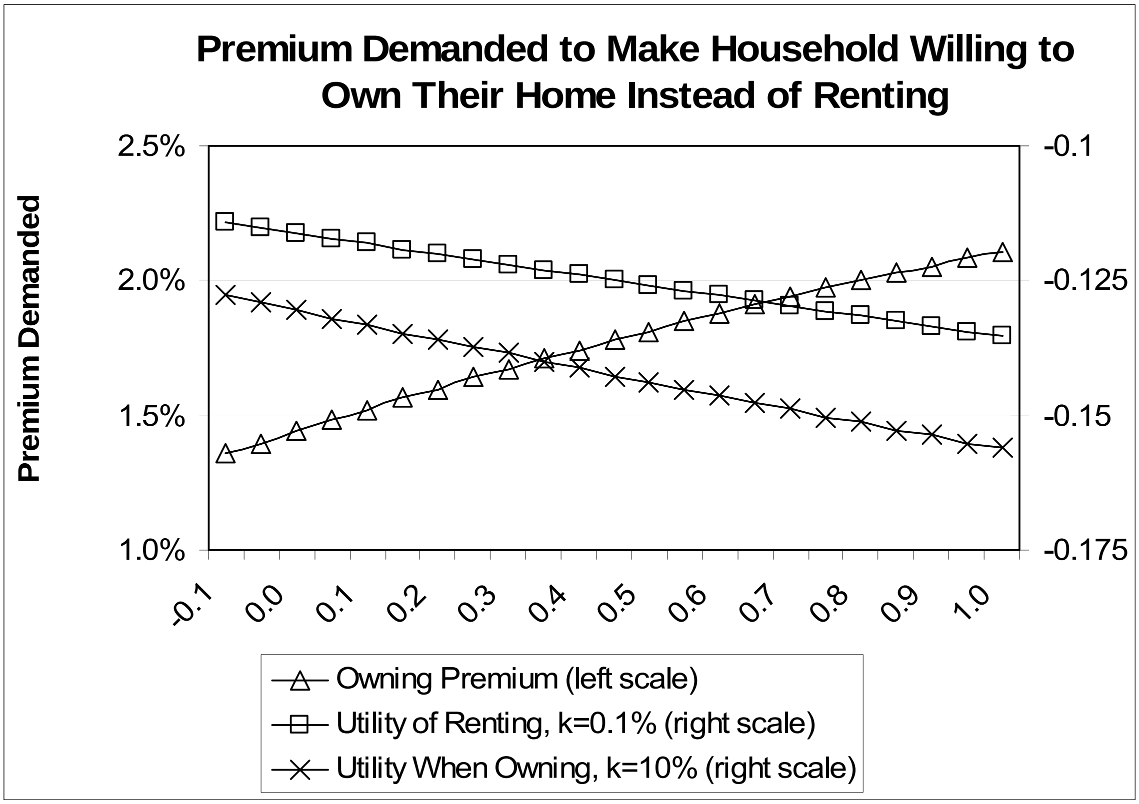
This figure plots the marginal lifetime utility of first-period housing consumption against first-period housing consumption, h_1. The cost of adjusting housing consumption is 10% of h_1. First-period income, Y_1=2; second period income for a given spouse is either Y_2^E=1 with probability 1-p=1-q=0.9 or Y_2^U =0.5 with probability p=q=0.1. The correlation of the household's unemployment shocks is ρ=0.2. As a result, total household second-period income is 2, 1.5, or 1. Lifetime utility is given as the sum of log food and log housing consumption in periods 1 and 2. Given these parameters, it is optimal to adjust housing consumption in the second period only if both spouses become unemployed within the range of values for h_1 shown.

Figure 2.4:



This figure plots the optimal quantity of consumption against the correlation of spouses' unemployment events, ρ. The cost of adjusting housing consumption is 10% of h_1. First-period income, Y_1=2; second period income for a given spouse is either Y_2^E=1 with probability 1-p=1-q=0.9 or Y_2^U =0.5 with probability p=q=0.1. As a result, total household second-period income is 2, 1.5, or 1. Lifetime utility is given as the sum of log food and log housing consumption in periods 1 and 2. Given these parameters, it is optimal to adjust housing consumption in the second period only if both spouses become unemployed. First-period housing consumption, h_1, is increasing in ρ, while first-period food consumption, f_1, is decreasing in ρ. Total consumption, h_1+f_1, is increasing in ρ.

Figure 2.5



The cost of adjusting housing consumption is 10% of h_1. First-period income, Y_1=2; second period income for a given spouse is either Y_2^E=1 with probability 1-p=1-q=0.9 or Y_2^U =0.5 with probability p=q=0.1. As a result, total household second-period income is 2, 1.5, or 1. Lifetime utility is given as the sum of log food and log housing consumption in periods 1 and 2. Given these parameters, it is optimal to adjust housing consumption in the second period only if both spouses become unemployed. The "x" and "□" lines plot the relationship between the correlation of household labor income, ρ, and the utility. These lines differ in the cost of adjusting housing consumption, so that naturally the higher moving cost corresponds to the lower utility. The higher moving cost is meant to represent as the case of a homeowner; the lower moving cost represents the case of a renter. The "Δ" line represents the demanded ownership premium, the percent by which wages in all periods and states would have to be increased to induce the agent to accept the higher moving cost over the lower moving cost. A higher premium suggests that a household is less willing to own a home and requires greater compensation for doing so. This premium is increasing in ρ, suggesting that increasing income correlation should make households more likely to rent their homes.

Table 2.1:
Model Calibration for Various Parameters

moving cost	p,q	Y_2u/Y_2e	h_1*	f_1*	move if both unemployed	move if one unemployed	Move if neither unemployed	dU/df_1_uu	dU/df_1_eu	dU/df_1_ee	dU/dh_1_uu	dU/dh_1_eu	dU/dh_1_ee	$dh_1/d\varphi$	$df_1/d\varphi$	$d(f_1+h_1)/d\varphi$
.1%	10%	50%	0.964	0.965	Yes	Yes	Yes	-0.83	-0.24	0.07	-0.83	-0.24	0.07	-	-	-
1%	10%	50%	0.997	0.964	Yes	Yes	No	-0.91	-0.27	0.08	-0.96	-0.32	0.09	+	-	-
5%	10%	50%	0.994	0.963	Yes	Yes	No	-0.98	-0.30	0.09	-1.11	-0.40	0.11	+	-	-
10%	10%	50%	0.968	0.958	Yes	No	No	-1.00	-0.61	0.14	-1.22	-1.24	0.26	+	-	+
20%	10%	50%	0.967	0.957	Yes	No	No	-1.22	-0.59	0.14	-1.68	-1.21	0.27	+	-	+
50%	10%	50%	0.939	0.939	No	No	No	-4.42	-0.40	0.22	-8.83	-0.80	0.44	-	-	-
10%	**.01%**	50%	1.000	1.000	Yes	No	No	-1.22	-1.00	0.00	-1.44	-2.00	0.00	+	-	+
10%	**5%**	50%	0.982	0.977	Yes	No	No	-1.10	-0.77	0.08	-1.32	-1.55	0.15	+	-	+
10%	**10%**	50%	0.968	0.958	Yes	No	No	-1.00	-0.61	0.14	-1.22	-1.24	0.26	+	-	+
10%	**15%**	50%	0.957	0.940	Yes	No	No	-0.92	-0.48	0.19	-1.14	-1.00	0.35	+	-	+
10%	**20%**	50%	0.946	0.925	Yes	No	No	-0.85	-0.38	0.24	-1.07	-0.81	0.42	+	-	+
10%	**30%**	50%	0.927	0.895	Yes	No	No	-0.73	-0.22	0.32	-0.95	-0.51	0.56	+	-	+
10%	10%	**20%**	0.979	0.908	Yes	Yes	No	-3.71	-0.54	0.22	-4.27	-0.79	0.28	-	-	-
10%	10%	**30%**	0.984	0.932	Yes	Yes	No	-2.34	-0.48	0.16	-2.74	-0.70	0.21	-	-	-
10%	10%	**40%**	0.958	0.943	Yes	No	No	-1.43	-0.79	0.18	-1.69	-1.60	0.34	+	-	+
10%	10%	**50%**	0.968	0.958	Yes	No	No	-1.00	-0.61	0.14	-1.22	-1.24	0.26	+	-	+
10%	10%	**60%**	0.977	0.970	Yes	No	No	-0.70	-0.45	0.10	-0.88	-0.91	0.19	+	-	+
10%	10%	**70%**	0.977	0.977	No	No	No	-1.12	-0.28	0.09	-2.23	-0.56	0.17	-	-	-

This table presents a summary of calibration results for various parameter values. All rows assume $Y_1=2, Y_2^E=1$. Lifetime utility is given as the sum of log food and log housing consumption in periods 1 and 2. The first three rows show k, p and q, and Y_2^U, respectively. Given these parameter values, the optimal levels of initial housing and food consumption are given in the fourth and fifth rows. The sixth, seventh, and eighth rows show under what circumstances it will be optimal to move. The ninth through fourteenth rows show the impact of changes in initial food or housing consumption on utility in various states of the world. The final three columns show how increasing the correlation of unemployment (introducing a mean-preserving spread in risk) impacts consumption. A "+" indicates increased consumption in the face of increased risk. A "-" in the final column indicates an aggregate precautionary saving motive.

Table 3.1: Probability of One or Both Spouses Becoming Unemployed
Over the Subsequent 6 or 12 Months,
by Whether Couple Shares an Occupation

	neither unemployed	one unemployed	both unemployed	unemp rate	unemp correlation	# of obs.
6 months						
sameocc	90.94%	6.05%	0.63%	3.66%	14.19%	8,194
diffocc	88.74%	8.78%	0.21%	4.60%	-0.02%	246,867
difference	2.20%	-2.73%	0.42%	-0.94%	14.22%	
12 months						
sameocc	85.29%	9.85%	1.14%	6.07%	13.57%	6,661
diffocc	80.71%	15.33%	0.35%	8.01%	-3.96%	198,233
difference	4.57%	-5.48%	0.79%	-1.95%	17.53%	

Notes: The unit of observation is a couple x month. The sample consists of married couples who both report being employed in one month and who either identify as having the same or different three-digit occupation codes. The table reports the fraction of households in each category who have neither, one, or both spouses report having an unemployment spell during the subsequent 6 or 12 months. Data is from the 1996 wave of the Survey of Income and Program Participation.

Table 3.2: Rate of Moving if Neither, One, or Both Spouses Become Newly Unemployment

		Homeowners	
	No one unemployed	One newly unemployed	Two newly unemployed
Probability of moving over the next month			
P(moving)	0.33%	0.89%	4.10%
Number of obs.	260,324	3,952	122
Probability of moving over the next six months			
P(moving)	2.18%	4.07%	11.34%
Number of obs.	219,968	3,340	97
Probability of moving over the next twelve months			
P(moving)	4.38%	6.48%	16.44%
Number of obs.	177,130	2,562	73
		Renters	
	No one unemployed	One newly unemployed	Two newly unemployed
Probability of moving over the next month			
P(moving)	2.61%	3.29%	4.88%
Number of obs.	48,337	1,397	41
Probability of moving over the next six months			
P(moving)	15.79%	17.60%	31.25%
Number of obs.	40,084	1,159	32
Probability of moving over the next twelve months			
P(moving)	28.57%	33.37%	39.13%
Number of obs.	31,783	917	23

Notes: The unit of observation is a couple x month. The sample consists of married couples who both report being employed in one month and then report themselves as neither unemployed, one new unemployed, or both newly unemployed in the next month. The table reports the fraction of households in each category who move to a new home, and the number of people in each category. The probability of moving measures whether there will be at least one change of address during the measured time span. Data is from the 1996 wave of the Survey of Income and Program Participation.

Table 3.3: Sample construction

Restriction	Number lost	Total remaining
Original sample		2,778,194
Live in an MSA	1,016,455	1,761,767
Married	779,536	982,231
Head and spouse both age 25 or over	63,992	918,239
Listed occupations	20,499	897,740
Head and spouse work full-time	572,470	325,270
8 or fewer people in household	1,513	323,757
Not a farm household	2,318	321,439
Family income between 0 and $900,000	134	321,305
Both head and spouse have income ≥ 0	1,160	320,145
Occupation not rare (contains 200+ persons/year)	17,803	302,342
Positive house value	70,632	231,710

Notes: Source is 1980, 1990, and 2000 IPUMS.

Table 3.4: Top 20 Occupations by Percent of Husbands with the Same Occupation as Their Wives

	Husband's Occupation, 1950 basis	Same Occupation as Wife		
		Mean	Freq.	Percent
1	Teachers	44.75%	7,059	3.29%
2	Nurses, professional	29.35%	719	0.33%
3	Physicians and surgeons	21.75%	1,568	0.73%
4	Operative and kindred workers	20.91%	13,168	6.13%
5	Clerical and kindred workers	20.38%	9,024	4.20%
6	Managers, officials, and proprietors	17.02%	34,978	16.29%
7	Real estate agents and brokers	14.96%	1,825	0.85%
8	Professional, technical & kindred workers	13.03%	7,622	3.55%
9	Professors (subject matter unspecified)	12.48%	1,514	0.71%
10	Lawyers and judges	11.97%	2,656	1.24%
11	Cooks, except private household	11.57%	1,271	0.59%
12	Medical and dental-technicians	10.28%	1,002	0.47%
13	Social and welfare workers	9.48%	812	0.38%
14	Editors and reporters	8.87%	710	0.33%
15	Salesmen and sales clerks	8.76%	11,453	5.33%
16	Managers & superintendents, building	7.15%	643	0.30%
17	Insurance agents and brokers	6.57%	2,451	1.14%
18	Officials & administrators	5.98%	1,321	0.62%
19	Bookkeepers	5.90%	542	0.25%
20	Office machine operators	5.83%	1,115	0.52%

Notes: Only occupations comprising at least 0.25 percent of the sample are shown in this table.

Table 3.5: Summary statistics

	Owners Only		Renters Only	
Variable	Mean	Std. Dev.	Mean	Std. Dev.
Head and spouse have same OCC	0.096	0.294	0.096	0.295
House value; rent	175,839	128,917	650	344
Family income	90,314	57,840	61,722	39,720
Head's imputed unemployment rate	0.066	0.023	0.071	0.025
Spouse's imputed unemployment rate	0.136	0.039	0.147	0.041
P(one unemployed)	0.193	0.046	0.208	0.049
P(both unemployed)	0.009	0.005	0.011	0.006
Head's share of income	0.622	0.171	0.598	0.181
Head's UE × Head's income share	0.041	0.018		
Spouse's UE × Spouse's income share	0.050	0.026		
Same OCC × Head's income share × Spouse's share	0.021	0.065		

Notes: Dollar amounts are in real (2000) dollars.

Table 3.6: The effect of higher correlation in income risk on house value

LHS variable: log(house value)	(1)	(2)	(3)
Same Occupation × Head's income share × Spouse's share	**0.183** **(0.019)**	**0.119** **(0.015)**	**0.085** **(0.017)**
Head's unemployment rate × Head's income share	-7.836 (0.382)	-1.320 (0.330)	1.352 (0.499)
(Head's unemployment rate × Head's income share)^2	31.345 (2.773)	-5.074 (2.345)	-13.093 (3.239)
Spouse's unemployment rate × Spouse's income share	-3.660 (0.316)	0.152 (0.271)	1.698 (0.381)
(Spouse's unemployment rate × Spouse's income share)^2	16.812 (1.446)	3.343 (1.122)	1.743 (1.457)
P(both unemployed) × Head's income share × Spouse's share	-39.909 (3.560)	-67.128 (3.007)	-52.239 (3.649)
Income share of head	0.020 (0.016)	0.166 (0.014)	0.240 (0.029)
Log(family income)	0.632 (0.003)	0.409 (0.002)	0.371 (0.002)
Demographic controls?	No	Yes	Yes
MSA x year dummies?	No	Yes	Yes
Head and Spouse occupation dummies?	No	No	Yes
Adjusted R^2	0.2999	0.2615	0.3003

Notes: Left-hand-side variable is log(house value). All specifications include year dummies. Sample consists of married homeowner households where both spouses work full-time. More details are in table 1. N=231,710. Demographic controls in columns (2) and (3) include dummies for: the number of persons in the household, the number of kids in the household, the education of the head and spouse, and age brackets for the head and spouse.

Table 3.7: The same relationship does not hold for rent

LHS variable: log rent	(1)	(2)	(3)
Same Occupation × Head's income share × Spouse's share	**0.061** **(0.072)**	**-0.016** **(0.070)**	**0.003** **(0.074)**
Head's unemployment rate × Head's income share	21.930 (1.281)	23.375 (1.308)	13.914 (1.936)
(Head's unemployment rate × Head's income share)^2	-150.395 (9.204)	-156.103 (9.206)	-80.124 (12.203)
Spouse's unemployment rate × Spouse's income share	4.191 (1.045)	5.965 (1.048)	1.211 (1.469)
(Spouse's unemployment rate × Spouse's income share)^2	-8.151 (4.405)	-12.179 (4.338)	4.493 (5.158)
P(both unemployed) × Head's income share × Spouse's share	-118.203 (10.993)	-123.107 (10.908)	-32.821 (12.953)
Income share of head	-0.391 (0.058)	-0.181 (0.059)	-0.202 (0.124)
Log(family income)	0.386 (0.009)	0.288 (0.010)	0.212 (0.010)
Demographic controls?	No	Yes	Yes
MSA x year dummies?	No	Yes	Yes
Head and Spouse occupation dummies?	No	No	Yes
Adjusted R^2	0.0628	0.0517	0.1321

Notes: Left-hand-side variable is log(monthly rent). All specifications include year dummies. Sample consists of married homeowner households where both spouses work full-time. More details are in table 1. N=58,501. Demographic controls in columns (2) and (3) include dummies for: the number of persons in the household, the number of kids in the household, the education of the head and spouse, and age brackets for the head and spouse.

Table 3.8: The effect on house value when effective transaction costs are lower

LHS variable: log(house value)	(1)	(2)	(3)
Same Occupation × Head's income share × Spouse's share	**0.243** **(0.037)**	**0.215** **(0.031)**	**0.149** **(0.031)**
Same occupation × Income shares × Imputed P(moving)	**-0.418** **(0.215)**	**-0.655** **(0.177)**	**-0.437** **(0.175)**
Imputed P(moving)	-0.049 (0.016)	0.561 (0.061)	0.448 (0.061)
Head's unemployment rate × Head's income share	-7.917 (0.383)	-1.329 (0.330)	1.275 (0.498)
(Head's unemployment rate × Head's income share)^2	31.967 (2.775)	-4.840 (2.349)	-12.570 (3.240)
Spouse's unemployment rate × Spouse's income share	-3.638 (0.316)	0.125 (0.271)	1.599 (0.382)
(Spouse's unemployment rate × Spouse's income share)^2	16.552 (1.448)	3.510 (1.220)	2.058 (1.459)
P(both unemployed) × Head's income share × Spouse's share	-40.229 (3.563)	-66.839 (3.008)	-51.579 (3.652)
Income share of head	0.019 (0.016)	0.167 (0.014)	0.237 (0.029)
Log(family income)	0.631 (0.003)	0.406 (0.002)	0.370 (0.002)
Demographic controls?	No	Yes	Yes
MSA x year dummies?	No	Yes	Yes
Head and Spouse occupation dummies?	No	No	Yes
Adjusted R^2	0.3000	0.2638	0.3019

Notes: Left-hand-side variable is log(house value). All specifications include year dummies. Sample consists of married homeowner households where both spouses work full-time. More details are in table 1. The probability of moving is imputed within-sample from the share of households in the same age/education/has kids cell that moved in the last year. N= 231,405. Demographic controls in columns (2) and (3) include dummies for: the number of persons in the household, the number of kids in the household, the education of the head and spouse, and age brackets for the head and spouse.

Table 3.9: The effect of higher correlation in income risk on the probability of owning

LHS variable: Owner dummy	(1)	(2)	(3)
Same Occupation × Head's income share × Spouse's share	**-0.065** **(0.011)**	**-0.043** **(0.010)**	**-0.050** **(0.011)**
Head's unemployment rate × Head's income share	5.627 (0.207)	3.501 (0.207)	1.400 (0.317)
(Head's unemployment rate × Head's income share)^2	-36.183 (1.240)	-23.866 (1.450)	-6.374 (2.016)
Spouse's unemployment rate × Spouse's income share	1.718 (0.171)	1.395 (0.170)	0.775 (0.243)
(Spouse's unemployment rate × Spouse's income share)^2	-9.620 (0.755)	-9.367 (0.739)	-4.489 (0.899)
P(both unemployed) × Head's income share × Spouse's share	-43.166 (1.883)	-34.076 (1.847)	-11.149 (2.267)
Income share of head	-0.097 (0.009)	-0.092 (0.009)	-0.027 (0.019)
Log(family income)	0.206 (0.001)	0.189 (0.001)	0.177 (0.002)
Demographic controls?	No	Yes	Yes
MSA x year dummies?	No	Yes	Yes
Head and Spouse occupation dummies?	No	No	Yes
Adjusted R^2	0.0881	0.1103	0.1299

Notes: Linear probability model. Left-hand-side variable is a dummy for owning the house. All specifications include year dummies. Sample consists of married homeowner households where both spouses work full-time. More details are in table 1. N=302,431. Demographic controls in columns (2) and (3) include dummies for: the number of persons in the household, the number of kids in the household, the education of the head and spouse, and age brackets for the head and spouse.

Table 3.10: The Effect of Unemployment Insurance on the Relationship Between Same Occupation and House Value.

Dependent variable: Log house value	
UI replacement rate (RR)	-0.060 (0.124)
Same Occupation × Head's income share × Spouse's share	0.227 (0.040)
Same Occupation × Head's income share × Spouse's share × RR	-0.352 (0.115)
Income control?	Yes
Unemployment × share controls?	Yes
Quartic in log family wage income?	No
Other demographics?	Yes
MSA dummies?	Yes
Number of observations	167,194
R-squared	0.5389