Commitment, Risk, and Consumption: Do Birds of a Feather Have Bigger Nests?

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Abstract

This paper presents evidence from microdata on how consumption commitments – goods like housing for which adjustment is costly – change the relationship between risk and consumption. We argue that commitment provides a motive to reduce consumption in advance of possible future losses too small to warrant adjusment but not for losses large enough to make adjustment worthwhile. This implies that a mean-preserving increase in risk that makes small losses less likely but larger losses more likely can actually increase housing consumption. We exploit a novel source of variation in unemployment risk: whether a couple shares the same occupation. Couples who share an occupation face increased risk as their unemployment shocks are more highly correlated. Such couples spend more on owner-occupied housing than other couples, spend no more on rent, and are more likely to rent than own. This pattern is strongest when the household faces higher moving costs, or when unemployment insurance provides a less generous safety net.

1 Introduction

Conventional economic wisdom suggests that households should respond to risk by saving more and consuming less. However, this precautionary saving intuition follows from the assumption that households can costlessly adjust their level and mix of consumption (e.g., Leland (1968), Sandmo (1970), Drèze and Modigliani (1972), and Kimball (1990)). This simplification is often at odds with reality, as adjusting the consumption of many goods requires the payment of some transaction cost. For example, to reduce housing consumption, homeowners must incur the costs of selling a house, buying a new one, and moving. Goods with this feature are often referred to as consumption commitments. The empirical literature on precautionary saving has examined the link between risk and saving, wealth, or consumption, but has paid remarkably little attention to adjustment costs (Browning and Lusardi (1996), Carroll and Samwick (1997, 1998)).

We argue that commitment provides a motive for saving in advance of small losses that is not present for larger ones. By way of intuition, when households choose the quantity of a consumption commitment such as housing, they consider the circumstances under which they will adjust this commitment (move) in the future. Adjusting committed consumption will be optimal only after large losses. After a loss that is too small to warrant adjustment, the household must reduce non-housing consumption substantially and the marginal utilities of housing and non-housing consumption will diverge. Reducing housing consumption *ex-ante* allows the household to mitigate the divergence of housing and non-housing consumption *ex-post* in the event of a small loss. By contrast, when a loss is large enough to make adjustment optimal *ex-post*, moving serves to rebalance housing and non-housing consumption to equate marginal utilities. As such, households that anticipate large prospective losses no longer need to reduce housing consumption *ex-ante*. This implies that a mean-preserving increase in income risk that makes large losses more likely but small losses less likely can lead to greater housing consumption.

We present evidence from microdata that in the presence of commitment, such a mean preserving increase in risk can lead to increased housing consumption. This result is at the nexus of the empirical precautionary saving, S-s, and consumption commitments literatures. The recent literature on consumption commitments does not address prudence or precautionary saving directly, focusing instead on risk aversion. For example, Chetty and Szeidl (2006) find that commitments increases risk-aversion over losses too small to warrant adjusting committed consumption though not over losses large enough to warrant such adjustment. Browning and Crossley (2004) and Chetty and Szeidl (2006) show that consumption responds differently to realized shocks to income in the presence of commitments, but do not estimate how income risk affects *ex-ante* consumption. The empirical literature on durable goods and S-s bands links adjustment costs, uncertainty and consumption. The focus of this literature is on estimating how shocks impact adjustment dynamics rather than target consumption (Attanasio (2000), Eberly (1994), Bertola *et al* (2005)). Indeed, much of this research, following Grossman and Laroque (1990), is concerned with the effect of adjustment costs on optimal portfolio allocation (Fratantoni (1998, 2001), Flavin (2001), Flavin and Yamashita (2002), Chetty and Szeidl (2005)). We consider how increasing risk will impact target consumption differently depending upon where the distribution of possible shocks falls relative to the S-s adjustment bound.

We identify a set of predictions that come from incorporating commitments into a stylized model of precautionary saving. Following much of the empirical precautionary saving literature, we use occupation-based variation in unemployment risk. By testing these predictions using housing consumption for dual-earning couples, we exploit a novel source of variation: whether couples share an occupation as a proxy for the correlation in their risks of unemployment. Dual-earning couples face the risk that one spouse could become unemployed (a small loss, too small to justify moving) or both spouses could become unemployed (a large loss, large enough to justify moving). Couples with higher unemployment correlations face more risk in a mean-preserving sense – they face a higher probability that neither or both spouses will become unemployed but a lower probability that exactly one spouse will become unemployed.

This identification strategy has several advantages compared with previous research. Occupation-based unemployment risk, as in Carroll and Samwick (1997, 1998) or Skinner (1988), is subject to the critique that households select occupations based on their risk aversion (Lusardi (1997)). Instead, we control for the occupation of each spouse directly and then exploit variation in within-household diversification. This research design provides an alternative to the natural experiment approach used in Fuchs-Schundeln and Schundeln (2005). There may be a variety of reasons to think that same-occupation couples will differ from other couples in ways other than risk, and that these differences may impact housing consumption. To deal with this concern, our empirical strategy exploits not only the difference between same- and different-occupation couples in housing consumption, but also how this difference varies with the size of possible losses or adjustment costs.

Looking at dual-unemployment for couples provides a larger range of losses than is considered in most past research. In the range of single-unemployment losses based on occupation-level variation exploited in prior work, our findings mirror the standard precautionary saving results: couples in occupations with higher unemployment probabilities consume less housing. In this paper, we hold total unemployment risk fixed while expanding the range of loss sizes to include dual-unemployment. We then look at an increase in risk that reduces the probability of single-unemployment (where commitment provides an additional motive to reduce housing consumption) while increasing the probability of dual-unemployment (where the motive to reduce housing consumption is weaker).

In this setting, we make and test four predictions. First, couples with higher unemployment correlations should consume more housing. Such couples are more likely to suffer a large loss – two spouses becoming unemployed. Since this large loss state is one in which buying a smaller house initially would not have helped to mitigate an imbalance between housing and non-housing consumption, these couples will consume more housing. Using household-level data from the Integrated Public Use Microdata Series (IPUMS) of the U.S.

Census, we find that same-occupation homeowners, who face higher unemployment correlations, spend at least 2.1 percent more on their houses than do different-occupation couples. This result obtains even after controlling for income, each spouse's occupation, and a host of other characteristics.

Second, couples with higher unemployment correlations should consume more housing only when adjustment costs are high. When adjustment costs are low, moving will be optimal after even small losses. In this case, the standard precautionary saving result will obtain. Couples who rent their homes face lower adjustment costs than do homeowners. Not only do these couples have much higher moving rates, but moving rates are similar whether one or both spouses becomes unemployed. Consistent with this prediction, same-occupation renters spend no more on their rent than do different-occupation renters. We also find that when couples face effectively higher moving costs because they are unlikely to move for exogenous demographic reasons, the difference between same- and different-occupation homeowners in housing spending increases.

Third, couples with higher unemployment correlations should consume more housing only when "large" losses are large enough to induce moving. If moving is never optimal, then the standard precautionary saving result will again obtain. To test this prediction, we exploit variation across states in their unemployment insurance schedules. When unemployment insurance is more generous, households are less likely to move when both spouses become unemployed. We find that the difference in housing spending between same- and different-occupation homeowners is greater when unemployment insurance is less generous.

Fourth, couples with higher unemployment correlations should be more likely to rent their homes. If moving out of owner-occupied housing is optimal only in the face of large losses, then homeowners with higher unemployment correlations face effectively higher costs of home owning since they expect to move more frequently. Consistent with this prediction, same-occupation households are less likely to be homeowners than otherwise identical different-occupation households. As expected, this gap increases with the effective cost of moving.

All of these empirical results are consistent with a model of consumption that incorporates adjustment costs. Taken together, they are inconsistent with alternative hypotheses. For example, if the increased housing consumption by same-occupation homeowners was explained by a preference for housing among same-occupation couples, same-occupation renters should also spend more than different occupation renters; they do not. If same occupation couples preferred to own their houses, or had larger precautionary savings motives, they would be more likely to buy houses; they are not. In either case, there is no reason why the unobserved taste for homeownership or differences in precautionary saving motive should vary with the exogenous cost of moving or the generosity of the unemployment insurance system.

The remainder of this paper is arranged as follows: Section 2 sets up a simple model of consumption commitments which predicts that a mean-preserving increase in risk can increase a household's committed consumption; we describe the data in Section 3 and present results in Section 4; Section 5 concludes.

2 A Model of Income Risk and Consumption Commitments

In this section, we outline a stylized model of precautionary saving that incorporates consumption commitments. While the model presented here is standard, this is the first paper to focus on the non-linear implications for precautionary saving of a model with consumption adjustment costs. Chetty and Szeidl (2006) argue that commitment makes households more risk averse in the domain of small losses (too small to warrant adjusting committed consumption) than large ones (large enough to warrant adjusting committed consumption). This paper argues that the same is true for prudence as well as risk aversion. Commitment provides an incentive to reduce housing consumption (and therefore save) relatively more in anticipation of possible small losses than large ones. A mean-preserving increase in risk that makes large losses more likely but small losses less likely can increase committed consumption and reduce saving, thus inverting the standard precautionary saving result.

2.1 Modelling Consumption Commitments

Following Chetty (2003), we present a model with 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; 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. We will consider $g(x) = \ln(x)$ and $g(x) = x - \frac{1}{2}\alpha x^2$ as two possible functional forms for g. For algebraic simplicity, we will set $\mu = 1$ so that the two goods are equally important to the household, though relaxing this assumption does not affect the substance of any of the results we obtain. Also, while separability is not strictly necessary, it is important that the marginal utility of food increases relative to the marginal utility of housing 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.

As in the literature on precautionary saving, we treat household labor income risk as exogenous and endogenize consumption and saving. 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 abstract from the investment problems examined in other work, we make the simplifying assumptions that there are no risky assets and that the riskless interest rate is zero.[1] We also assume that the household cannot save in the

[1] The correlation between housing costs and income risk (Davidoff (2005) and Campbell and Cocco (2003))

housing asset.[2] In our model, home ownership is like a two-period rental contract with a penalty for early exit.[3] In the second period of the model, the household receives an income $\tilde{Y}_2$, which is not known at time $t = 1$. At that time, the household must allocate its wealth, $Y_1 + \tilde{Y}_2 - h_1 - f_1$, between the two goods. If a household adjusts its consumption of good h, the transaction cost is $k(h_1)$. 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, a 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 determine optimal consumption and indirect utility in the second period and then work backwards. In the second period, the household maximizes

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

may provide a further boost to housing demand.

[2]Transforming the price of a housing asset into the flow cost of the consumption of housing services, the homeowner's equivalent of rent, is a well-documented procedure that underlies our h notation. For an exposition of the user cost of owner-occupied housing, see Hendershott and Slemrod (1983) or Poterba (1984). The consensus of the literature (Henderson and Ioannides (1983), Goetzmann (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 as an asset and consumption good does not preclude its use as an indicator of consumption. Showing the conditions under which households might save precautionarily in housing is beyond the scope of this model. We will come back to this issue later to make sure a savings motive is not driving our empirical results.

[3]Equivalently, home owning can be a purchase and resale of a housing asset that neither appreciates nor depreciates.

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

$$\left\{h_2 = f_2 = \frac{1}{2}\left(Y_1 + \tilde{Y}_2 - h_1 - f_1 - k\left(h_1\right)\right)\right\} \text{ if } h_2 \neq h_1 \quad (5)$$
$$\text{and } \left\{h_2 = h_1;\ f_2 = Y_1 + \tilde{Y}_2 - 2h_1 - f_1\right\} \text{ if } h_2 = h_1$$

and indirect utility is

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

where $h_2 = h_1$ if and only if

$$2 \bullet g\left(\frac{1}{2}\left(Y_1 + \tilde{Y}_2 - h_1 - f_1 - k\left(h_1\right)\right)\right) \leq g\left(h_1\right) + g\left(Y_1 + \tilde{Y}_2 - 2h_1 - f_1\right). \quad (7)$$

The household will not adjust housing consumption, h, unless the shock to wealth is large enough that the benefits of rebalancing consumption exceed the costs of moving. 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.[4] The benefits of adjusting housing consumption are swamped by the costs of moving. If it experiences a large shock, the household is willing to pay a cost to adjust housing consumption.[5] As described in Chetty (2003) or Chetty and Szeidl (2006), this leads to a non-convex indirect utility function, shown in Figure 1. At the kink point in the figure, the household is indifferent between moving and not moving. The figure shows

[4] Another way households could respond is by reducing the maintenance expenditures on their houses. In that case, it would be more difficult for us to find an effect empirically since housing consumption would be adjustable within a small range. Gyourko and Tracy (2003) show that households defer maintenance to smooth consumption over transitory shocks to income.

[5] 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 non-durables as well. The difference in these results stems from Browning and Crossley's focus on the impact of liquidity constraints and transitory or small shocks on consumption.

that the marginal utility of wealth is much higher when the household is just rich enough that it does not have to reduce housing consumption (to the right of the kink) than when it is just poor enough that it does have to (to the left). Once we have solved for the optimal consumption rule in the second period, we can solve for optimal consumption in the first period. The household's lifetime utility function (2) can be rewritten as:

$$U(h_1, f_1) = g(h_1) + g(f_1) + E\left[\max\left\{\begin{array}{c} g(h_1) + g\left(Y_1 + \tilde{Y}_2 - 2h_1 - f_1\right), \\ 2 \bullet g\left(\frac{1}{2}\left(Y_1 + \tilde{Y}_2 - h_1 - f_1 - k(h_1)\right)\right) \end{array}\right\}\right]. \quad (8)$$

To better understand the optimal consumption rule in the first period, we must add structure by making assumptions about the distribution of $\tilde{Y}_2$. In this paper, we explore an empirically relevant type of income risk – unemployment risk.[6] We assume that the household has two wage earners, a husband and wife, and that uncertainty comes from the possibility that one or both may become unemployed in the second period. To reduce the number of states to consider, 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 husband's probability of unemployment is p while the wife's is q. There is a correlation ρ between the employment status of the husband and wife. Therefore, the distribution of household income in the second period, $\tilde{Y}_2$, can be written as:

$$\begin{aligned} &\tilde{Y}_2 = 2Y_2^E \text{ with probability } 1 - p - q + \phi \\ &\tilde{Y}_2 = Y_2^E + Y_2^U \text{ with probability } p + q - 2\phi \\ &\tilde{Y}_2 = 2Y_2^U \text{ with probability } \phi\text{, where} \\ &\phi \equiv pq + \rho\sqrt{pq(1-p)(1-q)}. \end{aligned} \quad (9)$$

[6] The negative skewness of unemployment risks will be important in generating our results, since households that move will move only into smaller houses. While the intuition would still apply, the direction of the model's predictions will be quite different for other types of risks. For example, if households face 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), it should lead to even greater reductions in housing consumption than would be predicted by a model of precautionary saving without consumption commitments.

The three states correspond to both spouses being employed, exactly one being unemployed, and both being unemployed. Increasing the correlation of the couple's unemployment events, ρ, while holding p and q fixed is equivalent to adding a mean-preserving spread in the distribution of household labor income, increasing the probability of the best and worst outcomes (neither or both unemployed) while decreasing the probability of the medium outcome (exactly one unemployed). However, the expected household income,

$$E\left[\tilde{Y}_2\right] = 2Y_2^E - (p+q)\left(Y_2^E - Y_2^U\right), \tag{10}$$

is independent of ρ and depends on the rates of unemployment, p and q, additively.[7]

2.2 Risk and Consumption With and Without Commitment

A standard 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, the expected utility function is just

$$U(h_1, f_1) = g(h_1) + g(f_1) + E\left[2 \bullet g\left(\frac{1}{2}\left(Y_1 + \tilde{Y}_2 - h_1 - f_1\right)\right)\right]. \tag{11}$$

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:

$$U(h_1) = g(h_1) + E\left[g\left(\frac{1}{2}\left(Y_1 + \tilde{Y}_2 - 2h_1\right)\right)\right]. \tag{12}$$

[7] 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. We focus on variation in ρ both because of its novel implications and also because it can be identified in the data relatively cleanly.

Then, the first order condition can be rewritten as:

$$0 = \begin{bmatrix} g'(h_1) + (1-p-q+\phi)\left[-g'\left(\frac{1}{2}\left(Y_1 + 2Y_2^E - 2h_1\right)\right)\right] \\ +(p+q-2\phi)\left[-g'\left(\frac{1}{2}\left(Y_1 + Y_2^E + Y_2^U - 2h_1\right)\right)\right] \\ +\phi\left[-g'\left(\frac{1}{2}\left(Y_1 + 2Y_2^U - 2h_1\right)\right)\right] \end{bmatrix}. \tag{13}$$

Lemma 1 *Let h_1^* be the solution to (13). If $g''' > 0$, then $\frac{dh_1^*}{d\rho} < 0$; if $g''' = 0$, then $\frac{dh_1^*}{d\rho} = 0$; if $g''' < 0$, then $\frac{dh_1^*}{d\rho} > 0$.*

Proof. *See Appendix A.1.* ■

The result is a simple illustration of precautionary saving and follows Kimball (1990). ρ is a measure of household risk which is independent of expected household wealth. 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 $g''' > 0$ to be a realistic description of people's preferences, and therefore predict a negative relationship between risk and consumption. For quadratic utility functions ($g''' = 0$), 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 $k > 0$ and is in a range where it is optimal to move only when both spouses become unemployed.[8] Even when $g''' \geq 0$, increasing risk can actually increase consumption. Since this is difficult to show analytically for most utility functions and costs of adjustment, we prove this result for the simple case of quadratic utility and fixed adjustment costs. The subsequent subsection provides the graphical intuition behind these results, which can also be obtained numerically given realistic assumptions about utility and adjustment costs.

[8] The relationship between risk and committed consumption will depend on where the distribution of risk falls relative to the S-s adjustment bound. If k is small relative to the size of the loss (so that the household chooses to move after small losses or even no loss) or if k is big relative to the size of the loss (so that the household never moves), precautionary savings results will still obtain.

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

$$
\begin{aligned}
U(h_1, f_1) = & \left(h_1 - \frac{1}{2}\alpha h_1^2\right) + \left(f_1 - \frac{1}{2}\alpha f_1^2\right) \qquad (14) \\
& + E\left[\max\left\{\begin{array}{c} \left[\begin{array}{c} h_1 - \frac{1}{2}\alpha h_1^2 \\ + \left(Y_1 + \tilde{Y}_2 - 2h_1 - f_1\right) - \frac{1}{2}\alpha\left(Y_1 + \tilde{Y}_2 - 2h_1 - f_1\right)^2 \end{array}\right], \\ \left[\left(Y_1 + \tilde{Y}_2 - h_1 - k - f_1\right) - \frac{\alpha}{4}\left(Y_1 + \tilde{Y}_2 - h_1 - k - f_1\right)^2\right] \end{array}\right\}\right].
\end{aligned}
$$

Lemma 2 *Let $\{h_1^*, f_1^*\}$ maximize (14). If model parameters make it strictly optimal to set $h_2^* \neq h_1^*$ if and only if $\tilde{Y}_2 = 2Y_2^U$, then $\frac{dh_1^*}{d\rho} > 0$.*

Proof. *See Appendix A.2.* ∎

Postlewaite et al. (2006) argue that commitment can make an otherwise risk-neutral consumer risk-averse. Here, we show that commitment can make an individual with quadratic utility ($g''' = 0$, who ordinarily would not display precautionary saving or dis-saving) consume more housing in the face of increased risk.

When it is optimal to adjust housing consumption only when both spouses become unemployed, increasing risk (ρ) affects consumption through three distinct channels. First, standard precautionary saving implies that increased risk leads to reduced consumption when the third derivative of utility is positive. Since we assumed quadratic utility for Lemma 2, this channel is absent by construction in this case. Second, increasing risk effectively reduces wealth. As ρ goes up, the probability of both spouses becoming unemployed increases. This increases the probability of adjusting housing consumption and therefore increases expected moving costs. This makes the household poorer and reduces consumption.

Third, increasing risk reduces the probability that exactly one spouse will become unemployed. In the one-unemployed state, the household chooses to reduce food consumption and to maintain housing consumption. Therefore, the marginal utility of food consumption exceeds the marginal utility of housing consumption. The possibility of such a small loss provides a strong prudential motive, giving the household an incentive to reduce housing consumption in the first period. When there is no adjustment in the second period, reducing housing consumption by \$1 in the first period will lower housing consumption by \$1 and increases food consumption by \$2 in the second period. When small losses are likely in the second period, reducing housing consumption in the first period is appealing to increase non-housing consumption in the likely small loss states, when the marginal utility of non-housing consumption is particularly high. Therefore, an increase in risk that reduces the probability of the suffering a small loss increases first-period housing consumption. Lemma 2 shows that the third channel dominates the first two, so that increased risk leads to increased initial housing consumption.

2.3 Graphical Illustration of Household Risk and Commitment

The proof in the last subsection assumed that preferences were quadratic and adjustment costs were fixed. While these assumptions are necessary to obtain an analytically tractable solution, they are not necessary to obtain the same results numerically. To develop intuition behind these results and to show that they are not confined to a special case, we show the effect graphically. We use the two-period model described in Section 2 in which uncertainty comes from the possibility that one or both spouses could become unemployed.[9] Utility is assumed to be of the log form, $g(\cdot) = \ln(\cdot)$, and we consider proportional moving costs, $k = ch_1$. We vary household risk by changing ρ, the correlation of spouses' unemployment. Numerical calibration of this model yields results identical to those discussed here.

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 become unemployed than when only one becomes unemployed. Therefore, a mean-preserving increase in risk increases the expected marginal utility of wealth. As a result, increasing risk reduces the optimal level of consumption whenever the cost of adjusting

[9] We assume that $Y_2^U = 0.5 \cdot Y_2^E$. Furthermore, we assume $Y_1 = 2 \cdot Y_2^E$, so that household income stays constant if both partners remain employed. Without loss of generality, we normalize by setting $Y_2^E = 1$.

consumption is small.

This is illustrated by Figure 2, which shows the marginal lifetime utility of first-period housing consumption, $dU\left(h_1, f_1^*\left(h_1\right)\right)/dh_1$, for different 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 spouses (or one or none) are employed in the second period? These lines represent the first-order condition for first-period housing in various states 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.[10] If both husband and wife are unemployed, the "△" plot, then the marginal utility of first-period housing consumption is strongly negative; the family could have increased lifetime utility had it bought a smaller house initially. By contrast, if both spouses are employed, the "□" plot, then the marginal utility of first-period housing is positive; the family could have increased lifetime utility had it bought a bigger house initially. The "o" plot, representing the marginal utility when exactly one spouse becomes unemployed, is in between.

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

$$E\left[dU\left(h_1, f_1^*\left(h_1\right)\right)/dh_1\right] = 0, \tag{15}$$

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 ("△" and "□" plots) by reducing the weight on the one employed state ("o" plot). Since the "△" plot (neither employed) is substantially lower than the "o" plot (one employed) and the "□" plot (both employed), a mean preserving spread will move the expected marginal utility (the "+" plot) down and therefore reduce the optimal

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

level of initial housing consumption. This is a graphical representation of precautionary saving.

Figure 3 depicts the same problem as Figure 2, but with a 10 percent proportional cost of adjusting housing consumption, $c = 0.1$. Throughout the range of interest, it is optimal to adjust housing consumption only if both spouses become unemployed. The noteworthy feature of this figure is the extremely low marginal utility of first-period housing consumption when exactly one spouse becomes 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 in order to maintain their housing consumption. This implies a strong prudential motive in the domain of small losses that is absent for larger ones.

When exactly one spouse becomes unemployed, 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). This provides a strong motive to reduce housing consumption in advance of possible single-unemployment. In this context, inducing a mean-preserving spread has a very different effect than if moving costs were absent. 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 and therefore increases the optimal level of initial housing consumption.

Given sensible parameters, this setup implies a substantial positive relationship between income correlation and housing consumption. For example, if the income for the unemployed is half that of the employed, there is no earnings growth for the employed, the probability of becoming unemployed is 10 percent, and the cost of moving is 10 percent,[11] it is optimal to adjust housing only if both spouses become unemployed. Figure 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 2.9 percent (and decreases optimal non-housing consumption by 1.0 percent). The saving rate falls from 3.8 percent to 2.9 percent when the correlation of income increases.

These results for housing consumption and saving are exactly the reverse of what would be predicted by a precautionary saving model without 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 an 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.

2.4 Risk and the Willingness to Undertake Commitments

The previous subsections have shown that in the presence of substantial moving costs, increasing risk could lead homeowners to spend more on housing. But increasing risk increases the probability that both spouses will be unemployed, and therefore the probability of needing to move and hence pay moving costs. While households need to consume housing, they need not take on such large expected moving costs. Renting a home has substantially lower

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

adjustment costs. If households have exogenous heterogeneity in their preference for home ownership, then on average they should be more likely to rent as risk increases, since the odds of moving, and therefore the effective cost of owning a home, goes up.

To demonstrate this, we make the stylized assumption that renting a home involves almost no moving costs, so that the household can always adjust housing consumption. By contrast, owning a home involves a substantial moving cost (10 percent of housing consumption), so that given the other parameter assumptions it will be optimal to move only when both spouses are unemployed.[12]

In this setting, we compute the income premium that a household must be offered to make it willing to accept the higher moving costs of home ownership. Figure 5 plots household utility with and without moving costs for various levels of spousal income correlation, ρ. While consumption falls as risk increases when there are substantial moving costs, utility falls as risk increases regardless 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 choose the high transaction cost option, owning (the "$\triangle$" plot). 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 lifetime 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.

[12] 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 must pay transfer taxes, financing costs for a new home, movers, and must incur a host of nonpecuniary costs. These costs include the search for a new home, the time cost of selling the original home, and the psychic costs of uprooting. Renters face much lower moving costs. They have smaller or no realtor's fees, taxes, or upfront financing costs and do not have to sell their prior apartment. Also, search costs for rental housing are lower, since the market is thicker and more commoditized.

3 Data and variable construction

To test these predictions empirically, we need a source of household-level data that contains information about housing consumption, moving, changes in employment status, income, and the occupations of both husbands and wives. No one data set contains information about all of these variables for a large number of households. For data on changes in employment status, occupation, and the probability of moving, we use the April 1996 panel of the Survey of Income and Program Participation (SIPP), which follows a panel of households for 48 months between April 1996 and March 2000. When we examine the effect of sharing an occupation on housing consumption and home ownership, we use a pooled cross-section of households from the 1980, 1990, and 2000 Integrated Public Use Microdata Series (IPUMS) of the U.S. Census. These data are a 1 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, a limited moving history, and a number of demographic variables and geographic identifiers.[13]

The SIPP initially contains 3,897,211 person $\times$ month observations, and the three waves of the IPUMS together initially contain 2,778,194 household-level observations.[14] We impose several restrictions on our samples which, taken together, reduce the number of usable observations to 270,136 household $\times$ month observations for the SIPP and 302,342 household observations for the IPUMS. (These restrictions are detailed in Appendix Table A.) In both the SIPP and IPUMS, we limit our attention to married couples in which both spouses are currently employed. In the IPUMS, we also impose the restrictions that both spouses work full-time and live in Metropolitan Statistical Areas (MSAs). We consider only married households so we can distinguish empirically between occupational choice and unobserved

[13] Owners typically overestimate the value of their houses by 6 percent on average, but their errors do not appear to be systematically related to any observable variables (Goodman and Ittner (1992)). Since house value and income are recorded as ranges, we assign the midpoint of the range or 1.5 times the top code. All dollar values are converted to real (2000) using the CPI.

[14] We pool the three decades together for greater statistical power, especially for when we examine various subsamples of the data. We will also report results from some of the key regressions when estimated on each decade separately.

taste for risk. In the IPUMS, we discard households containing part-time or unemployed spouses because it is difficult to accurately measure their occupation, as well as their potential earnings capacity.[15] We restrict our attention to MSAs so we can control for local housing costs. MSAs are geographical areas defined by the Bureau of the Census intended to correspond to labor market areas and thus match up well to local housing markets.

We make extensive use of occupation data in both data sets. The IPUMS reports one occupation variable with 227 categories that is consistently defined over all three waves, based on occupation definitions from 1950. As detailed in Table 1.A, the average rate of same-occupation couples across all occupations in the sample is 9.6 percent. In the SIPP data summarized in Table 1.B, the prevalence of same-occupation couples is somewhat lower, at 3.2 percent, since occupation definitions in the SIPP are more granular, with 463 three-digit codes. Table 2 lists the 20 occupations in the IPUMS with the highest fraction of same-occupation couples. The fraction of same-occupation couples varies widely by occupation – it ranges from 15 percent for physicians to zero for many occupations not listed in the table. That range cannot be fully explained by random matching. Column 3 reports the fraction of same-occupation couples that would arise if couples were paired at random. While random matching might account for some of the same-occupation couples in a few common occupations (managers, sales workers, clerical workers), it does not explain the high rate of same-occupation couples among doctors or lawyers. Nor does the frequency of same-occupation pairings appear to be income-related.

Consistent with the framework developed in Section 2, our proxy for income risk will be unemployment. In the SIPP, we define a person as employed when they have a job all month or have a job part of the month but spend no time as laid off or searching for a job; we define them as unemployed when they spend all month unemployed or have a job only part of the month and spend some of the month as laid off or searching for a job. In the IPUMS,

[15] In particular, one spouse might keep their labor supply in reserve as a buffer in case the other spouse becomes unemployed (Cullen and Gruber (2000)). Since the relevant metric for a partially-employed couple is potential income and since it is hard to measure potential income for part-time workers, we restrict our attention to those families who appear to be working at their potential.

we define a person as unemployed when their stated usual hours of work in that year are zero. While we will restrict our sample to dual-employed couples, we will want to control for the probability of unemployment. We impute that probability for a husband (wife) as the average rate of unemployment for husbands (wives) in the same occupation and year, excluding the husband's (wife's) own observation. We compute this measure separately for husbands and wives, imposing the sample restrictions described in Appendix Table A (except for the full-time worker restriction).[16] Table 1 shows that the annual unemployment rate for home-owning husbands (p) in the IPUMS averages 6.5 percent and the unemployment rate for wives (q) averages 13.5 percent. The higher unemployment rates in the SIPP, 8.6 and 25.1 percent, respectively, are consistent with the more stringent definition of employment in these data.

For some of our empirical work, we will need an exogenous proxy for the likelihood of moving. We impute the likelihood of moving as the rate of recent moving by similar families. The IPUMS reports whether the family moved into their house within the last year. We construct the average rate of having moved in the previous year by husband's age $\times$ husband's education $\times$ presence of children cells. We define the bins using 10-year age brackets, nine education categories, and an indicator for whether the family has any children, and take the average for all of the households in that bin excluding the household in question. In the SIPP, where we need to know if the household actually moved after an unemployment event, we identify households that move by whether they change addresses between two consecutive monthly interviews.

4 Empirical Evidence

In this section, we examine the testable predictions of the theory developed in Section 2. First, do couples with higher income correlations (e.g. same-occupation couples) spend more

[16] Since people who are unemployed may state that they have no occupation – even when they have worked and plan to work in a given occupation – this procedure likely underestimates the true unemployment rate by occupation.

on consumption commitments (e.g. housing)? Second, is this relationship limited to those with relatively high adjustment costs (e.g. homeowners and not renters, or those who were unlikely to move for other reasons)? Third, do couples with higher income correlations choose housing consumption with lower adjustment costs (e.g. renting)? Fourth, is the relationship between income correlation and housing consumption strongest when dual unemployment is most likely to induce moving (e.g. when unemployment insurance is less generous)?

4.1 Sharing an Occupation, Unemployment Correlation, and the Probability of Moving

Before turning to our hypothesis tests, we present some evidence from the SIPP that suggests our empirical context roughly matches the conditions of our model. First, sharing the same occupation appears to be a reasonable proxy for higher unemployment correlations within the couple. Same-occupation couples are more likely to be either both employed or both unemployed, and less likely to have just one spouse unemployed. This fact is documented in Table 3, which reports the probability of one or both spouses becoming unemployed at some point over the next six months, conditional on both being employed in the current month, broken out for same- and different-occupation couples. The overall rate of becoming unemployed is roughly similar for same- and different-occupation couples (4.0 percent vs. 4.4 percent for husbands, and 7.1 vs. 8.0 percent for wives).[17] Same-occupation couples have higher rates of both becoming unemployed (1.5 percent vs. 0.7 percent) and both remaining employed (90.4 percent vs. 88.3 percent), and lower rates of just one spouse becoming unemployed (8.2 percent vs. 11.1 percent). These rates of single- and dual-unemployment imply a correlation of unemployment events of 5.7 percent for different-occupation couples

[17]Since unconditional unemployment rates are not identical for same- and different-occupation couples, we include in subsequent regressions a variety of individual- and occupation-level controls that account for differences in permanent income. Also, most results compare not only same- and different-occupation couples, but also interact this variable with measures of the size of loss or size of adjustment costs. As such, any systematic difference in unemployment rates or permanent income between same- and different-occupation couples will not explain our results.

but of roughly 23.7 percent for same-occupation couples.[18]

Second, dual-unemployment appears to proxy for a "large shock" to a greater extent than single unemployment since dual-unemployment substantially increases the likelihood of moving. Table 4 reports the fraction of home-owning households that move within six months of one or both spouses becoming unemployed. Conditioning on both spouses being employed in the previous month, we measure the change in employment status as the number of spouses (zero, one, or two) who are unemployed in the current month. Over the subsequent six months, the rate of moving is just over 2 percent if both spouses had remained employed. If just one of the spouses had become unemployed, the probability of moving during the subsequent 6 months increases by nearly 2 percentage points, to almost 4 percent. But if both spouses had become unemployed, the likelihood of a move skyrockets by almost 6 percentage points more, to nearly 10 percent. In results not presented in the tables, we have found a scaled-up acceleration in moving rates at 12-month horizons, with dual unemployment indicating a nearly 20 percent hazard of moving. We have also found that this pattern is not present for households who rent their homes. Those couples move at relatively high rates that are insensitive to unemployment shocks. Of course, since we do not observe unemployment severity, the realization of moves after an unemployment shock is only a rough indicator of the probability of crossing an S-s bound.[19]

[18] We use unemployment here, even though some of the unemployment spells are probably voluntary, because the concept appears to be relatively well-measured in the SIPP. If we instead use the SIPP's layoff variable, the correlations are nearly the same. For same-occupation households, the correlation of being laid off over the next six months conditional on being employed this month is 25.1 percent, while for different-occupation households it is about 1.4 percent. Splitting the sample by "same industry" rather than "same occupation" yields essentially the same results.

[19] Since some unemployment events in the data have a larger effect on permanent income than others, they do not correspond perfectly to the unemployment states in the model. In particular, a substantial fraction of unemployment shocks are quite temporary. As such, the estimates in Tables 3 and 4 will not map perfectly to model parameters. Even if all households who suffer dual-unemployment (as defined in our model) move, it is not surprising that many household listed as dual-unemployed (but whose unemployment is very transitory) in the data do not move.

4.2 The Relationship Between Income Risk and House Value for Homeowners

We begin by comparing the housing consumption and tenure choices of same- and different-occupation couples. Our primary approach will be to regress a measure of housing consumption (log house value for homeowners, log rent for renters, and an indicator variable for owning a house for the tenure choice) on a same-occupation indicator variable, 1_ρ. Since the same-occupation variable proxies for the mean-preserving increase in risk, as measured by the correlation, ρ, a positive coefficient indicates that more risk leads to increased consumption. We include controls for the probability of the husband and wife becoming unemployed (p and q, respectively) and the probability that both would be unemployed if the risks were independent (pq), since p and q contain information not just about risk, but also expected income. We include the squared unemployment rates for the husband and wife, p^2 and q^2, in case the relationship between the risk of unemployment and housing demand is nonlinear in a way that is not reflected in the model. We control for family income, Y, the share of the income earned by the husband, s, and year effects, δ_t. Some specifications will include dummies for the MSA of residence (k) interacted with year, $\delta_{k,t}$, as well as 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, and the husband's and wife's occupations. Whereas much research on precautionary saving uses occupation-level variation in risk, we control for occupation directly and exploit variation in within-household diversification. We estimate regressions of the form:

$$\ln\left(P^H\right)_{i,t} = \begin{bmatrix} \alpha_1 1_{\rho,i,t} + \alpha_2 p_{i,t} + \alpha_3 q_{i,t} + \alpha_4 pq_{i,t} + \alpha_5 p_{i,t}^2 + \alpha_6 q_{i,t}^2 + \alpha_7 s_{i,t} \\ +\gamma \ln\left(Y\right)_{i,t} + \varphi Z_{i,t} + \delta_{k,t} + \varepsilon_{i,t} \end{bmatrix} \tag{16}$$

on a sample of homeowners from the IPUMS for household i in year t.[20]

[20] This regression is similar in spirit to those in Carroll and Samwick (1997, 1998). Those papers quantify precautionary saving by regressing measures of permanent and transitory income risk, as well as a variety

Estimating equation (16), we find that couples who share an occupation spend more on owner-occupied housing. The first column of Table 5 reports the results when the only additional covariates are the unemployment rate controls, log of family income, and the income share of the husband. Husbands and wives with the same occupation spend 4.3 percent more on housing (with a 0.4 percent standard error) than couples with different occupations.[21]

Consistent with empirical precautionary saving papers that exploit occupation-level variation in unemployment risk (e.g. Carroll and Samwick (1997, 1998)), husbands in occupations with high risks of unemployment spend less on housing ($\alpha_2 < 0$). We also find that households that face greater occupation-based unemployment risk spend less on housing ($\alpha_4 < 0$) But our key finding is that these results are attenuated or even reversed when the correlation of couples' unemployment increases ($\alpha_1 > 0$).

The positive relationship between "same occupation", 1_ρ, and housing spending, $\ln\left(P^H\right)$, is consistent with our theory and is not what would be expected from a precautionary saving model without commitment. However, it might merely reflect unobserved factors that are correlated with both 1_ρ and $\ln\left(P^H\right)$. To address this concern, we begin by controlling for MSA of residence in each year and a host of demographic characteristics. For example, by including MSA $\times$ year dummies and thus comparing housing spending for same- and different-occupation homeowners within a metro area in a given year, we control for the possibility that same-occupation couples may tend to locate in areas with high housing prices. The resulting estimates can be found in the second column of Table 5. Same-occupation couples buy houses that are on average 2.7 percent more expensive than other couples'. The estimated coefficient on the husband's income share becomes positive with

of controls, on various measures of household wealth. Other papers take a similar approach in the housing context. Those empirical studies find a negative relationship between income risk and home ownership (Diaz-Serrano (2005), Haurin (1991), Robst et al. (1999)). Prior evidence on housing spending is ambiguous. Haurin and Gill (1987) find that military husbands' incomes positively affect their housing spending but their wives' incomes (which they argue are more uncertain) do not. Haurin (1991) examines the effect of income risk on house spending, and fails to find a statistically significant effect.

[21] Current income is a good predictor of housing consumption, with an estimated elasticity of 0.625 (with a standard error of 0.003). The income share of the husband is insignificant in this specification.

the additional controls, indicating that more inequity in the couple's earnings is correlated with higher housing spending.[22] The estimated coefficient on family income falls because the added demographic characteristics proxy for the household's permanent income.

Next, to control for the possibility that same-occupation couples are more prevalent in occupations that have a strong unobservable preference for housing, we include dummy variables for each spouse's occupation. Once we remove the effect of either spouse's occupation on housing consumption, does sharing an occupation further increase that consumption? In other words, do a dual-doctor and a dual-lawyer couple together spend more on owned housing than two doctor/lawyer couples? This regression implicitly assumes that the household's occupation-based taste for housing is simply the sum of each spouse's individual preference, as estimated from the sample of different-occupation couples.

These results are reported in the third column of Table 5. The new coefficient on "same occupation" implies that, controlling for each spouse's occupation, MSA $\times$ year effects, and a variety of demographics, same-occupation couples spend 2.1 percent (0.4 percent standard error) more on their houses than do different-occupation couples. Table 3 notes that same-occupation couples have an 18 percentage point higher correlation in unemployment risk, so simple extrapolation gives an elasticity of house spending with respect to the unemployment correlation of 0.12 (0.021/0.18). The unemployment rate and income controls decline in magnitude and significance with the addition of the occupation dummies, 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.

These results are robust to using "same industry" as our proxy for couples' unemployment correlation. We have replicated the analysis using the IPUMS 1950 constant industry definitions, and imputing unemployment rates based on the husband's and wife's indus-

[22] This result is economically quite large; increasing the head's income share by one standard deviation (0.17) leads a household to spend almost 2 percent more on housing. While income share might be a measure of risk, it might also merely reflect the possibility that people who like to spend money pair up with spouses who make a lot of it. Therefore, we use the income share variable as a control and focus on the same-occupation variable as a much better identified measure of risk.

tries. As an example, we report one set of these replications in column 4. This column corresponds to the specification in column 3, replacing occupation variables with industry ones. All else equal, home-owning couples that share the same industry spend 5.6 percent more on housing. Since the difference in unemployment correlation between same- and different-industry households is also 0.18, the elasticity of house spending with respect to unemployment correlation is 0.31 (0.056/0.18).

One potential concern is that sharing the same occupation is a proxy for similarity in general, and the kind of people who choose similar spouses have a certain preference for housing. However, similarity *per se* does not seem to account for our findings. In regressions that we do not report, we have controlled for other dimensions on which spouses can be the same, namely age (in ranges) and education. While these variables occasionally have a statistically significant effect on housing spending, the sign of this impact is not uniform. Furthermore, including these variables has almost no effect on the estimated same-occupation coefficient.

Indeed, this baseline result is remarkably robust in a number of dimensions. In Table 6, we examine the relationship between "same occupation" and housing spending for different subsamples. We do this both to show that the result is generally applicable across the population, but also to ascertain that "same occupation" is not spuriously correlated with an observable characteristic. The reported coefficients are the estimated "same occupation" effects from regressions analogous to the one reported in the third column of Table 5.

In the first row of Table 6, we split the sample by decade, running separate regressions for 1980, 1990, and 2000. Our finding is not restricted to any particular time period. The "same occupation" effect also is not limited to any particular age or education group. However, the magnitude of the effect of a higher correlation in unemployment risk on housing spending for homeowners is significantly bigger for same-occupation households where the husband is under age 45 or where neither of the spouses have had any post-secondary schooling. In addition, households whose incomes are above the sample median have a smaller, and statistically insignificant, "same occupation" effect. Instead, relatively low-income families are much more sensitive to unemployment risk. Finally, we split the sample based on the division of labor income between husband and wife. The correlation in unemployment risk between spouses when one of them does not make very much money should be less of a factor in the housing decision. We test this relationship by comparing the estimated "same occupation" effect for households where the husband earns between 40 and 80 percent of the total labor income to those with more unequal division of earnings. The 40/80 cutoffs are approximately one standard deviation above and below the mean husband's share of income. We find sharing the same occupation has a larger effect on housing spending when the distribution of income between spouses is more equal.

The theory developed in Section 2 suggests that a positive relationship between risk and housing consumption should be present only when moving costs are high. When effective moving costs are low, households should behave as would be predicted by a precautionary saving model without commitment, in that a mean-preserving spread in risk reduces housing spending. But when effective moving costs are high, housing spending should rise with risk. This allows a more refined test of our hypothesis, where we test whether the interaction of adjustment costs and same-occupation status is positive while controlling separately for the direct effects of adjustment costs and sharing the same occupation. That is, does the difference in housing consumption between same- and different-occupation homeowners grow as transaction costs rise? This refinement can be used to rule out the possibility that same-occupation couples spend more on housing because they have an unobservable taste for housing, as long as that taste is not confined only to high adjustment cost households. Similarly, if the increased housing spending by same-occupation couples reflects precautionary saving invested in owner-occupied housing, there is no reason to believe that precautionary saving in housing should be largest for households who are less likely to move.

One source of variation in adjustment costs comes from the 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 planned never to move. For households who were planning to move, a bad income shock merely accelerates the timing of a move that was going to happen soon anyway. 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 extreme, a household that was about to move anyway does not face any additional housing transaction cost from unemployment. Conversely, the transaction cost is largest for a household 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. The tendency of same-occupation couples to spend more on housing (relative to different-occupation couples) should be stronger when the exogenous probability of moving is lower.

In our consumption commitments framework, we would expect a positive coefficient on 1_ρ and a negative coefficient on $P(\text{move}) \times 1_\rho$. To test this hypothesis, we 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 Section 3. We re-estimate equation (16), adding the interaction of our imputed probability of moving with "same occupation," $P(\text{move}) \times 1_\rho$, as well as $P(\text{move})$ by itself as a control. The identifying assumption underlying this regression is that any difference between same- and different-occupation couples in the unobservable preference for housing is uncorrelated with the moving rate of similar households, after controlling separately for each of the household attributes we use to impute the probability of moving, and other household characteristics.

The second column of Table 7 reports the results of this regression. (The first column of this table merely repeats the results of the fully saturated regression from the third column of Table 5.) The estimated coefficient on 1_ρ in the second column corresponds to the case where the household expects never to move and thus faces the largest possible transaction costs. Consistent with our theory, this coefficient is positive and higher than in the first column, rising from 0.021 to 0.034 (0.007). The interaction between same-occupation and the probability of moving is negative and significant, at -0.088 (0.039). Thus, increasing risk does not increase housing spending when the probability of moving is high (and therefore the effective transaction cost is low). The standard deviation in the probability of moving for owners is 0.32, so the precautionary motive dominates (the coefficient on "same occupation" becomes negative) for moving rates that are 0.86 standard deviations above the mean.[23]

4.3 The Relationship Between Income Risk and Rent for Renters

A more obvious source of variation in moving costs stems from the tenure choice, as home renters face much lower moving costs than homeowners. As a result we should observe a weaker relationship between risk and housing consumption for home renters than for homeowners. Indeed, if renters' moving costs are low enough, greater risk should lead to lower spending on rent. Also, variation in transactions costs stemming from the exogenous probability of moving should make little difference for renters, since they face low moving costs whether or not they plan to move.

We find that for renters, a mean-preserving increase in risk has no effect on the demand for rental housing. This result is reported in the third column of Table 7, which replicates the regression in the first column for a sample of renters, replacing log(house value) with log(rent) as the explanatory variable. The estimated coefficient on the same-occupation variable is basically zero, at -0.002, and not statistically significant. By contrast, note from the first column that same-occupation couples spend significantly more on owner-occupied housing than different-occupation couples. The difference between the same-occupation effect for owners and renters is 0.023, and is statistically significant at the 95 percent confidence level.[24] Finding different effects for owners and renters suggests that consumption commitments

[23] The "same occupation" effect turns negative ($0.034 - P(\text{move}) \times 0.088 < 0$) when $P(\text{move}) > 0.39$. That is 0.86 standard deviations above the mean ($(0.39 - 0.11)/0.32$). To get a sense of the scaling, at the mean, a home-owning household expects to move every nine years (1.0/0.11). At a probability of moving 0.86 standard deviations above the mean, the expected length-of-stay is two years ($1/(0.11 + 0.39)$).

[24] We tested the null that the same-occupation coefficient was the same for renters and owners by stacking the observations and fully interacting all variables with a renter dummy. The null was whether "same occupation" $\times$ renter was equal to zero.

rather than unobserved attributes explain the tendency of same-occupation couples to spend more on housing. If sharing an occupation were merely a signal of an unobservable preference for housing, renters who share an occupation should rent more expensive homes than renters who do not and the difference between the estimated coefficients on "same occupation" for owners and renters should be small.

The fourth column of Table 7 presents a regression which adds both $P(\text{move})$ and a $P(\text{move}) \times 1_{\rho}$ interaction to the regression predicting log(rent) in the third column. This regression specification is identical to the one shown in the second column, with log(rent) replacing log(house value) as the explanatory variable. The impact of "same occupation" alone is negative but insignificant. The interaction variable has a positive coefficient but is also statistically insignificant. However, both of these coefficients are statistically significantly different from their analogs for owners in column 2. Since renters face low transaction costs regardless of whether or not they plan to move, we would not expect the relationship between risk and consumption to be affected by the probability of moving.

4.4 The Relationship Between Income Risk and Home Ownership

Another implication of the model is that renting becomes relatively more appealing as the correlation between spouses' unemployment events increases. Knowing that simultaneous unemployment – and therefore moving – is more likely for them, same-occupation couples may adapt by renting, rather than owning, in order to save on the costs of future moves. The fifth column of Table 7 confirms that same-occupation couples are less likely to own their homes. This column repeats the regressions in the first and third columns, replacing the explanatory variables with an indicator that takes the value of one if the household owns their home. The increased sample size reflects the fact that this regression includes both homeowners and renters. For this linear probability model, the estimated coefficient on "same occupation" is -0.014 (0.003), so same-occupation couples have a 1.4 percentage point lower rate of home ownership relative to different-occupation households, *ceteris paribus.*

Since those same-occupation couples have an 18 percentage point higher unemployment correlation, the elasticity of home ownership with respect to the correlation in risk is -0.078 (-0.014/0.18).

This result also helps to confirm that the relationship between risk and housing spending represents housing consumption and not precautionary saving invested in a housing asset. If precautionary wealth were invested in housing, increasing risk would make households more likely to buy and less likely to rent their homes.[25] By contrast, our model implies that increasing risk would make households more likely to rent and less likely to own their homes.[26]

As we noted earlier, our model predicts that same-occupation households will have a relatively stronger preference for renting only in the presence of significant moving costs. We test this refinement in the sixth column of Table 7 by adding as covariates the interaction of the imputed probability of moving and the same-occupation indicator, $P(\text{move}) \times 1_{\rho}$, as well as the imputed probability of moving alone, $P(\text{move})$. This column merely repeats the regressions shown in columns two and four, with the home ownership indicator variable as the dependent variable..

Since effective moving costs are highest for households that are unlikely to move for exogenous demographic reasons, we would expect the difference between same- and different-occupation couples in the propensity to own should be most negative for these households. As the probability of moving rises, the difference between same- and different-occupation couples should become less negative, so $P(\text{move}) \times 1_{\rho}$ should have a positive coefficient. This prediction stands in contrast to the expected effect of $P(\text{move})$ on tenure choice. Since

[25] Buying a larger house is an inefficient way to save. The return on housing is comprised of the capital gain plus the rental value of living in the house (the dividend). Homeowners are constrained to consume their entire dividend, so buying a bigger house as a form of saving forces the household to over-consume housing in the first period, leaving a net-of-the-consumption-value return on the owner-occupied house that is lower than an alternative investment (such as rental housing).

[26] This own/rent result also rejects other alternatives that induce households with greater risk to invest in housing. One such story is that the housing asset is protected in bankruptcy, so if a same-occupation couple is more likely to file for bankruptcy, they should purchase more housing. If that hypothesis explained the results, riskier households should be more likely to own their homes and not rent, which is contrary to the evidence in the fifth column of Table 7.

frequent movers, whether or not spouses share an occupation, pay higher expected moving costs, they should be more likely to rent. Therefore, $P(\text{move})$ should have a negative coefficient.

The sixth column of Table 7 presents results that match the predictions of the model. In the first row, the estimated coefficient on "same occupation" corresponds to households that implicitly expect never to move. The point estimate of -0.027 (0.005) is nearly twice as large as the average effect across all households, which is the coefficient reported in the fifth column. Unsurprisingly, frequent movers tend to rent as indicated by the negative and significant coefficient in the second row. In the third row, the interaction term shows a positive and significant coefficient. As the probability of moving increases, the difference in the propensity for home ownership between same- and different-occupation households becomes less negative. Simple extrapolation from the point estimate of 0.084 (0.026) shows that the gap between same- and different-occupation couples is eliminated when the probability of moving is roughly 32 percent, equivalent to a three-year expected stay.

4.5 Self-selection

It is useful to consider whether the overall pattern of results we observe in Tables 5 and 7 could be generated by an unobserved taste for housing by same-occupation couples, combined with endogenous self-selection into home ownership. First, suppose same-occupation couples had a higher mean unobserved taste for housing than different-occupation couples, so their preference distribution were shifted to the right. That form of heterogeneity would cause same-occupation homeowners to spend more on their homes. But it would also suggest, counterfactually, that same-occupation renters would spend more on rent. If same-occupation couples merely had a preference for home ownership, it could explain why same-occupation couples have higher spending on owner-occupied housing but not rental housing. But that model would predict that same-occupation couples would be more likely to own their houses, which is contradicted by the data.

However, if same-occupation couples had the same mean but higher variance in the unobserved preference for housing than different-occupation couples, it could explain more of the empirical regularities we find. Since same-occupation households would have thicker preference tails – they either love housing or they hate it – same-occupation households who loved housing would own and also spend more than the more neutral different-occupation households. Those same-occupation households who disliked housing would rent and not spend much on rent relative to different-occupation households. In addition, depending on the clearing price of owned housing, it is possible that more different-occupation than same-occupation households prefer owning. In that case, same-occupation households would have a lower rate of home ownership. If this explanation is true, it implies a straightforward and testable prediction. The residuals for the same-occupation, home-owning couples in the housing demand regression should be more right-skewed than those for the different-occupation couples. Similarly, the residuals for the same-occupation renting couples in the rent regression should be more left-skewed. In our data, there is no distinguishable difference in skewness in residuals between same- and different-occupation couples, so variation in the second moment of unobserved taste for housing cannot explain our results. Furthermore, it seems unlikely that any difference between same- and different-occupation couples in the taste for housing is present only for households with a low exogenous probability of moving. This would have to be true to explain the pattern of coefficients on the interaction between "same occupation" and the imputed probability of moving.

4.6 Consumption Commitments and Unemployment Insurance

Our final empirical test examines how the generosity of unemployment insurance (UI) affects the relationship between "same occupation" and housing spending. More generous UI effectively reduces the size of shocks to permanent income since it affords the unemployed the ability to set a higher reservation wage in their job search (Feldstein and Poterba (1984)). A theory incorporating consumption commitments predicts a positive relationship between "same occupation" and housing spending only when the household experiences a loss large enough to induce moving. Therefore, the difference in housing spending between same- and different-occupation couples should *decrease* (become less positive) when unemployment insurance becomes more generous. By contrast, a model of precautionary saving without commitment would predict that increasing risk reduces spending less when UI is more generous; the difference in housing spending between same- and different-occupation couples should *increase* (become less negative) as UI becomes more generous (e.g., Engen and Gruber (2001)).

There are several sources of variation in the generosity of UI. While state UI programs typically compensate the unemployed for up to 50 percent of lost wages up to a cap, the level of the cap and the replacement rate schedule vary across states, over time, and according to the number of dependent children. In addition, the generosity of UI is a nonlinear function of income: the replacement rate remains constant until income reaches the cap, at which point it declines with income.[27] Lastly, this nonlinearity in the replacement rate implies that the share of income earned by each spouse influences the couple's total replacement rate in the event that both spouses lose their jobs. For example, if both spouses earn exactly the cap amount and both become unemployed, they collectively will receive 50 percent of their former wages. But if one spouse earns twice the cap amount and the other earns almost nothing – total family income is the same but its allocation is not – the family can at best replace 25 percent of their former income.

To implement this test, we calculate UI replacement rates for each spouse using the unemployment insurance calculator developed by Cullen and Gruber (2000) and extended by Chetty.[28] Since the calculator contains information about UI since 1984, we restrict our sample to 1990 and 2000. We calculate the household's replacement rate as the average replacement rate for each spouse, weighted by their respective income shares. Then we

[27] Once income exceeds the cap, the absolute benefit amount remains level at 50 percent of the cap amount but is declining as a percentage of income.

[28] We are grateful to Raj Chetty for letting us use his UI calculator and benefit data.

interact this measure of the household's replacement rate with the same-occupation, unemployment rate, income share and other control variables from equation (16), and test whether the coefficient on the "same occupation" × replacement rate interaction is negative. Assuming that the variation in UI generosity is uncorrelated with differences between same- and different-occupation couples in the unobservable demand for housing or home ownership, then this interaction term provides a clean test of the consumption commitments theory.

We make one further refinement to the empirical specification. Although 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 their unemployment rates. To correct this mismeasurement, we weight the unemployment and same-occupation variables by the husband's and wife's shares of family income. In Table 1, on average husbands earn 62.1 percent of household income when both spouses are working full-time. Labeling 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 based on the interaction of both spouses' attributes, is multiplied by both income shares, $1_\rho s(1-s)$. We also control for the husband's income share and the husband's × wife's income shares independently. While including these interaction terms in the earlier regressions also would have been justified, in practice doing so makes little difference in the estimated coefficients and their statistical significance, so we opted for a more easily interpretable specification. However, the UI replacement rate is also a function of s, so omitting it in this context would lead to a biased estimate of the interaction of "same occupation" with UI generosity.

We estimate the following regression on the sample of homeowners, where R denotes the replacement rate and $g\left(p_{i,t}, q_{i,t}, s_{i,t}\right) = ps_{i,t} + q(1-s)_{i,t} + pqs(1-s)_{i,t} + (ps)^2_{i,t} + (qs)^2_{i,t}$:

$$\ln\left(P^H\right)_{i,t} = \begin{bmatrix} [\beta_1 1_{\rho,i,t} + \beta_2(1_{\rho,i,t} \times R_{i,t})]s(1-s)_{i,t} \\ +\beta_3 g\left(p_{i,t}, q_{i,t}, s_{i,t}\right) + \beta_4(g\left(p_{i,t}, q_{i,t}, s_{i,t}\right) \times R_{i,t}) \\ +\beta_5 s_{i,t} + \beta_6(s_{i,t} \times R_{i,t}) + \beta_7 s_{i,t}(1-s_{i,t}) + \beta_8(s_{i,t}(1-s_{i,t}) \times R_{i,t}) \\ +\gamma_1 \ln\left(Y\right)_{i,t} + \gamma_2(\ln\left(Y\right)_{i,t} \times R_{i,t} + \varphi Z_{i,t} + \delta_{k,t} + \varsigma_{s,t} + \varepsilon_{i,t} \end{bmatrix} \quad (17)$$

This regression interacts the same occupation dummy from equation (16), as well as the unemployment rate, family income, and income share controls, with the household's replacement rate. Since this specification includes MSA $\times$ year dummies ($\delta_{k,t}$), state $\times$ year dummies ($\varsigma_{s,t}$), and income share controls, we are examining how same- and different-occupation households respond differently to variation across states in their UI programs, while controlling for any state-level generosity that affects same- and different-occupation households equally.

We find that increasing the correlation in unemployment risk raises housing spending more for homeowners with lower UI replacement rates. Since the effect of the UI replacement rate may not be linear, we report three functional forms for the replacement rate, R: an indicator for being in the bottom decile of the replacement rate by decade, an indicator for the bottom quartile, and a linear function of the replacement rate. We compute robust standard errors, clustered on state, year, and replacement rate segment.[29] In the first column of the top panel of Table 8, which includes the entire set of covariates except the husbands' and wives' occupation dummies, the estimated same-occupation effect for the top 90 percent of households by replacement rate (the excluded group) is 0.077 (0.019). In order to evaluate

[29] For the bottom-decile specification, the replacement rate segments are simply the bottom 10/top 90 percent ranges. Similarly, for the bottom-quartile specification, the segments are the bottom 25/top 75 percent ranges. In the linear specification, the segments are the linear portions of the UI replacement schedule. Each spouse can be on one of three sections: the spouse is ineligible (R=0); the spouse's income is below or at the benefits maximum (typically this means R=0.5, although the cap varies over time, across states, and by family structure); or the spouse's income is above the benefits maximum (typically, 0<R<0.5, depending on the state's cap). Of the six possible spousal combinations, five are populated with households in our data, and we cluster on those combinations interacted with year. The empty segment is both spouses having incomes above the benefits maximum.

the same-occupation effect at the mean, we need to multiply it by the average income shares of the husband and wife. Those averages are approximately 2/3 and 1/3, respectively, so multiplying the estimated coefficient by 2/9 yields an estimate comparable to those in the previous tables. Here, the average same-occupation couple with a UI replacement rate in the top 90 percent spends an additional 1.7 percent more on housing than do different-occupation couples with similar replacement rates. Consistent with our predictions, the difference in spending on housing between same- and different- occupation couples is biggest in the lowest replacement rate decile. The second row of the first column reports how the difference in housing spending between same- and different occupation couples changes in the bottom replacement rate decile. Bottom-decile, same-occupation couples spend an additional 6.0 percent (1.8 percent standard error) more on housing relative to different-occupation couples in the same decile, net of any same/different occupation differences in spending for the top 90 percent.[30] While we do not report the estimated coefficients on the interactions of the husband's and wife's unemployment rates with the replacement rate, in all cases higher risks of unemployment reduce housing spending more when UI replacement rates are very low.

In column 2, a similar pattern is seen when we divide households into the top three quartiles and bottom quartile by replacement rate. The same-occupation couples in the top 75 percent spend 1.7 percent more on housing than do comparable different-occupation couples. Same-occupation couples in the bottom quartile spend an additional 3.3 percent more on housing than do bottom-quartile different-occupation households, all relative to the difference in spending between same- and different-occupation couples in the top three quartiles.

In the third column, the replacement rate enters linearly. Unlike in the previous columns, here a higher value for R implies more generous UI, so we expect a negative coefficient. The first row corresponds to same-occupation couples with a zero replacement rate. They spend 4.5 percent ($0.203 \times 2/9$, 1.4 percent standard error) more on housing than comparable

[30] 6.0 percent is calculated as the product of the estimated coefficient (0.267) and the product of the average husband's and wife's income shares ($2/3 \times 1/3 = 2/9$). The standard error is similarly adjusted.

different-occupation couples. As the replacement rate increases, the difference in housing spending between same- and different-occupation couples falls. For each 10 percentage point increase in the replacement rate, the gap shrinks by 0.72 percentage points. In a sign that the replacement rate relationship is nonlinear, this interaction term is statistically significant only at the 91 percent confidence level.

The bottom panel repeats the estimation, but adds occupation dummies. In the first two columns, the estimated "same occupation" effect is about one-third smaller, but remains statistically significant. The estimated coefficients on the interaction terms, however, are only one-fourth their prior magnitude and no longer are statistically significant. Both coefficients of interest in the linear specification (column 3) are indistinguishable from zero.

5 Conclusion

This paper shows the surprising effect that consumption commitments can have on the role of risk in households' consumption decisions: households may increase consumption in response to increased risk. We illustrated this idea in the context of a dual-career household that faces unemployment risk and consumes housing. Suppose the household faces the risk of an income shock large enough that moving would be worthwhile. This household may purchase a house of roughly the size that it would want in the absence of the shock, since buying a smaller house initially would not spare it from moving in the event of the shock. By contrast, if a household faces the risk of an income shock that would not be large enough to induce moving, they must buy a house small enough to ensure sufficient non-housing consumption after they have paid for their committed housing consumption. In this context, a mean-preserving increase in risk that makes large shocks more likely and small shocks less so will increase housing consumption. This striking result is the opposite of what would be predicted by a precautionary saving model without commitment.

This result requires adjustment costs to be high enough to deter moving in all but the worst states. Therefore, it should not apply when moving costs are low, as they are for renters or those who expect to move soon. Furthermore, households with higher unemployment correlations – who are more likely to face shocks large enough to induce moving – should be more likely to consume housing with lower adjustment costs; they should rent rather than own their homes.

When we proxy for a mean-preserving increase in risk by whether a married couple shares the same occupation, which is a proxy for a higher correlation in unemployment risk, we find that this behavior is pervasive in the data. Controlling for each spouse's characteristics, including their individual occupations and probabilities of unemployment, we find that same-occupation households spend relatively more on housing. As expected, this result is confined to homeowners, and is strongest for those owners who face effectively higher moving costs due to a lower exogenous probability of moving. Furthermore, same-occupation couples, compared to other couples, are relatively more likely to rent their homes, with this difference confined to households that are less likely to move for demographic reasons. Finally, same-occupation couples spend relatively more on housing consumption compared to different-career couples when unemployment insurance is less generous. All of these patterns are consistent with households increasing housing consumption in the face of increased risk in the presence of moving costs.

Of course, our finding that commitments affect the relationship between risk and consumption does not deny the importance of prudence in generating precautionary saving. It merely follows from the precautionary motive being particularly strong in the domain of losses too small to warrant adjustment. The resulting nonlinear relationship between risk and consumption as the distribution of potential losses widens may help explain the widely varying estimates of the magnitude of precautionary saving. One would expect to find larger precautionary saving effects when examining the risk of small losses (e.g. Carroll and Samwick (1997, 1998), Kazarosian (1997)) and attenuated effects when examining the risk of large losses (e.g. Lusardi (1988), Carroll *et al* (2003), Skinner (1988)). Our findings may also explain why precautionary saving results are quite sensitive to the sample in which they are measured (Hurst et al. (2005)).

Overall, the net positive effect of risk on consumption can be quite significant for many households. Simple calibrations suggest that the size of this net positive effect should be of roughly the same magnitude as the negative effect in a precautionary saving model without commitment. Empirically, for households with the highest moving costs, we estimate that an 18 percentage point increase in the unemployment risk correlation between spouses raises housing spending by 3.4 percent for households that never plan to move (from Table 7, column 2). That change in correlation corresponds to more than doubling the likelihood of joint unemployment (from 0.67 to 1.47 percent). Extrapolating, a one percentage point increase in the risk of dual unemployment would raise housing spending by 4.25 percent.

These findings are important, in part, because they illustrate that households do not necessarily behave in the manner predicted by the usual precautionary saving intuition. However, we have chosen to limit the scope of our analysis to a context that can be cleanly isolated in the data. The intuition that the scope of losses impacts the precautionary motive in the presence of adjustment extends beyond dual-career couples, unemployment risk, and housing consumption. It remains for future empirical work to show that greater risk in the face of consumption commitments can sometimes lead to lower saving or wealth, and for all types of households and consumption commitments.

A Appendix A: Proofs

A.1 Proof of Lemma 1

The first order condition can be written as:

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

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 since $g'' < 0$. (g is assumed to be concave.) The numerator will be positive 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 $g''' > 0$. 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:

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

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

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

$$f_1^* = \frac{1}{4}\left(Y_1 + 2Y_2^E + (p+q)\left(Y_2^U - Y_2^E\right) - k\phi\right)$$

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

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

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

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:

$$\begin{aligned} \frac{1}{2}\left(Y_1 + 2Y_2^U - k - f_1 - h_1\right) &> Y_1 + 2Y_2^U - f_1 - 2h_1 \\ 0 &> \frac{1}{2}Y_1 + Y_2^U + \frac{1}{2}k - \frac{1}{2}f_1 - \frac{3}{2}h_1. \end{aligned} \tag{19}$$

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 with certainty 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 strictly for all greater values. Therefore,

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

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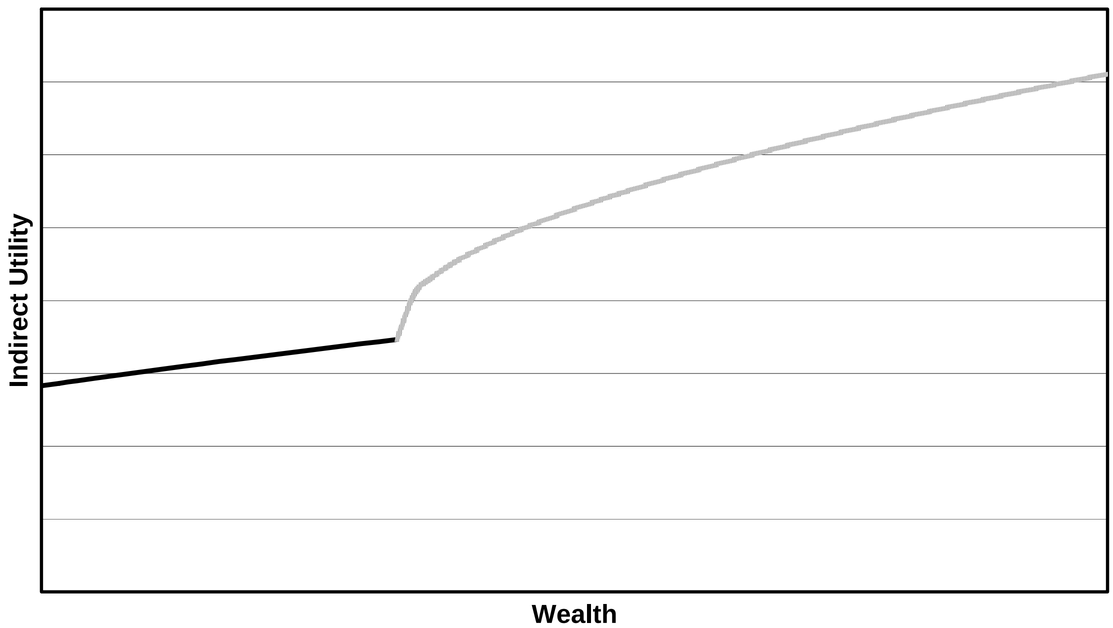
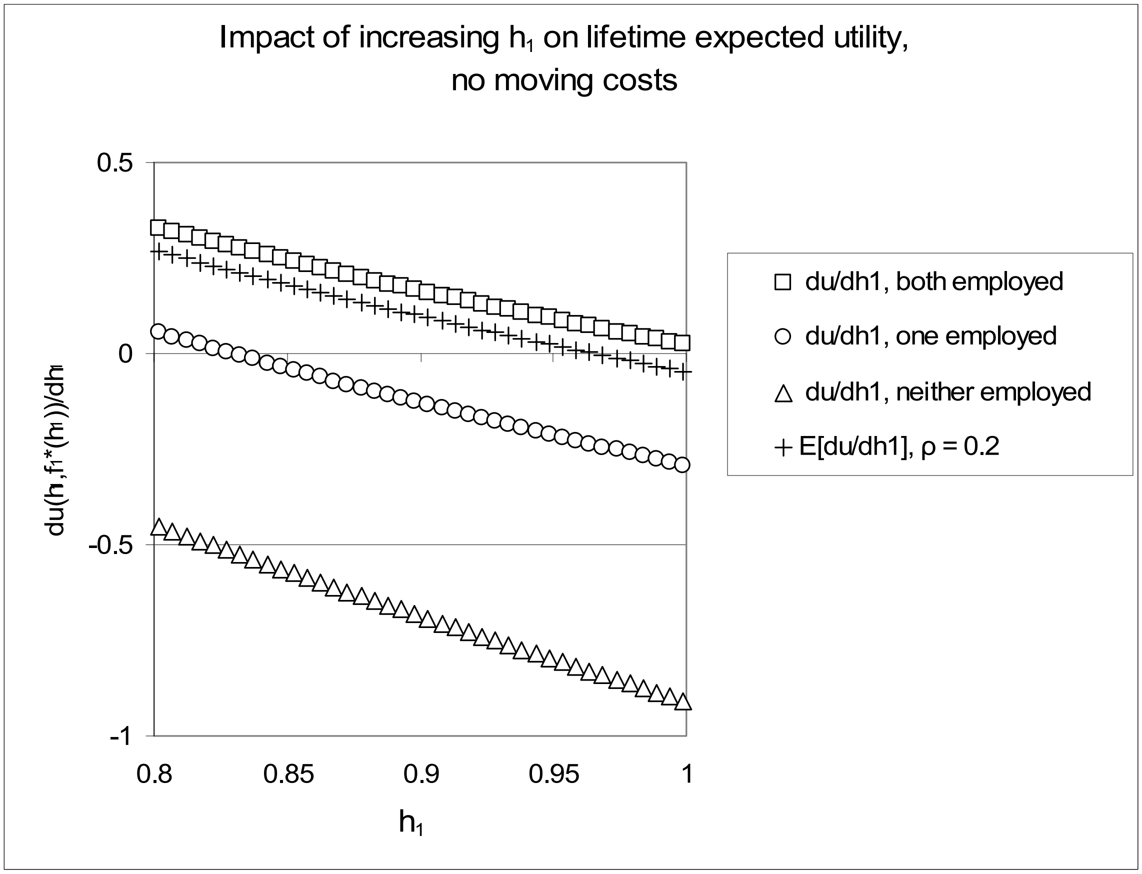
Figure 1:

Indirect Utility of Wealth in the Second Period
Given Housing Consumption in the First Period



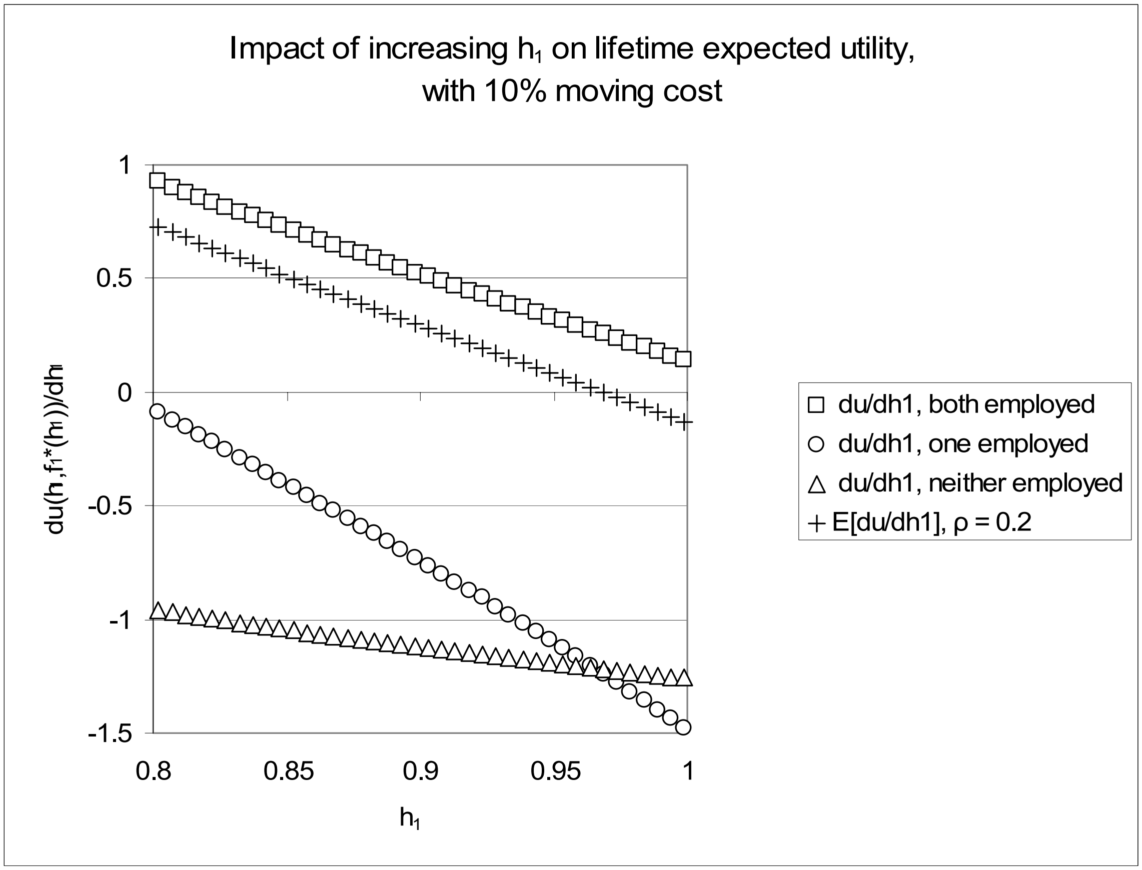
Notes: This figure plots the indirect utility in the second period, assuming that wealth is optimally allocated between food and housing. Not to scale.

Figure 2:



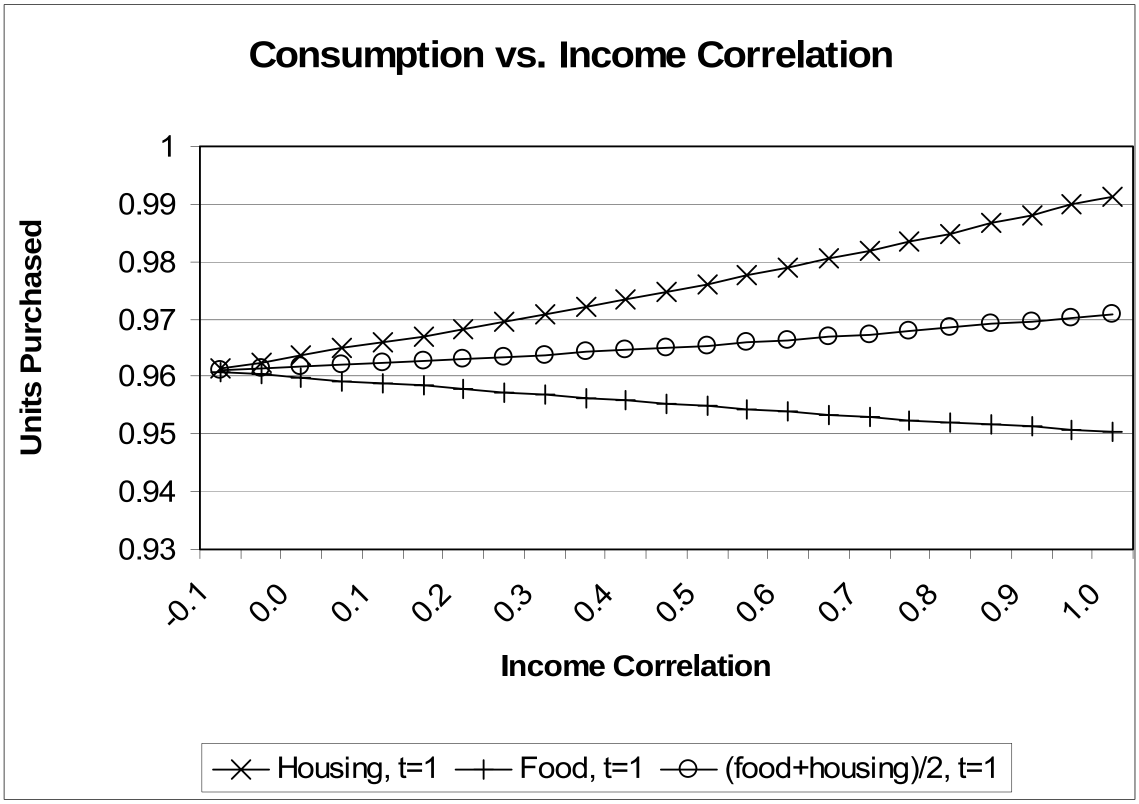
Notes: This figure plots the marginal lifetime utility of first-period housing consumption against first-period housing consumption. There are no moving costs, so k=0. First-period income, Y_1=2; second period income for a given spouse is either Y_2^E=1 with probability 1-p=1-q=0.9 or Y_2^U =0.5 with 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 3:



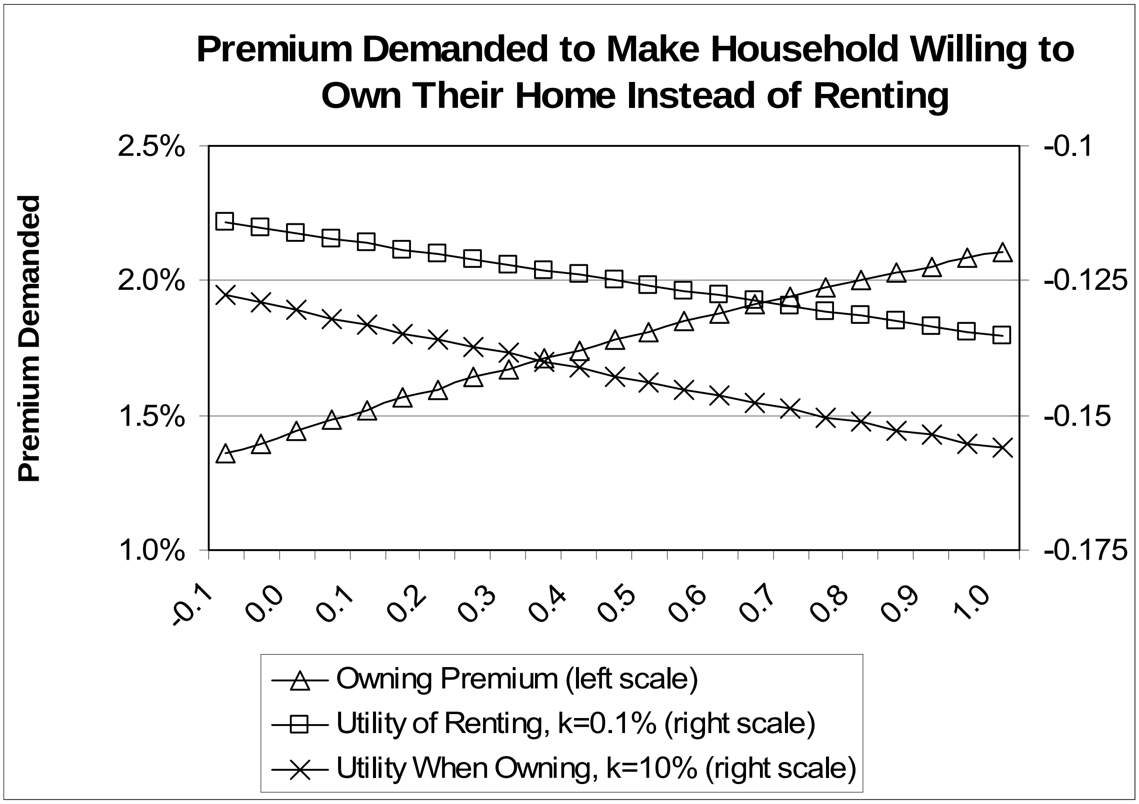
Notes: This figure plots the marginal lifetime utility of first-period housing consumption against first-period housing consumption, h_1. The cost of adjusting housing consumption is 10% of h_1. First-period income, Y_1=2; second period income for a given spouse is either Y_2^E=1 with probability 1-p=1-q=0.9 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 4:



Notes: 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 5



Notes: 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 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.

Table 1.A: IPUMS Summary statistics

	Owners Only		Renters Only	
Variable	Mean	Std. Dev.	Mean	Std. Dev.
Husband and wife report same occupation (1950 definitions)	0.096	0.294	0.096	0.295
Husband and wife report same industry (1950 definitions)	0.141	0.348	0.127	0.333
House value; monthly rent	175,893	129,027	666	332
Family income	91,252	59,064	61,777	39,942
Husband's imputed unemployment rate (*p*)	0.065	0.022	0.071	0.025
Wife's imputed unemployment rate (*q*)	0.135	0.038	0.147	0.041
Husband's share of income	0.621	0.170	0.598	0.181
Imputed probability of moving	0.148	0.083	0.196	0.093
Sample average probability of moving	0.112	0.315	0.338	0.473
Number of observations	231,598		48,464	

Notes: Data are from the 1980, 1990, and 2000 IPUMS. Sample construction is detailed in Appendix Table A. Dollar amounts are in real (2000) dollars. The number of observations for the "same industry" row is 240,680 for owners, and 59,987 for renters. The sample size differs because a larger fraction of the IPUMS sample reports their industry than do their occupation.

Table 1.B: SIPP Summary statistics

Variable	Mean	Std. Dev.
Husband and wife report same occupation	0.032	0.155
Husband and wife report same industry	0.094	0.292
Family income	69,570	54,164
Husband's unemployment rate	0.086	0.280
Wife's unemployment rate	0.251	0.434

Notes: Data are from the April 1996 panel of the Survey of Income and Program Participation, which covers 48 months between April 1996 and March 2000. Sample construction is detailed in Appendix Table A.

Table 2: Top 20 Occupations by Percent of Couples Who Share the Same Occupation

		(1)	(2)	(3)
	Occupation, 1950 basis	Same Occ. Share of the Occ.	Occ. Share of Sample	Rate of Same Occ. With Random Sorting
1	Physicians and Surgeons	15.05%	0.51%	0.25%
2	Teachers	11.91%	5.24%	2.16%
3	Operative and Kindred Workers	11.87%	6.55%	3.61%
4	Managers, Officials, and Proprietors	11.27%	11.49%	6.14%
5	Lawyers and Judges	10.17%	0.81%	0.37%
6	Professors (subject matter unspecified)	7.62%	0.58%	0.29%
7	Managers & Superintendents, building	7.60%	0.37%	0.19%
8	Professional, technical & kindred workers	7.28%	3.15%	1.63%
9	Real estate agents and brokers	6.82%	0.83%	0.42%
10	Members of the armed services	5.90%	0.64%	0.13%
11	Salesmen and sales clerks	5.52%	4.25%	2.10%
12	Clerical and kindred workers	4.97%	8.68%	3.29%
13	Janitors and sextons	4.81%	1.46%	0.60%
14	Editors and reporters	4.47%	0.39%	0.19%
15	Cooks, except private household	4.28%	0.97%	0.47%
16	Policemen and detectives	3.72%	0.78%	0.17%
17	Mail carriers	3.60%	0.34%	0.12%
18	Insurance agents and brokers	3.31%	1.10%	0.54%
19	Stock and bond salesmen	3.30%	0.28%	0.13%
20	Service workers, except private household	3.00%	0.56%	0.23%

Notes: Only occupations comprising at least 0.25 percent of the sample are shown in this table. Column (1) presents the ratio of the number of same occupation couples in an occupation to the number of couples where either (or both) spouse has that occupation. Column (2) is the ratio of the number of couples where either (or both) spouse has that occupation to the total number of couples. Column (3) is the fraction of couples with one or both spouses in an occupation who would share an occupation if pairings were done at random (i.e. without regard to occupation). Data are from the 1980-2000 IPUMS.

Table 3: Probability of one or both spouses becoming unemployed at some point during a six-month window conditional on both initially employed, by whether the couple shares an occupation

	Probability no spouses unemployed during subsequent six months	Probability at most one spouse unemployed during subsequent six months	Probability both spouses unemployed at some point during subsequent six months	Probability husband becomes unemployed during subsequent six months	Probability wife becomes unemployed during subsequent six months	Unemploy-ment correlation	# of observations
Different Occupation	88.25	11.08	0.67	4.42	8.00	0.057	261,494
Same Occupation	90.38	8.15	1.47	3.96	7.13	0.237	8,642
Difference	2.13	-2.93	0.80	-0.47	-0.87	0.179	

Notes: The unit of observation is a couple × 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 where neither, one, or both spouses report having a unemployment spell during the subsequent six months. Data are from the April 1996 panel of the Survey of Income and Program Participation.

Table 4: Probability of moving over the next six months if neither, one, or both spouses become newly unemployed, for current homeowners

	No one unemployed	One newly unemployed	Two newly unemployed
P(moving)	2.18%	3.96%	9.73%
Marginal P(moving)		1.78%	5.77%
Number of observations	219,968	4,119	113

Notes: The unit of observation is a couple × month. The sample consists of married couples who both report being employed in one month and then report themselves as neither unemployed, one unemployed, or both 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 subsequent six months. Data are from the April 1996 panel of the Survey of Income and Program Participation.

Table 5: The effect of higher correlation in unemployment risk on log house value, for homeowners

LHS variable: log(house value)	(1)	(2)	(3)	(4)
Proxy for income correlation	Same Occupation			Same Industry
Same Occupation [I_ρ] (Same Industry)	**0.043 (0.004)**	**0.027 (0.003)**	**0.021 (0.004)**	**0.056 (0.003)**
Husband's unemployment rate [p]	-6.026 (0.271)	-2.290 (0.227)	1.516 (0.375)	1.120 (0.502)
Husband's unemployment rate^2 [p^2]	23.872 (1.580)	6.804 (1.304)	-8.089 (2.086)	-4.430 (2.927)
Wife's unemployment rate [q]	-0.098 (0.205)	0.455 (0.172)	0.213 (0.293)	-1.225 (0.282)
Wife's unemployment rate^2 [q^2]	-1.234 (0.707)	-1.922 (0.586)	0.460 (1.027)	4.636 (0.910)
Husband's unemployment rate × Wife's rate [$p \times q$]	-11.313 (1.496)	-6.554 (1.239)	-2.644 (1.282)	-2.738 (1.700)
Income share of husband [s]	-0.006 (0.007)	0.107 (0.006)	0.092 (0.006)	0.110 (0.006)
Log(family income)	0.625 (0.003)	0.390 (0.002)	0.357 (0.002)	0.397 (0.002)
Demographic controls?	No	Yes	Yes	Yes
MSA × year dummies?	No	Yes	Yes	Yes
Husband and Wife occupation (industry) dummies?	No	No	Yes	Yes
Adjusted R^2	0.2976	0.3180	0.3370	0.3313
Number of observations:	231,598	231,598	231,598	240,680

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 Appendix Table A. Demographic controls in columns (2) – (4) include dummies for: the number of persons in the household, the number of kids in the household, the educations of the husband and wife, and age brackets for the head and spouse. Data are from the 1980-2000 IPUMS.

Table 6: The effect of same occupation on log house value, estimated separately for various sample splits, for homeowners

Splits by:			
Decade:	1980	1990	2000
Same occupation	0.017 (0.007)	0.023 (0.006)	0.017 (0.007)
N	61,085	94,879	75,634

Husband's Age	≤ 45	46-64
Same occupation	0.022 (0.005)	0.017 (0.006)
N	124,351	102,847
Education	Some college for ≥1 spouse	No college for either spouse
Same occupation	0.016 (0.004)	0.034 (0.009)
N	166,915	64,683
Family Income	Above median	Below median
Same occupation	0.005 (0.004)	0.033 (0.007)
N	130,018	101,580
Husband's income share	Between 0.4 and 0.8	Not between 0.4 and 0.8
Same occupation	0.024 (0.004)	0.017 (0.009)
N	177,629	53,969

Notes: This table reports the estimated coefficient and standard error on the "Same Occupation" dummy variable from a regression of log house value on the "same occupation" dummy, plus controls. The regression is run separately (e.g.: all variables are fully interacted) for each of the samples in the splits. The samples are drawn from the 1980-2000 IPUMS. These regressions use the same specification as in column 3 of table 3.5, including unemployment risk controls, husband's income share, log family income, demographic dummies, occupation dummies for both husband and wife, and MSA × year dummies (MSA dummies alone in the single-decade regressions). Median income is calculated by year. The medians are (in real $2000): 1980 – 68,325; 1990 – 72,831; 2000 – 80,000. "Some college" means at least one of the two spouses have had at least one year of post-high school education. The "income share" cutoffs of 0.4 and 0.8 are approximately one standard deviation above and below the mean of 0.61. The number of observations in each row adds up to 231,598, except for the "Husband's Age" specification, which excludes the "65+" category (4,400 observations).

Table 7: The effect of same occupation on the demand for housing and homeownership, and the impact of effective moving costs

	(1)	(2)	(3)	(4)	(5)	(6)
LHS variable:	Log(House Value)		Log(Rent)		Own = 1	
Sample:	Homeowners		Renters		Renters and Homeowners	
Same Occupation	**0.021** **(0.004)**	**0.034** **(0.007)**	**-0.002** **(0.017)**	**-0.050** **(0.034)**	**-0.014** **(0.003)**	**-0.027** **(0.005)**
Imputed P(moving)		-0.933 (0.069)		0.718 (0.265)		-0.624 (0.045)
Same occupation × Imputed P(moving)		**-0.088** **(0.039)**		**0.248** **(0.156)**		**0.084** **(0.026**)
Log(family income)	0.357 (0.002)	0.358 (0.002)	0.201 (0.009)	0.200 (0.009)	0.177 (0.002)	0.178 (0.002)
Demographic controls?	Yes	Yes	Yes	Yes	Yes	Yes
MSA × year dummies?	Yes	Yes	Yes	Yes	Yes	Yes
Occ. dummies for each spouse	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.3370	0.3366	0.1310	0.1312	0.1414	0.1423
Number of Observations	231,598	231,598	58,464	58,464	290,062	290,062

Notes: Sample is the 1980-2000 IPUMS. These regressions use the same set of controls as in column 3 of table 3.5, including unemployment risk controls, husband's income share, log family income, demographic dummies, occupation dummies for both husband and wife, and MSA × year dummies. The probability of moving, in even numbered columns, is imputed as the fraction of households in an age × marital status × presence of kids cell (excluding the household that the moving rate is being imputed to) that moved over the prior year. The reported coefficients for owners in columns (1) and (2) and their analogs for renters in (3) and (4) are statistically significantly different from each other. Columns (5) and (6) report the results from a linear probability model.

Table 8: The effect of unemployment insurance on
the relationship between same occupation and house value, for homeowners

LHS variable: log(house value)	(1)	(2)	(3)
Functional form of UI replacement rate (RR)	Dummy for bottom decile	Dummy for bottom quartile	Linear
Same Occupation × Husband's income share × Wife's share [$1_p \times s \times (1-s)$]	0.077 (0.019)	0.076 (0.020)	0.203 (0.065)
Same Occupation × Husband's income share × Wife's share × RR	0.267 (0.079)	0.148 (0.056)	-0.323 (0.190)
Adjusted R^2	0.5539	0.5550	0.5568
Occupation dummies?	No	No	No
Same Occupation × Husband's income share × Wife's share [$1_p \times s \times (1-s)$]	0.049 (0.022)	0.057 (0.023)	0.036 (0.063)
Same Occupation × Husband's income share × Wife's share × RR	0.084 (0.072)	0.027 (0.050)	0.056 (0.190)
Adjusted R^2	0.5662	0.5670	0.5682
Occupation dummies?	Yes	Yes	Yes

Notes: Robust standard errors, corrected for correlation by state x year x segment on the UI schedule, are in parentheses. Across the columns, UI segments are bottom decile/top 90 percent; bottom quartile/top 75 percent; and in the linear specification, the segments are the linear portions of the UI replacement schedule. Each spouse can be on one of three sections: the spouse is ineligible, the spouse's income is below or at the state benefits maximum; or the spouse's income is above the benefits maximum. Collectively, there are six possible combinations and five are populated with households in our data. The empty segment is both spouses having incomes above the benefits maximum. In addition to the variables reported above, all columns include controls for log family income, s, $s \times (1-s)$, $p \times s$, $q \times (1-s)$, $p^2 \times s$, $q^2 \times (1-s)$, (where s is the husband's share of household wage income and p and q are the husband's and wife's imputed unemployment rates, respectively) as well as each of the preceding variables interacted with the replacement rate measure. Each column also includes MSA × year dummies, state × year dummies, and controls for the number of persons in the household, number of children, educational attainment of the husband and wife, and age of the husband and wife. The bottom panel also includes occupation dummies for the husband and wife. Data are from the 1990 and 2000 IPUMS, with the UI replacement rate imputed based off of state of residence, year, and income of the husband and wife. RR is the income-weighted average of the husband's and wife's individual UI replacement rates. The sample average husband's share of income is 0.62. The number of observations is 156,285.

Appendix Table A: Sample Construction

Restriction	Number lost	Total remaining
<u>Data source: IPUMS</u>		
Original sample		2,778,194
Live in an MSA	1,016,455	1,761,767
Married	779,536	982,231
Husband and wife both age 25 or over	63,992	918,239
Listed occupations	20,499	897,740
Husband and wife both 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 above zero and not missing	113	321,326
Both husband and wife have income ≥ 0	1,160	320,166
Occupation not rare (contains > 200 persons/year)	17,806	302,360
Cell size for imputing probability of moving ≥ 30	185	302,175
House value or rent non-missing and > 0	12,113	290,062
<u>Data source: SIPP</u>		
Original sample (person × month)		3,897,211
Married couple households × month	3,117,752	779,459
Drop extended families	160,775	618,684
Reported occupation	127,711	490,973
Can follow employment status for six months	90,404	400,569
Employed in current month	130,433	270,136

Sources: 1980, 1990, and 2000 IPUMS; April 1996 panel of the SIPP