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Financial and Housing Wealth, Expenditures and the Dividend to Ownership

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Abstract

For a household, home ownership provides necessary shelter, potential investment returns associated with property appreciation and a hedge against increased housing related cash outlays. In addition to potential appreciation, individual households benefit over time from a housing dividend defined as the difference between the market rent for the individual household's housing unit and the household's actual house ownership costs. The purchase of a house can substantially fix a household's recurring housing related expenditures and generates a hedge (implied housing dividend) that increases with ownership tenure. This expenditure hedge (dividend) to home ownership is documented using pooled, cross-year samples from the Consumer Expenditure Survey (CEX). The housing dividend delivers a non-trivial effect on household non-housing expenditures after controlling for housing value, housing equity, financial assets and income.

Key words: housing, imputed rent, consumption, wealth effect, expenditure, dividend

JEL codes: D11, D12, G14, R21, R31

Financial and Housing Wealth, Expenditures and the Dividend to Ownership

1. Introduction

Understanding how home ownership and financial wealth impact household level expenditures and decision-making is essential. In the U.S., slightly less than two-thirds of households own the home in which they live and housing wealth constitutes a substantial portion of total household wealth (Poterba et al., 2011, and others). In fact, influential works document a housing wealth effect on consumption greater than the more broadly discussed stock-based equity wealth effect.[1] The housing wealth effect has been shown using macro-level aggregate data (Case et al., 2005) and using micro-level (household-level) data (Bostic et al., 2009).[2] Notwithstanding this existing literature, however, much remains to be explored regarding the relations between housing, macro-level consumption, household level non-housing expenditures and decision-making.[3]

[1] We do not want to get caught up in semantics. There is a difference between consumption and expenditures, especially at the household level and for durable goods and durable services. Consumption is a theoretical concept in economic models dated at least as early as in Friedman (1957), and expenditure is an empirical measure that is used to approximate consumption. At the macro-level the distinction may be less relevant given the specific question of interest. It is acknowledged that some consumption items may be purchased once upfront, but their produced utility streams will be spread over time. The literature of consumption studies using micro household data usually concentrates on expenditures on food or non-durable goods and non-durable services (see the superb summary and references listed in Deaton (1992), and more recently, Vissing-Jørgensen (2002), Malloy, et al. (2009), Aguiar and Hurst (2013), Aguila, et al. (2011), Attanasio, et al. (2012), Blundell, et al. (2012), among others). In these expenditure categories, consumption and expenditures are less likely to diverge drastically from each other. Whenever possible, we use "consumption" in a theoretical discussion setting, and "expenditure" in an empirically oriented context. We also highlight that at the household level we are modeling expenditures, or where the household obtains and spends its resources or cash flows.

[2] A large body of literature compares the housing wealth effect with the stock wealth effect. Beside what is cited elsewhere in this paper, a non-exhaustive list includes Benjamin et al. (2004), Slacalek (2009) and Carroll et al. (2011), among others.

[3] Engelhardt (1996) and Skinner (1996) show that the consumption response to housing capital gains, especially positive ones, is rather small. A homeowner can benefit from rising housing wealth by pledging the house as collateral to borrow to fund consumption. By doing this, the consumer retains or increases access to cash and liquid assets that can be used to pay for expenditures. Cooper (2013) shows that this borrowing channel is significant, particularly for those households who might be liquidity constrained. Gan (2010) provides similar evidence for Hong Kong.

The central issues in the present study are household level expenditures and decision-making conditional on home ownership. Extending Sinai and Souleles (2005) who argue that ownership provides rent hedging, a new and relevant measure for households, the housing dividend (or hedge reflective of potential benefits to fixing housing services expenditures) is assessed while controlling for other measures of housing wealth common to the literature, including house value or equity. The principal interest is the relation between this dividend (or hedge benefit) and household expenditures. The housing dividend is defined as the difference between equivalent market rent for a household's housing unit and the household's actual recurring house ownership costs (expenditures such as debt service, property taxes, maintenance costs, et cetera). The definition of housing dividend is rooted in the user cost (or imputed rent) concept that occupies a central place in the housing economics literature (Poterba, 1984; Himmelberg et al., 2005 and others) and provides empirical recognition that the benefit to home ownership at the household level is related to fixing actual cash outlays for shelter in addition to purely an appreciation return and associated potential increased borrowing capacity. We obtain the formula of housing dividend by recasting the components of user cost into an explicit, simple form that resembles the common asset pricing framework from Miller and Modigliani (1961) and Flood and Hodrick (1990).[4]

Housing is an asset that is either bought and owned or rented for use and occupancy. An individual or household makes a choice to live somewhere and determines how to pay for that choice. The formulization of a housing dividend explicitly recognizes an additional way households may benefit from home ownership. Acquisition of an owner-occupied housing unit, even with debt, hedges payment of the future equivalent market rent (which reflects the then

[4] Research of testing for housing market efficiency makes progress without particular needs for a clarified definition of the housing dividend. Cho (1996) surveys related empirical studies.

current market price for occupancy), while allowing for asset appreciation. When market equivalent rents rise, while ownership related costs remain the same or increase less proportionately to market rents, homeowners benefit. That is, a homeowner is not forced to increase expenditures to acquire the equivalent amount of housing services because he/she has substantially hedged current and future expenditures through ownership. The household can reallocate money that would have gone to paying more for housing services if these services were unhedged. The benefit comes from not having to spend more over time for the same quality of housing in contrast to a renter's situation in a market of rising rents. This is the economic and practical mechanism behind the operation of the housing dividend.

The housing dividend benefit is further distinguished from the benefit of borrowing capacity by using the house as collateral (Cooper, 2013). The household retains the right to borrow additional funds greater than the existing debt as equity increases over time. The benefit to borrowing (a cash-out refinancing or home equity line or loan) is a change in cash available for expenditure on non-housing goods, but additional borrowing can also reduce the future housing dividend benefit since a new and higher level of housing ownership expenses (primarily debt service) may be required. Although more borrowing reduces housing dividends in the current and future periods, it allows households to obtain liquidity needed for expenditures.

Since the focus is the relation between housing and consumption, detailed U.S. household data from the Consumer Expenditure Survey (CEX) for homeowners across years is used in the analysis. The CEX provides detailed information on housing and non-housing household expenditures, along with measures of household wealth, which enables analysis connecting housing dividends with non-housing expenditures while controlling for wealth.[5] Hence, our

[5] In contrast, Gan (2010) uses credit card spending to measure consumption, which presumably includes spending on a subset of both nondurable and durable goods and services, but excludes all others where a credit card is not used.

baseline approach starts with regressions of homeowners' non-housing expenditures on housing dividends while controlling for financial and housing wealth. The housing dividend variable is positive and significant, both statistically and economically, in predicting a household's non-housing expenditures. This is so even when house value is decomposed into home equity and mortgage balance. The results are robust across various specifications and suggest that housing ownership and the ability to hedge housing expenditures over the long-term allows households to increase non-housing expenditures. The choice to own allows for greater expenditures on non-housing goods over the long-term while allowing households to also hold an asset with appreciation or return potential.

The results also have implications for the buy-versus-rent literature which requires assumptions related to the use of any net cash flow differences with regime (rent or buy) switching.[6] These assumptions typically assume that households exclusively allocate cash flow "savings" from correctly renting or buying to financial assets which then earn a market return. Our results show that households may tap these cash flow savings for consumption. Finally, further decomposition of the data by time period suggests that the housing dividend effect declined during the housing boom period when housing assets were seemingly more liquid and debt was available for cash out refinancings. During the boom period, households concurrently faced a reduced housing dividend as the over-priced assets acquired during the period limited any hedging benefit as the cost of ownership increased substantially.

The paper proceeds as follows. Section 2 positions the paper in relation to various strands of the literature. Section 3 derives the conceptual framework from the definition of user cost. Section 4 provides the empirical specifications for our estimation based upon that conceptual

[6] Beracha & Johnson (2012) provide an example of the constructs related to the buy versus rent literature which includes debt assumptions, cash flows assumptions and housing quality assumptions across rental and owner based markets.

framework. Section 5 clarifies the CEX sample selection criteria and addresses measurement issues related to several key variables. Sections 6, 7 and 8 present and discuss the estimation results. Section 9 concludes.

2. Related Literature

The research is related to several strands of the economics and finance literatures. First, the study extends the growing literature devoted to understanding the relationship between housing wealth and non-housing consumption. The relations between housing related wealth and non-housing consumption have long been a focus of interest to economists and policy makers. The literature often focuses on static measures of housing and financial wealth without expliciting addressing flows, potential income returns or the ability to hedge expenditures. The goal has been to determine how levels (or changes in the levels) of asset values impact expenditures throughout the economy. For example, at the aggregate market level, Case, et al. (2005), using international country-level plus U.S. state-level data, estimate that the elasticity of consumption to housing market wealth is between 0.04 and 0.16.[7]

Among research using U.S. household-level data, Engelhardt (1996) estimates that the Marginal Propensity to Consume (henceforth MPC) out of real housing capital gains is 0.03 (3 cents for every dollar increase in housing wealth) for the median household. By matching a CEX sample with Survey of Consumer Finances (SCF) data, Bostic et al. (2009) obtain estimates of the elasticity of consumption to home value of 0.04 to 0.06, and estimates of the elasticity of consumption to home equity of 0.02 to 0.04. Guo and Hardin (2014) examine a Panel Study of Income Dynamics (PSID) sample and obtain the same magnitude of estimates for the elasticity

[7] Case, et al. (2011) update their previous analysis by extending the sample to more recent years, and find that new results only reinforce their previous conclusions.

of consumption to home equity as in Bostic et al. (2009). They note this estimate varies among households depending on wealth composition. Households with different levels of net worth in financial and real estate assets show different expenditure patterns. Cooper (2013) employs a very different set of regression specifications and estimates the MPC out of housing wealth at 0.06, with a MPC out of home equity of 0.02 to 0.06.[8] None of the noted studies explicitly recognizes the benefit to ownership when the actual cash expenditures for housing are substantially fixed or hedged. Complementing and extending existing research, this paper investigates this additional homeowner benefit.

The second link and extension of existing literature is related with user cost. The definition of housing dividend is closely tied with the concept of user cost, one of the fundamental building blocks in the housing economics literature (Poterba, 1984; Himmelberg et al., 2005). We demonstrate in a straightforward manner that the equilibrium condition involving user cost can be written as a dividend discount model (DDM) with housing dividend and discount rate appropriately defined. While much of the application of user cost has been devoted to quantifying the effect of preferential tax treatments to homeowners (Poterba and Sinai, 2008), housing tenure choice determinants (Green, 1996; Green and White, 1997), and house price-rent dynamics (Duca, et al., 2011), we focus on the consumption benefits of the housing dividend. Household recognition of flow attributes inherent in the owner cost equation impacts expenditures.

In equilibrium, user costs should equal rents for dwelling units. In a series of papers, however, Verbrugge and Garner (Verbrugge, 2008; Garner and Verbrugge, 2009a, 2009b)

[8] These studies also estimate elasticities of consumption to income and to financial wealth by including them as additional regressors. Results vary. The elasticity estimates of income are around 0.10 to 0.30. The elasticity estimates of financial wealth are in the range of 0.01 to 0.10. Except Cooper (2013), all of the cited studies above find a larger housing wealth elasticity than the financial wealth elasticity.

demonstrate that the estimated user costs and rents diverge persistently from each other to a surprising degree. The findings are robust regardless of using aggregate indexes or CEX unit-level data. We note that *part of* this gap between the rent and the user cost is related to what we define as the housing dividend.

The third (somewhat more loosely) related literature strand includes studies on investors'/consumers' differentiation between dividends and capital gains. One of the primary theoretical foundations of financial economics is the irrelevance of dividend policy as applied to firm value (Miller and Modigliani, 1961). Under perfect and complete market conditions, the way a firm chooses to distribute returns related to earning power should not matter in its valuation. [9] When the distribution of dividends conflicts with consumption needs, investors/consumers can always reinvest disbursed dividends or sell shares to create dividend equivalents, thus insulating individual consumption from variations in corporate dividend disbursement. Recent empirical studies testing this theorem with micro level data of stock holdings, however, resoundingly reject the dividend irrelevance tenet (Baker et al., 2007; Dong et al., 2005; Graham and Kumar, 2006), although there are lively debates on why the tests fail.[10] By proposing and clarifying the housing dividend construct related to housing wealth, we open the possibility of subjecting housing wealth to the same category of tests with implications attached to the distinctive features of housing wealth.

[9] Relaxing assumptions in Miller and Modigliani (1961) would challenge the Miller-Modigliani irrelevance theorem. Latest developments along this vein in the field of corporate finance include DeAngelo and DeAngelo (2006), and Mori (2010).

[10] Finding different consumption propensities for dividends versus capital gains is potentially justified by the duration dependent net return structure generated by capital gains taxation (Balcer and Judd, 1987; Dammon et al., 2001). Mental accounting is another behavioral finance explanation for investors' preference for cash dividends (Shefrin and Statman, 1984). Meanwhile, it is well-known that equity dividend incomes are concentrated in high-income households. These households' consumption behavior likely differs from the average household, and, in particular, may be less sensitive to cash flow considerations (Poterba and Slemrod, 2007). Hence, it is difficult to extrapolate the Baker et al.'s (2007) estimated propensity to consume to the general population.

3. Theoretical Framework

In this section we give a precise definition of the housing dividend and expose its role in the pricing of house assets through an analogous formula of the dividend discount model (DDM). We show that insofar as a current occupant-homeowner can fix the operating cost of residing in the house compared with later comers, the resulting housing dividend flow shall be greater than that of a new buyer in the market. This housing dividend accruing to the homeowner shall increase over time, provided that the difference between market equivalent rent and ownership operating cost increases over time.

Since a housing dividend is an implicit cash flow to current homeowners, its liquidity is superior to home equity since access to the latter often involves non-trivial transaction costs. We derive the testable hypothesis concerning the relationship between housing dividend and household expenditure: homeowners' consumption expenditures respond more to housing dividend than to home equity. Two particular extensions of this hypothesis are: (1) when the liquidity of home equity increases (decreases) due to favorable (unfavorable) market conditions, the relative response of consumption to housing dividend versus to home equity is decreased (increased) accordingly; (2) insofar as the size of housing dividend rises with ownership tenure, the consumption response to housing dividend also increases with ownership tenure.

We highlight a remark from Himmelberg et al. (2005, pp.68): "The 'dividend' portion of the return from owning a house comes from the rent the owner saves by living in the house rent-free …" This insight is correct in that the "dividend" indeed includes the rent saved, hence its nature of implicit cash savings. But, this remark does not adjust for the realistic senario that homeowners may have to pay mortgages and maintenance costs, two cash outflow items that

renters do not have to endure. From a household expenditure or cash flow stand point, ownership alone does not signal the actual benefit over renting.

We start with the familiar (long-run) equilibrium condition in the housing market that annual cost of owning a particular house should equal the annual cost of renting it, which renders a potential buyer indifferent to owning versus renting:

$$\text{Annual cost of ownership}_t = \text{Rent}_t. \qquad (1)$$

The majority of households in the U.S. purchase their primary residence with a mortgage. Therefore, the exact formula to compute the annual cost of ownership (e.g., see Himmelberg et al. (2005)) in the left-hand side of (1) shall be modified to include the terms related to mortgage debt

$$\begin{aligned}\text{Annual cost of ownership}_t \equiv (1-\alpha_t)P_t(r_t^f + \gamma_t) + P_t(\iota_t + \alpha_t r_t^{m,p} + \\ \alpha_t r_t^{m,i}) - \tau_t P_t\left(\iota_t + \alpha_t r_t^{m,i}\right) + P_t\delta_t - (E_t(P_{t+1}) - P_t)\ ,\end{aligned} \qquad (2)$$

where P_t is the house price at time *t*, α_t the loan-to-value ratio, r_t^f the risk-free interest rate, γ_t the risk premium to compensate for the higher risk of owning versus renting, ι_t the property tax rate, τ_t the effective income tax rate, $r_t^{m,p}$ the amortized mortgage principal deduction rate, and $r_t^{m,i}$ is the mortgage interest rate. The third term in (2) captures the tax exemption benefit of mortgage interest and property tax. δ_t is the fraction of maintenance cost relative to home value. The last term is the expected capital gain.

User cost, a central concept in the literature of housing economics, is the annual cost of ownership expressed as a fraction of the house value,

$$\begin{aligned}\text{User cost}_t \equiv \text{Annual cost of ownership}_t/P_t \\ =(1-\alpha_t)(r_t^f + \gamma_t) + (1-\tau_t)\left(l_t + \alpha_t r_t^{m,i}\right) + \alpha_t r_t^{m,p} + \delta_t - E_t g_{t+1},\end{aligned} \qquad (3)$$

where $E_t g_{t+1}$ is the expected growth rate of house value. Note that (3) is a definitional equation paraphrased from the definitional equation (2). Hence, the equilibrium condition (1) can be rewritten into

$$\text{User cost}_t \times P_t = \text{Rent}_t \, .$$

Back to the equilibrium equation (1), its simplicity obscures one critical aspect of homeownership: once a house is purchased, the value of some components in the annual cost of ownership will be more fixed than others for the foreseeable future. More specifically, when a homeowner enters into a mortgage contract, the periodic mortgage payment will be largely determined, especially for a fixed rate mortgage; the maintenance cost for the specific house structure shall not fluctuate in response to its market price or rent; the property tax is levied based upon the assessed value, which will be less volatile than the market price; and, various tax exemptions will add to the relative stability of the tax bill.

To capture this in the model, suppose at time t=0, a buyer purchased a house when the cost of ownership was less than the rent, that is,

$$\begin{aligned}(1-\alpha_0)P_0(r_0^f+\gamma_0)-(E_0(P_1)-P_0)+P_0\big(l_0+\alpha_0 r_0^{m,p}+\alpha_0 r_0^{m,i}\big)-\\ \tau_0 P_0\big(l_0+\alpha_0 r_0^{m,i}\big)+P_0\delta_0<\text{Rent}_0\,.\end{aligned} \tag{4}$$

Take the last three terms in the left-hand side of (4) (mortgage payment and property tax, tax exemption savings, and maintenance cost) and name them as the *operating cost of ownership*, or OC for short:

$$\text{OC}_0 \equiv P_0(l_0+\alpha_0 r_0^{m,p}+\alpha_0 r_0^{m,i})-\tau_0 P_0\big(l_0+\alpha_0 r_0^{m,i}\big)+P_0\delta_0\,. \tag{5}$$

From our preceding discussion, after purchase, OC will be fixed to this new homeowner. Yet the vector of the market price, rent, and risk-free rate and risk premium will continue to fluctuate over time $(\text{Rent}_t, P_t, r_t^f, \gamma_t)_{t=1}^{\infty}$.

In the idealized setting, for this specific house, its structure and size cannot be changed, and there are always buyers in the market bidding on this house. Sooner or later, at some point of time t>0, to potential buyers, the equilibrium condition for the house will again be attained:

$$\text{Rent}_t = (1-\alpha_t)P_t(r_t^f + \gamma_t) - (E_t(P_{t+1}) - P_t) + \text{OC}_t. \quad (6)$$

Equation (6) is restructured from the equilibrium condition (1), singling out OC_t for its tendency of being fixed. Equation (6) can be reformatted into

$$P_t = \frac{\text{Rent}_t - \text{OC}_t}{1 + (1-\alpha_t)(r_t^f + \gamma_t)} + \frac{E_t(P_{t+1})}{1 + (1-\alpha_t)(r_t^f + \gamma_t)} \ , \quad (7)$$

where the perceived dividend for potential buyers is

$$\text{DIV}_t \equiv \text{Rent}_t - \text{OC}_t \ , \quad (8)$$

which is the present definition of the *housing dividend*: the difference between market rent and operating cost of ownership. If we iterate (7) into future periods, it becomes a version of the dividend discount model, with the current price P_t represented by the present value of the future dividend stream with the corresponding discount rate as $(1-\alpha_t)(r_t^f + \gamma_t)$.

For the homeowner who currently resides in the house, however, the operating cost is OC_0 rather than OC_t. Thus, the actual housing dividend enjoyed by this occupying homeowner is $\text{Rent}_t - \text{OC}_0$. Let P_t^o denote the private value placed by the occupying homeowner, then

$$P_t^o = \frac{\text{Rent}_t - \text{OC}_0}{1 + (1-\alpha_t)(r_t^f + \gamma_t)} + \frac{E_t(P_{t+1})}{1 + (1-\alpha_t)(r_t^f + \gamma_t)} \ . \quad (9)$$

In a generally up-trending market, new buyers will face higher mortgage payments and property taxes than the current homeowner who has resided in the house for some time. Therefore the operating cost of ownership of the current homeowner will be less than that of potential buyers,

$$\mathrm{OC}_0 < \mathrm{OC}_t \,, \tag{10}$$

while other determinants in the market on the right-hand side of (9) will be the same for both. This implies, for the current homeowner, the housing dividend accruing is higher than what would accrue to a new owner:

$$\mathrm{DIV}_t^o > \mathrm{DIV}_t \,. \tag{11}$$

where Div_t^o is the housing dividend enjoyed by the current homeowner who purchased the house at period 0. Hence, the market price of the house is below her private value placed on it:

$$P_t < P_t^o \,. \tag{12}$$

This suggests continued occupancy of the house and not a sell, other things held constant.

Having established the intrinsic benefit of owning and occupying the house and enjoying the housing dividend flow, we demonstrate that given that the liquidity attributes of the housing dividend are superior to those of home equity, the consumption response to a change in housing dividend is accordingly higher than that to the change of home equity.

This is best illustrated in a continuous-time stochastic setting for analytical convenience. We write the house pricing equation (7) in its continuous-time counterpart form in which the market price of the house, P_t, faced by the homeowner, follows the Brownian process

$$\frac{dP_t}{P_t} = (c + d)dt + \sigma_c dZ_{c,t} + \sigma_d dZ_{d,t} \,, \tag{13}$$

where c is the expected rate of capital gain, and d is the expected housing dividend yield. σ_c^2 and σ_d^2 are the instantaneous conditional variances correspondingly. There is a (probably positive) correlation between housing dividends and capital gains denoted by the instantaneous covariance

$\sigma_{c,d}$. From our previous discussion, the current occupant-homeowner enjoys higher housing dividend flow than that expected in the market for a potential buyer. We capture this by adding a positive φ to d so that $d + \varphi$ is the housing dividend yield for the current homeowner.

Aside from housing, the homeowner can also save in a risk-free security at the constant rate r_f.[11] Net worth at the end of period t, W_t, is divided between home equity and savings in the risk-free asset, S_t,

$$W_t = \theta(P_t - L_t) + S_t, \tag{14}$$

where L_t is the mortgage loan balance. Since housing dividend is a kind of cash savings, it is a component of S_t. Since cashing out home equity involves some transaction costs, θ $(0 < \theta < 1)$ is the liquidity discount coefficient applied to home equity.

Let ω_t be the fraction of wealth held in the home equity. With consumption in period t denoted by C_t, the dynamic evolution of the homeowner's net worth over time is

$$\begin{aligned} dW_t = {} & [\omega_t(\theta c + d + \varphi) + (1 - \omega_t)r^f]W_t dt - C_t dt - \omega_t W_t r^{m,p} dt \\ & + \omega_t W_t\left(\theta\sigma_c dZ_{c,t} + \sigma_d dZ_{d,t}\right) . \end{aligned} \tag{15}$$

where $r^{m,p}$ is the amortized mortgage principal reduction rate. Furthermore, we assume the investor/consumer is maximizing the expected discounted future utility

$$E \int_{s=t}^{T} e^{-\rho s} U(C_s) ds , \tag{16}$$

[11] The essence of the model remains the same should income and more assets be allowed for, but the derivation will be considerably more cumbersome.

where ρ is the discount rate, and $U(.)$ is the within-period utility function. The investor/consumer's objective is to maximize (16) subject to (15). The maximized value of the function (16) is denoted by the value function $J(W_t)$.

The solution to this problem can be characterized by the standard Hamilton–Jacobi–Bellman equation

$$\rho J(W) = \max_{C,\omega}[D^c J(W) + U(C)] \ ,$$

where

$$D^c J(W) = [(\omega(\theta c + d + \varphi - r^{m,p}) + (1-\omega)r^f)W - C]J_W(W)$$
$$+\frac{1}{2}\,\omega^2 W^2(\theta^2\sigma_c^2 + \sigma_d^2 + 2\theta\sigma_{cd})J_{WW}(W),$$

from which we solve out

$$\omega^* = -\frac{(\theta c + d + \varphi - r^{m,p} - r^f)J_W(W)}{(\theta^2\sigma_c^2 + \sigma_d^2 + 2\theta\sigma_{cd})WJ_{WW}(W)} \ .$$

In order to proceed for an explicit solution of optimal consumption, C^*, a particular form of utility function for $U(C)$ has to be specified. Let it be the Constant Relative Risk Aversion (CRRA) function,

$$U(C) = \frac{C^{1-\gamma}}{1-\gamma},$$

from which we solve out the optimal consumption as

$$C^* = \frac{\gamma-1}{\gamma}\left[r^f + \frac{\rho}{\gamma-1} + \frac{1}{2\gamma}\frac{(\theta c + d + \varphi - r^{m,p} - r^f)^2}{(\theta^2\sigma_c^2 + \sigma_D^2 + 2\theta\sigma_{cd})}\right]W \equiv \kappa \cdot W \qquad (17)$$
$$\equiv \kappa(\theta \cdot \mathrm{HE} + S) = \ \kappa\theta \cdot \mathrm{HE} + \kappa \cdot S \ .$$

In (17) the Marginal Propensity to Consume (MPC) for home equity is $\kappa\theta$, and for liquid savings (a portion of which comes from housing dividend) it is κ. Apparently, from its algebraic expression, κ increases with c, d or φ, implying a higher MPC when the housing dividend or the capital gain is higher. But the increase in κ is larger with respect to the increase in d or φ, as the latter two have no liquidity discount, in contrast to the case for c. To the extent that the magnitude of φ would rise for the current homeowner because of longer tenure, the MPC would be higher, all else equal. Finally, although it is difficult to pin down the direction of change in κ in response to a change in θ (which depends on the sign of, say, $d + \varphi - r^{m,p} - r^{f}$), at least, when θ increases — that is, when the liquidity of home equity improves — the relative difference between the MPC of home equity and the MPC of housing dividend will shrink.

4. Empirical Framework

Following the theoretical model outlined in the last section, a homeowner's housing dividend (*DIV*) can be measured by the following equation,

$$DIV = EquivRent + TaxSavings - MorPayments - MaintCosts, \qquad (18)$$

where $EquivRent$ is the current market rent of the homeowner's present house, and the other three variables are tax benefits, mortgage payments (including insurance expenses and property taxes) and house related maintenance costs, respectively. Constructed in such a way, *DIV* represents the housing dividend benefit arising from home ownership. It measures the implied cash flow benefit associated with ownership.

We start with the following specification to estimate the relationship between logs of expenditures (*C*), housing dividend (*DIV*), home value (*H*), financial wealth (Fin), and income (I),

$$\log(C_{i,t}) = \beta_0 + \beta_1 \log(DIV_{i,t}) + \beta_2 \log(H_{i,t}) + \beta_3 \log(Fin_{i,t}) + \beta_4 log(I_{i,t}) + X'_{i,t}\beta + u_t + \varepsilon_{i,t}\ , \quad (19)$$

where i is the household index, and t is the year index. $X_{i,t}$ is the vector of household-level demographic controls (such as age, family size, etc.), u_t captures year effects, and $\varepsilon_{i,t}$ is the idiosyncratic disturbance term.[12] Equation (19), without the housing dividend variable, is a fairly conventional specification in the literature (Bostic et al., 2009).

The housing dividend includes measures of mortgage debt. To demonstrate that the housing dividend effect is not merely a manifestation of a mortgage effect, we break down home value into equity and mortgage debt in the second specification. Including home equity (*HE*) and mortgage balance (M),

$$\log(C_{i,t}) = \beta_0 + \beta_1 \log(DIV_{i,t}) + \beta_2 \log(HE_{i,t}) + \beta_3 \log(M_{i,t}) + \beta_4 \log(Fin_{i,t}) + \beta_5 \log(I_{i,t}) + X'_{i,t}\beta + u_t + \varepsilon_{i,t}\ . \quad (20)$$

Housing equity and mortgage debt are joint determinants of consumption at the household level. From a cash flow standpoint, the amount of mortgage debt outstanding reflects cash that has

[12] Due to the fact that the financial wealth information is only available in the fifth interview of CUs in CEX, we cannot exploit the quarterly panel nature of CEX.

been withdrawn against the property's value which may have allowed consumption or investment in financial assets at a prior point. This withdrawn cash either decreases the cash outlay that would otherwise occur (when the loan is used towards purchases of the property), increases the balance of other assets (when the cash is spent on purchases of other assets or investments which likely enhances liquidity) or is channeled directly towards consumption. The cash flow impact of mortgage loans on consumption expenditures has found empirical support in recent studies (Muellbauer, 2007; Benjamin and Chinloy, 2008; Guo and Hardin, 2014).

5. Sample Selection and Measurement Issues

NBER's CEX extracts are used to construct the pooled sample for the period 1988 to 2011.[13] Housing market prices and housing costs of ownership, along with mortgage balances outstanding, are extracted from the BLS version of the original CEX sample.[14] The criteria for a consumer unit (CU) (most likely a household) to be selected for analysis are standard: the CU has to be interviewed consecutively for four quarters (the maximum number of quarters for which a CU could be interviewed), is a "complete income reporter" as defined by the BLS, is not

[13] 1995:Q3-Q4 and 2004:Q3-Q4 observations are omitted due to a sample frame change that occurred in 1996 and 2005, which makes it impossible to track a small fraction of the consumer units for the full year. Observations from years prior to 1988 as well as 1991:Q2-Q4 and 1992 are omitted due to unavailability of detailed expenditure files on mortgage payments and house operational costs.

[14] NBER CEX files (cleaned and streamlined by Ed Harris and John Sabelhaus) condensed hundreds of expense categories into a much smaller set of summary categories (the documentation can easily be accessed at http://www.nber.org/data/ces_cbo.html) and annualized the data. The BLS version of the CEX samples also includes some summary categories that may overlap with those in the NBER extract version, but they are presented on a quarterly basis. Whenever possible, we use what is already available in the NBER version; if a particular variable or spending category is opaque, missing, or limited in construction in the NBER version, we turn to the family (FMLY) or detailed expenditure files of BLS version. For example, the variable of owned housing principal reduction in the NBER version includes the reduction of mortgage principals on vacation properties, whereas the BLS version distinguishes between these two. For the post-2007 data for which NBER version is unavailable, we follow Harris and Sabelhaus' procedure to create those summary-level expenditure variables to be consistent.

a student household, and has unambiguous homeownership status.[15] We only use the house-related records pertaining to the property that the consumer unit occupies and further restrict the sample to households reporting positive pre-tax income and positive food expenditures. Financial wealth equals the combined balances in checking, savings, and brokerage accounts. All measures of expenditures are annualized. All economic variables, if applicable, are deflated to 2005 dollars using the CPI-U index.

Summary statistics of the benchmark analysis sample are presented in Table 1. The typical household is headed by a 52 year-old person. 67 percent of the heads of household from the sample periods are married. The typical family size is 2.7 members. 89 percent of the households live in urban areas. 89 percent of household heads are caucasian. In the sample, the median value of home equity is substantially greater than the value of financial wealth, but is only slightly greater than the balance of mortgage debt. The financial wealth has the greatest variation relative to its mean. Perhaps most important, the median housing dividend, which is a recurring flow measure, is very similar in size to the median stock holdings of a household. In essence, the typical household receives a flow benefit (implied dividend) on an annual basis that is almost equivalent to its stock of financial assets. For example, a household may receive $3,000 per year by accounting for its housing dividend while holding only $2,500 in stock/financial assets. The household would need $60,000 in financial assets yielding 5% annually to generate an equivalent dividend yield on its financial assets. This highlights the importance and relevance of housing dividends.

Expenditure measures are of three primary types: durable goods, non-durable goods, and services, in accordance with the latest 2009 comprehensive revision of classifications of Personal

[15] Which means, for instance, a homeowner who rents a property elsewhere to live in is discarded from the sample.

Consumption Expenditures (PCE) (McCully and Teensma, 2008).[16] In the standard classification system, services include housing and utilities, healthcare, transportation services, recreation services, food services and accommodations, financial services and insurance, and other services. However, for our purpose, housing-related maintenance, insurance and other expenses are excluded from services expenditures to avoid a confounding bias due to the use of these expenses to generate the housing dividend (which already includes these expenditures and debt service as part of the recurring expenditures related to home ownership). Total consumption expenditures are the sum of the above three primary types. Food expenditures include food consumed at and outside the home in our analysis.[17] These estimates related to food facilitate comparisons with previous studies using PSID data to examine wealth effects and food expenditures. We also add two broader measures of services and total expenditures that add education expenses and charitable giving into the components of their baseline definitions.

The CEX data provide estimates of the market value for each household's housing unit. The BLS version of the CEX is used to extract this value from the household's initial interview. The value estimate is provided by the CU. Correspondingly, the mortgage principal balance is also the amount reported by the household. Home equity is calculated as the difference between these two.

[16] In general, goods are commodities that can be stored and perhaps used over time, and services are commodities that cannot be stored and have to be consumed at the time and location of purchase. For an item that has both a goods component and a services component, the classification is based on the predominant component (e.g., spending on alcoholic beverages consumed away from home is classified as services). Durable goods have an average useful life of at least 3 years, including motor vehicles and parts, furnishings and durable household equipment, recreational goods and vehicles, and other durable goods. Nondurable goods have an average useful life of less than 3 years, including food and beverages purchased for off-premises consumption, clothing and footwear, gasoline and other energy goods.

[17] In the 2009 revision of the NIPA Personal Consumption Expenditures classification system, purchased meals and beverages at food services and drinking places are counted as services (Bureau of Economic Analysis, 2012), thus spending at restaurants is now counted as service expenditures, in contrast to as non-durable goods as before. However, the food expenditure used in this paper covers both food purchased for home production as well as consumed at restaurants, therefore is a mix of components from non-durable goods and services categories.

Recall that the housing dividend for homeowners is defined as the equivalent market rent (what a homeowner would receive should he or she rent the house) plus tax savings related to interest payments and property taxes, then subtracted by the mortgage payments (inclusive of principal reduction,[18] mortgage interest and property taxes), house maintenance, repairs, insurance, and other expenses. Two data issues related to this variable are worth noting. First, the variables used to derive the "housing dividend" are all available in CEX, except individual federal tax rates, without which a homeowner's tax savings cannot be exactly imputed. While it may be possible to impute household-level tax benefits related to homeownership, we, however, have chosen not to do so, which likely understates housing dividends. The present results would likely be strengthened should tax benefit estimates be incorporated.

Second, the equivalent market rent for the house of a homeowner is self-assessed. These self-reported rents could be noisy relative to some benchmark, either professionally assessed rents or the predicted values of a hedonic regression model.[19] The benchmark is difficult to define, however, if the owner-occupied dwelling units fundamentally differ from rental units by location and zoning codes restrict actions that can be taken by homeowners. In addition and more important in the context of CEX data, a benchmark or general index does not tie each household observation (concerning the household's mortgage debt, financial assets, household expenditures, et cetera) directly to a property. A homeowner has both advantages and disadvantages in providing an estimate of equivalent rent when compared with professional assessors. On one hand, a homeowner has to stay alert to rental market conditions to be able to offer an accurate

[18] This variable is to be distinguished from another variable — special or lump sum mortgage payments, which may or may not be related with refinancing or property transactions. As a robustness check, we exclude all observations that report non-zero values for lump sum mortgage payments, or non-zero values in purchase or selling prices of properties, and find virtually no difference in results.

[19] Francois (1989) lists a number of reasons why a hedonic model using market rents would underestimate the true underlying rents.

estimate. On the other hand, it is possible that a homeowner possesses superior information that is unavailable to outside assessors in estimating equivalent rent.[20] Specifically, for the present case, Garner and Verbrugge (2009a) find that in CEX data the self-reported equivalent rents are sensibly related to the limited set of housing characteristics, such as home value, number of rooms, structural type, age of dwelling, poverty rate in the region, et cetera. This suggests homeowners are reasonably informed concerning the housing market when estimating market rents. In any case, if there is any potential classical measurement error in the self-reported equivalent market rent that enters into the housing dividend variable, the textbook conclusion for errors-in-variables holds that the coefficient estimates of household dividend are biased towards zero. The implication is that the reported estimates of the housing dividend variable could be in the low-end range of its true parameter value which strengthens the results presented.[21, 22]

Likewise, some concerns with respect to the accuracy of the wealth variables (financial wealth in particular) in CEX data need to be addressed. For instance, Bostic et al. (2009) argue that the CEX financial wealth variables may be noisy and of limited scope. This is why they resort to a statistical matching algorithm to combine CEX with Survey of Consumer Finances

[20] Heston and Nakamura (2009) note the possibility that homeowners might place above market values when assessing equivalent rents if units have special features.

[21] It is possible that the noise in equivalent rents is non-random, correlated with household characteristics or even expenditures in one way or the other. Explicit evidence on this, especially for the CEX self-reported rent data, is elusive. If the literature on the quality of homeowners' self-assessed house value is of any guidance, no consensus has been attained. Goodman and Ittner (1992) and the earlier studies cited therein, and more recently, Kiel and Zabel (1999) and Agarwal (2007), find homeowners mostly overestimated their house value by several percentage points relative to an outside benchmark. Ihlanfeldt and Martinez-Vazquez (1986) find the discrepancy between homeowners' self-assessed house value and appraisal value is related to owners' race and age. Agarwal (2007) finds that whether a homeowner is an overestimator or an underestimator depends on a host of household socioeconomic characteristics. In contrast, Kain and Quigley (1972), Goodman and Ittner (1992) and Kiel and Zabel (1999) find the errors in these estimates are not statistically significantly related to characteristics of the owners. The discrepancy in the findings of studies cited above may well rest on the different data sources these authors use. Regardless, owners' assessed house value is heavily employed in empirical work. In theory, how a consumer plans his or her consumption depends justifiably on the perception of wealth and income level he or she has given the information set at that point of time. Agarwal (2007) provides evidence supporting this view.

[22] In addition, the limitations of CEX data on housing characteristics variables prevent us from taking a cross-hedonic estimation to obtain predicted equivalent rents for these households, as done in Goodman (1988). To assess the impact of over-estimating rents, we discount each household's reported rent value by as large as 10% and still find the housing dividend effect is comparable to the home value wealth effect in terms of MPCs.

(SCF) samples to obtain balance sheet-related measures. This view, however, does not represent the consensus on the issue, as a number of studies have endorsed the validity of available CEX balance sheet information (Attanasio, 1994; Johnson and Li, 2009, 2010; Maki, 2001). Johnson and Li (2009, Table 3) show that the mean levels of primary mortgage, vehicle loans, and credit card balances of consumer units in the CEX are fairly close to those in the SCF, while the CEX displays lower variation in these variables relative to the SCF.[23]

To shed light on measurement concerns, we present in the appended Table A1 the estimated coefficients of home value and financial wealth without controlling for the housing dividend. This is the baseline specifiction used in Bostic et al. (2009, Table 3). Compared with their results, the present estimates show a somewhat larger effect for home value (0.10 for durables and 0.12 for total expenditures) and for income, but a similar effect for financial wealth in terms of elasticity.[24] This is consistent with the view that wealth variables in CEX are not necessarily noisier in the classical sense of errors-in-variables violations. Again, recognition is made with regard to the overall data associated with this and other papers related to the area of interest, which nonetheless is central to policy and household decision-making.

6. Life-cycle patterns

Figure 1 depicts housing dividend life-cycle patterns. The sample is divided into eight 5-year age groups based on the head of household's age. The last group is with age equal to or

[23] This probably reflects the top-coding of some of the variables in CEX. In Table A2, we provide the estimates from the median regressions, which are less likely to be affected by top-coding, to show that they are similar to those yielded by linear regressions.

[24] These estimates are comparable to other studies using different sources of micro data and different estimation schemes. For example, by exploring a large panel data set of Hong Kong households with various econometric specifications, Gan (2010) estimates a housing wealth effect of about 0.10-0.19 measured by the elasticity of consumption.

above 65. The mean of housing dividends (in 2005 dollars) is computed for each group from all years, from 1988 to 1996, from 1997 to 2006, and from 2007 to 2011, respectively. The period of the late 1990s to 2005 or 2006 represents the housing booming period preceding the latest housing market crash (Glaeser, et al., 2010; Ferreira and Gyourko, 2011). The age related measures are meaningful in several ways. It is likely that households headed by older members have longer house tenure while the life-cycle pattern should follow a typical housing choice or housing quality pattern.

Figure 1 clearly demonstrates that inflation adjusted housing dividends increase across the age groups for all three time periods. For the entire sample, the mean real housing dividend increases from $860 for the 25-29 age group to over $6,700 for the 65+ age group. This trend suggests that the housing dividend (housing expenditure hedge) accrues more to households headed by older persons, likely due to the fact that many of them have resided longer in their current housing units. This fact is confirmed by Figure 3, showing the rise of housing dividend with housing tenure. Interestingly, Garner and Short (2009) also find that older households' (age 65 and above) implicit rental incomes (akin to our housing dividends) are greater than younger households' across all deciles of income distribution, no matter what method is used for computing the equivalent rents of owner-occupied house units. The life-cycle profile of housing dividends contrasts with the hump-shaped profiles of earnings and consumption expenditures documented in Ghez and Becker (1975) and Gourinchas and Parker (2002).

To better understand the rise in housing dividend with age, the dividend is broken into three components (equivalent rent, mortgage payments, and maintenance, insurance and other expenditures) to study the relative importance of each in driving the observed trend. Since the BLS data does not disaggregate information for mortgage and maintenance prior to 1994, and

there was a sample frame change for the 1995 survey, we focus on the 1996-2011 period. Figure 2 presents the decomposition results underlying the pattern in Figure 1.

The most striking observation from this figure is the steep decline in real mortgage payments (the red, solid curve) after age 35-39. The inflation adjusted rental value of the housing unit (the blue, dashed curve) increases slightly and peaks at age 40-44 and then gradually levels off. This is consistent with the life-cycle variation in family composition, which in turn leads to the variation in the demand for housing services over the life-cycle. The last component, maintenance costs (the green, dotted curve), again inflation adjusted, is stable as expected, slowly increasing with age until about age 60 and then leveling off. Taken together, the market equivalent rent contributes to a larger share in the housing dividend over time, as real rents increase over time and mortgage payments become a smaller component of expenditure over time.

7. Primary empirical results

Since expenditure and wealth variables are in logarithms in the specifications, their associated coefficients are interpreted as elasticities. To compute the marginal propensity to consume (MPC) estimate, each of the estimated coefficients is multiplied by the ratio of the respective expenditure relative to the wealth/income variable.[25] For example, to obtain the MPCs for food expenditure, the food elasticities from the regressions are multiplied with food expenditure relative to the value of each of the wealth component variables and income. Since

[25] For aggregate data, within the representative agent framework, the coefficients from the regression of the log consumption on the log of wealth components may be interpreted as wealth shares, given the co-integration relationship between these variables arising from the budget constraint (Ludvigson, 2007).

the ratios differ across households, a benchmark is needed. The median of a ratio measure in the sample, a common benchmark statistic, is used to calculate the corresponding MPC.

Table 2 provides initial results using home value as the housing measure for households with heads aged 26 to 55, the primary wage-earning age group. In these regressions, home value is used without decomposition into equity and debt components. The results offer initial support for the importance of the housing dividend, as the coefficients are statistically significant across expenditure categories. The MPCs also have practical significance. While the estimated elasticities of the housing dividend variable are smaller than all the ones for home value and most for financial wealth, the implied MPCs of the housing dividend are meaningful. For total expenditure, the estimated elasticity of the housing dividend is 0.0115 with a MPC of over 4 cents for every dollar. This MPC rises to above 5 cents if education expenses and charitable giving are counted. The housing dividend MPC is greater than the home value MPC.[26] The control variables have coefficients in line with expectations.

In addition, Table 2 shows that the housing dividend effect differs by expenditure type. The housing dividend has its greatest impact on food and service expenditures.[27] For food expenditure, the elasticity estimate of housing dividend is 0.024, statistically significant at the 1% level. Its implied MPC is 0.02, virtually identical to the MPC for after-tax income and larger than the MPC of home value. For service expenditures, the elasticity is 0.01, again statistically significant at the 1% level. The implied MPC is 0.022, greater than the MPC of home value, but

[26] The estimated elasticities for the conventional wealth components are generally similar to those in the literature (see the referred studies in Section 2). For example, when we look at the total expenditure, the estimates are in line with existing studies: the home value elasticity is 0.0962 with a MPC of 0.02, the financial wealth elasticity is 0.0178 with a MPC of 0.09 and the log of after-tax income coefficient is 0.2484 with a MPC of 0.12. All are statistically significant at the 0.01 level.

[27] Recall that service expenditure includes food at restaurants. See Section 4 for related discussion.

less than that of financial wealth or income. For both expenditures, the housing dividend is meaningful, both statistically and practically.

For durable expenditure, the MPC of housing dividend is negative at -0.035 and is significant at the 5% level.[28] This is likely due to the fact that the housing dividend is implicit and is more fungible with non-durable expenditures, while durable expenditures (such as the purchase of a new vehicle) are usually financed through collateral based loans. This could occur if, say, other things equal, the growth of durable goods loans positively correlates with that of mortgage loans, for this would increase the purchasing power of households for the durable goods. Although not of key interest in our investigations, the finding certainly deserves further research.

Overall, the housing dividend is closely associated with increased food and service expenditures as well as non-durables. The economic and statistical significance of the housing dividend in predicting non-housing expenditures is apparent, even after controling for home value, which implies that the dividend irrelevance argument (Miller & Modigliani, 1961; Baker, et al., 2007) is not stringently applicable to housing as an asset and that homeowners benefit from fixing or hedging their ownership expenses via purchase. Households can subsequently reallocate the underlying income to food, services and other types of expenditures, independent of whether households have taken on additional housing related debt or housing disposition.

The regressions in Table 3 have home value decomposed into home equity and mortgage debt as separate regressors, corresponding to specification (20).[29] This specification isolates the effect of the housing dividend from the effects of home equity and mortgage debt. With this

[28] We also note that the goodness of fit for the regression of durable expenditure is substantially lower than other expenditures.

[29] In addition, to address the concerns of top-coding for wealth and income variables in the CEX (Poterba & Slemrod, 2007), we conduct median regressions with the same set of dependent and independent variables and obtain similar results, as are presented in Table A2.

specification, the estimated elasticities for home equity and financial wealth related to total expenditure from the current CEX sample are comparable to those found in Guo and Hardin (2014) which uses PSID data. The elasticities for mortgage debt are much smaller in comparison, but this smaller magnitude masks the variations evidenced during different housing market phases, as is shown by Table 4 and will be discussed in the next section.

The results in Table 3 extend those in Table 2, and highlight a more meaningful role for the housing dividend. For total expenditure, the estimated elasticity for the housing dividend, 0.0133, is once again statistically significant at the 1% level and is larger than its counterpart in Table 2 (0.0115). More important, the MPC for the housing dividend (0.05) is more than double the MPC for the home equity variable (0.02).

Comparisons across expenditure types continue to exhibit heterogeneity in the impact of the housing dividend. The corresponding estimated coefficients and implied MPCs for the housing dividend are very similar to those in Table 2. More noteworthy is the fact that the MPCs for the housing dividend are all larger than those of home equity and mortgage debt across all expenditure categories except durables. The housing dividend coefficient for the durable expenditure again remains negative. The housing dividend MPC for the broadly defined total expenditures category is the greatest when compared to those for other expenditure types, is slightly stronger than that in Table 2, and is substantially greater than those for housing equity and debt.

Overall, the results in Table 2 and Table 3 show that the housing dividend is of practical significance. Households benefit by the fixation of home ownership costs and the hedging of changes in housing service costs as reflected by inflation adjusted changes in the market value of rents after controlling for housing equity, financial wealth and income. Households also benefit

from home ownership by paying down their mortgages which provides an opportunity to generate cash via refinancing or sale. These two benefits are separate and on top of the accumulation of housing wealth as measured by house equity. Our results differentiate between an investment return in housing (appreciation) and an ownership gain from actually owning and occupying the property.

8. Empirical results segmented by real estate cycle and by housing tenure

Beginning in the late 1990s, but especially during the early 2000s up until 2006, the United States saw a change in its residential housing markets characterized by excess price appreciation amid easy credit and subprime lending (Ferreira and Gyourko, 2011; Mayer, 2011). During the residential boom, housing morphed from a long-term consumption good with potential for long-term appreciation to a perceived investment option with substantial liquidity. In addition, subprime mortgages, low documentation loans and other aggressive lending options were not as widespread or accessible in the housing market until the late 1990s and early 2000s when the housing market expanded faster than fundamentals.[30] These changing market conditions and their impacts on housing dividends warrant separate examinations of the three periods of the sample (1988-1996, 1997-2006, and 2007-2011) when market conditions arguably differ. The analysis below is restricted to households in the 26-55 age group.

Table 4 presents the results associated with the three sub-periods. The models substantially retain the statistical relations over the periods with regard to the food expenditure, service expenditure, and the broader measures of service and total expenditures (inclusive of

[30] We provide only the description and do not investigate causal relations related to mortgage lending changes and price appreciation.

educational and charitable spending). A couple of meaningful and interesting observations, however, emerge from the cross-period comparison, especially when the housing market crash period is compared with the rest.

First and foremost, the housing dividend effects are statistically significant and larger, in terms of both the elasticities and the MPCs in the last period than in the earlier periods. For the period 2007-2011, the implied MPC of the housing dividend on the narrower measure of total expenditures is almost 9 cents per dollar (9.5 cents for the broader measure of total expenditure). In contrast, the counterpart MPCs for home equity are 1.3 and 1.6 cents, respectively, dramatically lower than those of the housing dividend. For the period 1997-2006, the implied MPC of the housing dividend on total expenditure is 2 cents per dollar (2.9 cents for the broader measure) and is not statistically significant at a conventional level. However, the corresponding home equity MPCs (2.1 and 2.5 cents, respectively) are now comparable and statistically significant. These results accord well with the general hypothesis that as the liquidity of home equity declines, as was the case in 2007-2011, the gap between the impact of housing dividend and that of home equity expands. The housing dividend's relevance is underscored.

Some remarks on the housing market for these periods are in order. The results suggest that the willingness on the part of home buyers to purchase housing or take on debt to buy real estate above intrinsic value eliminates the ability to meaningfully hedge housing expenditures. During the boom period, buyers were willing to pay more for housing than the economic benefit that accrues to housing as measured by rental or occupancy costs. In addition, some existing homeowners refinanced existing debt for immediate cash, at the cost of diminishing or eliminating housing dividend altogether. This resulted in a large number of transactions in this period that truncated or failed to generate cash flow benefits. In other words, many market

participants fixed their ownership costs at such an elevated level that generation of a dividend benefit in the future is limited.[31] As the market reverts back to one more in line with the long-term trend, not only do these homeowners lose from the housing value correction, but they also fail to gain from lower housing costs that accompanied the market correction due to leverage taking. These households have little or no equity (as has been noted in the default literature), but also have higher housing costs (due to higher debt service needs, for example) relative to rental options. Only through default and foreclosure and/or debt restructuring, coupled with increases in rents, can the housing dividend increase for these households.[32]

The evidence presented in Table 4 is further consistent with the popular belief that during the boom period a house was used more like an "ATM" as homeowners took on mortgage debt to fund consumption, especially for durables and service expenditures. For the 1997-2006 period, the elasticity of durables to mortgage balance is 0.15, and that of services to mortgage balance is 0.08. This is in sharp contrast to 0.0037 (which is not statistically significant) and 0.0086 for these two elasticities in the period 2007-2011. The results are confirmatory of the general narrative for the boom period.

Concerning our second hypothesis that homeowners with longer housing tenure enjoy a larger housing dividend benefit and thus additional consumption expenditures, Table 5 presents the results for our sample segmented by housing tenure. The first subgroup is comprised by households with housing tenure of less than 5 years, the second, between 5 and 15 years, and the third, between 15 and 25 years. The estimated elasticities of housing dividend in response to total

[31] Existing literature highlights a mismatch in the house price-to-income ratio and price-to-rent ratio for the boom period. For example, see Beracha and Johnson (2012).

[32] While full investigations are beyond the scope of this paper, the results suggest that a differential between housing-service cost and rent could be a factor in mortgage default. A household might continue to service debt even with little or no equity if rental options for similar properties are priced such that the cost of the rental option (inclusive of moving costs) from a cash flow standpoint is equal or higher.

expenditure increase slightly from the first to the third subgroup, but they are still less than 0.02 in magnitude. However, the implied MPCs for total expenditure increase notably along with the housing tenure. Beyond 15 years of tenure in the same house, the more narrowly defined total expenditure increases 6.6 cents (7.9 cents for the broader measure) in response to one dollar increase of housing dividend. In contrast, for those whose tenure was less than 15 years, these MPCs are 4.0 and 5.0 cents, respectively. These patterns affirm our proposed hypothesis that the impact of housing dividend will rise with housing tenure.

9. Conclusion

The user cost concept widely adopted in the housing economics literature is reformulated into a discounted dividends model which serves as the basis for this research. The model links market rent, ownership costs and expected capital gains unequivocally within a discounted cash flow or dividends model. While the derivation of the model is of some interest, the primary focus is the introduction and application of the housing dividend construct to existing empirical models and presenting evidence showing that the housing dividend impacts household level non-housing expenditures. No studies, to our knowledge, have attempted to discern the effects of a housing ownership related implicit dividend on consumption expenditures. This gap in the literature is likely due to the literature's historical focus on macro-level issues and a dearth of large-scale data sufficiently detailed to capture differences in both market equivalent rents and actual occupancy expenditures at the household level.

The empirical results based upon CEX data show that this housing related dividend is important in determining household expenditures. This is in addition to other wealth effects

documented in the literature such as house value, home equity, mortgage debt and financial assets. The vital role of the housing dividend on expenditures, even after controlling for housing wealth, implies that pure application of the dividend irrelevance tenet to consumption is unlikely in practice, probably due to the distinctive illiquidity of the housing market, as our model conjectures and our empirical results verify.

Overall, this research strongly suggests that the benefit to home ownership as related to consumption comes not only from the accumulation of housing equity and potential cash-outs from mortgage loans. An additional benefit to home ownership, related to hedging or fixing housing costs, is provided. A supplementary extension is related to the buy versus rent literature where the assumption is that households have the ability and willingness to segment housing related cash flows based solely as investment related flows. The present research challenges the assumption that households will save/invest all cash flow generated from regime switching between house renting and buying. Households likely spend part of any benefit and perhaps also lose out on the forced savings related to ownership.

At the policy level, the results suggest that a better understanding of household level economic decision-making is needed. Also, a deeper understanding of how household wealth accumulation and expenditures change when housing prices departure from their historic value relative to rent is required. Households vary in their individual circumstances and these impact their economic decisions. In the long run, households should have the correct incentives and education or knowledge to make sound choices. These choices may also be related to the local markets within which they reside. We also need to recognize that ownership can reduce uncertainty in required household level expenditures which will impact consumption choices. Policies that reduce uncertainty in housing costs and concurrent household level volatility in cash

flow allocated to housing are likely to be beneficial and need assessment. Policies that reduce uncertainty in costs may be as useful as policies that address price uncertainty and volatility. Additional research is needed to shed more light on these topics.

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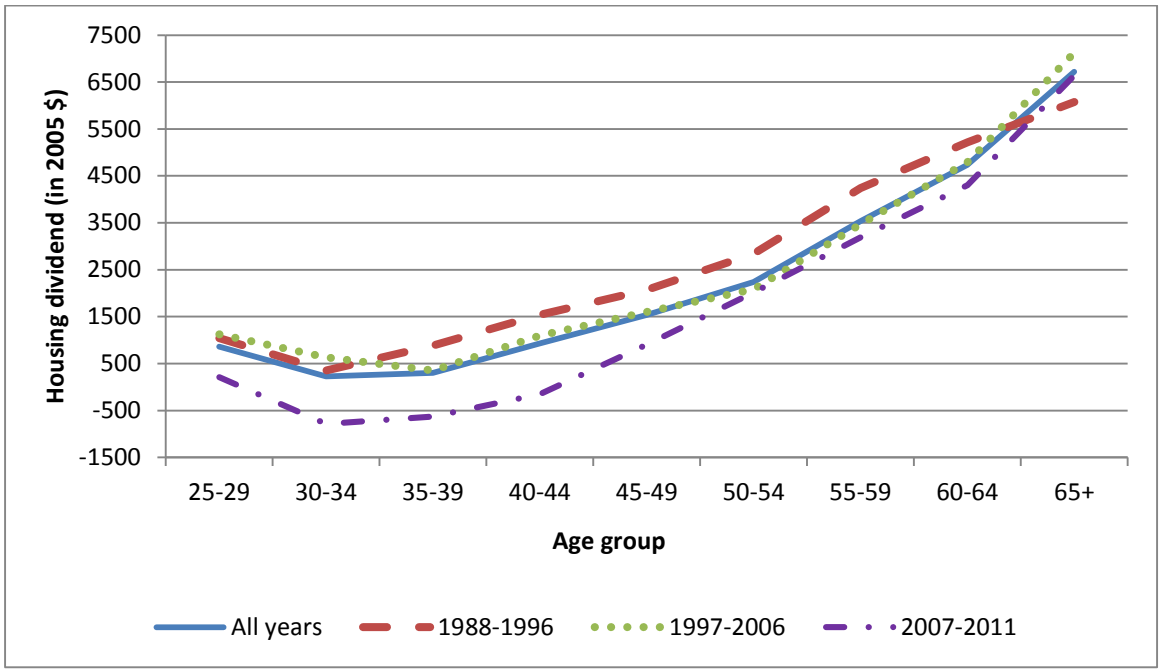
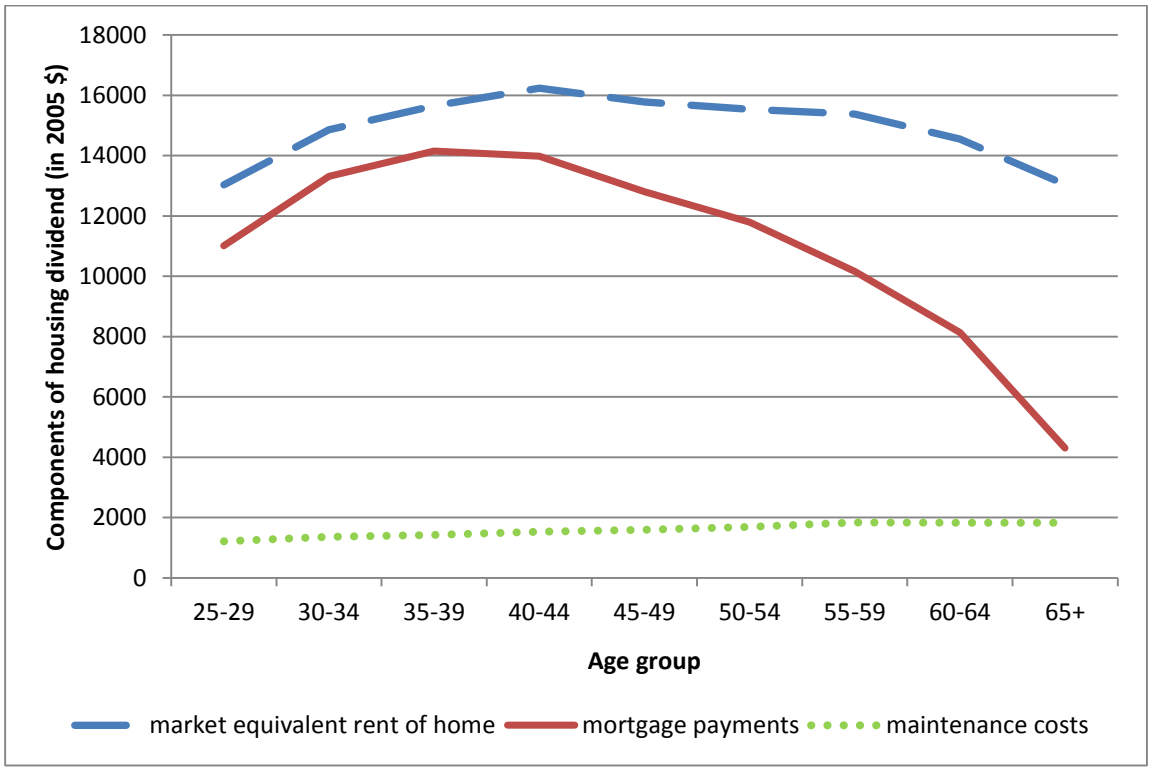
Figure 1 Life-cycle patterns of the housing dividend for homeowners



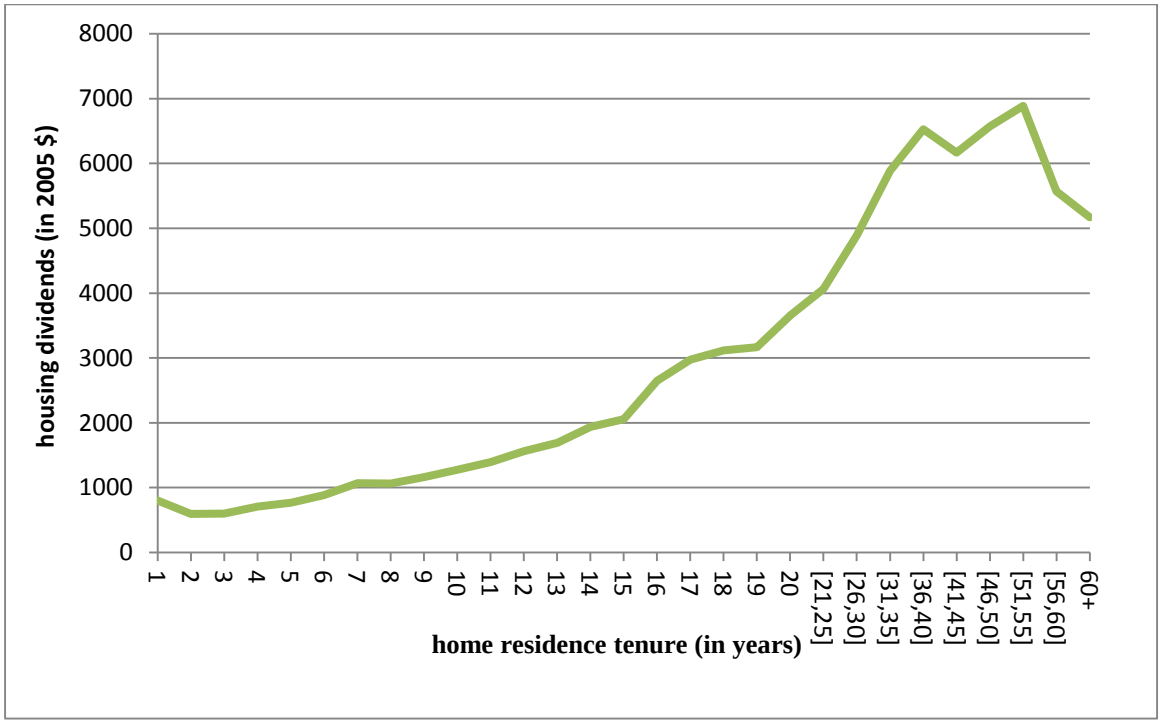
Notes: The graph demonstrates the means of annual housing dividends for each age group. Values in various years are adjusted by CPI-U to 2005 dollars. "All years" series are calculated based on all CEX household observations for the entire period. "1988-1996", "1997-2006" and "2007-2011" are based on household observations from 1988 to 1996, from 1997 to 2006, and from 2007 to 2011, respectively.

Figure 2 Decomposition of the housing dividend for homeowners



Notes: The graph demonstrates the means of housing dividend components for each age group from 1996 to 2011 for which the data for decomposition variables are available in CEX. Values of various years are adjusted by CPI-U to 2005 dollars. Mortgage payments include payments to reduce mortgage principal, mortgage interests, and property taxes. Maintenance costs include costs of house maintenance and repairs, insurance costs, and other expenses.

Figure 3 Housing dividend by tenure



Notes: The graph demonstrates the median of housing dividends by tenure of home ownership based on CEX household observations from 1996 to 2011. Values in various years are adjusted by CPI-U to 2005 dollars.

Table 1 Summary statistics for CEX sample data

	All Years			Year 1988-1996			Year 1997-2006			Year 2007-2011		
	Median	Mean	Std. Dev	Median	Mean	Std. Dev	Median	Mean	Std. Dev	Median	Mean	Std. Dev
Housing dividend	3,309	3,170	8,892	3,322	3,227	6,844	3,421	3,331	9,362	3,062	2,829	9,748
Home value	161,324	216,959	206,873	131,109	161,358	110,183	160,085	216,404	209,044	177,907	242,133	230,921
Home equity	73,322	124,947	182,188	55,529	78,740	89,909	60,039	108,130	171,744	104,481	164,240	213,612
Mort. bal.	69,739	92,012	96,456	66,128	82,618	68,548	87,455	108,274	92,915	40,544	77,892	107,499
Stockholdings	2,511	56,663	234,609	4,498	33,375	85,322	2,311	66,068	269,244	1,492	62,608	293,171
After-tax income	52,829	65,285	54,411	48,855	56,948	41,968	53,477	66,219	56,286	56,440	71,740	60,406
Age	52	53.6	15.9	50	52.6	16.2	52	53.7	15.9	54	54.4	15.7
Family size	2	2.7	1.4	2	2.8	1.5	2	2.7	1.4	2	2.6	1.5
Marital status	1	67.0%	47.0%	1	69.5%	46.1%	1	66.9%	47.1%	1	64.7%	47.8%
Urban residence	1	89.5%	30.6%	1	86.3%	34.3%	1	89.0%	31.2%	1	93.6%	24.6%
Race - white	1	88.6%	31.8%	1	90.5%	29.3%	1	88.2%	32.3%	1	87.5%	33.1%

Notes: All observations from all years are included in calculating these summary statistics. Wealth variables include both positive and negative values. All values are in 2005 dollars.

Table 2 Housing dividend and household expenditures of homeowners (for the age group 26-55)

	Food	Nondurables	Durables	Services	Total	Services (broader definition)	Total (broader definition)
Log housing dividend	0.0241***	0.0107***	-0.0354**	0.0124***	0.0115***	0.0143***	0.0127***
	(0.003)	(0.003)	(0.013)	(0.003)	(0.003)	(0.003)	(0.003)
Log home value	0.0806***	0.0501***	0.1063***	0.1332***	0.0962***	0.1461***	0.1049***
	(0.006)	(0.003)	(0.023)	(0.008)	(0.007)	(0.009)	(0.007)
Log financial wealth	0.0070***	0.0056***	0.0851***	0.0213***	0.0178***	0.0246***	0.0198***
	(0.001)	(0.001)	(0.004)	(0.001)	(0.001)	(0.001)	(0.001)
Log after-tax income	0.1912***	0.1504***	0.5328***	0.2619***	0.2484***	0.2884***	0.2639***
	(0.012)	(0.009)	(0.037)	(0.015)	(0.014)	(0.017)	(0.015)
Implied MPC							
Housing dividend	0.0206	0.0131	-0.0075	0.0221	0.0428	0.0280	0.0505
Home value	0.0036	0.0031	0.0022	0.0131	0.0196	0.0164	0.0229
Financial wealth	0.0078	0.0089	0.0494	0.0525	0.0947	0.0691	0.1119
Income	0.0209	0.0231	0.0276	0.0610	0.1226	0.0757	0.1392
Other variables							
Age	0.0352***	0.0234***	0.0064	0.0166***	0.0120**	0.0111**	0.0097*
	(0.005)	(0.004)	(0.022)	(0.005)	(0.005)	(0.005)	(0.005)
Age Squared	-0.0004***	-0.0002***	-0.0002	-0.0001**	-0.0001*	-0.0001	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Family size	0.1155***	0.1239***	0.1061***	0.0393***	0.0691***	0.0504***	0.0737***
	(0.003)	(0.003)	(0.013)	(0.003)	(0.003)	(0.003)	(0.003)
Marital status	0.1047***	0.1482***	0.2562***	0.0843***	0.1266***	0.0955***	0.1308***
	(0.010)	(0.009)	(0.044)	(0.010)	(0.010)	(0.011)	(0.010)
Urban residence	0.0476***	-0.0230*	-02315***	0.0827***	-0.0156	0.0925***	-0.0070
	(0.013)	(0.012)	(0.063)	(0.014)	(0.014)	(0.015)	(0.014)
Race-caucasian	0.1158***	0.1099***	0.4122***	0.0502***	0.1013***	0.0309***	0.0877***
	(0.011)	(0.009)	(0.053)	(0.011)	(0.011)	(0.012)	(0.011)
Year 1993-1996	-0.0907***	-0.1051***	-0.0244	0.0301***	-0.0163	0.0337***	-0.0128
Year 1997-2000	-0.1145***	-0.1498***	-0.1039*	0.0133**	-0.0397**	0.0144	-0.0377**
Year 2001-2004	-0.1768***	-0.2143***	-0.3320***	-0.0384**	-0.0953***	-0.0196	-0.0829***
Year 2005-2007	-0.1553***	-0.1460***	-0.6110***	-0.0425**	-0.1212***	-0.0173	-0.1033***
Year 2007-2011	-0.1021***	-0.1816***	-0.8649***	0.0273*	-0.1551***	-0.0133	-0.1408***
(Constant)	4.2987***	5.8112***	0.2983	4.1541***	5.6599***	3.8592***	5.4489***
Observations	13,603	13,602	13,601	13,601	13,602	13,601	13,602
Adjusted R-squared	0.421	0.449	0.184	0.424	0.406	0.445	0.431

Notes:

(a) This is the pooled sample 1988-2011, for households whose head aged 26-55. The sample does not include observations from 1995:Q3-Q4 and 2004:Q3-Q4, due to sampling frame change starting in 1996 and 2005, which leads to a portion of families not able to be tracked across a full year. Neither does the sample include observations from 1991:Q2-Q4 and 1992, due to missing detailed expenditure files on mortgage payments and house ownership costs.

(b) MPC indicates the calculated Marginal Propensity to Consume. Transforming coefficients into MPCs involves multiplying them with a benchmark (in our case, the median) of the corresponding expenditure-wealth (income) ratios.

(c) Dependent variables are the logs of expenditure of each type (food, nondurables, durables, services, and total). The broader definition of services and total expenditures includes education and charity expenses. *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively. Robust standard errors are presented in parentheses.

(d) Food expenditure includes spending on food consumed at home, at work, and at places outside home. Nondurable goods have an average useful life of less than 3 years, including food and beverages purchased for off-premises consumption,

clothing and footwear, gasoline and other energy goods, and other nondurable goods. Durable goods have an average useful life of at least 3 years, including motor vehicles and parts, furnishings and durable household equipment, recreational goods and vehicles, and other durable goods. Services include house utilities, health care, transportation services, recreation services, food services and accommodations, financial services and insurance, and other services. The total expenditure is the sum of the above three primary types.

Table 3 Housing dividend and household expenditures of homeowners: decomposition of home value (for the age group 26-55)

	Food	Nondurables	Durables	Services	Total	Services (broader definition)	Total (broader definition)
Log housing dividend	0.0240***	0.0095***	-0.0263**	0.0153***	0.0133***	0.0172***	0.0146***
	(0.003)	(0.003)	(0.013)	(0.003)	(0.003)	(0.004)	(0.003)
Log home equity	0.0441***	0.0310***	0.0188	0.0642***	0.0452***	0.0709***	0.0497***
	(0.003)	(0.003)	(0.014)	(0.004)	(0.004)	(0.004)	(0.004)
Log mortgage bal.	0.0069***	0.0039***	0.0176***	0.0135***	0.0086***	0.0144***	0.0093***
	(0.001)	(0.001)	(0.006)	(0.002)	(0.001)	(0.002)	(0.002)
Log financial wealth	0.0074***	0.0058***	0.0850***	0.0220***	0.0184***	0.0254***	0.0203***
	(0.001)	(0.001)	(0.004)	(0.001)	(0.001)	(0.001)	(0.001)
Log after-tax income	0.1999***	0.1535***	0.5447***	0.2780***	0.2604***	0.3056***	0.2768***
	(0.013)	(0.009)	(0.037)	(0.016)	(0.015)	(0.018)	(0.016)
Implied MPC							
Housing dividend	0.0205	0.0116	-0.0056	0.0273	0.0496	0.0338	0.0581
Home equity	0.0044	0.0043	0.0009	0.0139	0.0203	0.0174	0.0240
Mortgage bal.	0.0005	0.0004	0.0007	0.0023	0.0031	0.0028	0.0036
Financial wealth	0.0083	0.0093	0.0494	0.0542	0.0975	0.0713	0.1152
Income	0.0218	0.0236	0.0282	0.0648	0.1286	0.0802	0.1460
Other variables							
Age	0.0341***	0.0219***	0.0098	0.0140***	0.0100*	0.0084	0.0076
	(0.005)	(0.004)	(0.023)	(0.005)	(0.005)	(0.005)	(0.005)
Age Squared	-0.0004***	-0.0002***	-0.0002	-0.0001*	-0.0001	-0.000	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Family size	0.1155***	0.1242***	0.1062***	0.0394***	0.0694***	0.0510***	0.0743***
	(0.003)	(0.003)	(0.013)	(0.003)	(0.003)	(0.003)	(0.003)
Marital status	0.1047***	0.1487***	0.2720***	0.0849***	0.1264***	0.0966***	0.1309***
	(0.010)	(0.009)	(0.045)	(0.011)	(0.011)	(0.012)	(0.011)
Urban residence	0.0476***	-0.0124	-0.2035***	0.1100***	0.0060	0.1238***	0.0172***
	(0.013)	(0.012)	(0.064)	(0.015)	(0.015)	(0.015)	(0.015)
Race-caucasian	0.1195***	0.1128***	0.4345***	0.0557***	0.1079***	0.0348***	0.0933***
	(0.011)	(0.009)	(0.054)	(0.011)	(0.011)	(0.012)	(0.012)
Year 1993-1996	-0.0807***	-0.0987***	-0.0384	0.0408**	-0.0100	0.0465***	-0.0054
Year 1997-2000	-0.0965***	-0.1359***	-0.1073*	0.0360**	-0.0234	0.0399**	-0.0198
Year 2001-2004	-0.1562***	-0.2018***	-0.3254***	-0.0069	-0.0758***	0.0168	-0.0603***
Year 2005-2007	-0.1376***	-0.1361***	-0.6001***	-0.0113	-0.1009***	0.0176	-0.0808***
Year 2007-2011	-0.0724***	-0.1658***	-0.8050***	0.0255	-0.1216***	0.0446**	-0.1036***
(Constant)	4.6037***	6.0212***	0.8064	4.7036***	6.0785***	4.4631***	5.9025***
Observations	12,996	12,995	12,994	12,994	12,995	12,994	12,995
Adjusted R-squared	0.416	0.449	0.183	0.409	0.396	0.430	0.420

Notes:

(a) This is the pooled sample 1988-2011, for households whose head aged 26-55. The sample does not include observations from 1995:Q3-Q4 and 2004:Q3-Q4, due to sampling frame change starting in 1996 and 2005, which leads to a portion of families not able to be tracked across a full year. Neither does the sample include observations from 1991:Q2-Q4 and 1992, due to missing detailed expenditure files on mortgage payments and house ownership costs.

(b) MPC indicates the calculated Marginal Propensity to Consume. Transforming coefficients into MPCs involves multiplying them with a benchmark (in our case, the median) of the corresponding expenditure-wealth(income) ratios.

(c) Dependent variables are the logs of expenditure of each type (food, nondurables, durables, services, and total). The broader definition of services and total expenditures includes education and charity expenses. *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively. Robust standard errors are presented in parentheses.

(d) Food expenditure includes spending on food consumed at home, at work, and at places outside home. Nondurable goods have an average useful life of less than 3 years, including food and beverages purchased for off-premises consumption, clothing and footwear, gasoline and other energy goods, and other nondurable goods. Durable goods have an average useful life of at least 3 years, including motor vehicles and parts, furnishings and durable household equipment, recreational goods and vehicles, and other durable goods. Services include house utilities, health care, transportation services, recreation services, food services and accommodations, financial services and insurance, and other services. The total expenditure is the sum of the above three primary types.

Table 4 Housing dividend and household expenditures of homeowners: real estate cycle sub-periods: 1988-1996, 1997-2006, vs. 2007-2011 (for the age group 26-55)

	Food	Nondurables	Durables	Services	Total	Services (broader definition)	Total (broader definition)
1988-1996 Sub-period							
Log housing dividend	0.0196***	0.0008	0.0018	0.0149**	0.0110	0.0173***	0.0127***
	(0.006)	(0.006)	(0.023)	(0.007)	(0.007)	(0.007)	(0.007)
Log home equity	0.0440***	0.0388***	0.0502**	0.0731***	0.0592***	0.0798***	0.0631***
	(0.007)	(0.006)	(0.024)	(0.009)	(0.009)	(0.009)	(0.009)
Log mortgage bal.	0.0352***	0.0205***	0.0994***	0.0604***	0.0473***	0.0630***	0.0498***
	(0.008)	(0.001)	(0.031)	(0.009)	(0.010)	(0.009)	(0.010)
Log financial wealth	0.0116***	0.0077***	0.0431***	0.0236***	0.0163***	0.0270***	0.0182***
	(0.002)	(0.002)	(0.010)	(0.003)	(0.003)	(0.003)	(0.003)
Log after-tax income	0.1688***	0.1571***	0.4336***	0.2469***	0.2395***	0.2658***	0.2487***
	(0.025)	(0.022)	(0.092)	(0.036)	(0.041)	(0.037)	(0.042)
Implied MPC							
Housing dividend	0.0213	0.0013	0.0008	0.0316	0.0525	0.0404	0.0637
Home equity	0.0057	0.0071	0.0041	0.0197	0.0353	0.0243	0.0402
Mortgage bal.	0.0035	0.0030	0.0067	0.0130	0.0223	0.0151	0.0249
Financial wealth	0.0131	0.0126	0.0304	0.0544	0.0858	0.0701	0.1020
Income	0.0208	0.0281	0.0313	0.0612	0.1327	0.0732	0.1453
Observations	2,647	2,647	2,647	2,645	2,647	2,645	2,647
Adjusted R-squared	0.419	0.449	0.133	0.395	0.370	0.418	0.395
1997-2006 Sub-period							
Log housing dividend	0.0160***	0.0038	-0.0455**	0.0102**	0.0053	0.0130***	0.0072
	(0.004)	(0.004)	(0.019)	(0.004)	(0.005)	(0.005)	(0.005)
Log home equity	0.0429***	0.0317***	0.0216	0.0571***	0.0400***	0.0635***	0.0444***
	(0.004)	(0.004)	(0.020)	(0.005)	(0.005)	(0.006)	(0.005)
Log mortgage bal.	0.0488***	0.0375***	0.1546***	0.0841***	0.0707***	0.0949***	0.0775***
	(0.006)	(0.005)	(0.027)	(0.007)	(0.007)	(0.008)	(0.007)
Log financial wealth	0.0067***	0.0057***	0.0833***	0.0206***	0.0181***	0.0241***	0.0200***
	(0.001)	(0.001)	(0.006)	(0.001)	(0.001)	(0.001)	(0.001)
Log after-tax income	0.1748***	0.1470***	0.4709***	0.2493***	0.2466***	0.2739***	0.2605***
	(0.016)	(0.014)	(0.048)	(0.021)	(0.020)	(0.024)	(0.022)
Implied MPC							
Housing dividend	0.0130	0.0045	-0.0101	0.0181	0.0193	0.0253	0.0285
Home equity	0.0047	0.0049	0.0013	0.0143	0.0212	0.0180	0.0250
Mortgage bal.	0.0036	0.0039	0.0066	0.0141	0.0254	0.0182	0.0298
Financial wealth	0.0068	0.0081	0.0481	0.0480	0.0909	0.0635	0.1065
Income	0.0179	0.0215	0.0252	0.0568	0.1200	0.0708	0.1359
Observations	6,378	6,378	6,377	6,378	6,378	6,378	6,378
Adjusted R-squared	0.424	0.462	0.155	0.404	0.388	0.427	0.415
2007-2011 Sub-period							
Log housing dividend	0.0436***	0.0276***	-0.0102	0.0280***	0.0314***	0.0281***	0.0314***
	(0.006)	(0.006)	(0.027)	(0.007)	(0.006)	(0.007)	(0.006)
Log home equity	0.0437***	0.0250***	-0.0013	0.0723***	0.0470***	0.0799***	0.0527***
	(0.008)	(0.006)	(0.031)	(0.009)	(0.008)	(0.010)	(0.008)

Log mortgage bal.	0.0038***	0.0022***	0.0037	0.0086***	0.0048***	0.0086***	0.0050***
	(0.002)	(0.001)	(0.007)	(0.009)	(0.002)	(0.002)	(0.002)
Log financial wealth	0.0053***	0.0037***	0.0980***	0.0201***	0.0166***	0.0231***	0.0184***
	(0.001)	(0.001)	(0.008)	(0.002)	(0.002)	(0.002)	(0.002)
Log after-tax income	0.2267***	0.1487***	0.6433***	0.2961***	0.2624***	0.3279***	0.2825***
	(0.025)	(0.015)	(0.067)	(0.030)	(0.025)	(0.032)	(0.027)
Implied MPC							
Housing dividend	0.0306	0.0255	-0.0007	0.0398	0.0875	0.0435	0.0945
Home equity	0.0030	0.0023	0.0000	0.0106	0.0134	0.0134	0.0163
Mortgage bal.	0.0003	0.0002	0.0001	0.0013	0.0014	0.0015	0.0016
Financial wealth	0.0071	0.0068	0.0432	0.0603	0.0983	0.0790	0.1184
Income	0.0238	0.0207	0.0197	0.0668	0.1141	0.0839	0.1331
Observations	3.971	3,970	3,970	3.971	3,970	3,971	3,970
Adjusted R-squared	0.427	0.439	0.165	0.458	0.436	0.476	0.461

Notes:

(a) This is the pooled sample 1988-1996, 1997-2006, and 2007-2011, respectively, for households whose head aged 26-55. The sample does not include observations from 1995:Q3-Q4 and 2004:Q3-Q4, due to sampling frame change starting in 1996 and 2005, which leads to a portion of families not able to be tracked across a full year. Neither does the sample include observations from 1991:Q2-Q4 and 1992, due to missing detailed expenditure files on mortgage payments and house ownership costs.

(b) MPC indicates the calculated Marginal Propensity to Consume. Transforming coefficients into MPCs involves multiplying them with a benchmark (in our case, the median) of the corresponding expenditure-wealth(income) ratios.

(c) Dependent variables are the logs of expenditure of each type (food, nondurables, durables, services, and total). The broader definition of services and total expenditures includes education and charity expenses. *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively. Robust standard errors are presented in parentheses.

(d) Food expenditure includes spending on food consumed at home, at work, and at places outside home. Nondurable goods have an average useful life of less than 3 years, including food and beverages purchased for off-premises consumption, clothing and footwear, gasoline and other energy goods, and other nondurable goods. Durable goods have an average useful life of at least 3 years, including motor vehicles and parts, furnishings and durable household equipment, recreational goods and vehicles, and other durable goods. Services include house utilities, health care, transportation services, recreation services, food services and accommodations, financial services and insurance, and other services. The total expenditure is the sum of the above three primary types.

Table 5 Housing dividend and household expenditures of homeowners: separate results by housing tenure (for the age group 26-55)

	Food	Nondurables	Durables	Services	Total	Services (broader definition)	Total
Tenure <= 5 years							
Log housing dividend	0.0234*** (0.004)	0.0126*** (0.006)	-0.0425** (0.020)	0.0164** (0.007)	0.0121** (0.005)	0.0159*** (0.005)	0.0121*** (0.005)
Log of home value	0.0713*** (0.009)	0.0493*** (0.007)	0.0744** (0.024)	0.1352*** (0.012)	0.0931*** (0.011)	0.1485*** (0.014)	0.1014*** (0.011)
Log financial wealth	0.0088*** (0.001)	0.0063*** (0.001)	0.0889*** (0.007)	0.0237*** (0.002)	0.0202*** (0.002)	0.0279*** (0.003)	0.0226*** (0.002)
Log after-tax income	0.1586*** (0.016)	0.1306*** (0.014)	0.4795*** (0.049)	0.2243*** (0.023)	0.2227*** (0.021)	0.2388*** (0.025)	0.2305*** (0.022)
Implied MPC							
Housing dividend	0.0200	0.0154	-0.0091	0.0291	0.0451	0.0311	0.0481
Home value	0.0032	0.0031	0.0016	0.0133	0.0189	0.0166	0.0222
Financial wealth	0.0098	0.0100	0.0516	0.0584	0.1074	0.0784	0.1282
Income	0.0173	0.0201	0.0248	0.0523	0.10998	0.0627	0.1216
Observations	6,032	6,032	6,032	6,030	6,032	6,030	6,032
Adjusted R-squared	0.393	0.435	0.174	0.391	0.373	0.411	0.397
Tenure > 5 years to Tenure <= 15 years							
Log housing dividend	0.0250*** (0.004)	0.0099** (0.004)	-0.0237 (0.019)	0.0110** (0.005)	0.0106*** (0.005)	0.0140*** (0.005)	0.0128*** (0.005)
Log of home value	0.0836*** (0.010)	0.0479*** (0.008)	0.1280*** (0.039)	0.1312*** (0.012)	0.0959*** (0.011)	0.01434*** (0.013)	0.1045*** (0.012)
Log financial wealth	0.0054*** (0.001)	0.0044*** (0.001)	0.0752*** (0.007)	0.0193*** (0.001)	0.0149*** (0.001)	0.0222*** (0.001)	0.0167*** (0.001)
Log after-tax income	0.2028*** (0.016)	0.1611*** (0.013)	0.5264*** (0.064)	0.2792*** (0.023)	0.2550*** (0.023)	0.3158*** (0.025)	0.2767*** (0.024)
Implied MPC							
Housing dividend	0.0214	0.0121	-0.0050	0.0196	0.0397	0.0274	0.0506
Home value	0.0037	0.0030	0.0027	0.0129	0.0195	0.0161	0.0229
Financial wealth	0.0060	0.0070	0.0437	0.0476	0.0791	0.0623	0.0944
Income	0.0221	0.0247	0.0272	0.0651	0.1259	0.0829	0.1460
Observations	5,354	5,353	5,352	5,354	5,353	5,354	5,353
Adjusted R-squared	0.438	0.446	0.176	0.436	0.411	0.461	0.438
Tenure > 15 years and Tenure <= 25 years							
Log housing dividend	0.0221*** (0.011)	0.0099 (0.008)	-0.0218 (0.037)	0.0022 (0.009)	0.0177** (0.009)	0.0081 (0.010)	0.0198** (0.009)
Log home equity	0.1098*** (0.020)	0.0608*** (0.014)	0.1423* (0.073)	0.1373*** (0.019)	0.1060*** (0.017)	0.1538*** (0.021)	0.1181*** (0.017)
Log financial wealth	0.0053*** (0.002)	0.0070*** (0.002)	0.0921*** (0.011)	0.0209*** (0.003)	0.0191*** (0.002)	0.0227*** (0.003)	0.0200*** (0.003)
Log after-tax income	0.2601*** (0.048)	0.1801*** (0.022)	0.6550*** (0.088)	0.3361*** (0.031)	0.3005*** (0.027)	0.3749*** (0.033)	0.3252*** (0.028)
Implied MPC							

Housing dividend	0.0190	0.0120	-0.0046	0.0039	0.0661	0.0158	0.0787
Home equity	0.0049	0.0038	0.0030	0.0135	0.0216	0.0172	0.0258
Financial wealth	0.0088	0.0111	0.0535	0.0515	0.1012	0.0636	0.1130
Income	0.0284	0.0277	0.0339	0.0783	0.1483	0.0984	0.1716
Observations	1,824	1,824	1,824	1,824	1,824	1,824	1,824
Adjusted R-squared	0.433	0.473	0.222	0.470	0.472	0.488	0.495

Notes:

(a) This is the pooled sample for households whose head aged 26-55 segmented by their housing tenure. The sample does not include observations from 1995:Q3-Q4 and 2004:Q3-Q4, due to sampling frame change starting in 1996 and 2005, which leads to a portion of families not able to be tracked across a full year. Neither does the sample include observations from 1991:Q2-Q4 and 1992, due to missing detailed expenditure files on mortgage payments and house ownership costs.

(b) MPC indicates the calculated Marginal Propensity to Consume. Transforming coefficients into MPCs involves multiplying them with a benchmark (in our case, the median) of the corresponding expenditure-wealth(income) ratios.

(c) Dependent variables are the logs of expenditure of each type (food, nondurables, durables, services, and total). The broader definition of services and total expenditures includes education and charity expenses. *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively. Robust standard errors are presented in parentheses.

(d) Food expenditure includes spending on food consumed at home, at work, and at places outside home. Nondurable goods have an average useful life of less than 3 years, including food and beverages purchased for off-premises consumption, clothing and footwear, gasoline and other energy goods, and other nondurable goods. Durable goods have an average useful life of at least 3 years, including motor vehicles and parts, furnishings and durable household equipment, recreational goods and vehicles, and other durable goods. Services include house utilities, health care, transportation services, recreation services, food services and accommodations, financial services and insurance, and other services. The total expenditure is the sum of the above three primary types.

Table A1 Housing wealth, financial wealth and household expenditures (for the age group 26-55)

	Food	Implied MPC	**Nondurables**	Implied MPC	**Durables**	Implied MPC	**Services**	Implied MPC	**Total**	Implied MPC
Log home value	0.0960*** (0.005)	0.0039	0.0587*** (0.004)	0.0033	0.1083*** (0.018)	0.0020	0.1430*** (0.006)	0.0127	0.1079*** (0.006)	0.0198
Log financial wealth	0.0065*** (0.001)	0.0072	0.0057*** (0.001)	0.0091	0.0840*** (0.003)	0.0488	0.0210*** (0.001)	0.0517	0.0180*** (0.001)	0.0955
Log after-tax income	0.1933*** (0.009)	0.0211	0.1502*** (0.007)	0.0231	0.5080*** (0.029)	0.0263	0.2710*** (0.012)	0.0631	0.2488*** (0.012)	0.1228
Age	0.0360*** (0.004)		0.0260*** (0.003)		-0.0024 (0.017)		0.0212*** (0.004)		0.0110*** (0.004)	
Age (squared)	-0.0004*** (0.000)		-0.0002*** (0.000)		-0.0001 (0.000)		-0.0002*** (0.000)		-0.0001 (0.000)	
Family size	0.1103*** (0.002)		0.1194*** (0.002)		0.0998*** (0.009)		0.0374*** (0.002)		0.0663*** (0.002)	
Marital status	0.1101*** (0.007)		0.1538*** (0.007)		0.2736*** (0.034)		0.0874*** (0.008)		0.1310*** (0.008)	
Urban Residence	0.0534*** (0.010)		-0.0075 (0.0009)		-0.1519*** (0.046)		0.0794*** (0.010)		0.0018 (0.011)	
Race-caucasian	0.1160*** (0.008)		0.1137*** (0.007)		0.4609*** (0.041)		0.0655*** (0.009)		0.1138*** (0.009)	
Year 1993-1996	-0.0829***		-0.0967***		-0.0127		0.0547***		0.0001	
Year 1997-2000	-0.1048***		-0.1403***		-0.0720*		0.0409***		-0.0163	
Year 2001-2004	-0.1517***		-0.1917***		-0.2559***		0.0145		-0.0500***	
Year 2005-2007	-0.1212***		-0.1260***		-0.5524***		0.0147		-0.0777***	
Year 2007-2011	-0.0667***		-0.1591***		-0.8046***		0.0430***		-0.1069***	
(Constant)	4.2109***		5.6980***		0.2359		3.8681***		5.5361***	
Observations	22,954		22,953		22,952		22,952		22,953	
Adjusted R-squared	0.413		0.440		0.178		0.428		0.402	

Notes:

(a) This is the pooled sample 1988-2011, for households whose head aged 26-55. The sample does not include observations from 1995:Q3-Q4 and 2004:Q3-Q4, due to sampling frame change starting in 1996 and 2005, which leads to a portion of families not able to be tracked across a full year. Neither does the sample include observations from 1991:Q2-Q4 and 1992, due to missing detailed expenditure files on mortgage payments and house maintenance costs.

(b) MPC indicates the calculated Marginal Propensity to Consume. Transforming coefficients into MPCs involves multiplying them with a benchmark (in our case, the median) of the corresponding expenditure-wealth(income) ratios.

(c) Dependent variables are the logs of expenditure of each type (food, nondurables, durables, services, and total). *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively. Robust standard errors are presented in parentheses.

(d) Food expenditure includes spending on food consumed at home, at work, and at places outside home. Nondurable goods have an average useful life of less than 3 years, including food and beverages purchased for off-premises consumption, clothing and footwear, gasoline and other energy goods, and other nondurable goods. Durable goods have an average useful life of at least 3 years, including motor vehicles and parts, furnishings and durable household equipment, recreational goods and vehicles, and other durable goods. Services include house utilities, health care, transportation services, recreation services, food services and accommodations, financial services and insurance, and other services. The total expenditure is the sum of the above three primary types.

Table A2 Median regressions of housing dividend and household expenditures of homeowners (for the age group 26-55)

	Food	Nondurables	Durables	Services	Total	Services (broader definition)	Total (broader definition)
Log housing dividend	0.0232***	0.0091***	-0.0082	0.0127***	0.0118***	0.0146***	0.0157***
	(0.004)	(0.003)	(0.013)	(0.004)	(0.004)	(0.003)	(0.004)
Log home equity	0.0353***	0.0246***	0.0272**	0.0519***	0.0373***	0.0548***	0.0403***
	(0.003)	(0.003)	(0.013)	(0.004)	(0.004)	(0.003)	(0.004)
Log mortgage bal.	0.0045***	0.0021*	0.0101*	0.0084***	0.0037***	0.0085***	0.0050***
	(0.001)	(0.001)	(0.005)	(0.001)	(0.001)	(0.001)	(0.002)
Log financial wealth	0.0069***	0.0048***	0.0510***	0.0186***	0.0166***	0.0224***	0.0182***
	(0.001)	(0.001)	(0.004)	(0.001)	(0.001)	(0.001)	(0.001)
Log after-tax income	0.2364***	0.1869***	0.5927***	0.3685***	0.3333***	0.4079***	0.3585***
	(0.006)	(0.005)	(0.022)	(0.006)	(0.006)	(0.006)	(0.006)
Implied MPC							
Housing dividend	0.0199	0.0111	-0.0017	0.0227	0.0440	0.0286	0.0624
Home equity	0.0035	0.0034	0.0013	0.0112	0.0168	0.0134	0.0195
Mortgage balance	0.0004	0.0002	0.0004	0.0014	0.0014	0.0017	0.0019
Financial wealth	0.0076	0.0076	0.0296	0.0458	0.0883	0.0629	0.1030
Income	0.0258	0.0287	0.0307	0.0859	0.1645	0.1071	0.1891
Observations	12,996	12,995	12,994	12,994	12,995	12,994	12,995
Pseudo R-squared	0.246	0.266	0.099	0.251	0.244	0.268	0.261

Notes:

(a) This is the pooled sample 1988-2011, for households whose head aged 26-55. The sample does not include observations from 1995:Q3-Q4 and 2004:Q3-Q4, due to sampling frame change starting in 1996 and 2005, which leads to a portion of families not able to be tracked across a full year. Neither does the sample include observations from 1991:Q2-Q4 and 1992, due to missing detailed expenditure files on mortgage payments and house maintenance costs.

(b) MPC indicates the calculated Marginal Propensity to Consume. Transforming coefficients into MPCs involves multiplying them with a benchmark (in our case, the median) of the corresponding expenditure-wealth (income) ratios.

(c) Dependent variables are the log of expenditure of each type (food, nondurables, durables, services, and total). The broader definition of services and total expenditures includes education and charity expenses. *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.

(d) Food expenditure includes spending on food consumed at home, at work, and at places outside home. Nondurable goods have an average useful life of less than 3 years, including food and beverages purchased for off-premises consumption, clothing and footwear, gasoline and other energy goods, and other nondurable goods. Durable goods have an average useful life of at least 3 years, including motor vehicles and parts, furnishings and durable household equipment, recreational goods and vehicles, and other durable goods. Services include house utilities, health care, transportation services, recreation services, food services and accommodations, financial services and insurance, and other services. The total expenditure is the sum of the above three primary types.