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Wealth Effects and Consumption in Thailand

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Abstract

The effects of changes in wealth on consumption in Thailand are estimated, using a cross-sectional household survey conducted in 2010. It is found that consumption, after conditioning for income and household characteristics, is increasing in wealth, whether measured in terms of net worth or gross asset values. The estimated elasticity of consumption with respect to wealth is 0.06, while the estimated income elasticity is 0.60. The corresponding marginal propensity to consume out of wealth is estimated to be around 0.02-0.03. Physical assets, such as housing, matter for consumption more than financial assets, with the elasticity being about five-fold larger. Durable goods consumption is found to be much more sensitive to wealth than consumption of non-durable goods. The paper also discusses evidence that wealth effects may vary across households, and can be explained by the levels of existing wealth and certain household characteristics.

Keywords: consumption, wealth effects

JEL Classification: E21, C21, D91

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1 Introduction

Over the past decade or so, there has been a resurgence of interests in the macroeconomic consequences of wealth shocks. The reasons for interests differ from one case to the next, depending on country-specific experiences. In the US, the run-up in the stock prices during the dotcom episode and the steep climb in house prices during the years leading up to the subprime crisis have stimulated a large body of studies on wealth changes and their impact on consumption. The focus on implications for spending is understandable, since the wealth gain or loss from asset price changes is in marked-to-market terms, and therefore wealth shocks will have macroeconomic impact only to the extent that they induce changes in spending behaviour.

In other countries, the primary sources of major wealth shocks can often be different in nature. For example, changes in wealth can be caused by unexpected damage to physical assets, induced by natural disaster such as flood or widespread human-made disruptions such as riots or wars. In these scenarios, the calculation of economic loss typically involves quantifying the effect on GDP in terms of lost production in affected industries, which is a supply-side approach. This standard approach is popular and widely adopted in policy research especially for emerging market economies (for example see Prasitdechsakul (2010) for an analysis of the 2010 major flood in Thailand). The focus on production side means that the demand-side impact is often bypassed, despite the fact that damages to wealth could also depress demand and spending, if households are induced to save more and consume less to rebuild their wealth. This common practice is hardly due to negligence, but largely reflects the fact that the relationship between wealth and consumption is simply not well understood for many emerging economies. This paper is an attempt to enhance our understanding of the linkage between wealth and spending in the case of Thailand.

At the conceptual level, almost any standard theory of consumption recognizes wealth as an important determinant of consumption, as it represents a pool of available resources, accumulated from past savings, from which consumption can be drawn. Any exogenous change in wealth therefore amounts to direct shock to the budget constraint of a household, and thereby affecting its consumption. Discerning the extent of this *wealth effect* on consumption empirically is important for both policy makers interested in evaluating the macro implications of wealth shocks, as well as for economists developing the theory of consumption. Empirical investigation is however often plagued by the lack of wealth data, necessitating an adoption of proxies, such as house prices as a proxy for housing wealth for example. Other studies have to be content with using the values of assets as a proxy for wealth. In some rare cases, researchers may be able to observe both the total values of assets and the total values of liability, which enable them to infer *net worth*, a proper measure of wealth. This paper is one such case. It will be argued that measuring net worth properly is not only more consistent with underlying theory, but also important for an accurate estimation of wealth effect.

The approach in this paper is to exploit the cross-sectional pattern of micro-level consumption behaviour and its relationship with household-level wealth, to obtain an estimate of wealth effect. Under a clear theoretical framework, the empirical estimate will have a causative interpretation and many typical econometric concerns are much less severe than commonly believed. The data set used, the Socioeconomic Survey conducted in 2010, also offers a number of advantages. It provides direct observation about wealth, income, as well as a large number of household characteristics that may explain different patterns of consumption. The richness of micro-level data allows one to investigate many aspects of wealth effect that otherwise cannot be deduced from time-series macro type data, such as the distinction between direct wealth effect and the wealth effect that may manifest itself via household-specific features. This paper will also exploit the data to explore issues that have received little attention in the global literature on wealth effects, for example the potential nonlinearity in wealth effects and heterogeneous wealth effects with respect to household characteristics.

The paper will be organized as follows. Section 2 reviews the canonical Euler-type theory of consumption, and argues that it can be recast in a cross-sectional representation with a simple empirical prediction. Section 3 discusses the data used, and presents all the empirical estimates. Discussion of results follow in Section 4, before Section 5 concludes.

2 Some Theory

Consider the canonical optimal consumption plan problem without uncertainty, where the consumer in period t aims to solve

$$\max \sum_{n=0}^{T-t} \beta^n u(C_{t+n}) \tag{2.1}$$

subject to

$$W_{t+1} = R(W_t - C_t) + P_{t+1} \tag{2.2}$$

$$\sum_{n=0}^{T-t} R^{-n} C_{t+n} = W_t + \sum_{n=0}^{T-t} R^{-n} P_{t+n} \tag{2.3}$$

where C_t, W_t, P_t, and R denote consumption, net asset holding (wealth), permanent income, and the fixed gross interest rate respectively. Under CRRA utility function $u(C) = C^{1-\rho}/(1-\rho)$, the solution to this optimization problem is

$$C_t = k(W_t + \bar{P}_t^T) \tag{2.4}$$

where $k = \frac{1-R^{-1}(R\beta)^{1/\rho}}{1-(R^{-1}(R\beta)^{1/\rho})^{T-t+1}}$ and $\bar{P}_t^T \equiv \sum_{n=0}^{T-t} R^{-n} P_{t+n}$ is the lifetime discounted permanent income.[1] Intuitively, agents should consume the amount that is a linear combination between the *non-human wealth* W_t and the *human wealth*, a discounted sum of permanent labour income stream $\bar{P}_t^T$.

In theoretical discussion, it is customary to assume in addition that the permanent income P_t grows at a constant gross rate G, which reduces $\bar{P}_t^T$ further to $\frac{1-(G/R)^{T-t+1}}{1-(G/R)} P_t$. This paper does not need to specialize to this particular case, but the example serves to highlight why the current permanent income P_t, and by implications current *observed* income, may be an important signal of $\bar{P}_t^T$.

What does this simple model predict in terms of the cross-sectional pattern of consumption? Provided that all agents share the same utility function and all have access to perfect capital market, equation 2.4 will hold over the spatial as well as the time domain. In other words, for any given time t and a population I of households, the consumption of household $i \in I$ obeys

$$C_i = k(W_i + \bar{P}_i) \tag{2.5}$$

where $\bar{P}_i$ denotes the lifetime discounted permanent income of household i, taking into account the permanent income profile and longevity $T-t$ specific to it. Thus the canonical consumption model, when interpreted cross-sectionally, predicts that the variation of consumption across households at any given time owes to the heterogeneity in terms of non-human wealth W_i and lifetime discounted permanent labour income $\bar{P}_i$.

The spatial interpretation jettisons the representative agent assumption by allowing different wealth endowments, but the uniformity of optimization problem across agents is still assumed. Thus this paper ignores the possibility that poorer households may be more credit constrained, or that the ability to generate permanent income is associated with skills in finding more optimal consumption plan. All households are the same *homo economicus* except for their wealth and permanent income endowments.

In light of the structural form 2.5, the empirical strategy is as follows. The key objective is to estimate the consumption function, and in particular obtain an estimate for the marginal propensity to consume (MPC) out of wealth, namely k in the context of the above model. Lifetime permanent income $\bar{P}_i$ and wealth W_i are both taken as exogenous variables (in econometric sense), with the former depending on household-specific characteristics and the latter determined by the household's optimal consumption chosen the period before according to equation 2.2. While W_i is directly observed in the data set, $\bar{P}_i$ is not and must be implicitly estimated as a function of observables Z_i. The

[1] For details of derivation, see for example Carroll (2009).

general specification of interest is therefore given by

$$C_i = kW_i + k\Psi(Z_i) \tag{2.6}$$

When implementing this scheme empirically, this paper will operate in log terms, assume that Ψ is a linear function and choose Z_i that comprises observed current income Y_i and a vector of other household-specific characteristics $\tilde{Z}_i$ that are informative about the present value of permanent income $\bar{P}_i$. The empirical specification will therefore take the general form

$$\log C_i = \alpha + \beta_1 \log Y_i + \beta_2 \log W_i + \beta_3' \tilde{Z}_i + \varepsilon_i \tag{2.7}$$

Interpreted within the canonical model of consumption under certainty, the estimate of β_2 is effectively the elasticity analogue of k, which in turn is a function of R, β, ρ, and remaining lifetime.[2] Equation 2.7 may also represent a more general structure, for example where uncertainty is present and the precautionary motive for saving is at work. In this case, the estimates for β_1 and β_2 will be tempered by precautionary considerations in addition to consumption smoothing. The goal is not to test different consumption theories however, but rather to propose an empirical specification that is at least in line with the simplest model-implied structural form, but at the same time also allows the data to speak.

3 Estimating Wealth Effects

3.1 The Data

The data set is the *Socioeconomic Survey (SES)* conducted in 2010 jointly between the National Statistical Office (NSO) and the Bank of Thailand (BOT), which after cleaning is a cross-section of 11,201 households.[3] The 2010 survey includes both the standard questionnaire used by the NSO in its regular annual survey, as well as a special set of questions designed by the BOT which concerns the household balance sheet composition. The data set allows us a rare peek at the values of various assets held by households, as well as household net worth (the values of assets net of liabilities) which is what W_i represents in the theoretical model.

[2] Knowledge of these parameters coupled with the model prediction $k = \frac{1-R^{-1}(R\beta)^{1/\rho}}{1-(R^{-1}(R\beta)^{1/\rho})^{T-t+1}}$ would enable one to obtain MPC. Nonetheless in the context of Thailand, where there are few microeconomic estimates for preference parameters, a direct estimate of MPC is necessary and will probably yield a more accurate result. For instance, even if it is known for certain $R = 1.05$, $\rho = 0.5$, and $T - t + 1 = 20$, MPC can still vary between 0.03 to 0.3 as β is varied between 1 to 0.8. A small inaccuracy in the estimate of preference parameters can therefore have a significant impact on the estimate of MPC.

[3] Households with income per month in excess of 1 million baht, in view of other characteristics such as spending, probably report income inaccurately and are therefore removed. There are two such households.

For consumption C_i, this paper uses the average monthly total expenditures per household, which includes both consumption and non-consumption spending. The latter category includes voluntary spending such as gifts and insurance premiums, which explains why they are treated as consumption. For observed current income Y_i, the average monthly total income per household is used, which includes income from all sources.[4]

The total value of assets held is computed as the sum of the values of housing and real estate, vehicles, equipments, livestock, and financial assets. This results in a measure of total asset, denoted A_i. In the following, this paper will distinguish between the physical asset A_i^p and the financial asset A_i^f. The total liability L_i is the sum of outstanding mortgages, education loans, vehicle loans, consumption loans, non-farm business loans, farming loans and other loans. Net worth (or wealth in short) can then be defined simply as $W_i = A_i - L_i$. There is a technical problem for those households whose net worth is zero or negative, since logarithmic transformation is not feasible. There are 399 such households, and this paper's approach is to drop them from the sample, leaving 10802 households for estimation.[5]

The *SES* contains a variety of household characteristics that could be correlated with permanent income or other outside-model factors. The household size can be used to control for the scale effect. The age of household head approximates the stage of household's life cycle and consequently its remaining stream of permanent income. Households are split into three age groups, (1) below 30, (2) 30-50, and (3) above 50, and construct three corresponding dummy variables. Only the last two dummies are needed for regression analysis, to measure the effect of belonging to each age group relative to the first age group benchmark.

The job characteristics of a household head should be a very important determinant of permanent income, and therefore three separate groups of dummy variables are included to control for this type of heterogeneity. First, occupation of each household head is classified into four categories, namely (1) labourers or economically inactive, (2) elementary occupation such as craftsman and operators of machines or plants, (3) associate professionals, service workers and skilled workers, and (4) professionals, corporate managers and senior officials. Four dummies are constructed, and the last three are again kept for estimation. This classification, while admittedly arbitrary, is ordered according to the International Standard Classification of Occupation (ISCO 88). A reasonable hypothesis is that permanent income should be increasingly higher for latter groups.

[4] An inspection of the data suggests that this measure, which is reported in the NSO questionnaire (code name B17), is more reliable than the *total income* reported in the BOT survey (FP39), which does not ask for breakdowns of income sources and is more irregular probably due to this reason.

[5] Bostic et al. (2007) encounter the same problem, but argue that provided A_i and L_i are both log-normal, then $A_i - L_i$ is a normal variable which can be included in the specification outright. This paper however opts to drop this relatively small subset of households, and interprets the results as applicable to households with at least some net positive wealth. Incidentally, the sample distribution of $\log W_i$ has a long left tail and is unlikely to be normal.

Another set of two dummies is introduced to capture the influence of household heads working in the (1) manufacturing and (2) service sectors, relative to the agricultural sector benchmark. Two more dummies measure the effects of household heads being (1) employees and (2) entrepreneurs, relative to being unemployed.

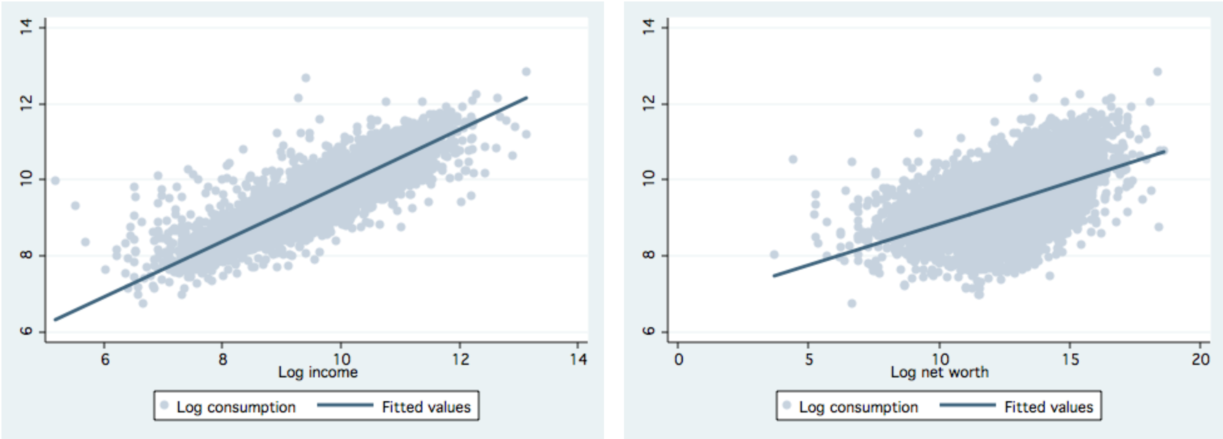
The maximum education attainment of each household head is divided into three levels: (1) Primary education or lower, (2) Secondary education, (3) University degrees or vocational training, and dummy variables are constructed for these three education levels. Again the last two dummies are retained for regression. Next three dummy variables are defined and retained, corresponding to the regions in which households live, namely (1) Central, (2) South and (3) Bangkok, to measure the geographical impact on permanent income relative to living in North or North East. Another dummy is introduced to identify whether households live within the municipal areas or not. The last dummy tracks whether households own their homes or hold some form of mortgages. In total, these household characteristics make up a vector $\tilde{Z}_i$ of 17 variables, designed to control for various sources of heterogeneity across households.

$$\tilde{Z}_i = \begin{cases} \text{Household size} \\ \text{2 age dummies} \\ \text{3 occupation dummies} \\ \text{2 sector dummies} \\ \text{2 employment status dummies} \\ \text{2 education dummies} \\ \text{3 regional dummies} \\ \text{Municipal area dummy} \\ \text{Home ownership dummy} \end{cases}$$

The SES is collected using stratified sampling method, and therefore each household is assigned a weight by the NSO. Since the objective is to measure wealth effect at the national level, all reported results will be based on weighted least-squares in the following.

3.2 Main Results

The basic relationship between $\log C_i$ versus $\log Y_i$ and $\log W_i$ are robust and positive as depicted in Figure 1 which shows scatter plots against linear fitted lines. Linear relationship appears to do a reasonable job in describing the cross-section of log variables. This is in sharp contrast to the relationship in alternative scales, such as C_i versus Y_i, or C_i/Y_i against W_i/Y_i, which are even by casual observation incongruent with linearity. The Box-Cox regression model also gives an estimate for parameter θ of -0.075, a lot



(a) $\log C_i$ against $\log Y_i$ **(b)** $\log C_i$ against $\log W_i$

Figure 1: Consumption versus income and wealth

closer to 0 than to 1, suggesting that the dependent variable is $\log C_i$ rather than C_i.[6] This justifies the chosen log-linear functional form as the appropriate specification.

Income explains about 78% of variations in consumption - a simple regression of $\log C_i$ on $\log Y_i$ yields an R^2 of 0.78. The elasticity of consumption to income alone is 0.73. This result is in line with international stylized facts where, cross-sectionally, consumption can typically be explained well by a Keynesian-type consumption function (see Romer (2005)). A similar finding for Thai data justifies the choice of current income as one proxy for the permanent income. On the other hand, wealth accounts for 20% of consumption variability, and the elasticity of consumption to wealth is lower at around 0.20.

The sensitivity of consumption to wealth is significantly lower after conditioning for income. The first column of Table 1 (Specification I) shows the estimation result when $\log Y_i$ is the only proxy for permanent income. The elasticity of consumption to wealth drops to 0.025, while the elasticity to income remains high at around 0.710. These estimates provide crude baseline estimates for the order of magnitude of income versus wealth effects on consumption decision when both are jointly estimated. Income seems to matter a lot more.

Of course this simple specification will most likely yield inconsistent estimates, as it omits factors such as education or age which are important determinants of future permanent income and hence consumption, and are likely to be correlated to both current income and wealth. Therefore there is likely to be an omitted variable bias problem.

Specification IV is designed to correct this problem by controlling for various sources of household heterogeneity, as captured by observed household characteristics $\tilde{Z}_i$. Conditioning on $\tilde{Z}_i$, the elasticity of consumption to wealth is larger at 0.058. Income matters

[6]Recall that the Box-Cox transformation specifies the dependent variable as $(C_i^\theta - 1)/\theta$ which converges to $\log C_i$ as $\theta \to 0$ and $C_i - 1$ as $\theta \to 1$.

Table 1: Wealth effect on consumption

$\log C_i$	Specifications					
	I	II	III	IV	V	VI
$\log Y_i$	0.710	0.703	0.706	0.573	0.558	0.564
$\log W_i$	0.025			0.058		
$\log A_i$		0.030			0.073	
$\log A_i^p$			0.018			0.048
$\log A_i^f$			0.005			0.009
Household size				0.048	0.047	0.047
Age 30-50				0.031	0.019	0.024
Age>50				-0.035	-0.050	-0.040
Occ: elementary				0.046	0.035	0.043
Occ: associate				0.053	0.048	0.053
Occ: professional				0.083	0.072	0.082
Sec: manufacturing				0.044	0.045	0.044
Sec: services				0.051	0.050	0.048
Emp: employees				-0.014	-0.013	-0.025
Emp: enterpreneurs				-0.052	-0.055	-0.063
Edu: highschool				0.078	0.074	0.077
Edu: university				0.120	0.105	0.116
Region: central				0.148	0.145	0.150
Region: south				0.098	0.103	0.105
Region: Bangkok				0.235	0.232	0.241
Municipal area				0.041	0.038	0.040
Home ownership				-0.053	-0.077	-0.057
Constant	2.406	2.403	2.493	3.007	3.000	3.163
R^2	0.781	0.799	0.781	0.813	0.815	0.813
N	10801	11187	11200	10797	11183	11195

[a] All estimates are significant at 0.00001 level of confidence, and hence t-statistics are not shown.

less compared to the baseline, but remains the single most important determinant of consumption with elasticity of 0.573, about 10 times larger than the wealth elasticity. These are the main results of this paper.

All estimates reported in Table 1 are statistically highly significant, with t-statistics (not shown) higher than 40 in all cases. These high t-values are partly a byproduct of using weights which result in a very large effective sample size, in the range of about 18-20 million households. However, when the same specifications are estimated without weighting, all included variables remain statistically highly significant.

The impact of each component of $\tilde{Z}_i$ in Specification IV can be interpreted as follows. A greater number of household members increases consumption as expected, for the obvious reason that household size raises the scale of household future permanent income. The impact of age on consumption varies, depending on the stage of household life cycle. The households in the 'prime' working age of 30-50 years old consume the most followed by younger households, whereas those older than 50 years old consume the least. The dependence of consumption on age runs counter to the prediction of life cycle hypothesis (Modigliani and Brumberg (1954)), which conjectures that households should smooth out consumption over life time, and hence consumption should be independent of age after conditioning for different levels of permanent income. This finding is certainly not the first to document evidence against the life cycle hypothesis: simple age profiles of consumption in many countries are known to exhibit similar pattern, with consumption rising steadily with age before withering away towards retirement (see Deaton (1997)). A variety of outside-model factors may account for this observation. For example, the pickup in consumption by about 0.031 in log scale as consumers grow into the 30-50 age bracket may be due to the imperfect capital market, which prevents younger households from borrowing against their future permanent income. A drop in consumption as households reach their retirement age may reflect unobserved factors, such as household preferences that vary with age (for example older households may have less demanding lifestyle and lower need for durable goods), or labour productivity that rises from older cohort to younger ones.

Occupation matters for consumption, most likely because it is a relevant indication of permanent income. Under this hypothesis, professionals earn and consume the most, followed by associate professionals, elementary workers and labourers respectively. Being a professionals raises consumption quite materially, by about 0.083 in log scale compared to being a labourer. Sector in which a household works also determines consumption, again probably via permanent income. Perhaps as generally expected to be the case in Thailand, service sector is associated with highest consumption, followed closely by manufacturing sector, while agricultural sector trails behind noticeably.

On the other hand, being an entrepreneur is negative for consumption relative to being an employee. Being an employee in turn lowers consumption by 0.014 compared to not having any job. One conjecture is that these dummies are picking up the risk aversion effects, which are important for consumption as recent research demonstrates (see Carroll (2001)). To the extent that working at all raises lifetime permanent income, this positive impact is already fully reflected in the current income, existing wealth, occupation and other characteristics. The remaining effect that cannot be explained by the underlying theory has to do with the uncertainty aspect of jobs. Being an entrepreneur is associated with greatest uncertainty, while an employee still faces the uncertainty of losing job. The greater rationale for precautionary saving when households have more to lose probably results in the estimated negative impact.

Higher education attainment raises consumption considerably as expected, most likely by increasing permanent income. Attending a high school raises consumption by 0.078 in log scale compared to attending a primary school or lower, and going to a university increases consumption further by 0.042 (=0.120-0.078). It should be noted that these positive effects exist even after controlling for occupation and other work-related characteristics. Education therefore appears to pay in and of itself.

The geographical regions, somewhat surprisingly, have the most material impact on consumption. Working in Bangkok, for example, raises consumption by as much as 0.235 in log scale relative to working in the North and North East regions. A natural hypothesis is that regions are a good indicator for available economic opportunities (e.g. in terms of market thickness or positive network externalities), which in turn predict future permanent income and hence consumption. Under this interpretation, economic opportunities are least favourable in the North and North East regions, and increasingly better in the South, Central and Bangkok respectively. [7] The same hypothesis also helps explain why living in the municipal area raises consumption, although the impact is not as large as living in the right regions.

Lastly, full ownership of one's home lowers consumption, relative to taking some mortgages or renting. A possible explanation is that home ownership exposes households more directly to home and land price fluctuations, raising the volatility of net worth and providing a motive for precautionary saving.

While the estimated effect of each component of $\tilde{Z}_i$ can be rationalized and reconciled with coherent economic postulates, it should be stressed that $\tilde{Z}_i$ is introduced primarily to control for household heterogeneity relevant for permanent income. The ultimate objective remains to derive a consistent estimate for wealth elasticity, by avoiding the problem of omitted variables. This paper has experimented with a variety of other controlling variables, and found that the estimated wealth effect was in all cases similar to that reported in Table 1.

3.3 Physical versus Financial Wealth Effects

Many previous studies of wealth effects on consumption often use total value of assets rather than net worth as the measure of wealth (a primary example being the landmark Case et al. (2005)). Despite being inconsistent with the underlying theory, this paper reports comparable estimates in Specifications II and V, Table 1. The elasticities of consumption to total asset are 0.030 and 0.073 respectively, both higher than those in Specifications I and IV, suggesting that the failure to measure net worth properly may result in an overestimation of wealth effect on consumption. Despite the bias, it should be noted that the wealth elasticity is still only a small fraction of income elasticity.

One virtue of using total asset value for wealth is that it can be readily split into the

[7] The results should be contrasted with the distribution of current income which ranks the South above the Central region.

physical and financial categories (A_i^p and A_i^f respectively), which allows an investigation of their relative importance. Specifications III and VI show that physical assets matter for consumption more than financial assets about 4-5 times in terms of elasticity. The result echoes the findings of Case et al. (2005) and others who found the impact of housing wealth to be much more important than financial wealth. One interpretation is that physical assets play an additional role of generating permanent income for households, while financial assets are held largely as a store of wealth. Since physical assets are correlated more with the present value of permanent income, they affect consumption more.

In the above exercise, it would have been more logical in principles to construct net worth measures corresponding to physical and financial categories, say W_i^p and W_i^f. However the physical-financial distinction is inherently an asset concept, and there is not always a clean division in the case of liabilities, at least as recorded in the SES data. Business loans, for example, may be used for either investments in equipments or held in financial forms. Notwithstanding these difficulties, this paper adopts an arbitrary convention that only housing and vehicle loans are grouped as the physical debt, whilst the rest is considered financial debt. Such division unfortunately implies negative financial wealth for as many as 3,701 households, rendering logarithmic transformation impossible for a very large subset of total sample.

If one insists on dropping those households with negative financial net worth from the sample in order to apply logs transformation, the results are as reported in the first two columns of Table 2 (the detailed listing of $\tilde{Z}_i$ is suppressed). The estimated wealth effects coming from physical wealth become less important than financial wealth according to Specification VII, but are more important according to Specification VIII after conditioning for household characteristics $\tilde{Z}_i$. Special caution must be exercised in interpreting these results however, since they are derived from only 7,384 households, less than 60 per cent of the entire sample. In particular, the importance of financial wealth may be overstated from selection bias, since the dropped households with negative financial wealth may be precisely those whose physical wealth is healthier and are better positioned to withstand financial wealth shocks without adjusting consumption than an average household.

Given the potential selection bias problems, this paper follows the approach of Bostic et al. (2007) and includes W_i^p and W_i^f in the specifications outright as an additional check for robustness (see the rationales and comments in footnote 5). These are Specifications IX and X in Table 2, which retain full sample. In this case, the financial wealth effect appears to be 3-10 times weaker than the physical wealth effect. Since those specifications which control for household heterogeneity are less prone to omitted variable bias, my overall assessment is that physical wealth likely plays a more prominent role in determining household consumption than financial wealth. This assessment is consistent

Table 2: Physical versus financial wealth effects

$\log C_i$	Specifications			
	VII	VIII	IX	X
$\log Y_i$	0.683	0.540	0.719	0.613
$\log W_i^p$	0.011	0.048		
$\log W_i^f$	0.031	0.032		
W_i^p			1.41×10^{-8}	1.51×10^{-8}
W_i^f			5.30×10^{-9}	1.31×10^{-9}
$\tilde{Z}_i$		Yes		Yes
Constant	2.529	3.158	2.639	3.305
R^2	0.799	0.834	0.780	0.806
N	7384	7381	11200	11195

[a] All estimates are significant at 0.00001 level of confidence, and hence t-statistics are not shown.

(a) A single structural break

(b) Non-constant elasticity

Figure 2: Nonlinear wealth effects on consumption

with results reported in Table 1. Quantifying the relative importance is subject to high uncertainty. The estimates based on specifications controlling for $\tilde{Z}_i$ suggest that physical wealth elasticity is larger than that of financial wealth by a (wide) range of 1.5-10 times.

3.4 Nonlinearity of Wealth Effects

Figure 1 shows that while the pattern of consumption as a function of income appears to be stable across all levels of income, the same cannot be said with the same degree of conviction about consumption as a function of wealth. Figure 2a reproduces Figure 1b but plots two fitted lines, one corresponding to the sub-sample of households with $\log W_i$ less than mean, with the other corresponding to the rest of the sample. The break in the slope of fitted lines suggests that the degree of wealth effect may depend on the level of wealth. Alternatively, one can model the dependence of wealth effect on the scale of wealth, by considering nonlinear consumption function. Figure 2b shows the fitted values when $\log C_i$ is regressed on $(\log W_i)^2$ and $(\log W_i)^3$. In each case, the goodness of fit improves from that under linear model (R^2 increases from 0.24 to 0.26 and 0.27 respectively). The predicted values from nonparametric kernel estimation, plotted in the same diagram, also suggest that these power functions may explain the data better than a linear one. This subsection quantitatively assesses the extent of nonlinearity of wealth effect.

The general specification allowing for nonlinear wealth effect takes the form:

$$\log C_i = \alpha + \beta_1 \log Y_i + \beta_2(W_i) \log W_i + \beta_3' \tilde{Z}_i + \varepsilon_i \tag{3.1}$$

where $\beta_2(W_i)$ is increasing in W_i. Two special cases will be examined, namely (i) there is a structural break in wealth effect, i.e. $\beta_2(W_i) = \beta^L$ if $W_i < W^*$ and $\beta_2(W_i) = \beta^H > \beta^L$ otherwise, and (2) wealth elasticity is non-constant and grows as a power function of wealth, i.e. $\beta_2(W_i) = \beta_2 \times (\log W_i)^\gamma$, $\gamma > 0$. In the first case, estimation involves a dummy variable, whereas the second case implies that consumption is a power function of wealth.

In examining a potential break in β_2, this paper works with a simplifying assumption that the break point is known to be at the sample mean of wealth distribution. In view of this hypothesis, a dummy variable D_i^w is defined corresponding to the households with net worth in log terms at or above the sample average of 12.89. The dummy is then interacted with $\log W_i$, giving rise to the specification

$$\log C_i = \alpha + \beta_1 \log Y_i + \gamma_1 \log W_i + \gamma_2 D_i^w + \gamma_3 D_i^w \log W_i + \beta_3' \tilde{Z}_i + \varepsilon_i \tag{3.2}$$

In other words, wealth elasticity is given by $\beta_2(W_i) = \gamma_1$ if $W_i < \exp(12.89)$, and $\beta_2(W_i) = \gamma_1 + \gamma_3$ otherwise. The estimated results, both when β_3 are and are not restricted to zero, are reported in Table 3 (again coefficients for $\tilde{Z}_i$ are not shown). In Specification XI, which does not control for household characteristics, the estimated wealth effect for households with below-average wealth is found to be very negligible, in fact slightly negative (-0.002). Only the sufficiently wealthy households have consumption that is sensitive to wealth (the coefficient of the interacting term is positive and significant at 0.071). This nonlinear wealth effect is preserved after conditioning for $\tilde{Z}_i$ in Specification XII. In this case, households with below-average wealth exhibit more material wealth effect, with elasticity of 0.030. The wealthier households however display wealth effect more than twice as strong, with elasticity of 0.081 (=0.030+0.051). The weighted average of wealth elasticities of the two groups is 0.059, which is almost identical to the baseline

Table 3: Nonlinear wealth effects

$\log C_i$	Specifications			
	XI	XII	XIII	XIV
$\log Y_i$	0.696	0.563	0.700	0.566
$\log W_i$	-0.002	0.030		
D_i^w	-0.901	-0.610		
$D_i^w \log W_i$	0.071	0.051		
$(\log W_i)^\gamma$			2.28×10^{-9}	0.000078
γ			6.674	3.186
$\tilde{Z}_i$		Yes		Yes
Constant	2.847	3.396	2.756	3.547
R^2	0.783	0.815	0.782	0.814
N	10801	10797	10801	10797

[a] All estimates are significant at 0.00001 level of confidence, and hence t-statistics are not shown.
[b] D_i^w is a dummy variable defined to be 1 for households with $W_i > 12.89$.
[c] The sixth row (with heading "γ") reports estimates for γ obtained from nonlinear least squares, performed on equation 3.3.

estimate under no structural break. Chow test for a structural break can be performed here, by testing whether the dummy and the interacting term are jointly significantly different from zero. The test strongly rejects the null hypothesis of no break.

The other method of modeling nonlinearity is to fit consumption against a power function of wealth, and estimate the following specification:

$$\log C_i = \alpha + \beta_1 \log Y_i + \beta_2 (\log W_i)^\gamma + \beta_3' \tilde{Z}_i + \varepsilon_i \tag{3.3}$$

All parameters including γ are estimated jointly by nonlinear least squares, and results are reported in the last two columns of Table 3. All estimates are highly significant and quite robust against different starting values for γ.[8] In Specification XIII, a very high degree of nonlinearity in wealth is needed to explain variation in consumption, with γ as high as 6.674. After conditioning on $\tilde{Z}_i$, γ is found to be less extreme at 3.186 according to Specification XIV. In this primary case, consumption is roughly a cubic function of net wealth, or equivalently wealth elasticity rises quadratically with the level of wealth. The distribution of wealth elasticity can be readily constructed from the distribution of wealth, and has a support of $[0.0013 - 0.046]$ with mean of 0.021. One implication is that if wealth effect is a quadratic function of wealth rather than a constant, the average

[8] There are other local optima in which fitted consumption is a concave function of wealth, for example when both β_2 and γ are jointly negative or when $\gamma < 1$. However in all these cases, the sums of squared errors are larger than the reported results, and are therefore discarded as globally suboptimal.

wealth effect is likely to be lower than the baseline estimate of 0.058. Likelihood ratio test indeed strongly rejects the null hypothesis of $\gamma = 1$.

These results provide some evidence that higher wealth may be associated with stronger wealth effect. What could be the causes of this nonlinearity? The theoretical prediction in equation 2.5 certainly does not account for why k should vary with W_i. One way to reconcile this dependence is to admit the possibility that W_i may itself be a determinant of present-valued permanent income $\bar{P}_i$. In this case W_i affects consumption through two distinct channels: (1) directly through higher non-human wealth (with MPC=k), and (2) by changing $\bar{P}_i$ which affects consumption further. If $\bar{P}_i$ is increasing in W_i, and at an increasing rate, then wealthier households are more sensitive to wealth shocks, because changes in wealth have more significant implications for future permanent income.

Greater wealth is often associated with better future opportunity. For example it allows more investment in the human capital of household members, which raises the household's expected permanent income profile. Greater wealth also raises social status, potentially opens up closer networking with similarly wealthy households and increases the future streams of permanent income. This dependence of future permanent income on wealth will furthermore be nonlinear if access to future opportunity is itself enhanced by greater wealth, for example by the segregation of schooling quality and agglomeration of class network. Schools in Thailand vary substantially in terms of quality, and parents are usually willing to pay a large premium to enroll their children into schools of choice. Only when they have enough financial means, can their wealth be invested profitably to raise the future permanent income of their offsprings. But once they do, any additional wealth will start to imply much higher present-valued permanent income, generating a higher wealth effect for these households. Similarly, class agglomeration implies a minimum threshold of wealth before membership to the exclusive class can be granted. For these reasons, a small gain in wealth of a poor household is unlikely to significantly change the education opportunity for its members or instantly lifts its social status. A minimum amount of wealth must be reached before its impact on permanent income can be felt.

Another factor contributing to the nonlinearity in wealth effect is the imperfection of capital market. While all households may want to increase their consumption in response to a positive shock to wealth, those with little net worth may be more credit constrained and cannot expand their consumption as much compared to wealthier households. Higher wealth relaxes this constraint, probably by lessening the asymmetric information concerns via higher collaterals, and therefore allows consumption to respond to wealth by more. In the literature, this is often referred to as the collateral channel of wealth effect (see Paiella (2009) for example).

Table 4: Wealth effects by household characteristics

$\log C_i$	Specifications							
	XV	XVI	XVII	XVIII	XIX	XX	XXI	XXII
	Age	Occ	Ind	Emp	Edu	Region	Muni	Home
$\log Y_i$	0.572	0.572	0.573	0.572	0.574	0.572	0.573	0.596
$\log W_i$	0.044	0.063	0.056	0.066	0.059	0.061	0.060	0.040
$D_i^1 \log W_i$	0.017	-0.008	0.002	-0.011	-0.001	-0.007	-0.004	0.038
$D_i^2 \log W_i$	0.016	-0.007	0.003	-0.008	-0.008	0.014		
$D_i^3 \log W_i$		0.002				-0.011		
$\tilde{Z}_i$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	3.181	2.959	3.036	2.917	2.988	2.983	2.984	3.279
R^2	0.813	0.813	0.813	0.813	0.813	0.813	0.813	0.814
N	10797	10797	10797	10797	10797	10797	10797	10797

[a] All estimates are significant at 0.00001 level of confidence, and hence t-statistics are not shown.
[b] D_i^n is the n-th dummy variable corresponding to the variable at the top of column.

3.5 Wealth Effects by Household Characteristics

The apparent nonlinearity of wealth effects naturally raises a related question. Does the degree of wealth effect vary with household characteristics? If so, which characteristics can best explain the variation in wealth effects across households? In answering these questions, the strategy is to interact each of the eight sets of household characteristics dummies with $\log W_i$, to assess empirically whether the heterogeneity in these characteristics leads to different degrees of wealth effects. The interaction terms are augmented to the baseline Specification IV. The results are reported in Table 4, where each column corresponds to each set of dummies.

Specification XV is essentially Specification IV augmented by interacting terms between the two age dummies and $\log W_i$. Variables D_i^1 and D_i^2 are ordered the same way as in $\tilde{Z}_i$, so they represent dummies for age groups 30-50 and >50 respectively. The results indicate that households older than 30 years old exhibit a larger degree of wealth effect compared to their younger counterparts. Between 30-50 and >50 age groups, the wealth elasticity appears to be similar. It may be argued that older households should have less room to smooth their consumption given lower remaining incoming flow of permanent income, and must therefore adjust consumption by more in response to any shock to wealth. While this hypothesis is able to explain why households younger than 30 years old should have a lower wealth elasticity, it still cannot explain the similarity between wealth effects among the last two age groups however.

Heterogeneity in terms of occupation, industry, employment status, education and

Table 5: Wealth effects by expenditure types

	Specifications			
	XXIII	XXIV	XXV	XXVI
	$\log C_i^{goods}$	$\log C_i^{services}$	$\log C_i^{durable}$	$\log C_i^{non-durable}$
$\log Y_i$	0.461	0.576	1.058	0.320
$\log W_i$	0.053	0.082	0.120	0.033
$\tilde{Z}_i$	Yes	Yes	Yes	Yes
Constant	3.365	1.510	-4.785	4.551
R^2	0.669	0.696	0.362	0.639
N	10797	10797	9542	10797

[a] All estimates are significant at 0.00001 level of confidence, and hence t-statistics are not shown.

municipality area generally implies only a small variation in the wealth elasticity. In other words, wealth effects are more or less uniform across households despite differences in these characteristics. Regions appear to have a more noticeable effect, with Bangkok having the smallest wealth elasticity, while the South having the largest. This could be due to better financial literacy and better access to financial services in Bangkok, while households in the South may be subject to higher income uncertainty (due for example to higher sensitivity to crop prices) that in turn requires them to adjust to wealth shocks by relatively more.

Owning a home almost doubles the wealth elasticity. This results is perhaps to be expected given the previous conjecture that owning a house exposes households to fluctuations in house prices. With more uncertainty to manage, these households have less capability to absorb shocks to their wealth, and therefore have consumption that is more sensitive to wealth.

3.6 Wealth Effects by Expenditure Types

All the specifications estimated so far exclusively focus on the effect that wealth has on *total* consumption. This section will now explore the wealth effects on different types of consumption expenditures, and seek to identify the type of consumption that is relatively more sensitive to wealth shocks. Of particular interests are the relative wealth effects on consumption of goods C_i^{goods} versus services $C_i^{services}$, and the relative wealth effects on consumption of durable goods $C_i^{durable}$ versus non-durable goods $C_i^{non-durable}$. Specification IV are therefore re-estimated with the dependent variable replaced by $\log C_i^{goods}$, $\log C_i^{services}$, $\log C_i^{durable}$ and $\log C_i^{non-durable}$ respectively. The results are reported in Table 5.

The estimation results suggest that wealth shocks have stronger effects on consumption of services than on consumption of goods. After controlling for household characteristics, the wealth elasticity for consumption of services is 0.082 while for consumption of goods, the elasticity is 0.053. The imperfect substitutability between goods and services, coupled with the fact that services are luxury goods, provides one explanation for the result. In other words, households optimally choose to adjust consumption of services first to absorb shocks to wealth, in order to smooth out consumption of goods which are deemed to be more necessary.

On the other hand, wealth effect on consumption of durable goods is much stronger than is the case for non-durable goods, according to Specifications XXV and XXVI. The estimated wealth elasticity for durable goods at 0.120 is the largest estimate of wealth effect so far, and is about four times larger than the elasticity for non-durable goods. There are at least two caveats regarding this estimate however. Firstly, 1,304 households report no purchase of durable goods during the survey, and must be left out of the sample as they cannot be log-transformed. This raises the possibility of selection bias, if households that do not buy durable goods are also more immune to wealth shocks. Secondly, and more importantly, consumption of durable goods is relatively poorly explained by the specification, with R^2 of only 0.362. That income, wealth, and other household characteristics jointly can explain so little of durable goods consumption suggests that the purchase of this type of goods may be closer to an investment decision than consumption.

4 Discussion

The estimates of wealth effects on total consumption, although varying with households' specific features such as net worth or age, are generally in the same order of magnitude, being no more than 0.07 in elasticity terms. In all cases, the wealth elasticity is in the region of about 10 times smaller than income elasticity. This section will now critically evaluate the estimates obtained, and discuss their quantitative implications.

4.1 Econometric Issues

One pertinent question is whether the estimate of wealth elasticity is subject to downward bias because some econometric issues are unaccounted for? Potential problems that could lead to biases include (1) endogeneity, (2) measurement error, and (3) omitted variables.

Endogeneity problem arises if wealth itself also depends on consumption. For example, if in addition to the structural form underlying equation 2.7 there is another structural relationship

$$\log W_i = \gamma_0 + \gamma_1 \log C_i + \eta_i \tag{4.1}$$

The concern is that if relationship like 4.1 indeed exists, equation 2.7 is only a reduced form and OLS estimation would yield an inconsistent estimate for the wealth elasticity. However, the endogeneity of wealth has already been taken into account in the derivation of the structural form 2.7, where wealth W_i is a state variable, evolving over time as a function past incomes and past consumption decisions. Current wealth is essentially last-period wealth plus last-period net saving. Thus, the process governing current wealth is no more than an accounting relationship, and does not entail any intra-period behavioural relationship that requires additional estimation (beyond that of consumption function 2.7). When interpreted cross-sectionally, wealth can consequently be taken as an exogenous variable, a quantity that households inherit from last period. Therefore, according to the standard theory of consumption, no meaningful structural relationship such as equation 4.1 can exist. The only exception is if one argues that $\gamma_1 \log C_i + \eta_i$ describes the shock to otherwise exogenously determined wealth. In this case, the estimated wealth effect computed from the reduced form ($\frac{\beta_2}{1-\beta_2\gamma_1}$) would be biased downwards and less than the true wealth effect β_2 if and only if $\gamma_1 < 0$. This author is not aware of a theory of consumption which predicts that in general more consumption would lead to more frequent negative shocks to wealth. Furthermore, the size of downward bias, even if one exists, is very unlikely to be large. For example, in the case of $\gamma_1 = -1$, the reduced form estimate of wealth effect of 0.06 would correspond to the true wealth effect of 0.064, which is still the same order of magnitude.

Another kind of endogeneity often pointed out in the literature is when wealth affects consumption via channels other than directly. In the context of the theoretical framework above, this means that equation 2.6 in fact takes the form

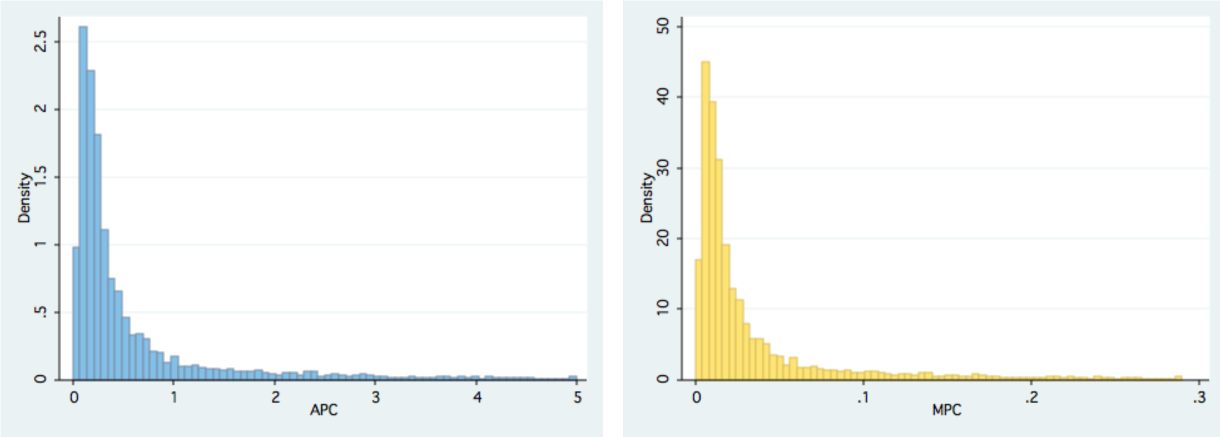
$$C_i = kW_i + k\Psi(Z_i(W_i), W_i) \tag{4.2}$$

For example, Poterba (2000) suggests that stock market wealth may indirectly influence consumption if those households who buy stocks may be in the financial service sector and may benefit from a rise in stock prices through higher demand for their services rather than direct wealth effect. In this instance, Ψ depends on W_i as well as Z_i. Paiella (2009) refers to this as the *income growth* effect, and also discusses other indirect wealth effects, such as *collateral channel*, where wealth shocks relax credit constraints and affect consumption. One can add to the list of concerns another possibility that household characteristics may themselves be a function of wealth, namely $Z_i(W_i)$. For example, becoming entrepreneurs or living in the municipal area may require a certain level of wealth, which implies that $Z_i(W_i)$ may be endogenous variables. A common argument in the literature is that unless these sources of endogeneity are taken into account, the estimated wealth effect will depart from the intended measure of *direct wealth effect* which may be the quantity of interest. There are three observations regarding this argument.

Firstly, for income growth effect, collateral channel and any other positive indirect effect, the reduced-form estimate of wealth effect will be above the 'direct wealth effect' since Ψ is increasing in its second argument. This potential overestimation is arguably less of a concern in the present study, where wealth effect is anyhow found to be on the low side. Secondly, and on a related note, it is not clear why one should exclusively be interested in the 'direct wealth effect', especially if the object of interest is the long-run effect on consumption of a permanent wealth shock, as is the case in the present study. The reduced form will pick up the aggregate effect of W_i on C_i both directly, and through Ψ. Indeed, in the discussion of nonlinear and heterogeneous wealth effects above, these indirect wealth effects are intentionally invoked to explain the results. Finally, to the extent that $Z_i(W_i)$ depends on W_i, the problem with specification such as 2.7 is that of multicollinearity and does not invalidate the use of ordinary least squares. Moreover standard symptoms of multicollinearity, such as oversensitivity of estimates to addition/deletion of a variable, are generally not present in any case.

With regards to measurement error problem, this paper is more agnostic. The problem is certainly less serious in the case of household characteristics, where reports of age or education should be subject to very small errors. On the other hand, wealth and income are more prone to the problem. If wealth was the only variable measured with error, then the estimated wealth effect on consumption would be subject to the attenuation bias towards zero. For example, in an extreme case where the variance of measurement error is a half of the variance of wealth itself, the attenuation bias formula suggests that the wealth effect is biased downwards by a factor of 2/3. This means that the estimated wealth effect of 0.06 in fact masks the true effect of 0.09. In more realistic cases, with less noisy measurement error, the bias will be smaller. If any independent variable other than wealth is also subject to measurement error, the bias for wealth effect could take any direction, and one should be concerned about an upward bias of estimated wealth effect just as much.

Omitted variable problem is potentially the more serious concern of the three. The strategy of controlling for a large set of observed household characteristics is designed precisely to minimize the extent of this problem. To the extent that there remains unobserved heterogeneity, there is not much that can be done. The unavailability of a panel data of this kind rules out techniques such as difference-in-differences, limiting one's options to simply conditioning on a large number of potential independent variables as has been done. It should be noted however that omitting relevant variables does not automatically imply that the wealth effect is underestimated. The estimate will only be biased downwards if the partial correlation between the omitted variable and wealth is negative (Greene (2008)).



(a) Distribution of APCs

(b) Distribution of MPCs

Figure 3: MPCs out of wealth for constant wealth elasticity

4.2 Elasticity versus Marginal Propensity

There are generally two metrics of wealth effects that have been estimated in the literature: (1) wealth elasticity of consumption, and (2) the marginal propensity to consume out of wealth or MPC. As previously argued, a linear model is a good approximation for the relationship between consumption, income and wealth only in log transformation, at least for Thai data. This means that MPC cannot be directly estimated from a linear regression model without likely incurring a severe misspecification problem. However, the two metrics of wealth effects are related by the identity

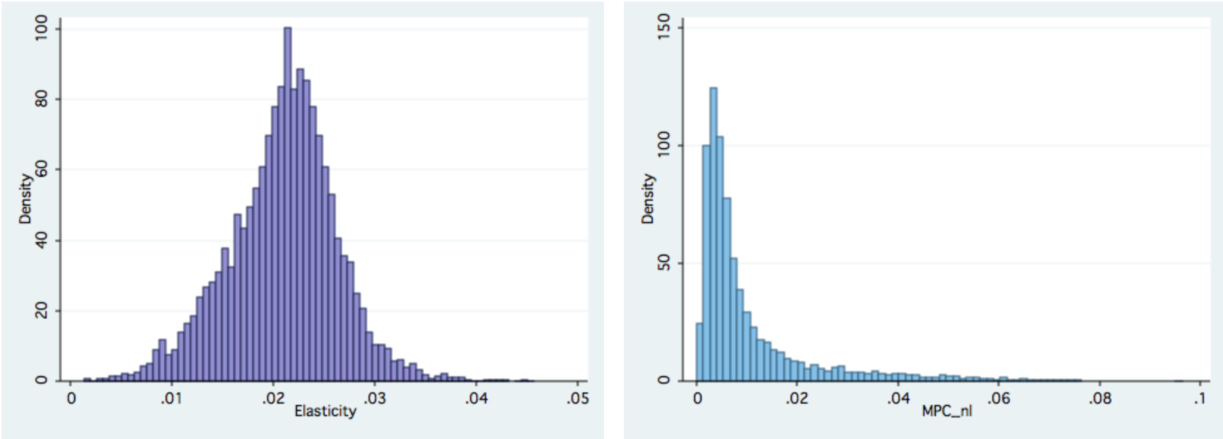
$$\frac{\partial \log C_i}{\partial \log W_i} \equiv \frac{W_i}{C_i}\frac{\partial C_i}{\partial W_i} \tag{4.3}$$

or in other words

$$\text{Marginal propensity} = (\text{Wealth elasticity}) \times (\text{Average propensity}) \tag{4.4}$$

Thus given the knowledge of the average propensity to consume, one can readily convert any metric of wealth effect to the other definition. This section will now attempt to derive MPC as implied by the estimated wealth elasticity.

Equation 4.4 shows that a single estimate of wealth elasticity can be consistent with a range of different MPCs if households have different average propensities to consume (APCs). There is indeed a large degree of dispersion in APCs out of wealth across households. Among those with at least some positive wealth (and hence positive APC), a few hundred households have extremely high APC, in the hundred thousand range. However a vast majority (more than 90%) has APC of no more than 5. Figure 3a plots the weighted histogram of APCs for this latter group of households to show the extent of heterogeneity.



(a) Distribution of wealth elasticity **(b)** Distribution of MPCs

Figure 4: MPCs out of wealth allowing for heterogeneous elasticity

It is apparent that the distribution of APC has a very long right tail, even after censoring the top decile. If wealth elasticity is constant across households at 0.058 as estimated in Specification IV, the implied distribution of MPC is given by Figure 3b which is simply the rescaled version of APC histogram. The sample mean of the implied MPC distribution, conditional on APC being less than 5, is about 0.034. This means that for this group of households, which makes up more than 90% of population, a 100-baht windfall shock to wealth would on average lead to a 3-baht change in consumption per year.

While excluding the top decile of APC from the calculation of MPC may be arbitrary, retaining these very large APCs would imply average MPC of around 416, a clearly flawed estimate. The problem is that the households with the highest APCs are endowed with the least net worth, and therefore are also expected to have the lowest wealth elasticity (recall the previous discussion of nonlinear wealth effect). Applying a constant elasticity of 0.058 to these households will lead to overestimation of their MPCs. Censoring these households from the computation of MPC is one crude way to alleviate this problem, as it amounts to assuming that these households' wealth elasticity is sufficiently low (much lower than 0.058) that despite their high APCs, their average MPC remains similar order of magnitude to 3%.

Another, perhaps less *ad hoc*, approach is to explicitly use the distribution of wealth elasticity under the assumption that the elasticity is a power function of wealth. This distribution is constructed from the nonlinear least squares estimates in Specification XIV, and is plotted in Figure 4a.

Using this distribution of wealth elasticity together with the distribution of APCs yields an implied distribution of MPCs as depicted in Figure 4b. The distribution of MPCs still inherits a long right tail from that of APCs, with maximum value of around 10.65 (not shown in the figure). The mean MPC in this case is 0.02, which is close to the

Table 6: Comparison with selected studies

Study	Country	Type of wealth	Elasticity	MPC
Micro-level survey data				
This study	Thailand	Total	0.06	0.02-0.03
		Physical	0.05	
		Financial	0.01	
Bernanke and Rotemberg (1999)	US	Total		0.04
Dynan and Maki (2001)	US	Equity		0.05-0.15
Maki and Palumbo (2001)	US	Total		0.03-0.05
Attanasio et al. (2009)	UK	Housing	0.04-0.21	
Bostic et al. (2007)	US	Housing	0.06	0.02
		Financial	0.02	
Chucherd (2006)	Thailand	Total	0.12-0.15	
Juster et al. (2005)	US	Housing		0.19
		Equity		0.03
Bover (2007)	Spain	Housing		0.03
Campbell and Cocco (2007)	UK	Housing	1.2	
Paiella (2007)	Italy	Total		0.04
Time-series macro data				
Case et al. (2005)	Advanced	Housing	0.11-0.17	
		Financial	0.00-0.02	
	US	Housing	0.05-0.09	
		Financial	0.03-0.07	
Benjamin et al. (2004)	US	Housing		0.08
		Financial		0.02
Peltonen et al. (2009)	Asia EM	Housing	0.00-0.39	
		Equity	0.05-0.14	
Carroll et al. (2010)	US	Total		0.01-0.07
		Housing		0.02-0.16
		Financial		0.01-0.06

first method's estimate.

4.3 Other Studies

Table 6 compares this paper's estimates to the findings of other selected studies. In general, the results in this paper appear to be broadly in line with estimated wealth effects found in other countries in terms of both elasticity and MPC. Furthermore, the finding that physical wealth such as housing wealth matters to consumption a lot more than financial wealth, is strongly echoed in other studies.

Chucherd (2006) is, to my knowledge, the only previous study on wealth effect in Thailand that is also based on the SES. The author drew on the three surveys conducted in 1998, 2002 and 2004, which unfortunately did not contain questions about assets.

Values of assets were therefore indirectly estimated from rent and interest data. The specification used is also different from the ones adopted in this paper, as wealth effect is measured by how the average propensity to consume out of income responds to the asset-to-income ratio. These reasons may account for the differences between the estimates in this paper and that of Chucherd (2006).[9]

Another notable point of departure from Chucherd (2006) is the estimate of wealth effect by expenditure types. This paper finds the wealth effect on durable goods consumption to be not only positive and statistically significant, but also much more pronounced compared to that on nondurable goods consumption. Indeed, the estimated wealth effect on durable goods consumption of 0.120 is the largest estimate among all specifications examined in this paper. This is in sharp contrast to Chucherd (2006) which found a negative wealth effect on consumption of durable goods, which the author then justified as being due to extraordinary boost in spending by low-income households post-1997 crisis. This exceptional pattern does not manifest itself in this study.

Another interesting benchmark is Peltonen et al. (2009), who use quarterly data on macroeconomic quantities to construct a panel of Emerging Market economies in Asia, including Thailand. House prices and stock prices are used as proxies for housing and financial wealth respectively. The dynamic panel specification also allows the authors to distinguish between short-run and long-run wealth effects. In the case of Thailand, the short-run housing wealth elasticity is 0.09, whereas that of stock market wealth is 0.02. In the long-run, the corresponding estimates are much higher at 0.39 and 0.09 respectively. In comparison, these estimates are much higher than those obtained in this paper (which should be interpreted as long-run elasticity estimates). It is well-known however, that an accurate estimate of long-run relationship usually requires a long time-series data, whereas the authors have to make do with 36 observations for Thailand. The wealth effects also vary very significantly across countries in their study. For example, housing wealth has no significant impact on consumption for China, South Korea, and Taiwan. Thailand is also the only case where housing wealth effect is found to be noticeably more important than the equity wealth effect, whereas for the majority of countries, the opposite is true. This latter result seems to be in disagreement with findings for other countries, where housing wealth effect is almost uniformly found to be larger. Further investigation seems to be warranted.

[9] Chucherd (2006) in fact reports total wealth effect of 1.4-1.8% in 'yearly basis', after annualizing the estimated coefficient for monthly consumption of 0.12-0.15. If the specification is indeed in log terms (which seems to be the case, given the author's interpretation of estimated wealth effect as an elasticity), annualizing is in fact not necessary, and hence the original unadjusted estimate is reported here.

5 Conclusions

This paper proposes a framework and an empirical strategy for estimating wealth effects from microeconomic survey data in Thailand. The availability of information about households' assets enable a more accurate quantification of the importance of wealth on consumption. The average impact of wealth is statistically significant, of magnitude about 0.06 in terms of elasticity and 0.02-0.03 in terms of the marginal propensity to consume. There is some evidence that wealth effect is nonlinear, and increases with the level of existing wealth. Some household-level characteristics can help explain differences in wealth effects as well, such as age, region and home ownership. Physical wealth, which is predominantly housing wealth, has a larger impact on consumption than financial wealth, broadly consistent with the body of international evidence. In terms of expenditure types, consumption of services is found to be more sensitive to wealth compared to that of goods, and consumption of durable goods responds more to wealth relative to nondurable goods consumption.

This micro-level study provides one perspective on the importance of wealth on aggregate variable, which should be of interests to macroeconomists. The estimates provide off-the-shelf ballpark for estimating the macroeconomic consequences of wealth shocks such as asset price movements, natural disasters, wealth redistribution policy, or other off-model impulses. The estimates can also be useful in a formal forecasting application, as they provide additional identifying restrictions. For example, the estimated wealth effects can be used to anchor the long-run steady state impact on consumption of a permanent wealth shock in macroeconomic models used for forecasting. Alternatively, the estimates can also be used to inform forecasters of certain qualitative pattern, such as the relative importance of each type of wealth shock, or the types of consumption that are most sensitive to these shocks, which will help put discipline on the exercise and consequently improve forecasting performance. In the future line of research, it would be useful to pursue other approaches of estimating wealth impact on consumption. The time-series approach in particular would be a welcomed complement to results obtained in this paper, and would also serve as an additional benchmark for comparison.

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A Data Codes

Variables	Description	Data codes
C_i	Average monthly total expenditures per household	$A07$
Y_i	Average monthly total income per household	$B17$
A_i : Housing	Value of housing and real estate	$BT02 + BT07$
A_i : Vehicles	Value of vehicles owned	$BT12$
A_i : Equipments	Value of equipments owned	$BT17 + BT22$
A_i : Livestock	Value of livestock owned	$BT12$
A_i : Financial	Value of financial assets	$BT29 + BT31 + BT33 + BT35 + BT37 + BT39 + BT41 + BT43 + BT45 + BT47$
L_i : Mortgages	Value of mortgages	$BT74 + BT77$
L_i : Education	Value of education loans	$BT81 + BT84$
L_i : Vehicles	Value of vehicle loans	$BT88 + BT91$
L_i : Consumption	Value of consumption loans	$BT95 + BT98$
L_i : Non-farm	Value of non-farm business loans	$BT102 + BT105$
L_i : Farm	Value of farming loans	$BT109 + BT112$
L_i : Others	Value of other loans	$BT116 + BT119$
$\tilde{Z}_i$: Household size	Household size	$HM01$ (maximum order)
$\tilde{Z}_i$: Age	Age of household head	$HM04$ (head)
$\tilde{Z}_i$: Occupation	Occupation of household head	$HM36$ (head)
$\tilde{Z}_i$: Sector	Types of industry (agriculture, manufacturing or services)	$HM38$ (head)
$\tilde{Z}_i$: Employment	Employment status of household head (unemployed, employees or employers)	$HM37$ (head)
$\tilde{Z}_i$: Education	Education of household head	$C04$
$\tilde{Z}_i$: Region	Region where household lives	REG
$\tilde{Z}_i$: Municipal area	Location of home (municipal or otherwise)	$AREA$
$\tilde{Z}_i$: Home	Home ownership	$HH03$
Weights	Weights provided by the NSO	$A52$

Data codes for household socio-economic survey conducted in 2010 by the National Statistical Office.