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The Wealth Effect – Theoretical Foundations, Methods and Results

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Abstract

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The aim of the paper is to survey basic theoretical foundations, empirical methods and some results in the field of the wealth effect. The first part is devoted to theoretical foundations, especially to implications of the permanent income hypothesis for the relation of consumption and wealth. Basic methods of empirical research and some results are surveyed in the next part. The rest of the paper is devoted to more detailed issues, e.g. to a question whether it is useful for purposes of the research to distinguish kinds of wealth, to the problem of the sensitivity of the results and to the research based on microeconomic data.

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1. Introduction

Big changes in wealth evoke a question: what influence do changes in asset prices exert on consumption and other macroeconomic variables? Most economists focus on the effects of changes in financial wealth, which is due to the fact that this kind of wealth is generally more volatile and this is also due to the developments of financial markets in the US during the end of the eighties and mid-nineties. From 1989 – 1999, wealth of American households was increased by 15 trillion USD (see e. g. Poterba 2000), most of which was due to an increase in stock prices (mainly from 1995 – 1999). Therefore the wealth effect on consumption has attracted the attention of both theorists and economic policy makers (see e. g. Greenspan 1999, concerning the question of the extent the Fed should take the development of asset prices into account when making its monetary policy).

The aim of the paper is to survey basic theoretical foundations, empirical methods and some results in the field of the wealth effect. The first part is devoted to theoretical foundations underlying the relationship between wealth and consumption. In the following section, the basic methods and results of empirical research are presented. The remaining sections focus on special issues: to what extent it is useful to distinguish between different kinds of wealth, whether the wealth effect is direct or indirect and the problem concerning the hypersensitivity of empirical results.

2. Theoretical foundations

Identity (1) for wealth accumulation represents a link between wealth and consumption. The identity shows that there are essentially two channels through which the wealth of people can be increased: either a part of current income is used for accumulation or the value of the current stock of wealth is increased. Therefore it holds that:

$$W_t = W_{t-1} + (Y_t - C) + \Delta p_t \cdot W_{t-1} , \quad (1)$$

where W stands for net wealth (i. e. wealth adjusted for the value of liabilities) as of the end of a given period. Households do not usually have much influence on the change in their wealth that is implied by a value change because it depends on behaviour of others, i.

e. on macroeconomic processes that are out of the control of individual household. However, the amount of savings is directly determined by households and so the change in wealth can be divided in two items: an item determined by intentional actions of households (savings) and an item, which is determined exogenously from the point of view of a single household. Palumbo and Davis (2001) give an example of how the wealth increment was divided between net savings and capital gains in the US from 1995 to 1999.

Table 1: Contribution of Holding Gains to Net Worth (in bn of current USD)

	1995	1996	1997	1998	1999	1995-1999
Change in net worth	2765	2519	3714	3350	4659	17007
Net savings (Y - C)	350	344	244	367	323	1628
Change in net worth due to holding gains	2465	2114	3515	3012	4342	15448
Ratio of holding gains to total change in net worth	0,90	0,84	0,95	0,90	0,93	0,91

Source: Palumbo, Davis, 2001, p. 6

Basic theoretical foundations for exploring the relation between wealth and consumption in the post-war consumption theories began with Friedman's permanent income hypothesis (Friedman 1957), followed by various versions of the life cycle theory of consumption (e. g. Ando, Modigliani 1963). According to these theories, consumption in a given period can be described as a function of total wealth, which includes both human wealth (value of expected income flows) and all sorts of non-human wealth.

An important piece of information concerning a change in net worth is, however, whether the change was or was not anticipated. According to the life cycle theory of consumption, people may plan, for example, vast changes in their non-human wealth without much changing their consumption. So when exploring the wealth effect we are interested more in the impact of unplanned changes in wealth on consumption. For consumption it can be written that

$$C_t^* = b^* \cdot (H_t + W_t) , \quad (2)$$

where C_t^* stands for consumption implied by the life cycle hypothesis, b^* is an aggregated propensity to consume and H_t stands for human wealth. Real consumption C_t^1 , however, does not have to equal the planned consumption C_t^* due to time lags in households' decision making etc. Human wealth H_t is not observable and therefore a proxy variable \hat{H}_t is used instead. Therefore, the planned consumption implied by the life cycle theory using this proxy variable can also differ from the real planned consumption and it is necessary to denote it in a different way, say \hat{C}_t . The life cycle theory implies

$$\hat{C}_t = b^* (\hat{H}_t + W_t) \quad \text{and} \quad C_t = b^* (\hat{H}_t + W_t) + \varepsilon_t, \quad (3)$$

It must be mentioned that in accordance with the theory, consumption is equal to a roughly constant ratio of total resources but not to a constant ratio of particular wealth items. For example, the consumption to wealth ratio (C_t / W_t) falls if an increase in non-human wealth is not accompanied by a corresponding increase in human wealth. Reduction of the C_t / W_t ratio therefore cannot itself give an information whether the wealth effect is or is not present.

The life cycle hypothesis can be more deeply based with the help of a utility analysis and this way it can be incorporated within the standard neoclassical framework (see e. g. Starr-McCluer 1998). If we consider a logarithmic utility function of $U = \sum_{t=0}^T \delta^t \log C_t$, where δ stands for a discount factor and T represents expected number of the remaining years of life, we can show the explicit relationship between b^* and the real interest rate r .

The agent's budget constraint is that the present value of total consumption equals total wealth (including the present value of future income flows). Therefore it must hold that

$$\sum_{t=0}^T \frac{1}{(1+r)^t} C_t = W_0 + \sum_{t=0}^T \frac{1}{(1+r)^t} Y_t, \quad \text{where } Y_t \text{ denotes expected income in period } t. \text{ The first order condition for all } C_t \text{ is that } \frac{\delta^t}{C_t} - \lambda \frac{1}{(1+r)^t} = 0. \text{ From this it follows that consumption}$$

¹ It should be mentioned here that from a theoretical point of view it is correct to subsume durables under investment and not under consumption. Only the services rendered by durables in the given period should be classified as a consumption.

grows in a constant rate because $\frac{C_{t+1}}{C_t} = \delta(1+r)$ and therefore $C_t = \delta^t (1+r)^t C_0$. After

substituting into the budget constraint we get $C_0 \sum_{t=0}^T \delta^t = \frac{1-\delta^{T+1}}{1-\delta} C_0 = W_0 + \sum_{t=0}^T \frac{Y_t}{(1+r)^t}$.

On the whole, for optimal consumption it must hold that

$$C_t^* = \frac{(\delta^t - \delta^{t+1})(1+r)^t}{(1-\delta^{T+1})} \cdot \left(W_0 + \sum_{t=0}^T \frac{Y_t}{(1+r)^t} \right), \quad (4)$$

so that the coefficient $b^* = \frac{(\delta^t - \delta^{t+1})(1+r)^t}{(1-\delta^{T+1})}$, which determines the propensity to consume from total wealth, is a function of both the expected remaining life span and of parameters r and δ . The higher is r and the shorter is T , the higher is b^* .

This theoretical foundation also, however, has some disadvantages, for example, M. Starr-McCluer (1998) mentions some problems concerning uncertainty. If there is uncertainty concerning future income flows, households may create so-called precautionary savings, which will serve them as a buffer stock for potential fluctuations in consumption and income flows. Increase of wealth due to wealth appreciation therefore may only supplement the precautionary savings without exerting any substantial influence on consumption.

Also, the fact that the current change in the price of assets and, thus, in the value of wealth, may be only transitory and not permanent can mean that consumption will react only slightly. This objection, however, is weakened by a counter-objection: if households believed that e.g. an increase in asset prices is only temporary, they would try to sell the assets for this higher price. Households where they believe the asset prices are too high often transfer this part of their wealth into another form. These assets are bought directly or indirectly by those households that do not consider their prices to be high only temporarily. In general, asset-holding households that are persuaded about the temporariness of price changes disappear quickly and so it is difficult to say to what extent the asset price volatility influences the wealth effect.

Another potential complication is the bequest motive, which may cause the budget constraint not to be totally exhausted. This can be solved, however, by considering the bequests to be a special kind of consumption.

A more essential objection is a question, whether the behaviour of well-to-do households can be described well enough by the life cycle model. Wealth is usually distributed very unevenly in society. Poterba (2000) e. g. suggests that in 1998 1% of the richest American households held more than one third of net worth, whereas the lowest 80% of American households held only about 20%. As far as the property of stocks is concerned, the differences are even more striking: the richest 1% owned more than 50% of total stock wealth, while the lower 4 quintiles held only 4,1%. If the wealth effect is to be successfully described by means of the life cycle model, it is necessary that this model would describe satisfactorily the behaviour of very rich households. It is possible, though, that the wealth of the rich households enters their utility function directly in the sense that it is not only a means of achieving consumption but a goal in itself (e. g. for prestige reasons). This would obviously substantially reduce the wealth effect (increase of wealth would not imply higher consumption because the very wealth accumulation is the final goal).

Another question is whether changes in wealth on pension accounts and various long-term saving programmes should be included when exploring the wealth effect. Capital gains in these programmes have usually low liquidity but on the other hand they raise the trustworthiness of households for granting a loan. Also the households can in response to appreciation of their assets on their pension accounts raise consumption using their more liquid resources.

Time lag between a change in wealth and a subsequent change in consumption to the “right” level, liquidity constraints and ability of households to get interest payments from their assets are among other problems that the life cycle model must face.

3. Basic Methods and Results of Empirical Research

As it was already mentioned, when exploring the wealth effect, from the theoretical point of view, it is convenient to distinguish whether the wealth increase is temporary or

permanent. Of course, in reality this distinction is hard to make. M. G. Palumbo and M. A. Davis (2001) suggest a classification of wealth changes due to appreciation to changes of stock market wealth and to changes due to change of prices of other assets. Then they compare a long-term real yield rate with the actual yield rate in the given period (yields from the stock market wealth and from other forms of non-human wealth are treated separately). The difference between the long-term and actual yield is considered to be a windfall gain (loss), which should exert some influence on consumption via the wealth effect.

The propensity to consume from total wealth (i. e. including the human wealth) depends on the economy's demographic profile, on liquidity constraints and interest rates. How can it be estimated? Either it is possible to estimate it on the basis of these factors, which directly influence its value, but most authors estimate it using data about real level of consumption and households' resources.

As a proxy variable for human wealth is usually chosen such a variable, which is a multiple of the actual income, i. e. $\hat{H}_t = kY_t$, where k is a constant coefficient. After substituting into (3), we get for the consumption

$$C_t = aY_t + b^*W_{t-1} + \varepsilon_t \quad (5)$$

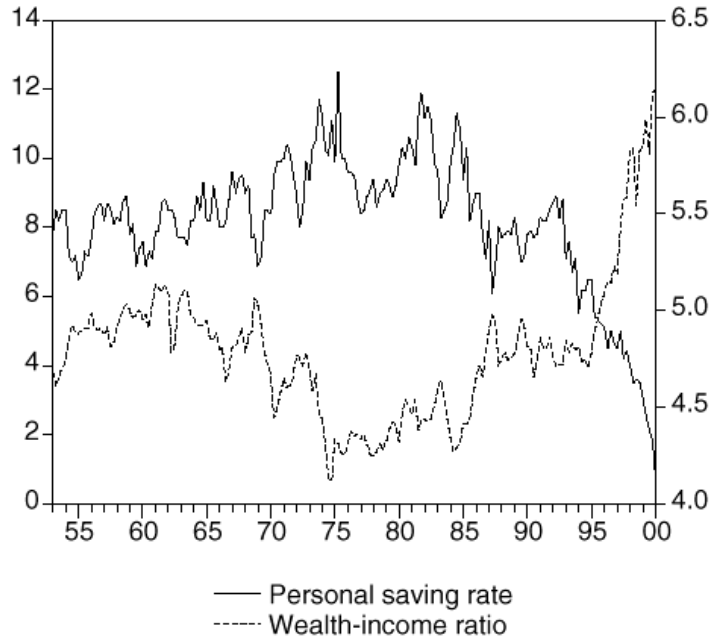
The proportionality of permanent income and current income is obviously untenable on an individual level. It can be retained, however, on a macroeconomic level if we assume that the economy's demographic structure is constant. A major disadvantage of the proportionality is that it eliminates the biggest achievement of the life cycle model, i. e. that the households smooth out their consumption despite transitory income fluctuations. One alternative way of estimating permanent income is by considering it a function of past real incomes.

Equation (5), however, cannot be tested using the OLS because the absolute value ε will gradually grow due to the upward trend of all three variables (simply it is non-stationary and therefore one of the basic assumptions of OLS is not met). The equation is detrended by dividing it by income

$$\frac{C_t}{Y_t} = a + b^* \frac{W_{t-1}}{Y_t} + \frac{\varepsilon_t}{Y_t} \quad (6)$$

The same set of facts can be explored, of course, by not observing the $\frac{C_t}{Y_t}$ ratio but by observing $\frac{S_t}{Y_t}$, i. e. the savings rate. In this case an inverse relation should be observed – the higher the ratio between wealth and income, the lower the savings rate.

Figure 1: Inverse Relation between the Personal Savings Rate and the Wealth to Income Ratio



Source: M. G. Palumbo, M. A. Davis (2001)

Logarithmic approximation can be used as an alternative, so it can be written:

$$\log(C_t) = \log(\hat{C}_t) + \varepsilon_t = c_0 + \alpha \log(Y_t) + \beta \log(W_{t-1}) + \varepsilon_t \quad (7)$$

Palumbo, Davis (2001) further suggest a distinction between transfer incomes Y^{τ} and other incomes $(Y_t - Y_t^{\tau})$ since the transfer income is usually received by households with a higher propensity to consume. The estimated equation is modified as follows

$$\frac{C_t}{Y_t} = a_1 + (a_2 - a_1) \frac{Y_t^{\tau}}{Y_t} + b^* \frac{W_{t-1}}{Y_t} + \frac{\varepsilon_t}{Y_t} \quad (8)$$

According to the research of Palumbo, Davis (2001) b^* equals roughly 4%. To what extent the wealth variable contributes to the fit of the model can be verified e. g. by setting b^* equal to 0 and re-estimating the parameters. If the standard deviation of the prediction errors is much higher without the wealth parameter, then it suggests that the wealth effect is significant for explaining the development of consumption.

Palumbo and Davis (2001) estimate the total wealth effect on consumption in absolute terms. They compare actual consumption with consumption that would have prevailed if income had developed in compliance with historical tendencies. According to the authors' view, the wealth effect was about USD 300 billion in 1999 and consumption was rising 1 percentage point faster in 1995-1999 due to the wealth effect. Other authors draw similar quantitative conclusions. Poterba (2000) considers 3% to be roughly the consensual level of the propensity to consume from wealth. These are, however, the long-term results.

Consumption observed in particular quarters of the year does not have to correspond to the values predicted by the life cycle model because e. g. there exists a time lag between the change in wealth on one hand and setting the new "correct" level of consumption on the other. In this case, though, there will be a tendency for error-correction, i. e. there will be a tendency for eliminating the difference between the theoretical and the actual value of consumption. After a one-off increase of wealth, for example, consumption will rise only gradually so that the wealth effect will manifest itself also only gradually but in longer terms the value of b^* will be approximate. If there were no error-correction tendencies for consumption, the equation (6) and (7) respectively could be retained by adjustment of income or of wealth. However, adjustment solely via income and wealth is against the established macroeconomic facts. If it were income that were to adjust, it would mean that a rise in stock market prices would imply a drop in future incomes, which is in contradiction with the general view that stock market prices can be considered a leading indicator of economic activity. If it were the wealth that is to adjust, it would imply that there is an easy way to predict the stock market fluctuations that is not exploited, which would stand in contradiction with rational behaviour.

Thus if there is in reality a tendency for error-correction of consumption, the consumption-income ratio and the percentage change of consumption between quarters will be

influenced by the gap between what is “planned”² and actual consumption in the preceding periods.

$$\Delta\left(\frac{C_t}{Y_t}\right) = \gamma_1 + \gamma_2\left(\frac{\varepsilon_t}{Y_t}\right) + \gamma_3 x_t + v \quad \text{OR} \quad \Delta \log(C_t) = \gamma'_1 + \gamma'_2 \varepsilon'_t + \gamma'_3 x_t + v' , \quad (9)$$

where ε_t stands for the difference between the actual and the planned consumption (ε'_t stands for the difference when using the logarithmic form) and x_t denotes other variables, which may in a short period influence the $\frac{C_t}{Y_t}$ ratio and the growth rate of consumption. If the coefficients γ_2 or γ'_2 respectively are significantly negative, it suggests a behaviour that can be considered to be an error-correction tendency of consumption. Palumbo and Davis (2001) e.g. conclude that $\gamma_2 = -0,15$ and $\gamma'_2 = -0,13$ using a specification that includes in x_t (among others) an index of consumption confidence, past consumption, unemployment and interest rates.

If households cannot smooth out their consumption because of liquidity constraints, then even an expected increase of income may be followed by a consumption increase. Increases in wealth, both expected and unexpected, also can have quantitatively different impacts than in case of absence of liquidity constraints. If the wealth increment has a liquid form, consumption can directly shift nearer to the smoothed level of consumption. If it has a non-liquid form, it may in some cases at least relax the liquidity constraints (e. g. an increase of real estate prices enables households to borrow more resources despite the fact that the real estates are not very liquid). Liquidity constraints therefore may lead to what is known as an “excessive” sensitivity of consumption with respect to income (excessive in comparison with the implications of the life cycle model). If the best possible prediction of income $\Delta \log(Y_t)$ is included in equation (9) (i. e. if $\Delta \log(Y_t)$ is substituted in the equation instead of the general variable x_t), we get

$$\Delta \log(C_t) - \gamma'_3 \Delta \log(Y_t) = \gamma'_1 + \gamma'_2 \varepsilon'_t + v' \quad (10)$$

² The term “planned“ denotes here the value of a variable, here of consumption, in compliance with given long-term predictions.

If there is an excessive sensitivity, then the error-correction characterised by the coefficient γ'_2 will be the higher, the higher will be the instantaneous response of consumption on income, i. e. the higher will be γ'_3

4. Distinction between Different Kinds of Incomes and Different Kinds of Wealth

There is a question whether a more detailed distinction of different kinds of incomes and mainly a more detailed distinction of different kinds of wealth would bring better results than the aggregated approach. Ludvigson and Steindel (1999) distinguish already in the basic equation between the permanent income³ YP and the household's wealth.

$$C_t = a + b \cdot W_t + c \cdot YP_t + \varepsilon_t, \quad (11)$$

In comparison with equation (3), the coefficient c and b can differ from each other. The authors mention that there does not have to be very deep theoretical reasons for the distinction of wealth into many items and for different propensities to consume. The difference in coefficients can be only an artefact due to aggregation. Different kinds of wealth are unevenly distributed among different households and it is therefore possible that, e. g., the stock market wealth is held by population with an age structure different from the average, with a subjective discount factor different from the average one etc.

As far as any distinction of different kinds of incomes is concerned, transfers can be sorted out (see equation (8)) because a higher propensity to consume can be expected in these cases. From the theoretical point of view it is convenient to sort out the property income from total real income. Value of human wealth should be approximated with the help of current working income so that human wealth would be overestimated when using total income (including property income) for approximation.

³ The authors suggest treating permanent income as a weighted average of past incomes (the further in the past the income belongs, the lower its weight)

Non-human wealth can be also classified into several items according to different properties of the assets, especially with regard to their liquidity. Palumbo, Davis (2001), for example, classify the non-human wealth into two groups: the stock market wealth and the rest. After making a distinction between working and property income they estimated the following equations

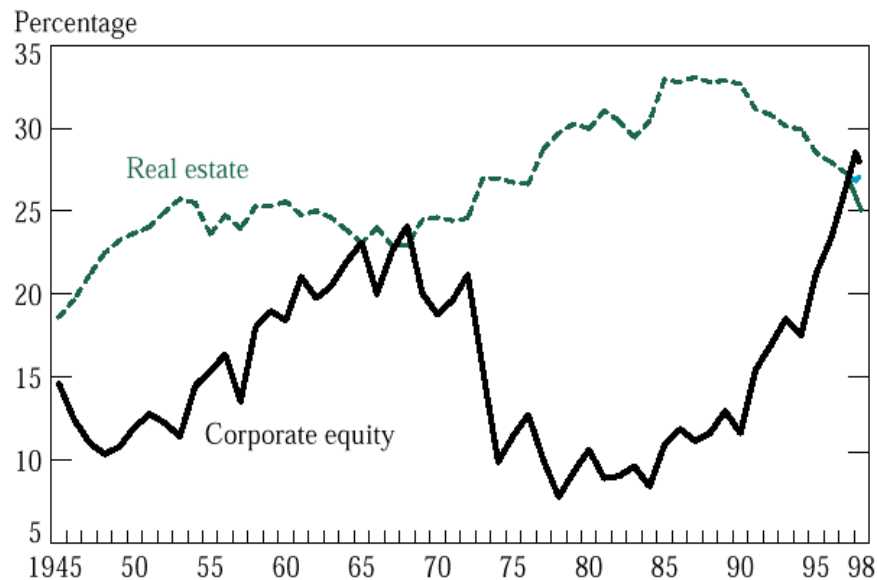
$$\frac{C_t}{\tilde{Y}_t} = a_1 + (a_2 - a_1) \frac{Y_t^s}{\tilde{Y}_t} + b_1 \frac{W_{t-1}^s}{\tilde{Y}_t} + b_2 \frac{W_{t-1} - W_{t-1}^s}{\tilde{Y}_t} + \frac{\varepsilon}{\tilde{Y}_t} \quad (12)$$

$$\log(C_t) = c_0 + \alpha \log(\tilde{Y}_t) + \beta_1 \log(W_{t-1}^s) + \beta_2 \log(W_{t-1} - W_{t-1}^s) + \varepsilon' \quad (13)$$

where \tilde{Y}_t stands for income after adjusting for the property income and W_{t-1}^s denotes stock market wealth. Consequences of the wealth classification into more items are not conclusive according to Palumbo and Davis (2001). It seems, though, that the influence of stock market wealth fluctuations is mitigated while other assets' price fluctuations gain influence. Unambiguous is the impact of sorting out the property income due to which total wealth effect is substantially strengthened.

Real estates represent a special kind of non-financial wealth, which is sometimes singled out. In most countries (including the US) it is true that they have a bigger share in portfolio than the stocks (see e. g. Tracy, Schneider and Chan (1999)). Furthermore real estate prices are much less volatile than stock market prices, so perhaps wealth effects due to changes in real estate prices should be treated separately.

Figure 2: A comparison of the share of real estate and stocks in terms of American household portfolios



Source: Tracy, Schneider a Chan (1999), p. 2

Lower volatility of real estate prices in comparison with stock market volatility suggests that the marginal propensity to consume out of real estate wealth could be higher than in the case of stock market wealth. Empirical research, however, has not given a clear answer to this. According to Girouard, Blondal (2001) the marginal propensity to consume from real estate wealth is more likely to be smaller than financial wealth. One of the possible causes of this finding is a much lower liquidity in the real estate market. Furthermore, an increase in net wealth due to a rise in real estate prices is probably at least partially balanced by a rise in implicit rents. This objection holds even in the case of households with a mortgage. However, there is obviously a bigger potential for the wealth effect if the household has a mortgage because a change in real estate prices implies a larger change in the household's net wealth.

The structure of stockholders may differ from the structure of real estate owners regarding age and their subjective time preference, which may also cause the marginal propensity to consume to be different for different kinds of wealth. Higher real estate prices imply that households have higher chances of receiving credit. This, however, is understood as a

credit channel of asset prices rather than a direct wealth effect (see e. g. Boone, Giorno, Richardson (1998)).

Further classification within the field of financial wealth is possible. The question is whether the effect of a change in stock prices is the same if the stocks are directly held as if they are held by a mutual fund. This question is taken into consideration e. g. by Poterba and Samwick (1995). According to them, responses could differ with different forms of investment not only because of different levels of liquidity but also because of lack of information when investing via a pension fund. In their empirical research, they concluded that the shift from direct holding to indirect holding of corporate shares, which is currently taking place in the US, probably does not influence the strength of the wealth effect.

There are also doubts as to whether wealth changes in pension accounts should also be included despite the fact that resources of pension accounts have for most people very low liquidity. Some authors estimate the wealth effect both in presence and in absence of the pension programmes (see e. g. Maki, Palumbo 2001). Poterba, Samwick (1995) show, however, that despite the aforementioned low liquidity, consumption of those who have resources in pension funds is more closely correlated with stock market development than with consumption of those who do not have resources on pension accounts. This speaks in favour of inclusion of the pension accounts wealth in total wealth.

The distinction of causes of stock market changes probably does not improve the results. Poterba, Samwick (1995), when analysing whether the source of stock market fluctuations matter, tested the following equation

$$\Delta \log C_t = \alpha_0 + \alpha_1 \Delta \log P_{t-1} + \alpha_2 \Delta \log D_{t-1} + \varepsilon_t, \quad (14)$$

where D_t stands for dividend payments. If the stock price influenced consumption only in the case that the dividend-price ratio does not change⁴, the coefficient α_2 would have to be significant. On the contrary, if the source of the stock price change does not matter, a change in the stock market wealth will influence consumption in the same way even if there is no increase in dividend payments and the α_2 coefficient should be insignificant.

⁴ Constancy of the dividend-price ratio or of the P/E ratio suggests that the price change is fundamentally based

Similarly instead of D_t , one can test the influence of profit-per-share. According to Poterba, Samwick (1995) the wealth effect is not dependant on the source of the stock price movement, and is the same whether or not it is accompanied by a change in either the P/E ratio or in the dividend/stock price ratio.

5. Microeconomic View, Direct and Indirect Wealth Effect

Regressions of equations similar to (6) can be interpreted in the sense that they are telling us how much consumption will change in response to a change in income and wealth only if the causality runs from income and wealth towards consumption. However, causality in the opposite direction is also thinkable. Development of non-human wealth can also be perceived as a leading indicator of income and consumption and in this sense it could be perceived as a consequence, and not a source, of income and consumption. The error-correction tendency mentioned above suggests, nevertheless, that there is causality running from wealth towards consumption. This, however, does not prove that there is at the same time no causality in the opposite direction, nor does the error-correction tendency itself indicate, in which direction the causality is more important.

Direction of causality is a subject e. g. for Otoo (1999). Using microeconomic data – she starts with the fact that the consumer sentiment index is correlated with the stock price index - it seems that causality runs from stock prices to consumer sentiment and not the other way round. If stock market changes signal future changes in income, then consumer confidence should change in the same way, not only for stockholders' households but for households who do not own stocks. On the contrary, if a stock price change is perceived rather in the same way as it is treated within the traditional wealth effect, consumer confidence should respond in proportion to the ownership of stocks. However, using microeconomic data there is yet another issue: the portfolios of individual households may change differently from changes in the stock market index as a whole, unless the household invested directly in index.

Otoo (1999) concludes that the consumer sentiment index responds similarly to stock market development depending on whether a household owns shares or not. The consumer

sentiment index, which was constructed for individual households on the basis of their answers to 5 qualitative questions, is itself problematic. Otoo (1999) argues in favour of the hypothesis that the stock market wealth has rather a signalling effect by saying that the microeconomic data show the development of stock prices to be closely connected with expectations concerning the economy as a whole. It is much less connected, however, with the expectations of private material situations and it is not significantly connected with expectations of potential unemployment. What does matter for a consumer when making a decision about private consumption, however, are expectations about his or her private financial situation, not the situation of the economy as a whole. If e. g. an expected macroeconomic boom is not accompanied by expectation of an improvement in the situation of a given household, then this household cannot be expected to change its consumption behaviour. The explanation by Otoo (1999) therefore, in my opinion, explains the correlation of the stock market index and the consumer sentiment index, on the other hand it casts some doubts over the relationship between the consumer sentiment index and consumption.

Maki, Palumbo (2001) also try to test causality direction and they also use microeconomic data. As against Otoo (1999) they do not use a problematic link in the form of the consumer sentiment index, instead they try to test directly whether individual savings rates dropped most in those households, who had the highest capital gains. If that is the case and if, on the contrary, the savings rate did not change much in households who did not benefit from the stock market rise, then it testifies in favour of the direct wealth effect. Maki and Palumbo (2001), who observed personal savings rates in the US in the nineties, used the following procedure: they separated households into groups that differed in their income and level of education. When classifying households with respect to income, they observed which portion of total assets corresponds to which particular quintiles. It is no surprise that particular kinds of assets and total assets as well are distributed disproportionately among the quintiles and the disproportionality of wealth distribution is even bigger than in the case of income distribution. Households belonging to the highest income quintile owned more than 80% of corporate shares, but they also had a more than 75% share in mutual funds and a more than 75% share in state securities.

When separating the households into income groups there is, however, a minor complication: some households do not stay in the same quintile for entirety of the period under consideration. This blurs the results because the aim is to find out in which direction and how much the personal savings rate changes due to wealth changes. But using this method we do not observe the savings rates of individual households, but the savings rates of particular quintiles. Therefore, we would need the households to stay within the same quintile. For this reason, Maki and Palumbo (2001) separated households into "educational groups". Given this criterium, one can assume that transfers between educational groups is quite small. They tested the following equation

$$\frac{S_{j,t}}{Y_{j,t}} = \beta_0 + \beta_1 \frac{NW_{j,t}}{Y_{j,t}} + \gamma_j + \delta_t + \varepsilon_{j,t} , \quad (15)$$

where the personal saving rate $\frac{S_{j,t}}{Y_{j,t}}$ for particular groups (index j denotes income quintiles or educational "cohorts" respectively) is a dependent variable and net wealth to income ratio $\frac{NW_{j,t}}{Y_{j,t}}$ is an independent variable. Equation (14), moreover, makes it possible for particular quintiles or educational "cohorts" respectively to have different savings rates disregarding the net wealth-to-income ratio⁵. This is due to γ_j , which is a coefficient of a dummy variable, which equals 1 where group j is concerned and 0 otherwise.

Table 2: Wealth Changes and Rate of Personal Savings

Rem.: Data do not include pension plans	Net Wealth to Income Ratio			Rate of Savings		
	1992	2000	Rozdíl	1992	2000	Differences in percentage points
The Highest Income Quintil	5.36	7.07	1.71	4.9	-4.4	-9.3
The Lowest Income Quintil	3.29	3.85	0.56	2.1	4.4	2.3
The Highest Educational Group	4.91	5.94	1.03	4.6	-1.5	-6.1
The Lowest Educational Group	1.74	1.97	0.23	1.1	2.8	1.7

Source: Maki, Palumbo (2001)

⁵ This leaves space for potential differences as to saving preferences of particular income or educational groups.

Results by Maki and Palumbo (2001) suggest that reduction in the aggregate rate of savings can be successfully explained in reference to the direct wealth effect. Whereas in the cases of households, which did not experience changes in net wealth-to-income ratios due to the stock market rise, there was no drop in their savings rates (on the contrary, there was a rise). As for the households from higher income and educational groups which experienced a growth in $\frac{NW}{Y}$ ratio, the savings rates dropped all the way down to negative values (see table 2).

This microeconomic analysis may seem to limit the relevance of objections against the wealth effect that were based on the fact that the wealth is distributed very unevenly and that rich households (which are the most influenced by changes of asset prices) have high personal savings rates and therefore the wealth effect is quantitatively unimportant. It is true that rich households are the ones that are particularly concerned, but it seems that even these households change their savings rates in line with the life cycle model.

Starr-McCluer (1998) also uses a microeconomic approach. What is interesting is that 85% of households responded negatively when asked whether they had changed their consumption behaviour due to price changes in their portfolios. Only 3,4% admitted that they increased their consumption due to stock price rises. However, roughly the same number of households responding had reduced their consumption in order to have additional resources for investments. A possible explanation is that in line with theory, the wealth effect is not quantitatively very important on a personal level, and, therefore, the households do not take it into account in their responses. If a household owns e. g. a stock wealth that amounts to a year's income, and if the year-by-year growth rate of the stock market is, say, 20% and the propensity to consume is about 3,5%, then consumption increases due to wealth effect only by 0,7%.

Poterba, Samwick (1995) try to decide whether wealth effect is direct or indirect. They explored the correlation between stock market development and luxury goods. The idea is that because of the disproportionate distribution of joint stock wealth in favour of the rich ones, stock market rises should lead to a higher demand for luxury goods. They test equation

$$\log\left(\frac{L_t}{C_t}\right) = \alpha_0 + \alpha_1 \log\left(\frac{L_{t-1}}{C_{t-1}}\right) + \alpha_2 \Delta \log P_{t-1} + \varepsilon_t, \quad (16)$$

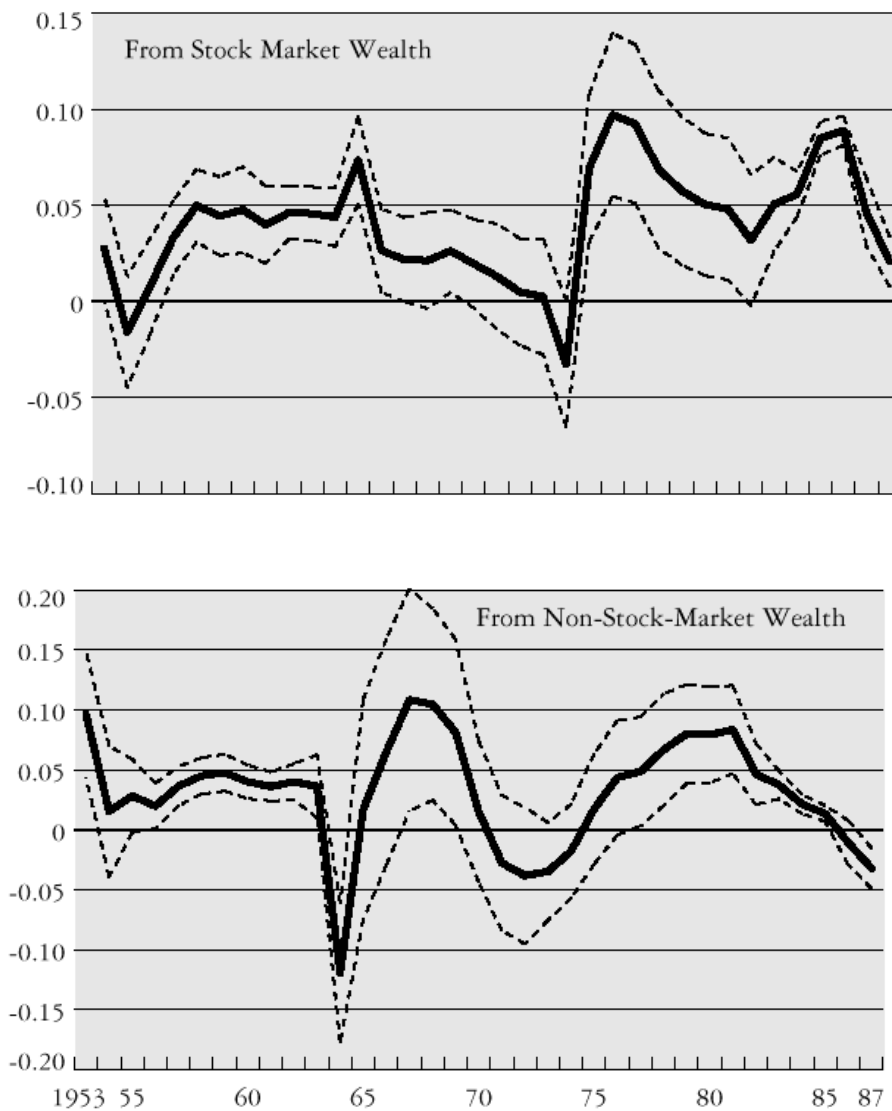
where L_t denotes expenses for certain goods categories (e. g., cars). The coefficient α_2 tells by how many percent a share of the given category in total consumption changes due to a percent change in stock prices. However, results of their analysis are ambiguous. Shares of some items, like e. g. cars, really grow after a stock market rise but a more detailed decomposition of the car item into luxury and other cars makes the results somewhat dubious. In the cases of many other items like entertainment and education, the null hypothesis cannot be rejected. So their results speak rather in favour of the indirect wealth effect.

6. Sensitivity of Results

There is a weak point in empirical research of the wealth effect. It is the high sensitivity of measured marginal propensities to consume to the chosen period, to consumption function specifications etc. This is also mirrored by the size of an interval of the measured marginal propensity to consume (Poterba (2000) posits 3% as a consensual value but the results by various authors range commonly from 1 to 5%).

Ludvigson, Steindel (1999) point to the problem of sensitivity. When testing the equation $C_t = a + b \cdot W_t + c \cdot YP_t + \varepsilon_t$ (see equation (11)), the authors performed a regression using also lagged variables with lags ranging from 1 to 3 quarters for the time period of 1953 to 1997. The coefficients are very sensitive to the chosen period. To illustrate, they rolled the regressions for a ten year period (i. e. they did a regression for 1953-1962, 1954-1963, etc.) and then compared the coefficients. Surprisingly, even if the chosen periods are close overlap to a big extent, the coefficients can differ substantially (see figure 3, where the year in the figure is always the first year of the decade under observation).

Figure 3: Marginal Propensity to Consume from Joint Stock and Other Wealth in Ten Year Periods



Source: Ludvigson, Steindel (1999), s. 34

If a regression was made e. g. only for period 1973-1982, it would lead to the conclusion that there was no such a thing as a wealth effect from joint-stock property. The same could be said about the wealth effect from other than joint-stock property e. g. in period from 1985 to 1994. On the contrary, in some years the regressions imply that the marginal propensity reaches up to 10%. All this indicates that there is a lot of uncertainty as for the quantitative importance of the wealth effect.

Poterba, Samwick (1995) suggest that a change in consumption due to the stock market fall in the last quarter of 1987 was much smaller than it could have been expected given the usual propensity to consume of about 3% (see table 3).

Table 3: Consumption and Stock Market Prices in 1987-1988 in the US

Quarter	Stock Price Change (in %, q-o-q)	Change in Total Consumption (in %, q-o-q)	Change in Consumption of Durables (in %, q-o-q)
1987: 1	14.8	-0.2	-6.7
1987: 2	1.9	1.0	3.2
1987: 3	4.6	0.7	3.3
1987: 4	-29.0	-0.3	-3.4
1988: 1	9.1	1.5	4.7
1988: 2	1.6	0.4	0.2
1988: 3	-2.3	0.5	-1.0

Source: Poterba, Samwick (1995), p. 340

As for total consumption, the null hypothesis cannot be rejected, i. e. it is possible that the stock market fall of 1987 had no effect on total consumption. However, the fluctuation had some impact on consumption of durables. Probable reasons for such a relatively small response of total consumption were that the financial crisis lasted for only a short time and also the drop in stock prices was to a big extent a correction of their previous sharp rise at the beginning of 1987.

7. Conclusion

There has been a lot of discussion about whether there is really such a thing as a wealth effect at all (see e. g. Poterba (2000)). However, this discussion is misleading because the wealth effect is necessarily implied as a consequence of the budget constraint. If an agent's budget constraint is increased, the agent either increases his or her consumption or transfers the resources to other users (charities, state, heirs etc.). The doubts surrounding the wealth effect, however, suggest that its quantitative importance is not very big. Therefore, the wealth effect as a subject of economic theory and policy is revived only in times of substantial fluctuations in asset prices. In spite of problems of high sensitivity of results, it can be said that the quantitative implications of the wealth effect are roughly in line with predictions of the modern theory of the consumption function. Another question is whether higher wealth leads directly to higher consumption, or whether higher asset

prices signal potentially higher incomes in the future and it is this expectation concerning incomes that raises consumption. Microeconomic data has shown, that consumption increases only with families who benefit from rises in stock prices. This supports the direct wealth effect. Classification of assets into several categories is not very conclusive concerning whether the wealth effect is the same for different kinds of assets.

Obviously, there are a lot of subjects for future research in this field, such as whether agents' responses are as fast and quantitatively important in cases of wealth-decline as they are in cases of wealth-increase. Another theme could combine the wealth effect with asset-price-changes due to credit channel of transmission etc.

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